TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D.
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Managing Editor: William Amt

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Aguilar, A.M.; Schaeffer, C.; and Spain, P.L. "BOLIVIAN MOTHERS CLUBS AS MEDIA: BUILDING ON COMMUNITY-BASED NETWORKS." Journal of Rural Health, January 1988, vol. 4, 23-28.

Summary

Because of Bolivia's high infant mortality rate, health officials sought effective ways to get information about ORT to Bolivian mothers, especially to those in rural areas who have little or no access to health facilities. They decided to capitalize on the existence of a network of mothers clubs throughout the country, which had been established by Caritas Boliviana to distribute food supplements. A three-year project is now attempting to transform these clubs from passive recipients of surplus food to active agents of health education.

The project combines face-to-face instruction of club members in diarrhea case management with distribution of ORS packets and a mass media strategy involving radio, flipcharts, and flyers. Preliminary evaluations suggest that the project has been successful in increasing the awareness of ORT among participants, the availability of ORS, and knowledge about diarrhea management. Moreover, informed club members were found to be sharing their knowledge with non-member mothers. The lesson to be learned is that health planners must use existing structures, especially when access to public health facilities is limited; and that both personal and mediated communication channels should be used.

Editorial Comment

This article reminds us that there are multiple avenues which may be pursued to inrease ORT access and use and improve home management of diarrhea. Diarrheal disease control programs often focus on the government health care delivery system when in fact this strategy limits coverage, sometimes severely, and hence limits potential outcomes. The private sector is often relatively ignored, even when it is the source of a significant proportion of health care. In Bolivia, the Caritas mothers clubs were a "window of opportunity" to disseminate messages about diarrhea management. This model can be tried in other country settings, particularly where the public health care infrastructure is weak, or where tghe private sector is better geared to reaching mothers at the grassroots level.

The role of education in diarrhea programs is to change behavior. The authors point out that using multiple channels of communication and continuing the input over time may be necessary to bring about behavioral changes. Based on the experience of numerous countries, it is now generally agreed that a mix of mass media, print, and face-to-face channels is more effective, and that these efforts must be continued. One medium is not enough. One campaign is not enough.

Educational efforts, whether administered through public or private sector channels, require supervision

and encouragement by program staff. The article does not discuss the level of supervision required to sustain the efforts of the mothers clubs in diarrhea management, but this is an area which must be given close attention. Unfortunately, many government programs are reluctant to "supervise" or support private delivery efforts, feeling that "it's not our business." If the public is receiving care from private sources, and the government is responsible for the public's health, then it is "our business." We need to seek better ways for government to collaborate with the private sector. In the program reported here, the private sector worked mostly on its own. We cannot depend on that happening elsewhere. (RSN)

Coreil, J. "INNOVATION AMONG HAITIAN HEALERS: THE ADOPTION OF ORAL REHYDRATION THERAPY." Human Organization, 1988, vol. 47, 48-57.

Summary

While programs to integrate traditional healers into modern health care activities are frequent and have been thoroughly studied and reported, little is known about the independent adoption of modern medical practices by folk practitioners. This study examines differential knowledge and use of ORT among four categories of healers: midwives, herbalists, shamans, and injectionists, in a country where national efforts to promote ORT have been taking place for about one year. Both survey and ethnographic data were used.

When asked about the common causes of diarrhea in children, healers of all types mentioned food, gaseous indigestion, mother's milk, teething, germs, and other illnesses. Diarrhea was found to be most often treated with a wide variety of herbal teas. Only 51% of the healers knew about ORT, and only one-third had prescribed it. Forty-one percent of the healers knew the home recipe for ORS, about the same as mothers. Midwives and injectionists were significantly more knowledgeable about ORT, thinking about diarrhea in terms of dehydration, and were more involved in dissemination of the technique than were herbalists and shamans. The more educated healers with heavier caseloads were more likely to have heard of ORT, as were female healers.

Healers indicated an interest in collaborating with the government's ORT program. While health officials are willing to collaborate with midwives in CDD programs, they are unwilling to establish a formal role for injectionists, an occupation which most feel should be discredited.

Editorial Comment

Like the mothers clubs in the report from Bolivia above, traditional healers are a potential alternative channel for reaching the public. In Haiti, a traditional remedy for diarrhea is the "rafrechi" or refreshing drink to cool the body, which is similar to ORS. Many of the healers had substituted the new ORS for the traditional rafrechi in their diarrhea treatment recommendations. One injectionist had purchased a stock of ORS himself from a grocery store and had demonstrated its preparation and use to parents.

The differences in explanatory models of diarrhea and the role of ORT between midwives and injectionists (hydration) compared to herbalists and shamans (cure/fortify) suggests that it may be useful to explore these models with a sample of the target group before designing an educational program for that group. This study is a useful model for that kind of exploratory study. (RSN)

Stanton, B.; Clemens, J.; Aziz. K.M.A.; et al. "COMPARABILITY OF RESULTS OBTAINED BY TWO-WEEK HOME MAINTAINED DIARRHOEAL CALENDAR WITH TWO-WEEK DIARRHOEAL RECALL." International Journal of Epidemiology, 1987, vol. 16, 595-601.

Summary

To determine whether a home-maintained calendar of diarrhea episodes is comparable to recall interviews in a developing country, the authors studied approximately 1,500 families for six months in Dhaka, Bangladesh. A record of the presence or absence of diarrhea was obtained by two approaches for each child under six years: a two-week health recall interview administered by a trained interviewer, and a two-week health calendar maintained by the primary caretaker of the children in the home.

The two methods were highly comparable. The comparability was not impaired by lack of maternal education or by increased numbers of children in the household. The health calendar appears to be a potentially reliable substitute for two-week health recall and offers the advantages of being less expensive for a project and more convenient for the mother.

Editorial Comment

As the article points out, there are a number of ways to measure diarrheal morbidity. None are ideal because all face the need to compromise between approaches which will increase accuracy and the need to keep logistic demands realistic. There have been studies reported from Brazil, Nigeria, and now Bangladesh which have used a "diarrhea diary" to examine diarrhea incidence. The Bangladesh study suggests that these diaries provide information which is comparable in quality to the method more commonly used to collect this information, the two-week

recall interview. The article points to a number of problems with the two-week recall method (overburdening respondents with frequent interviews, absenteeism, and personnel costs). Before suggesting that diarrhea diaries are a good alternative to the recall method, it is important to realize that the diaries have a similar set of problems.

In Nigeria, it was found that diaries required many person-hours of supervision, both by community residents selected for this purpose and by the research staff, and a high level of motivation among the mothers. The community supervisors in the Nigeria study required payment, although this may not be necessary in some country situations. This level of continuing supervision over one or more years (to detect seasonal variation and/or to measure impact) must be recognized at the outset.

A definite advantage of actively involving mothers in the collection of diarrhea information and of close interation between mothers and supervisors is that this provides a good opportunity for educating mtohers about diarrhea and its managment.

In this study, the person collecting the diaries at the two-week period also conducted a recall interview. While this was done for research purposes, it is likely that the mothers were stimulated to be more consistent in recording by knowing that their notes in the diary would be checked against their recall information. Thus, the method in that sense was more than the use of the diary alone.

It is clear that at present, longitudinal diarrhea measurement of diarrheal incidence is a demanding research activity, not a routine activity which should be undertaken by every diarrheal disease control program. Where country programs need or want baseline and follow-up determinations of diarrheal morbidity, they can turn to the WHO sample survey methodology using one two-week recall period with seasonal adjustment. (RSN)

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Nagaty, A. "IMPROVING ORAL REHYDRATION SALT INVENTORY MANAGEMENT IN RURAL HEALTH FACILITIES IN EGYPT." Socio-Econ. Plann. Sci., 1988, vol. 22, 15-22.

Summary

"In 1984, an operations research study to identify problems in the distribution of oral rehydration salts (ORS) to rural communities of Egypt pointed to the need for improved inventory management. Estimation of ORS demand and, subsequently, production plans, were based on epidemiologic rather than demand data. As a consequence, ORS packets were overstocked at the government rural health system drug stores. The last phase of the study ... addressed the problem of improving the flow of ORS inventory information; the objective was to develop an analytical tool that could be used at the periphery for inventory management.

ORS inventory data were obtained from a sample of health facilities and analyzed during two alternative mathematical inventory models. One of them, a cost-based model, proved inappropriate. The other, consisting of a set of equations relating both inventory and safety stock to six key varialbles, produced valuable insights into the inventory system dynamics. A simplified periodic ordering scheme was developed based on this model, and is currently being tested in two regions. This scheme is applicable to all levels of the ORS distribution system, and could be applied to other pharmaceutical items as well." (Reprinted from the article, p. 15.)

Editorial Comment

Distribution of ORS, inventory management at central stores and at peripheral health facilities, and ORS stock-outs at the community level are three critical problems which tend to be ignored in many diarrheal disease control programs. This is unfortunate because breaks in the chain of distribution and lack of ORS when it is needed have been the cause of program failure in a number of locations.

This report describes the data collection process, complete with rather complex mathematical models, which was used to analyze Egypt's ORS distribution situation. It is the sort of process that most countries need, in which factors such as lead-time needed between orders and delivery, shelf life of ORS, costs of ordering and holding ORS, and acceptable levels of stock-out are all taken into consideration. The program set a figure of 1% as the maximum fraction of service days when ORS could be short. That decision, in fact, says that stock-outs are not acceptable. We agree.

The calculations led to a simplified monthly ordering system with a one-month safety reserve; this is appropriate in Egypt because local production of ORS keeps lead-times short. The ongoing trial should prove if this scheme will work, as measured by whether it gets used by facilities in their ordering (seen from reports), whether it lowers the amount of

ORS kept in stock unnecessarily at unnecessary cost, and whether the stock-out frequency stays below 1% of service days.

A similar analysis and trial approach can be recommended for all national ORS distribution systems, particularly those which attempt to distribute ORS to community stocks (village depots) beyond the health facilities of the formal health system. (RSN)

Nathoo, K.J.; Glyn-Jones, R.; and Nhembe, M. "SERUM ELECTROLYTES IN CHILDREN ADMITTED WITH DIARRHOEAL DEHYDRATION MANAGED WITH SIMPLE SALT SUGAR SOLUTION." Central African Journal of Medicine, August 1987, vol. 33, 200-204.

Summary

Since 1982, the policy in Zimbabwe has been to use home-based sugar-salt solution (SSS) for both prevention and management of dehydration. A study was carried out at Harare Central Hospital to assess the type and prevalence of electrolyte abnormalities in 121 dehydrated children who had previously been managed with oral SSS.

The authors found 38 cases of hypokalemia (27.5%), 12 of hyponatremia (8.9%), 5 of hypoatremia (5.5%) and 65 (45.7%) of severe acidosis (bicarbonate level <10 mmol/l). Only one of the patients' mothers did not know a recipe for SSS. Seventy-eight percent were able to give correct recipes. The authors concluded that SSS should be used for prevention of dehydration; but in cases of established dehydration, the WHO complete formula is more appropriate for combatting hypokalemia and severe metabolic acidosis.

Editorial Comment

This report makes SSS appear less effective than it is. The patients reported on were a highly select group, all of whom had moderate to severe dehydration despite use of SSS, and had had diarrhea for a mean of 3.1 days. Also, of 524 patients referred for treatment by other clinics, only 138 had serum electrolytes estimated, doubtless the sicker ones.

While 121 of these were "SSS treatment failures," the rate of hypokalemia, hypernatremia, and acidosis reported are not representative of all children with diarrhea, all children treated with SSS, or even all children referred for hospital treatment. Clearly, as the report so effectively proves, patients with more active diarrhea who become dehydrated need replacement of bicarbonate and potassium, as well as NaCl and water. But we should not conclude that SSS is not good medicine, only that it is not ideal for treatment over more than a couple of days in patients with more active diarrhea.

The report provides enough proof to convince policymakers in Zimbabwe to introduce complete formula ORS for management of dehydrated patients, while retaining SSS for prevention of dehydration. For countries where ORS is already available, the report points out the need for us to do a better job in our communications efforts of informing mothers to bring their children for ORS when they get worse (despite home fluids or SSS), or when diarrhea is heavy for more than two days. Where SSS is promoted, we must be careful that mothers do not become overly reliant on SSS--and thus overly "self-reliant"--and fail to bring to medical attention the child who needs the more effective glucose of standard ORS rather than the sucrose of SSS, and who needs potassium and bicarbonate replacement.

Two additional points need to be made. First, while breastfeeding and administration of solid foods were continued in all but two children during the diarrhea, I wonder how much of these the children received. I suspect that the rate of failure of home therapy and the incidence of hypokalemia are higher in children who take in less food, either because their mothers don't offer it, or they are not hungry and refuse it.

Second, no effort was made to find out how much SSS the mothers actually gave their children. I have talked to too many mothers who say they gave SSS or ORS, but on more detailed questioning, they gave only a few spoonfuls. Were these patients SSS failures or inappropriately treated by their mothers? (RSN)

Nwoye, L.O.; Uwagboe, P.E.; and Madubuko, G.U. "EVALUATION OF HOME-MADE SALT-SUGAR ORAL REHYDRATION SOLUTION IN A RURAL NIGERIAN POPULATION." Journal of Tropical Medicine and Hygiene, 1988, vol. 91, 23-27.

Summary

A team of pediatricians and UNICEF officers in Nigeria developed standardized local measures and instructions for preparing a sugar-salt solution for use in the home. This study assessed the reproducibility of the recommended method and determined the accuracy and variability of the composition of solutions prepared by illiterate mothers after receiving instructions on preparation of the solution.

The study's results confirmed those of the earlier standardization team in regard to granulated and table sugar. However, with the study's mean weight of one salt measure was about 20% greater than that

of the standardization team. Spoon size and levelling technique might explain the discrepancy, though differences in salt type may be more likely.

Analysis of home-made solutions prepared by forty illiterate mothers showed that 60% made accurately composed solutions. The others made hypertonic solutions. Again, salt type, spoon size, and levelling technique were possible causes of their errors. The tendency to prepare hypertonic rather than hypotonic solutions may be culture-based as well as a reflection of natural maternal instinct. The authors conclude that health education in Nigeria should emphasize the danger of feeding a hypernatremic solution to a dehydrated child.

Editorial Comment

This article is another report in an increasing series of reports which highlight the difficulty many mothers have in preparing safe sugar-salt solutions and the need for ongoing reinforcement of messages on preparation of such solutions.

Concern about possible mixing errors has prompted WHO to recommend that SSS be mixed to give sodium concentrations in the 30-80 mmol/l range. The reasonableness of this approach is evident in the Nigerian study reported here. The Nigerian recipe for SSS aims for a sodium concentration of 45-70 mmol/l. Even so, the study found that some 40% of mothers mixed solutions with sodium levels above the upper limit of this range, with 12.5% of mothers mixing solutions with sodium concentrations above 120 mmol/l.

While a sodium level of 120 mmol/l is not in itself necessarily cause for alarm and probably would not be associated with clinical hypernatremia, the results of this study are worrisome in that the mothers were given "repeated demonstrations" on the mixing of SSS and even then, many had problems with the recipe. This suggests that ongoing intensive education of mothers, using reinforcing channels of communication, may be required to teach mothers how to prepare a solution such as SSS where multiple new instructions must be learned. The difficulty which many diarrheal disease control programs will likely have in achieving this level of effort has caused WHO to suggest that home fluids which do not require mothers to carry out complex new tasks may be better for promotion than SSS. (RSN)

Rowland, M.G.M.; Rowland, S.G.J.; and Cole, T.J. "IMPACT OF INFECTION ON THE GROWTH OF CHILDREN FROM 0 TO 2 YEARS IN AN URBAN WEST AFRICAN COMMUNITY." American Journal of Clinical Nutrition, 1988, vol. 47, 134-138.

Summary

"To determine the relationship between growth and morbidity in the first two y[ears] of life, [the authors] studied a cohort of 126 newborns in a Gambian township. Mean weight-for-age exceeded the National Center for Health statistics (NCHS) standards in the first half of infancy but there was a mean deficit of 1.2 kg [of growth] by age one y[ear]. Only two diseases contributed significantly to [this growth] faltering: diarrheal diseases were estimated to cause one-half of the deficit and lower respiratory tract infections (LRTI) one-quarter. LRTI reduced weight gain in young children by 14.7 g/day [of illness. In weaning infants, diarrheal diseases reduced weight gain by 14.4 g per day, but] had no significant impact on the growth of exclusively breast-fed infants. Growth velocity was normal in the second year of life, despite continuing infections." (Reprinted from the article, p. 134.)

Editorial Comment

This is a very important report. First, it provides evidence that, at least in this Gambian community, diarrhea is the major direct cause of growth failure, accounting for half of the observed growth deficit which accumulated during the first year of life. LRTI had a greater negative impact on growth per day of illness: a 14.7 g. reduction in weight gain versus an overall average of 2.3 g. for diarrhea. But because diarrhea was present in these children for so many days during the year--15.8% of the time, or 55 days of the year!--the overall impact of diarrhea on growth was greater. The Gambian pattern of diarrhea may be somewhat unusual; children there seem to have nearly continuous diarrhea during the rainy season. Nevertheless, its impact is clear.

Second, the report documents the fact that diarrhea in exclusively breastfed children has almost no impact on growth, while that in weaned children was four times greater (3.6 g/day versus 14.4 g/day). This difference was not due to less diarrhea in the breastfed group; the morbidity was the same. Fascinating!

The authors postulate that possible differences in the causes of the diarrhea in the weaned versus exclusively breastfed groups may be responsible. Bacterial contamination of weaning foods led to more bacterial diarrhea in the weaned group, with greater growth impact, while the breastfed group had diarrhea from other causes with less growth impact.

I'm more struck by the implications of their second explanation for this, however. They postulate that the breastfed kids were getting a much better diet than those that were weaned, both in total calories and balance/protein/micronutrients. The weaned children, teetering on the brink of growth failure, were pushed over the edge by diarrhea and grew poorly. The breastfed children, getting plenty

of rich breastmilk, could handle the diarrhea episode easily with little effect on growth.

What could be the mechanism for this protection of growth in the breastfed group? One possibility is a kind of nutritional reserve: they burn fat and get 9 calories/g lost, while the weaned kids have less fat and burn muscle tissue and thus lose 2.25 g. for every 9 calories used. The greater amount of water in muscle as compared to fat would accentuate this difference.

I am more inclined to emphasize a different mechanism, however. The exclusively breast-fed children got more food during illness and more caloric intake than the weaned children. When the breastfed kids got thirsty from their diarrhea, they got milk at 500-600 calories per liter. When the weaned kids got fluids, they got water, thin gruel, or even ORS, which have a much lower caloric content.

Breastfeeding did not protect these children from getting diarrhea, but it prevented diarrhea's impact on growth--perhaps by allowing a greater nutritional intake to be maintained, or by providing a nutritional reserve. One more reason to promote breastfeeding for the prevention of morbidity from diarrhea. (RSN)

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World Health Organization. "PERSISTENT DIARRHOEA IN CHILDREN IN DEVELOPING COUNTRIES: REPORT OF A WHO MEETING." WHO/CDD/88.27. Geneva: WHO.

Summary

Persistent diarrhea is defined as diarrhea episodes of presumed infectious etiology that begin acutely but have an unusually long duration, in most studies 14 days or longer. Using this definition, 3-20 percent of acute diarrheal episodes in developing countries become persistent. Children with the most diarrhea have the highest likelihood of persistent diarrhea. In one study, all children with diarrhea on 13 percent or more observation days over 30 months had at least one episode of persistent diarrhea; persistent diarrhea accounted for nearly half of all recorded diarrheal days.

Incidence of persistent diarrhea is similarly high in developing countries, ranging from 31 to 210 episodes per 100 child years, and affecting up to 63 percent of children in one 28-month observational study, 21 percent and 15 percent of children in other studies of 7 months' and one year duration. Peak incidence is between 6 and 24 months of age.

Although persistent diarrhea is a minor proportion of all diarrhea episodes, it is more likely to have severe consequences, with 36-56 percent of diarrhea-associated deaths being related to persistent diarrhea episodes, and case fatality rates of 14 percent for persistent diarrhea episodes compared to only 0.7 percent for shorter episodes. Weight loss during a persistent diarrhea episode is likely to be substantial.

Children with malnutrition or impaired immunity are more likely to have persistent diarrhea, and a previous diarrhea episode, either a recent acute one or a persistent episode, also appears to predispose to a persistent episode. Recent introduction of animal milk in the diet also predisposes to persistent diarrhea.

Vibrio bacteria and viruses do not appear to cause persistent diarrhea, but most other diarrhea-producing organisms do. Enteroadherent *E. coli* (EAEC) and enteropathogenic *E. coli* (EPEC), as well as cryptosporidium, are especially likely to cause persistent diarrhea, while other organisms are found with equal frequency in acute and persistent episodes, including *Shigella*, *Giardia*, and *Entamoebic histolytica*.

It is postulated that inappropriate drug and dietary management of an acute diarrhea episode may lead to its becoming persistent, while correct management (ORT and feeding) may prevent persistence. Adequate studies to test this have not yet been carried out. Studies do show that breastfeeding reduces the duration of acute episodes, and feeding of full strength cow's milk leads to clinical lactose intolerance with prolonged diarrhea in only 1 of 75 children with acute diarrhea.

Adequate studies of treatment of persistent diarrhea episodes are not yet available upon which to base clear recommendations for case management.

Dietary management appears to be very important in resolving the diarrhea, as well as in repairing its nutritional damage. Continued feeding, particularly breastfeeding, and identification and management of lactose intolerance by reducing lactose through dilution or fermentation or combining it with cereal, appear to be important elements in this. Specific antimicrobial treatment, when an etiologic organism can be identified, is effective, but blind use of antimicrobials is not recommended. Bloody diarrhea should be treated as shigellosis, with the locally appropriate antibiotic. ORT should be used to treat dehydration from persistent episodes. Other pharmacological agents are not currently recommended.

Editorial Comment

We have devoted so much space to summarize this review because of our recent recognition of the disproportionate importance of persistent diarrhea in causing the mortality and nutritional morbidity associated with diarrhea. While appropriate fluid and feeding of acute diarrhea episodes are still the primary intervention for control of diarrhea, it has become increasingly clear that we must follow that strategy with greater efforts to identify cases in which diarrhea has lasted 14 days or longer, and manage them appropriately.

For diarrhea control programs, this means first defining locally appropriate steps for more detailed questioning about diet, nutritional assessment, stool examination, dietary and antimicrobial recommendations, and referral criteria, as well as recording and reporting procedures, for cases in which initial history reveals that the diarrhea has persisted for 14 days or longer. This technical strategy then must be translated into action, through dissemination of technical information to doctors and health workers as part of training courses, regular meetings, or newsletters, and through monitoring and supervision approaches which include special attention to the identification, management, and recording of persistent diarrhea episodes.

The WHO document does not deal with prolonged episodes of non-infectious causes, and it studiously avoids the commonly used term "chronic diarrhea." This relates to the desire of the experts to base their conclusions and recommendations on data from clear research studies, which have generally attempted to limit their attention to persistent diarrhea as defined in the summary. The clinician, however, faced with a case of prolonged diarrhea of less than 14 days, say 12 days, one of unclear etiologic pattern (not clearly an acute episode of infectious etiology which has become prolonged), will have to interpret and extrapolate from these recommendations.

We may hope that a subsequent expert meeting could focus on the subtler task of translating this scientific summary into a clinical algorithm with practical hints for managing any cases of prolonged, chronic, or persistent diarrhea of whatever etiology in the developing country context. (RSN)

Gazala, E.; Weitzman, S.; Weizman, Z.; et al. "EARLY VS. LATE REFEEDING IN ACUTE INFANTILE DIARRHEA." Israel Journal of Medical Science, 1988, vol. 24, 175-179.

Summary

"A randomized ambulatory trial was performed to compare early (6-h) vs. late (24-h) refeeding in acute infantile diarrhea. Ninety infants with milk dehydration were enrolled in the study. Following an initial oral rehydration period (WHO formula), refeeding was introduced using a diet based on either breast milk or cow's milk. Early (n = 53) and late (n = 37) refeeding groups were similar in ethnic background, socioeconomic level, relevant past history, nutritional and clinical state, and stool pathogens. Infants were assessed upon their initial visit, at 24 and 48 h, and at 7 and 14 days thereafter for evaluation of weight, hydration state, stool frequency and need of hospitalization. No significant differences in the above parameters were observed between the two groups. Different patterns of refeeding (breast milk vs. cow's milk) in both early and late refeeding groups showed no significant differences in the features studied. Since the short-term clinical outcome following early refeeding in acute infantile diarrhea is not different from late refeeding, we suggest that early refeeding should be preferred, particularly in developing populations, in order to minimize the adverse nutritional effects of prolonged fasting during recurrent bouts of gastroenteritis." [Reprinted from the article, p. 175]

Editorial Comment

The 24-hour delay in refeeding in the late group is not in fact nearly as marked as the recommendations of many physicians in developing countries, for whom food withholding for 2-3 days is not uncommon advice. Here too the authors restarted feeding with a bang, giving full-strength milk or formula to children who had previously been on that diet. It is all too common in some countries to recommend starting with rather dilute milk or formula, and returning to full-strength feeding only after 5-7 days.

As such, the study is in fact comparing two relatively good feeding regimens, although we prefer the early one (refeeding at 6 hours). Both groups also got ORT, which provides a few calories and appears to stimulate the appetite. It is therefore not too surprising that no differences were observed between the two experimental groups. (RSN)

Reinthaler, F.F.; Link, G.; Klem, G.; et al. "CRYPTOSPORIDIOSIS IN CHILDREN WITH DIARRHOEA FROM SLUM AREAS IN SAN SALVADOR." Annals of Tropical Medicine and Parasitology, 1988, vol. 82, 209-210.

Summary

Stools of children with diarrhea in a slum of San Salvador were examined for *Cryptosporidium*. Of the 210 specimens analyzed, 3.8 percent were positive overall, with a rate of 14 percent positivity in children ages 0-1.

Editorial Comment

This brief report demonstrates again that epidemiologic studies of diarrhea these days must make the extra effort to stain and examine microscopically stool specimens while looking for *Cryptosporidium*. None of the specimens of children over age 6 had *Cryptosporidium*, whereas the rates in children 2-5 were 3/73 (3.1 percent). These older children could thus be excluded in future studies. (RSN)

For Your Information

Please note that the May 1988 issue of the TLU should be Vol. III, No. 4 and not Vol. III, No. 5 as was printed.

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Chowdhury, A.M.R.; Vaughan, J.P.; and Abed, F.H. "MOTHERS LEARN HOW TO SAVE THE LIVES OF THEIR CHILDREN." World Health Forum, 1988, vol. 9, 239-244.

Summary

The Bangladesh Rural Advancement Committee (BRAC) trained mothers in over 5 million Bangladeshi households to manage diarrhea using an oral rehydration solution prepared at home with a pinch of local salt, a fistful of unrefined sugar, and a half "seer" (467 ml) of water (sugar-salt solution or SSS). Two approaches to teaching were used. In the first, trained female workers trained mothers one-on-one in their homes on seven points of diarrhea treatment prevention. The mothers practiced the preparation and were advised to begin using it with their child's first watery stool. Supervisors routinely checked mothers' understanding and the correctness of solutions one month later to monitor each worker's effectiveness.

For the second approach, ("the concentrated reinforcement program"), the training team stayed in the locality for five months after the initial one month's household training, carrying out additional health education activities in schools, mosques, and meetings to popularize use of the solution. They also trained traditional birth attendants.

BRAC evaluated the program using both a village study with weekly surveillance, in-depth interviews, informal and focus-group discussions and a 7,000 household survey. Four separate illnesses with diarrhea symptoms were identified: (1) "agirno," or diarrhea caused by indigestion and food poisoning; (2) "amasha," or diarrhea with mucus, cause unknown; (3) "dud baga," or diarrhea in breastfed children due to contaminated breastmilk; and (4) severe, watery dehydrating diarrhea, as in cholera.

Usage rates were assessed for all four types of episodes in the previous two weeks even including a single watery stool in a day. About half of all such diarrhea episodes were not treated at all. Rates were as low as 1.6-2.9 percent in standard training areas to 4 percent in reinforcement areas for amasha, but were much higher for severe watery diarrhea: 25.6 percent to 31.6 percent in standard areas vs. 52.2 percent in reinforcement areas. Usage was significantly lower in households trained 3-6 years previously than in households trained 1-3 years previously: 4.1 vs. 8.2-9.9 percent for all diarrhea episodes.

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Lack of use was related to use of alternative treatments (drugs or traditional plants), the mother's feeling that the episode was not of the severe watery type, lack of availability of sugar at home (90 percent of households did not have sugar in October-December), or negative opinions about sugar-salt solution (SSS) among both quacks and bona fide health workers.

Up to 26 percent of mothers prepared solutions with a sodium concentration over 119 mmol/l. This may have been related to inadequate emphasis on the dangers of using too much salt, or to a shortage of experienced supervisory staff because of rapid program expansion.

In the standard, non-reinforced approach, the cost of the training program was $0.72 per household and $0.69 per child under five. Based on these results, BRAC has revised the training approach to:

- deal specifically with the four types of diarrhea;
- emphasize the dangers of too much salt and the importance of correct measuring;
- eliminate the reinforcement approach, substituting, instead, joint instruction of mothers from neighboring households to foster understanding and acceptance;
- promote refined sugar as a substitute when unrefined sugar is scarce.

Editorial Comment

BRAC's approach has in recent times run counter to the party line that promoting SSS is not a good strategy because of the high percentage of incorrectly prepared and potentially dangerous solutions made by mothers who misunderstand or cannot remember the recipe. BRAC proved that it was the education approach, not the mother, that was inadequate in programs with high error rates. The mothers they trained could remember--more than 90 percent in the first month.

BRAC's experience forces us to recognize that an SSS-based strategy can be appropriate if (and only if!) the program manager routinely does the early monitoring, later evaluation and consequent changes in educational content (messages) and process which the data demands. In short, an SSS-based strategy can work if it is supported by responsive, active program management.

But clearly, as this paper illustrates, responsive program management is not easy. It demands aggressive data collection and interpretation, and creative revision of the techniques used. How many programs using SSS are capable of that, or are actively doing it?

Secondly, the report shows once again that we must be more sensitive to the variety of terms and concepts used for diarrhea, both in our educational messages and in the questions we use on evaluation surveys. Reporting SSS usage rates by diarrhea type, as done in this report, gives us a much clearer understanding of the mother's decision making about treatment, as well as demonstrating, yet again, that mothers do behave very rationally.

Thirdly, the report raises the question, What should be the event which triggers the mother to start ORT? Is a single liquid stool too common? Is a single liquid stool usually inconsequential and non-pathologic, in the mother's opinion, so that no rational mother will make the extra effort of preparing and giving extra rehydration fluids when it occurs? Many programs use three liquid stools as their recommended trigger. We need more research on this point.

BRAC's strategies, educational approaches, and monitoring, evaluation and management techniques continue to be important models for all programs to emulate, or to differ from, depending on circumstances. This paper is an excellent review of their experience. (RSN)

Spain, P.L.; and McDivitt, J.A. "CONTINUOUS AND NON-CONTINUOUS USE OF WSS SOLUTION FOR ORAL REHYDRATION THERAPY AMONG RURAL GAMBIAN WOMEN." Journal of Tropical Pediatrics, April 1988, vol. 34, 88-90.

Summary

One of the key questions in the ORT field is, Which factors influence mothers to consistently use oral rehydration solution for their children with diarrhea? In The Gambia, water-sugar-salt (WSS) solution is promoted for home diarrhea treatment, while WHO packets are distributed at health facilities. A three-year health education project to encourage changes in mothers' management of their children's diarrhea, integrating radio broadcasts, pictorial flyers, and interpersonal communication, had previously been implemented in The Gambia. In order to identify the types of mothers who continued to use WSS after trying it for the first time compared to those who did not, this study followed a panel of 1,051 mothers with children under five. Knowledge of WSS mixing and administration, and access to health services, were measured as well. Interviewers asked mothers repeatedly to describe how they had prepared or administered WSS during the course of the interview, in order to check the reliability of the mother's knowledge.

The study found that 56 percent of the mothers gave the correct formula for mixing WSS at least three of the four times they were asked, while only 32 percent could correctly answer questions about both how to mix and how to use WSS properly. Only 35 percent of mothers used WSS continuously (for each

case of diarrhea); most (57 percent) showed a "skipping" pattern of use, using WSS for one episode, not using it for the next one or two, then using it again later. Only eight percent stopped WSS completely after an initial use. Continuous users of WSS were found to be a relatively disadvantaged group compared to non-continuous users: they tended to live farther away from health centers, to lack radios in their homes, and to lack regular supplies of sugar and salt. However, they were much more likely to have flyers on mixing WSS in their homes than non-continuous users. Membership in more isolated tribes was also significantly associated with continuous use, while age, education of the mother, and occupation of the head of the compound were not.

The authors suggest that women with access to health clinics and, perhaps, other diarrheal drugs use WSS only occasionally.

Editorial Comment

The Gambia health education project was a landmark in demonstrating to the world that an intensive ORT promotional strategy integrating mass media and interpersonal channels could raise use by mothers to very high rates in a short time.

Follow-up studies after the donor support had stopped and the promotional efforts had diminished severely then provided an additional landmark, demonstrating that usage rates feel off dramatically. It became the evidence used in convincing governments and donors that promotion of ORT, just like promotion of Coca-Cola, needed to be continuous and long-lasting if it was to be effective.

This study shows that those mothers who continued to use WSS regularly were more isolated, and had less access to health services. Since national treatment policy gives packets to patients coming to health facilities, one wonders if the mothers who had taken their child to the clinic and gotten ORS then said to themselves, "This ORS must be the real treatment; WSS must be just a poor substitute." Did the attractiveness of the ORS packet seduce them into discarding WSS?

A second tantalizing bit of information here is the news that mothers who had the sugar and salt needed for WSS in their homes were less likely to be continuous WSS users than mothers who did not have the ingredients at home. Having a radio was also associated with lower rates of continuous use.

It seems that mothers with more choices available are more likely to try different choices.

A final, more heartening bit of information: mothers who understood well both WSS mixing and use were more likely to be continuous users than less knowledgeable women, 53 percent versus 28 percent.

We might conclude that not having sugar or salt in the home is not a significant barrier to WSS use, at least in this environment; also, that more effective instruction about WSS will lead to higher rates of continuous use. And we may wonder if the presence of ORS packets may act to reduce the mother's faith in simpler home-made fluids. The Minister of Health of Nigeria, Dr. Ransome-Kuti, believes strongly that this is true, and has adopted a policy of not giving out ORS packets to mothers, to avoid eroding their belief in WSS. (RSN)

Pizarro, D.; Levine, M.; Posada, G.; et al. COMPARISON OF GLUCOSE ELECTROLYTE AND GLUCOSE GLYCINE ELECTROLYTE ORAL REHYDRATION SOLUTIONS IN HOSPITALIZED CHILDREN WITH DIARRHEA IN COSTA RICA. Journal of Pediatric Gastroenterology and Nutrition, 1988, vol. 7, no. 3, 411-416.

Summary

The authors compared standard WHO formula oral rehydration solution (ORS) with two "super ORS" formulations containing the standard WHO components plus either 55 or 110 mmol/L glycine (osmolality 311, 366, or 422 mOsm/kg H_2O, respectively). Ten male infants, ages 1-24 months, with diarrhea and overt signs of dehydration were assigned randomly to each group. The patients were rehydrated and maintained with the same fluid. No feeding was given for the first 24 hours, after which the children were given full strength milk formula ad lib in addition to the respective ORS.

Results showed no differences among the three solutions with respect to the time required to rehydrate, the amount or speed of weight gain, fluid intake, stool quantity, urine output, or serum electrolytes. No clinically significant rise in serum BUN was noted.

Editorial Comment

Here's one more study showing that glycine "doesn't work," that is, that adding it to standard ORS does not produce an enhanced absorption of fluid. This study did not show evidence of diuresis caused by the glycine, or a rise in BUN, two drawbacks of glycine reported elsewhere.

Geneva reports that early results from work with an alanine-fortified ORS are much more promising, suggesting an enhancement of absorption of as much as 40 percent. We await final reports from those studies, as well as some cost data to show how much the additional amino acid will add to the price of ORS, and some comments on difficulties in manufacturing, if there are any.

In the meantime, we should all keep in mind that food is the most practical and cheapest "Super ORS." Giving food like rice along with ORS will enhance fluid absorption, and reduce the duration of

diarrhea, i.e. "stop the diarrhea," which is what the mothers want. Thus, feeding is part of the rehydration treatment, part of the treatment of the diarrhea itself, as well as a nutritional benefit for the child. If we could get more doctors, and mothers, to think of feeding as part of their "medicine" for the diarrhea, part of the prescription, we would probably see no additional benefit from adding alanine or whatever purified food constituent to the patient's intake. Note that Pizarro withheld food from the patients in this study during the first 24 hours; for purposes of the study, that was a sensible decision. Giving food will probably eliminate any demonstrable benefit from additives to ORS such as glycine or alanine. We will see when the results of further studies become available. (RSN)

TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D.
Technical Writer: Karen White, M.A., M.L.S.
Managing Editor: William Amt

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These monthly bibliographical listings consist of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues. Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the TLU editorial staff, and are not meant to represent USAID policies or opinions. Your comments are welcome.

Walker, G.J.A.; Ashley, D.E.C.; and Hayes, R.J. "THE QUALITY OF CARE IS RELATED TO DEATH RATES: HOSPITAL INPATIENT MANAGEMENT OF INFANTS WITH ACUTE GASTROENTERITIS IN JAMAICA." American Journal of Public Health, vol. 78, February 1988, 149-152.

Summary

The importance of good case management of diarrhea has been acknowledged in the CDD field; yet, studies evaluating its effectiveness have rarely been carried out. This study assessed the quality of care of about forty randomly selected infants admitted with acute gastroenteritis to each of five hospitals in Jamaica. Twenty-six criteria for measuring the quality of case management were established on a consensus basis from questionnaires completed by doctors throughout Jamaica.

Low levels of adherence to consensus care criteria were found to be correlated with high levels of hospital-specific severity-standardized mortality rates. The main deficiencies in care at certain hospitals were non-weighing of infants, incomplete physical examinations, inadequate estimates of fluid requirements, and irregular recordings of fluid intake.

Inequitable resource allocation may account for some of the differences in case management standards among the hospitals studied. The authors believe that the observed differences can be largely attributed to varying quality of education and in-service training of doctors and nurses. Inadequate supplies of the record forms used to chart fluid intake and weight-for-age may be an important factor leading to deficient care as well.

Editorial Comment

Much of the credit for improved case-fatality rates from diarrhea has gone to oral therapy, often to the fluid component of oral therapy--ORT--alone. Doubtless some of this is deserved, as ORT has made effective management of dehydration feasible in rather primitive circumstances where staff and facilities would not allow IV rehydration to be routinely available. Yet, it is certain that a large proportion of the impact of ORT programs has not been due to the change in treatment from IV to oral, but to much broader improvements in the assessment, fluid management, and dietary management of diarrhea patients.

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This important paper takes a useful first step in attempting to measure this broader phenomenon. Its research suffers from its dependence on case records rather than on actual observation: we know that much information is either not recorded or recorded incorrectly. All patients had the degree of dehydration recorded, for example, but there is less possibility of determining the accuracy of that assessment when the patient cannot be examined directly. This paper also suffers from examining only admitted patients: we know that admission criteria differ among hospitals, some rehydrating all but the most severe as outpatients and primarily admitting patients with complications or malnutrition, while others admit less severely dehydrated patients and more without complications. (The authors attempt to deal with this, but incompletely; the data seem to report that all the patients in all five hospitals were treated initially with ORS--certainly some must have been severely dehydrated and were initially treated with IV fluids.)

Nevertheless, this paper beautifully illustrates some of the critical areas of deficient care. The three less sophisticated hospitals usually failed to weigh the child, and never recorded the weight on a growth chart. Certainly, their ability to detect malnutrition would have been low, depending entirely on insensitive clinical observation. Perhaps because of this, they usually failed to calculate the fluid deficit, and rarely recorded fluid intake and output. This suggests that the monitoring and management of the patient's fluid status were inadequate. The same three hospitals usually failed to ask about the usual diet (or at least to record it), which makes us wonder about how the patients' diets were managed.

The end results show the impact of careful care: a 1% case-fatality rate at the University hospital, and rates ranging from 2.4% to 9% at the other hospitals, with, if anything, more difficult cases being handled in the University hospital.

Record forms can function like a silent supervisor, demanding that the nurse or doctor obtain certain information to fill in the blanks. With a disease as important in mortality statistics as diarrhea, it is not unreasonable that detailed forms for assessment, as well as for recording fluid and food treatment and fluid output be made available and used for all admitted patients with diarrhea. Use of a detailed assessment form or register for outpatients, especially those needing oral rehydration, would help to assure that needed information is at least obtained on those less severely ill patients.

We can thank the authors for emphasizing this important point. Convenient forms and checklists encourage comprehensive care, and guard against forgetting. Even doctors sometimes forget, and need such aids. They help to daily reinforce the lessons learned in diarrhea training courses. (RSN)

Helmy, N.; Abdalla, S.; El Essaily, M. et al. "ORAL REHYDRATION THERAPY FOR LOW BIRTH WEIGHT NEONATES SUFFERING FROM DIARRHEA IN THE INTENSIVE CARE UNIT." Journal of Pediatric Gastroenterology and Nutrition, vol. 7, 1988, 417-423.

Summary

An Egyptian neonatal intensive-care unit carried out an observational trial (uncontrolled) of ORT on 62 low-birth-weight neonates.

The babies had a mean age of 13.89 days and a mean weight of 1500g. Mild to moderately dehydrated infants were rehydrated orally, severely dehydrated infants with intravenous fluids. Infants unable to suck were given ORS through a nasogastric tube. Standard WHO-formula ORS was used. Fifty-two of the children received ORT only; 58 received either cow's milk-based or soy-based formula within 12 hours after ORT was begun, the remaining four within 24 hours.

Outcomes were substantially improved by using ORT and early feeding, compared to the previous regimen of low-sodium IV treatment and fasting. Case-fatality rates from diarrhea declined from 28 percent previously to only 4.6 percent in the 62 infants studied. Diarrhea lasted less than 24 hours in 92 percent of the cases, as compared to 3.1 days with IV therapy. ORT corrected both hyponatremia and hypernatremia. In addition, strict prevention measures, such as handwashing, health education of personnel, and isolation of affected neonates, were introduced to the ICU. These resulted in a reduction of the incidence of diarrhea among neonates in the unit from 32 percent in 1980-82 to 12 percent during the study (1983-85).

The authors conclude that ORT is a safe, inexpensive therapy which has a high success rate and is more comforting to neonates than is IV therapy.

Editorial Comment

This report documents the high efficacy of ORT even in low-birth-weight neonates, some of whom had either hyponatremia or hypernatremia. It thus reconfirms Pizarro's results in Costa Rica. The treatment not only used oral rather than IV fluids for rehydration, but also aggressively reinstituted feeding. All of the infants studied were on artificial-milk formulas before the diarrhea began. Refeeding was begun generally after 6-8 hours, starting with half-strength formula (soy-based in 66% of patients), and reaching full strength in 24 hours.

Not only was case fatality reduced, but the duration of the diarrhea was shortened. It may be hypothesized that this was because of enhanced fluid

absorption due to the food, as well as more rapid healing of the intestine.

We may conclude that this study further confirms the effectiveness of oral therapy--both fluid and food--in neonates with diarrhea. (RSN)

Ahmed, S.M.; Islam, M.R.; and Kabir, I. "EFFICACY OF ORAL REHYDRATION SOLUTION IN CORRECTING SERUM POTASSIUM DEFICIT IN CHILDREN WITH ACUTE DIARRHOEA IN BANGLADESH." Journal of Tropical Pediatrics, vol. 34, February 1988, 24-27.

Summary

The authors point out that the WHO formula for ORS was originally developed for cholera patients, especially adults, who lose less potassium in their stool than do children with non-cholera diarrhea.

In order to test the efficacy of WHO ORS in correcting serum-potassium deficits in acute diarrhea, they studied 60 children under 4 years of age with acute watery diarrhea and moderate dehydration. After an initial 4-hour rehydration period with ORS alone, the children were given diluted formula, milk, and bread, but no fruit or other potassium-rich fluids. One-third of the patients were hypokalemic on admission. After 24 hours of therapy with sucrose-based ORS containing 20 mEq potassium per liter, almost half were still hypokalemic. After 48 hours, 10 patients out of 19 remained so. These data confirm the fact that infants and children may require significantly more potassium than do adults to replace their stool losses.

The authors suggest that the potassium concentration in the WHO ORS formula should perhaps be raised above 20 mEq/l. Otherwise, repeated therapy with oral solutions containing inadequate potassium may contribute to the increased morbidity and mortality of malnourished children suffering from diarrhea.

Editorial Comment

While the use of potassium-rich supplements such as green coconut water or fruit juices or foods such as banana may overcome the relatively low potassium content of standard formula ORS (20 mEq per liter), this paper indicates that when such supplements are not used in treating children with diarrhea and moderate dehydration, mild hypokalemia may develop.

Is this sufficient to recommend a change in the current formula for ORS? Factors to be considered would be the proportion of malnourished, potentially more hypokalemic children among ORS users, and the proportion of adults. I would not like to see a proliferation of ORS formulations of different potassium contents, due to the confusion this would create. Being conservative, I need more evidence that the current formulation has led to significant clinical complications (as opposed to laboratory evidence of hypokalemia alone) before I would want to urge the worldwide adoption of a new formula. (RSN)

Lukmanji, Z. "FORMULAE OF SUGAR-SALT SOLUTIONS RECOMMENDED FOR TREATMENT OF DIARRHOEAL DEHYDRATION AT HOME IN AFRICAN COUNTRIES." Annals of Tropical Paediatrics, vol. 8, 1988, 35-37.

Summary

"During a conference on diarrhoeal diseases in Tanzania in 1984, 19 participants representing 16 countries in Africa gave the formulae for oral rehydration solutions therapy (ORS) which they recommended or instructed for horne use in their own countries. There were gross variations in recommended quantities of sugar, salt, and water. Theoretical calculations indicated that the glucose concentration ranged from 29 to 174 mmol/l (recommended 30-112 mmol/l) and that of sodium from 9 to 116 mmol/l (recommended 30-80 mmol/l). It is very important that countries should ensure that the recommendations for making up oral rehydration solutions be standardized, otherwise dangerous or ineffectual concentrations of salt and sugar solutions may be used for rehydrating children." [Journal abstract]

Moy, R.J.D.; and Booth, I.W. "EDITORIAL: ACUTE DIARRHOEA: WHO NEEDS POTASSIUM?" Journal of Tropical Pediatrics, February 1988, vol. 34, 2-3.

Summary

Because of the expense and distribution problems of ORS packets, many countries throughout the world rely on water-sugar-salt (WSS) solutions for oral rehydration therapy. However, as this editorial points out, the consequences of potassium exclusion from WSS are not yet fully understood. The authors review the few existing studies on the use of WSS and body potassium depletion. They come to the conclusion that oral rehydration programs with WSS as their basis should more actively promote use of locally available sources of potassium in their programs. They also call for further studies on the relationship of potassium depletion to rate of recovery, complication rate, appetite suppression,

and weight loss during diarrhea episodes. If such studies uncover significant adverse effects of WSS, they warn, ORT programs emphasizing WSS may have to seriously rethink its use.

Editorial Comment

The two papers above address problems associated with the use of WSS: widely varying WSS recipes (4 different recipes from 4 hospitals in Tanzania, for example!), and lack of potassium.

We have dealt with the potential dangers of inaccurate mixing of WSS by mothers who have not remembered the recipe correctly. This article stresses that programs must ensure that the formulas being promoted are correct, and also uniform within a country.

The prospective studies of hypokalemia in diarrhea have been primarily laboratory ones, as the Bangladesh study of Ahmed described above, while there is ample documentation of low potassium levels in patients with paralytic ileus. The authors of this editorial point out that children with very low serum potassium (e.g., 2.0 mEq/l) may have no clinical ill effects. Children fed aggressively during diarrhea should take in potassium with their food. This may well make up for the lack of potassium in WSS, as well as provide nutrition and enhance fluid absorption.

We must constantly keep in mind that no patient should be treated with oral fluid alone, either WSS or ORS. Theoretical considerations or clinical studies of fluids used alone, compared to fluids used along with feeding, may not be important in most real-world situations. (RSN)

Washington, D.C. 20523

TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D.
Managing Editor: William Amt

October 1988
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Nasser, S.; Nossair, N.; Riyad, S. et al. "THE CLINICAL EPIDEMIOLOGY OF ACUTE DIARRHOEAL DISEASE IN EGYPTIAN CHILDREN." Journal of Tropical Pediatrics, vol. 34, August 1988, 150-157.

Summary

A baseline epidemiologic study was conducted by the Egyptian National Control of Diarrheal Diseases Project (NCDDP) in 1983. A census of children under three years from six communities was followed by a "canvass" to identify those whp had diarrhea within the past 24 hours. These children were visited daily for ten days. The canvass/follow-up process was repeated once, and then followed by a monthly one-day canvass over a period of 14 months.

The data showed a prevalence of diarrhea during the summer months (24%), compared to winter months (6%). Days of diarrhea per child per year ranged from 20 (urban) to 67 (rural). Bloody diarrhea was uncommon in comparison - 0.9 days per year (2.1% of diarrhea days). Vomiting was present in one-fifth (19 percent) of diarrhea days.

During follow-up, 9% had no diarrhea after the original canvass day, and 8% had diarrhea for more than ten days. The average number of days of diarrhea was 5.8, with two-thirds of these being watery. Signs of dehydration (vomiting, inactivity, and inelastic skin) were found more often when stools were watery (18%, 27%, and 6%, respectively) compared to 9%, 10%, and 2% rates for such signs when stools were loose on the first day of follow-up. Children receiving ORT on the first day were less likely to be inactive or have inelastic skin on the second day (not statistically significant, however). Drugs given without ORT had no effect on the prevalence of vomiting, inactivity, or inelastic skin on follow-up days, nor did they affect the duration of diarrhea. A full 41% of mothers had stopped breastfeeding on the first follow-up day, and 32% of mothers still had not returned to breastfeeding by ten days.

Editorial Comment

I found much of these data fascinating. I was surprised that bloody diarrhea days were so few--I would have expected at least 10%. Of the one-fifth of children who had watery diarrhea, approximately one-fifth of them had some signs of dehydration, about 4% less in those with only loose stools. That kind of information can be useful in planning ORS needs, as pointed out by the authors. They calculate ORS needs as: 25 watery diarrhea days per child X 350 ml ORS per day needed X number of children 0-3 years X approximate use rates.

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I was amazed that so many mothers stopped breastfeeding, and reduced other feeding. This has not been the case in other studies (Nigeria, India, Peru). It certainly points up the need to give additional attention in educational campaigns to the importance of continuing feeding during diarrhea.

The surprises in the data indicate how important it is to carry out such studies as part of the process of developing or improving health education and communications campaigns as part of CDD efforts. The study methods used here--census, rapid canvass, then intensive follow-up of active cases--seem practical and cost-effective. This approach has the important advantage of giving maximum attention to children who have diarrhea now, and not some time in the past. That eliminates all the problems of selective forgetting which are part of the more usual approach, which uses recall for cases occurring in the past two weeks. [RSN]

Cutts, F.; Cliff, J.; Reiss, R. et al. "EVALUATING THE MANAGEMENT OF DIARRHOEA IN HEALTH CENTRES IN MOZAMBIQUE." Journal of Tropical Medicine and Hygiene, vol. 91, 1988, 61-66.

Summary

A three-part evaluation of diarrhea management was conducted at 25 clinics located in one rural area and three urban areas in Mozambique. The first part was an observation of the consultation between the health practitioner and mother, where procedures of the clinical examination, questions asked, treatment prescribed, and health education given were recorded on a speical form. Second, mothers were interviewed as they left the health facility to measure their understanding of the treatment they were going to carry out at home. Third, patients' homes were visited within 20-30 hours after the initial consultation to get information on the child's current condition, type and frequency of diarrhea, how mothers were treating the diarrhea, and what utensils, containers, and ingredients were available that could be used to prepare ORS.

Observations were made in 218 cases. During the consultation, ORS was advised in 83% of the cases and ORS packets given in 72%, although no demonstration of its preparation was provided. The instructions given to mothers on the preparation and use of ORS varied greatly between the four health areas. For instance, at clinics where ORS was prescribed, less than half the mothers were informed of its use and the importance to continue giving fluids. Advice on how to recognize dehydration and the need to continue feeding was given in one area only, and in less than one-third of the cases consulted.

At the exit interviews, between 67 and 95% of the mothers could recall that they should mix the salts in one liter of boiled water. Few knew how much ORS to administer nor for how long; many believed one teaspoon thrice daily should be given, as is prescribed for other medicines. Most mothers thought that ORS stopped diarrhea rather than treated dehydration.

Only 28% of the patients' homes were visited. Most mothers had incorrectly administered ORS. Nevertheless, most of the children had recovered within 24 hours. Eighty-seven percent said they had used ORS, and of this 87%, 84% knew how to prepare it, though only 44% had a one liter container (only 7% in one of the rural areas). Food and breastfeeding were not withheld.

The authors conclude that health workers need improved supervision and training that stresses giving mothers thorough instructions on preparing and using ORS, including a demonstration.

Editorial Comment

This kind of evaluation is exactly what every CDD program should be carrying out. If the usual superficial assessment had been done, it would have appeared that good treatment was being given: there were high ORS prescription and provision rates, mothers knew how to mix it, etc. But when more details were obtained through the observational and interview techniques described, it became apparent that almost none of the children had actually received oral rehydration therapy. Less than half the mothers had no appropriate container, so they must have mixed the ORS incorrectly. Most had little idea of how much to give; indeed, they thought they should give just a few teaspoonfuls per day. No rehydration is likely to occur with that method of treatment!

The observations showed why: health education to the mothers was either not done at all, or was done poorly (for example, by a pharmacist to a group of mothers crowded around the dispensary window). With this information in hand, reports the article, the government has taken steps to improve the health education component of treatment through revised training and supervisory methods and materials preparation. It is such a pleasure to read that a study has, in fact, led to some programmatic action being taken.

The authors raise the question of whether clinics should give out ORS to mothers to use at home, especially when only 10.5% of the patients were dehydrated when they were seen, and shortages of ORS are frequent in health facilities. Nigeria has adopted a strong policy of not distributing ORS to mothers to use at home, but, rather, considering it a treatment to be given by a health worker, usually at a health facility. The emphasis in health education there is on teaching the mothers how to use a home-

prepared solution (sugar-salt solution). The home-made porridge and water approach suggested by the authors may be more effective in Mozambique, both because it is starch-based and because sugar and salt are not available in the majority of homes in that country. [RSN]

Sepulveda, J.; Willett, W.; Munoz, A. "MALNUTRITION AND NUTRITION: A LONGITUDINAL STUDY AMONG URBAN MEXICAN CHILDREN." American Journal of Epidemiology, vol. 127, no. 2, 365-376.

Summary

To address the hypothesis that malnutrition leads to a higher incidence of diarrhea, the authors studied a group of 284 children under two years of age in Mexico City. The children were divided into equal groups according to the categories normally nourished, mildly malnourished (75-89% of weight-for-age of the national norm), and moderately malnourished (60-74% of weight-for-age). Children with moderate malnutrition were matched with children from the normal and mild categories according to age, sex, and neighborhood.

The childrens' weight, height, and arm circumference were measured, and the children were reclassified for purposes of correlation with diarrhea incidence, not only at the start of the study but also every three months during the year-long study. A doctor and nurse visited each child at home every week to record data on the frequency and duration of diarrhea episodes. Data was analyzed by treating the nutritional and diarrhea incidence data for one child over 12 weeks as an independent "person-quarter." Thus, one child might be in the "mildly-malnourished" category during one quarter, but shift to the "moderately malnourished" or "normal" category the following quarter. During the study year, the nutritional category of 46% of the children changed.

The findings of the study showed that normally nourished children had a calculated average of 3.3 episodes of diarrhea per year; those mildly malnourished had 3.7; and those moderately malnourished had 6.0 episodes per year. Even after adjustment of risk for socioeconomic, sanitation, and demographic variables, malnourished children still had a 60% greater risk for diarrhea than normally nourished children.

The authors also analyzed the data using the methods of earlier reports (Chen, Tomkins) that had not demonstrated a difference in diarrhea incidence relative to nutritional status. These analyses confirmed the earlier reports.

The authors conclude that these data support the hypothesis that malnutrition predisposes a child to diarrhea.

Editorial Comment

Common sense suggests that malnutrition should lead to a higher incidence of diarrhea. Clinicians have reinforced this impression because they see the combination so often in the clinic. Careful studies in the past, however, have tried to separate out the influence on diarrhea incidence that other variables, often associated with malnutrition, might have. Poor children living in dirty environments are often malnourished, and have lots of diarrhea. The earlier studies concluded, however, that malnutrition played no additional role in increasing the rate of diarrhea beyond the rate caused by the poor, dirty environment.

Sepulveda and his colleagues identified weaknesses in the methods used in earlier studies. They noted that Chen and James had only classified the nutritional status of their cohorts once, at the beginning of their studies; changes in nutritional status during the followup period were not included in the analyses. Tomkins used only two classifications of nutrition, again made only once. The authors also noted that none of the previous studies controlled for confounding socioeconomic, demographic, environmental, and dietary factors. They corrected for these weaknesses.

The results support our common sense impression that malnourished children are more susceptible to diarrhea. These findings can be added to what has been demonstrated earlier, that malnutrition leads to longer and more severe diarrhea episodes. For the CDD program, this makes it doubly worthwhile to take steps to identify children with malnutrition, by weighing every child with diarrhea and determining their nutritional status from a weight-for-age growth chart. For the malnourished, special attention can then be given to educating their mothers about: preventing dehydration with ORT, feeding during diarrhea, and preventing diarrhea itself with handwashing, feces disposal, breastfeeding, measles immunization, and safe food preparation and storage. [RSN]

Brown, K.; Gastanaduy, A.; Saavedra, J. et al. "EFFECT OF CONTINUED ORAL FEEDING ON CLINICAL AND NUTRITIONAL OUTCOMES OF ACUTE DIARRHEA IN CHILDREN." The Journal of Pediatrics, vol. 112, no. 2, February 1988, 191-200.

Summary

Diarrhea patients in Peru 3-36 months of age received various dietary treatments to determine the effect of early full feeding on the severity and nutritional outcome of diarrheal illness. The basic formula

diet was composed of casein, sucrose, dextrin with maltose (Dextri-Maltose), and vegetable oil to provide 110 kcal/kg body weight/d (CSO-110). Four groups of randomly assigned patients received this formula full-strength or half-strength, ORS, and/or IV fluids only as follows:

- **Group 1**: full-strength formula from day one;
- **Group 2**: half-strength formula for two days, then full-strength;
- **Group 3**: only GES (glucose-electrolyte solution) for two days, half-strength formula for the next two days, then full strength formula; and
- **Group 4**: same diets as Group 3 except that only intravenous GES was used for the first two days.

The GES maintenance solutions provided 24 to 30 kcal/kg/d. Therapeutic success rates were similar among dietary groups, ranging from 90-97%. Stooling (stool weight) was initially less in group 4 ($P = .05$), but was initially similar among groups treated orally and among all four groups by the third day. Net apparent absorption of nitrogen, fat, carbohydrate, and total energy; retention of nitrogen; and increments in body weight, arm circumference, and skin-fold thicknesses were higher in the groups fed more and earlier. Thus, continued oral feeding with the CSO diets during the early phase of therapy led to a better nutritional outcome for the patients.

Editorial Comment

This exquisite study provides the detailed observations we have needed to prove why and how full feeding immediately in diarrhea treatment benefits the patient. Stool weight (volume) was greater in the group receiving the formula right away, but so was their weight gain and net nitrogen retention, compared to those who were "starved" (given only ORS or IV fluids initially). The children fed early gained approximately 140 gm more than those treated initially with ORS. What a difference in the prevalence of malnutrition in a population this would make if that 140 gm could be added with each diarrhea episode!

Brown and his colleagues used well-nourished children and lactose-free formula in their studies. We cannot, therefore, apply these results freely to malnourished children who may have greater digestive deficiencies and, hence, a greater chance of intolerance to food in general, and milk in particular.

These results do demonstrate for all types of patients, however, the importance of looking at the patient, not at the stool. If the patient is gaining weight well on full feeding, even if the diarrhea has not decreased or has increased slightly, the feeding should be continued. [RSN]

TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D
Managing Editor: William Amt

November 1988
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PRITECH is a USAID-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the TLU, a monthly bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues. Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the TLU editorial staff, and are not meant to represent USAID policies or opinions. Your comments are welcome.

Clemens, J.; Stanton, B. "AN EDUCATIONAL INTERVENTION FOR ALTERING WATER-SANITATION BEHAVIORS TO REDUCE CHILDHOOD DIARRHEA IN URBAN BANGLADESH: I. APPLICATION OF THE CASE-CONTROL METHOD FOR DEVELOPMENT OF AN INTERVENTION." American Journal of Epidemiology, Vol. 125, No. 2, 1987, 284-291.

Summary

In order to develop an educational intervention to improve water and sanitation practices in Bangladesh, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) conducted a study (based on empirical rather than a priori reasoning) to assess current hygiene behaviors in the home and to link them with diarrhea incidence by using a case-control methodology.

Case and control groups were identified through an initial, three-month interview process where, at two-week intervals, 1,350 families in 51 communities were asked if their children had contracted diarrhea during the previous two-week period. From these data, 45 families whose children had diarrhea at least 1.7 times the expected rate for children that age became the case group; the 53 families whose children had no episodes of diarrhea served as the control group. An unannounced visit to each of the families identified was conducted by an observer, who recorded water and sanitation practices over several hours, as well as noting socio-economic information about the family.

The case and control families had similar socioeconomic and demographic characteristics, and were not different with regard to their source of water (primarily tubewell or tap), their method of storage of drinking water, their food storage, or the presence of animals in the kitchen.

Differences in defecatory practices, feces and garbage handling, and maternal handwashing were noted between the groups. Eighty-two percent of the control mothers washed their hands before cooking, compared to 53 percent of the case group; 33 percent of the control children who could walk defecated in the family's living area, as opposed to 80 percent of the case group children; and 30 percent of the control children put waste in their mouth, versus 47 percent of the case children.

The researchers chose to focus on these three practices in preparing an educational intervention, which is described in the following article.

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Technologies for Primary Health Care

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PH: 703-841-0680. Telex: 3792632—PARK PL. AID Supported Contract #DPE-5927-C-00-3083-00

Stanton, B.; Clemens, J. "AN EDUCATIONAL INTERVENTION FOR ALTERING WATER-SANITATION BEHAVIORS TO REDUCE CHILDHOOD DIARRHEA IN URBAN BANGLADESH: II. A RANDOMIZED TRIAL TO ASSESS THE IMPACT OF THE INTERVENTION ON HYGIENIC BEHAVIORS AND RATES OF DIARRHEA."

Summary

Based on the results of the above case-control study, three health education messages were prepared that emphasized the importance of washing hands before food preparation, defecating away from common areas, and properly disposing of waste so that children do not play with it. During an eight-week period, 25 of the original 51 communities received these messages through discussion groups and supporting print materials. The 26 other communities of the control group continued to receive regular primary health care services, but without the additional health education activities. Both groups had similar rates of diarrhea and behavior patterns before the intervention.

Following the intervention, families in the 51 communities were observed for six months. Forty-nine percent of the mothers who received the messages washed their hands before preparing food, versus 33 percent of the control group. Neither group had a decrease in open defecation. Observations of waste disposal and of children eating waste were similar for the two groups. Diarrhea incidence was 26 percent lower for the intervention communities and was significantly lower for children aged 2-3 years.

The authors believe that effective interventions for the lowering of diarrhea incidence can be developed if they focus on only a few empirically observed behaviors at a time, and if educational messages are kept simple.

Editorial Comment

In developing mass media or one-on-one communications to promote ORT, feeding, and other aspects of diarrhea treatment, I have been struck by the importance of first testing the feasibility and acceptability of the actions which will be recommended to the mothers. Only after that testing should the actual messages which will be used in radio spots or mother's pamphlets be designed. This sequence, if followed, ensures that ORT communications are based on the actual conditions and behaviors of real mothers in real homes dealing with real kids with diarrhea, and not on conditions and attitudes imagined by managers or doctors in the capital. It also enhances the likelihood that those messages will be effective in changing behaviors.

This elegant study shows that the same commonsense approach applies as well to behaviors and message development about diarrhea prevention. Clearly, the intervention had to be based on the actual environment: most of these people had good water supplies, for example, so that a program emphasizing clean water would not have been able to make a difference in diarrhea incidence. The initial studies, while costly in time and expense, made it possible to avoid wasting time in activities or messages which had little chance of being effective.

Of the three hygiene behaviors which had been chosen, only one was ultimately susceptible to change, handwashing before food preparation. Changes in this behavior alone led to a 25% reduction in diarrheal incidence. One could imagine that in an environment with less availability of clean water, this behavior might not have been as effective unless the program made efforts to improve the availability of water.

In short, this pair of papers is strong evidence to push us all to avoid designing generic communications activities based on general principles, particularly in the area of prevention of diarrhea. If the investigators had designed messages emphasizing breastfeeding or food storage, those messages would have interfered with the ability of the mothers to remember about the importance of handwashing, and would have had little effect themselves in the environment of the study. In another area, with different conditions, such messages might be quite effective.

The lesson for people involved in diarrhea control programs should be clear: communications efforts must be based on research carried out prior to message design. Without adequate research in the specific communities where health education will be occurring, the messages designed may be quite ineffective, and waste much more time and money than the research would have consumed. [RSN]

Rajah, R.; Pettifor, J.; Noormohamed, M. et al. "THE EFFECT OF FEEDING FOUR DIFFERENT FORMULAE ON STOOL WEIGHTS IN PROLONGED DEHYDRATING INFANTILE GASTROENTERITIS." Journal of Pediatric Gastroenterology and Nutrition, vol. 7, 1988, 203-207.

Summary

"Prolonged diarrhea following an acute episode of dehydrating gastroenteritis in infants is often treated by the empirical removal of both cow's milk protein

and lactose from the feed, as they both have been implicated in the prolongation of diarrhea.

In order to assess the efficacy of this policy and to determine whether there are any advantages in using a lactose-free semi-elemental feed in this situation, infants with prolonged dehydrating gastroenteritis from a developing community in South Africa were studied. Male black children between the ages of 6 weeks and 2 years with prolonged dehydrating gastroenteritis (requiring intravenous fluids for longer than 72 h to maintain hydration) were randomly assigned to receive one of four feeds if the stool weight was greater than 30 g/kg body weight/24h on the fourth day of admission. The four formula feeds were a partially modified cow's milk formula; a lactose-free, casein-containing formula; a lactose-free, soy-protein-containing formula; and a lactose-free, whey-hydrolysate-containing formula. Stool weights were measured for the following 3 days.

Seventy-two children were enrolled into the study. Stool weights were similar in the four groups at the start of the trial, and fell significantly over the trial period in those groups receiving the lactose-free feeds. Mean stool weight in the cow's milk formula group did not change.

Thus, it appears that the continued feeding of a cow's milk-based lactose-containing formulae to infants with prolonged dehydrating gastroenteritis adversely affects their recovery. Whether the responsible factor was the presence of lactose or a fraction of cow's milk protein could not be determined in this study. Furthermore, the use of a semi-elemental feed does not appear to have any advantages over the cheaper lactose-free formulae in this situation." [Journal abstract]

Editorial Comment

The authors of this report draw conclusions with which I cannot wholly agree.

By observing only stool weights, they draw the broad conclusion that the infants fed the lactose- and milk-free feeds "responded better" than those fed the milk-based formula.

One can argue with the conclusions they drew from their observations. The mean stool weights at the end of the observation period were, in fact, not statistically different between the lactose-containing group and two of the three other groups. They singled out the lactose group as poor responders because a larger number of the group continued to have stools greater than 330 g/kg body weight on the last (fourth) day of the study, but only one of the non-milk groups was clearly different from the lactose: the other two showed a similar number of "failures".

More importantly, however, they did not observe the more important measure of treatment success, the child; they chose to look at the stool. Compare this report with the Peru study by Brown et al reviewed in last month's TLU. That study emphasized the importance of the child's weight gain as the most important indicator of the success of a particular nutritional treatment regimen. Brown's group found that the children with the best increases in body weight were those who were receiving the most concentrated feeds, who also had the highest stool weights. If Brown had used only the criteria for success used in this report, he would have judged that group the worst responders, and discarded full-strength feeds as worse than diluted or delayed feeds or intravenous treatment.

We don't know what the body weight changes were in this study. For that reason I am not able to conclude along with the authors that the lactose feed was less successful: the most important piece of data to make that judgment is missing from the report.

Why did the lactose group have more stool? The authors blame it on lactose, and milk specifically. I'm not so sure. Looking at the actual formula composition, one finds that all the carbohydrate in the lactose formula was either sucrose or lactose--both small, osmotically active molecules. The other three formulas had either exclusively or predominately maltodextrins as their carbohydrate component. Maltodextrins are predominately large molecules, and are less osmotically active. I wonder if this may have been the critical difference--not lactose per se, but osmolarity. The enhanced absorption of intestinal fluids seen with some cereal-based oral rehydration solutions (ORS), as compared to glucose-based ORS, is doubtless related in part to a similar difference in osmolarity. Here, the lactose formula had an osmolarity of 296, while the other three formulas were 169, 189, and 195 mOsmol/kg.

I also wonder what the results would have been if the children had been receiving ORS instead of intravenous maintenance hydration, and had gotten a mixed diet (e.g., rice mixed with the formula) rather than just formula.

Milk and lactose keep getting blamed, but a lot of that is undeserved. This study is an example of how incomplete methods and a pre-existing bias may lead to questionable conclusions. [RSN]

Siddique, A.; Akram, K.; Islam, Q. "WHY CHOLERA STILL TAKES LIVES IN RURAL BANGLADESH." Tropical Doctor, vol. 18, 1988, 40-42.

Summary

Thirty-nine cholera deaths in Bangladesh were investigated to determine the factors that prevent cholera patients from receiving proper medical attention. A control group of 31 people from the same neighborhood who had had cholera but survived was used for comparison.

The study found that 84.6 percent of the fatal cases, but only 41.9 percent of the survivors, had

been treated by village practitioners, who do not have a medical degree and who provide most of the health care at the village level. Fifty-four percent of the survivors had been treated by government doctors, as opposed to 5 percent of the fatal cases. The survivors tended to be socioeconomically better off and lived closer to the district health facility than the fatal cases.

Because there is such a dependency on village practitioners, the authors conclude that they should be trained in treating acute diarrhea and how to make patient referrals, and should work at local diarrheal treatment centers during epidemics.

Editorial Comment

The authors emphasize the importance of improving the skills of village practitioners, who, for the fatalities, were the consultation of last resort before dying. This is highly appropriate, yet often is not given priority by CDD programs. All too often we confine our efforts to the health personnel within the ministry of health official system, and ignore the fact that the majority of care is often being delivered by non-MOH, private practitioners.

One might also stress the importance of emphasizing referral in public education messages. Where cholera is an important disease problem, CDD programs should recognize that home or village level treatment may not be able to keep up with heavy stool losses, and put more emphasis on the dangers of diarrhea, on the availability of effective treatment at the local health center, and on the need for early treatment at a modern medical facility.

Cholera deaths are due almost entirely to dehydration. With our current knowledge of oral and intravenous treatment for dehydration, there is no good reason why anyone should die from cholera. [RSN]

TO OUR READERS

In order to keep our mailing list as current and thorough as possible, we would like to know if the address we have for you is correct. If it is not, please let us know at your earliest convenience so that we can make the appropriate changes. If you (or colleagues of yours) are not currently on our mailing list and would like to start receiving monthly issues of the TLU, please send us a letter indicating such, and we will be glad to add your name to our list. Also, please let us know if you wish to be taken off the TLU mailing list.

The PRITECH Information Center is in need of unclassified reports and other documents on diarrhea-related topics, particularly project-specific information. The Center would appreciate receiving only documents that have had their copyright waived so that they can be entered into the Center's collection and possibly featured in the TLU. The Center is also interested in obtaining information (address, cost) about other newsletters and journals published overseas that often are not available in U.S. libraries. Such periodicals include those prepared by ministries of health, national pediatrics organizations, universities, or community groups. We thank you and look forward to hearing from you soon.

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TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D.
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TO OUR READERS

The December 1988 and January 1989 issues of the TLU feature several articles that recently appeared in an issue of Social Science and Medicine. The Vol. 27, No. 1 issue of SSM is entirely devoted to the socio-cultural aspects of diarrhea, and the articles can be grouped as either theoretical, methodological, or case studies. Copies of the articles are available from the PRITECH Information Center.

Weiss, M. "CULTURAL MODELS OF DIARRHEAL ILLNESS: CONCEPTUAL FRAMEWORK AND REVIEW." Social Science and Medicine, vol. 27 no. 1, 1988, 5-16.

Summary

"Health planning for diarrheal diseases must be responsive to both epidemiological patterns and local perceptions of health, illness and need. A conceptual framework that relates patterns of distress, explanatory models, help seeking, and treatment practices to knowledge and use of oral rehydration therapy (ORT), dietary management, other specific treatments, and health policy issues provides the basis for our review of research on diarrheal illness-related beliefs and practices.

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Technologies for Primary Health Care

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"The ethnomedical model asserts that efforts to secure the compliance of target populations are likely to be inadequate without an alliance between health professionals and communities to identify and address mutually comprehensible objectives that are perceived locally as meaningful and relevant. An appreciation of local cultural models and the diversity of cultural contexts enables health professionals to (1) recognize the significance of local perceptions of diarrheal illness with respect to pertinent outcomes and perceived needs, (2) develop ways to introduce recommendations that communities will accept, and (3) make appropriate use of existing community resources representing local traditions." [Journal abstract]

Editorial Comment

This is a lovely summary of research about the "cultural construction" of diarrhea, as presented in the context of the four "patterns" mentioned in the above summary. Some of the examples cited are memorable: the inability to use melons, considered to be a "cool" food, to treat diarrhea, a "hot" illness, because of an association between melons and cholera; the likelihood that people will categorize a particular diarrheal episode--diagnose it, as it were--not on the basis of the appearance of the stool or other observable symptom, but rather on the basis of its "cause," which may include evil eye, teething, or worms; the community conceptualization of dehydration as another illness such as sunken fontanelle, with diarrhea being an accompanying, though incidental, problem; and the likelihood of falsely low rates of fluid treatment from some surveys because respondents did not classify the liquids they were indeed giving as "treatment."

Weiss also makes some important points regarding implementation of programs. He gives examples of ways in which programs can use local ideas in their programs: packaging ORS in pink packets to suggest that it is a hot remedy for a cold disease, for example. He comments that societies may demand a mass vaccination program or quarantine as the public health response to a cholera epidemic, even though they have limited biomedical effect. The reason for the demand is that these are societal rituals, responses that societies have understood and accepted to deal with "mysterious experiences that are...threatening." While societal demand does not change a useless activity into a useful one, program managers must deal actively with these politico-cultural demands as part of their response to an epidemic situation.

The danger, in my opinion, is that we get seduced into accepting the local culture's perspectives and explanations, even when they conflict with biomedical facts. There is an unstated assumption in much of this work that cultural beliefs cannot change. That just isn't true. With effective education and communication, for example, mothers can change their model of diarrhea to one which emphasizes dehydration and nutritional loss rather than merely stool output. This will lead to a more ready response to promotion of ORT and feeding. We ignore the power of these cultural responses to diarrhea at the peril of program failure: we must be sure our program identifies and responds to them actively. That doesn't mean that we should surrender to them. We should not, for example, tell the public that ORT is a purgative just because they use purgatives to treat diarrhea. Ideas can change.

The challenge is to make our education and communication efforts effective. That demands adequate research into cultural beliefs before taking action <u>and during implementation</u>, as well as adequate monitoring of results leading to changes in strategy where programs are not being effective. [RSN]

Bentley, M.E. "THE HOUSEHOLD MANAGEMENT OF CHILDHOOD DIARRHEA IN RURAL NORTH INDIA." <u>Social Science and Medicine</u>, vol. 27 no. 1, 1988, 75-85.

Summary

An in-depth anthropological study of child diarrhea in three villages in rural northern India investigated knowledge, beliefs, and practices of mothers related to the household management of child diarrhea. Three methodologies were used: ethnographic techniques, a detailed structured interview with both open-ended and closed questions, and participant observation in the home of behavior related to diarrhea during the course of actual diarrheal episodes through the recovery phase. Observations were recorded of the behaviors of the child, mother, and other child-care providers.

Almost all mothers studied continued to breastfeed normally, and did not decrease fluids during diarrhea. Withholding of food during the diarrhea did not usually occur, but the child's diet was shifted toward "softer" and "cooler" foods. The use of anti-diarrheals was widespread.

Ninety-five percent of mothers believed that diarrhea could be harmful; the most important result of diarrhea for 66% of mothers was "weakness."

Early use of ORT was found to be related to an understanding of diarrhea as fluid loss and the rehydrating/replacing function of ORT. But eighty-one percent of mothers who had previously used ORT but who do not plan to use it again were dissatisfied because it "did not stop the diarrhea." These mothers thought that ORT was a medicine that would cure the diarrhea. Therefore, in ORT interventions there is a need to explain that the function of ORT is to replace lost fluids, and not to stop the diarrhea. [Summary in part from journal abstract]

Editorial Comment

Bentley used more elaborate and demanding methods than the Mulls (see following article). The in-home observation allowed her to separate what people said they did from what they actually did. This showed that mothers did not stop feeding their children, even though they may have said they did. She found similar variation in the classification of diarrheas by the mothers as was seen in Pakistan.

Bentley expressed her concern at some of the messages used to promote ORT by frightening mothers, such as "DIARRHEA CAN KILL YOUR CHILDREN! SAVE THEM! GIVE THEM MORE TO DRINK!" Since mothers generally do not perceive diarrhea as potentially fatal, such messages may lead to rejection of the ORT component because mothers reject the basic "fact"--the fatality of diarrhea--on which the justification for using ORT is based. Is this really a problem? We need to heed her warning and take steps to find out.

She draws our attention very effectively to the point that "Improved diarrhea management is primarily a problem of behavior change." Unlike the physiology of the intestine, or the action of ORT, behavior and its cultural bases are different from culture to culture, from place to place. Because of that it seems harder to draw conclusions about behavior that can be applied everywhere, making the area seem less "scientific." This should not be so: as Bentley demands, "We must address the question of behavioral change in diarrhea management as systematically and scientifically as we do the develoment of such technological innovations as 'Super ORS.'" How true! Doing better at behavior change is the most important challenge in medicine and public health today. [RSN]

Mull, J.D. and Mull, D.S. "MOTHERS' CONCEPTS OF CHILDHOOD DIARRHEA IN RURAL PAKISTAN: WHAT ORT PROGRAM PLANNERS SHOULD KNOW." Social Science and Medicine, vol. 27 no.1, 1988, 53-67.

Summary

An in-depth interview on diarrhea concepts was carried out with 57 rural mothers from a population in which an epidemiologic survey was also being done. The interview schedule included 21 closed- and open-ended questions followed by six case descriptions for informants to diagnose and discuss.

Despite active government promotion of ORT for three years, 28% of the interviewees had never heard of using packets of ORS to treat diarrhea, and 60% had never heard of using sugar-salt-solution (SSS), although 56% had actually used ORS packets at some time and 37% had used SSS.

Errors in ORT were common, particularly underuse (giving 1-2 teaspooons of ORS 2-3 times daily), errors in mixing the solution (using half a packet, using wrong water volumes, or using the wrong sugar, salt, and water amounts for SSS), and giving sugar-water in addition to ORS or adding sugar to the ORS solution.

Most mothers perceived diarrhea to be an illness caused by or related to excessive heat in the body. This was attributed to hot weather, "hot" foods, or "hot" breastmilk. Sugar water was beneficial because of its cooling effect. The recommendations of the national CDD program to use certain foods during diarrhea, such as eggs, chicken, or potatoes, were bewildering to the mothers, for whom these foods were "hot" and therefore not appropriate during diarrhea. In contrast, addition of herbs or fruit juices to ORS, such as the citrus flavoring added to some commercial ORS preparations, was seen as appropriate, because of the'cooling' effect of citrus fruits.

Certain diarrheas were classified as folk illnesses, to be treated with related folk remedies rather than taking the child to a doctor: 26 of 57 had used untrained midwives (dais) for diarrhea attributed to a sunken fontanelle, and others had used Muslim religious leaders (21), holy men (19), or traditional healers (2) for diarrhea attributed to "evil eye," rather than consulting modern healers. Ironically, of those who went to "doctors," 84% said that only non-electrolyte drugs had been prescribed. The parallel epidemiologic survey, which used only a single word for diarrhea, did not detect these usage patterns related to sunken fontanelle and "evil eye"-related diarrhea.

Many mothers classified certain diarrheas as "natural," an expected part of growing up, and 33% said that diarrhea was "never" serious enough to need treatment. Diarrheas were commonly perceived as an illness only when accompanied by fever and vomiting.

Editorial Comment

The importance to CDD program managers of having and using this kind of information should be obvious. The authors stress the obvious need to put more attention on communication efforts which explain how to mix the ORS, and how much to give. Clearly, the mothers will give ORS in more appropriate volumes if they understand the concept of fluid loss and dehydration. The authors also stress the less obvious need to better design the communication efforts to include all the prevalent classifications or concepts of diarrhea, so that the diarrhea associated with sunken fontanelle (probably more severe dehydrating diarrhea), as well as the diarrhea diagnosed by the mothers as "natural" or due to "evil eye," will also get treated with rehydration therapy. They make the telling point that many of

the statistics on ORT use rates, based on questions using only a single word for diarrhea, may be quite inaccurate, since they do not include the mother's response to the "other diarrheas." To be effective, the program's feeding recommendations must take into account the "hot" and "cold" classifications of the recommended foods.

I was struck as well by the practicality and effectiveness of the methods they used. To add interviews of the sort described does not add impossibly to the work of an epidemiological survey, and is more efficient than running the same anthropological study independently. The additional information obtained is useful--even essential--in understanding and implementing the results of the simpler survey technique. The use of cases to stimulate discussion was obviously a very powerful tool for exposing concepts and beliefs that the investigators might never have thought of themselves, and should be considered for use in similar brief ethnographic studies in other cultures. [RSN]

TECHNICAL LITERATURE UPDATE

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Technical Editor: Robert Northrup, M.D.
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PRITECH is a USAID-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the TLU, a monthly bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues. Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the TLU editorial staff, and are not meant to represent USAID policies or opinions. Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Your comments are welcome.

TO OUR READERS

The December 1988 and January 1989 issues of the TLU are featuring several articles that recently appeared in an issue of Social Science and Medicine. The Vol. 27, No. 1 issue of SSM is entirely devoted to the socio-cultural aspects of diarrhea, and the articles can be grouped as either theoretical, methodological, or case studies. Copies of the articles are available from the PRITECH Information Center.

Nichter, M. "FROM ARALU TO ORS: SINHALESE PERCEPTIONS OF DIGESTION, DIARRHEA, AND DEHYDRATION." Social Science and Medicine, vol. 27, 1988, 39-52.

Summary

This study analyzed health care beliefs and practices of caretakers in regard to infant and children's diarrhea in rural low-country Sri Lanka, based on interviews and direct observations of families with a child suffering from diarrhea. Less than one-fourth of the observed cases of children's diarrhea were treated with ORS and, even in these cases, the caretakers failed to understand its function. The paper presents popular ideas concerning the causes of various kinds of diarrhea and their treatment.

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Technologies for Primary Health Care

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The author recommends that health education programs communicate a clear understanding of dehydration, explaining what ORS is for and the kinds of diarrhea it can treat, in terms that the local population will understand. Local terminology for diarrheal illnesses should be incorporated into health messages, as should cultural perceptions of dehydration. ORS should not be marketed as a medicine for diarrhea or in relation to a popular health concern without careful pretesting.

Editorial Comment

Several perceptions that mothers have are presented here. Those deserving mention include recogition that, where mother's breastmilk is thought to be responsible for the diarrhea, the mother is likely to reduce or withdraw it entirely; and the common assumption that a child's feces are not polluting or dangerous, which leads to failure to wash hands before cooking or food handling.

Nichter suggests that research should include the roles of drugs in popular perceptions of diarrhea treatment, which are thought to "dry" the diarrhea, to cool the body, to calm worms. He cautions against promoting ORS as a means of increasing strength, suggesting that so doing may lead to substituting ORS for food, and thus to malnutrition.

He urges appropriately that we make greater attempts to include the community in our efforts to control diarrhea, because the disease cannot be affected without changes in the environment and in behavior. Thus "ownership" of the effort by the community is important in motivating the community into action. One interesting approach he tried was to involve the village in keeping track of diarrhea episodes in diaries. The villagers' surprise at the frequency and cost of diarrhea stimulated their interest in taking steps to control it.

Lastly, he urges that we not fall into the trap of thinking of ORS as a magic bullet, or panacea, for the diarrhea problem. As a fundamental problem with its origins in ignorance, poverty, and a contaminated environment, broader development efforts are the real solution. Technological fixes like ORS "are resources, not solutions." [RSN]

Nations, M.K. and Rebhun, L.A. "MYSTIFICATION OF A SIMPLE SOLUTION: ORAL REHYDRATION THERAPY IN NORTHEAST BRAZIL." Social Science and Medicine, vol. 27, 1988, 25-38.

Summary

Fieldwork using qualitative methods was conducted in Fortaleza, Brazil, to determine the causes of the lack of access of villagers and sick children to ORS. Although ORS is easily prepared and administered in a home setting, they found that procedures in medical clinics and hospitals have the effect of convincing villagers in Northeastern Brazil that ORS is only administrable by physicians. By withholding ORS even when free packets are in the storeroom; by isolating the mother and making her feel inferior and incompetent through the use of medical jargon and not giving explanations; and by unnecessarily making the oral rehydration procedure overly technical (using repeated weighings and timing the process), physicians and the medical establishment cut off the mothers and children from functional access to ORS. No effort was being made by the health system there to teach mothers how to do ORT. The authors theorize that "the administration of ORT...is a ritualized process...put in place by medical personnel who feel [that their status is] threatened by the social and political implications of ORT," that is, by the possibility of putting control of this powerful treatment in the hands of illiterate traditional healers and mothers.

To test an alternative approach, traditional healers were mobilized to promote, use, and teach ORT to the villagers. The healers helped design new ORT health education materials for illiterate caretakers. In a community meeting, healers compared their current treatments for diarrhea, then did comparative tasting to reach agreement on the best combination of the medicinal teas already in use with sugar and salt. ORT and this solution were then used in traditional healing rituals.

The project succeeded in familiarizing caretakers with homemade sugar-salt solutions and government-issued packets and demonstrated the importance of a community-based, culturally sensitive approach.

Editorial Comment

This article shocked me with its anger and resentment against doctors and the medical system, but reading the three cases presented convinced me that the anger was justified. The cases show us from the villager's point of view how it feels to be turned away from a clinic without receiving ORT after walking all night to get there; how a mother feels when her diarrheic baby is "tortured" by doctors putting in an intravenous line using scalp vein needles without explaining anything to her; and how inferior and incompetent a mother will feel when ORT administration is transformed into a highly technical procedure which can be done only with marked and measured medical containers, a weighing scale, and a wristwatch, still without any explanation to the mother. Presented in that fashion, I saw immediately how ORT and the treatment of diarrhea had become part of a kind of social ritual which maintained medical personnel in a high position, and kept poor villagers feeling ignorant and powerless in the face of diarrhea in their children.

Fortunately, many medical systems have made real efforts to bridge the cultural gap to the village

mother, working hard to teach ORT effectively, and stressing home treatment of diarrhea. WHO's Treatment Plan A specifies clearly the knowledge and skills each mother of a diarrheic child should have when she leaves for home. Most programs are working hard to prevent situations like those presented in the three cases.

Doubtless, however, there are many places, and practitioners, where practices and "rituals" of keeping the patient ignorant are slow to change. We need to be alert to detect them, and aggressive in changing them. The opportunity to incorporate traditional healers into the treatment network should be considered wherever such healers play a prominent role in managing diarrhea cases. [RSN]

Bentley, M.; Pelto, G.; Straus, W. et al. "RAPID ETHNOGRAPHIC ASSESSMENT APPLICATIONS IN A DIARRHEA MANAGEMENT PROGRAM." Social Science and Medicine, vol. 27 no. 1, 1988, 107-116.

Summary

In order to gather more reliable data of populations' belief systems relevant to their health behaviors, primary health care programs are increasingly employing the technique of Rapid Ethnographic Assessment (REA). REA combines the rapid data collection of surveys (which tend to produce insufficient information about a lot of people) with anthropological observation (which requires too much time and gathers information on not enough people). The basic technique is the interview, using a semi-structured but flexible approach, stressing open-ended questions, but more limited than the classic ethnographic key informant interview. Time restraints limit the number of sites that are visited for an REA. Because results should be generalizable, the selection of representative sites and informants should be quite systematic.

REA was used in the Dietary Management of Diarrhea (DMD) project, an effort aimed at improving the approach to defining and promoting better feeding practices during and after diarrhea. A key aspect of the REA was the development of a highly structured ethnographic field guide for data collectors. The guide included detailed specifications on which topics were to be addressed, methods for introducing topics, structuring specific questions, and specifying probing questions. Data collectors were trained in project goals, sample selection, interviewing skills, and recording and analyzing data. This one-week training session was crucial because the REA staff had only six weeks to collect and analyze the data.

In Peru, 30 informants were selected, and in Nigeria 10, as representative of the countries' different ecological and socio-economic zones. Through observational interviews, information was collected on where people place diarrhea in an illness taxonomy, how diarrhea is treated (a "fold taxonomy"), and feeding practices during and after diarrhea.

The REA for the DMD project produced descriptive data that was important for planning subsequent project activities. Several limitations of REA in relation to the project were identified, however. These included the limited amount of time allotted for collecting thorough data; the need for more respondents (especially in Nigeria) so as to have sufficient variety; and the collection of non-diarrhea ethnographic information limited the time to focus on diarrhea-related information.

The authors conclude that REA will become more widely used as projects realize that an understanding of the targeted population is necessary for the success of the project.

Editorial Comment

The value of this type of approach should be obvious. It seems quite similar to the approach used by the Mulls in Pakistan (refer to the December 1988 issue of the TLU). With this technique available, programs can gather the additional cultural information they need in a practical and brief fashion. Two of the authors (Brown and Bentley) have written a broader guide for program planners and decision-makers entitled Improved Nutritional Therapy for Diarrhea, which provides overall instruction on how a program should approach the need to better specify what foods and feeding practices mothers should use during diarrhea. This manual incorporates the REA approach, and can be obtained free by writing the PRITECH Information Center. A parallel manual by Marcia Griffiths et al., entitled Improving Young Child Feeding During Diarrhea: A Guide for Investigaors and Program Managers, uses a slightly different but related approach. It too provides very practical guidance for field studies of feeding related to diarrhea and can be obtained free from PRITECH. The methods outlined in both manuals can be used as models for the application of these investigative approaches to other program needs, such as investigating home fluid use or preventive behaviors, and should prove quite useful. [RSN]

Scrimshaw, S.C.M. and Hurtado, E. "ANTHROPOLOGICAL INVOLVEMENT IN THE CENTRAL AMERICAN DIARRHEAL DISEASE CONTROL PROJECT." Social Science and Medicine, vol. 27, 1988, 75-85.

Summary

"The process of conducting applied anthropological work leading to health program development and evaluation is seldom described in the literature. This paper discusses the combination of factors which led to the involvement of anthropologists in the Central American Child Survival Project and how anthropological approaches are being used in the project. Ethnoclassification was used to illustrate the discrepancy between the proposed approach to treatment for dehydration produced by diarrheal disease and the actual beliefs and practices in 4 Central American communities. Techniques such as rapid, focused assessment using anthropological methods of data collection and presentation are discussed, as are strategies for presenting this information to health program planners and administrators." [Journal abstract]

Editorial Comment

Here too an important focus was on the development of a field guide specifying the subjects, checklists, and techniques for semi-structured interviews. As with the above Sri Lanka study, a wide range of classifications of diarrhea was found, each being managed in different ways. The principle of multiple etiologies and multiple treatments obtained from multiple medical and traditional sources is constant.

I was excited by the steps which led to wide application of the approach in the region. Workshops explored methods of conveying this ethnographic information to health care providers in ways which would influence their behavior. Health workers in Panama were trained in the rapid assessment of community behaviors and attitudes, so that they could apply it locally without lengthy and elaborate research. The ethnographic data collected was used to modify the survey instrument for the large baseline project study. Ultimately, the study was influential in convincing project directors not to concentrate solely on ORS distribution, but to include components aimed at home management with feeding and fluids.

It should be clear from this and previous papers in this group that there are tremendous advantages to be gained from incorporating anthropologists, ethnographic methods, and a strong emphasis on behavior in diarrhea control programs.

Is it possible that programs could be effective without including substantial efforts to define local cultural perceptions and practices related to diarrhea and include them in their communications efforts? I seriously doubt it. [RSN]

TECHNICAL LITERATURE UPDATE

A MONTHLY REPORT OF CURRENT LITERATURE ON DIARRHEAL DISEASES & RELATED HEALTH ISSUES

Technical Editor: Robert Northrup, M.D.
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Molla, A.M.; Molla, A.; Rohde, J. et al. "TURNING OFF THE DIARRHEA: THE ROLE OF FOOD AND ORS." J. Ped. Gastroent. Nutr, 1989, vol. 8, 81-84.

Summary

"Ninety-three boys aged 5 years or less who had diarrhea due to *Vibrio cholerae* were randomly assigned to treatment with glucose oral rehydration salt (ORS) or rice-based ORS. For the first 24 h[ours], ORS only was given to all the patients. During the next 24 h[ours], ORS and normal food were given. The efficacy of the two types of ORS was compared in terms of ORS intake, stool output, change in hematocrit reading, serum specific gravity, and increase in body weight. At the end of the first 24 h[ours] of treatment, a 50% reduction in ORS intake and stool output was observed in the 47 patients randomly assigned to receive rice ORS as compared with the 46 patients who received glucose ORS. During the second 24 h[ours] of treatment, a significant reduction in the stool output was noticed in the glocuse ORS group, making the efficacy of glucose ORS equal to that of rice ORS. The study suggests that normal food can impart some of the superiority of 'super' ORS to standard glucose ORS with regard to reduction of stool volume." [Journal abstract]

Editorial Comment

The exciting core of this report is, FOOD IS AN ANTIDIARRHEAL DRUG, or, paraphrasing the authors, food is the real "super" ORS.

I have for some time been saying that food is as important in diarrhea treatment for its role in rehydration, as for its role in maintaining nutrition and promoting more rapid healing of the intestinal cells.

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This report begins the job of demonstrating that hypothesis.

During the first 24 hours, when no food was given, the children given the ORS based on rice starch had a real reduction in stooling, compared to the glucose-ORS group. With the addition of food during the second 24 hours, the two groups became indistinguishable. To state that another way, the data suggests that giving food along with glucose ORS has the same effect as giving rice-based ORS - both approaches appear to reduce stooling.

Now, to be rigorous, the study design does not permit us to go so far as saying, "food plus electrolytes and water is as effective in rehydration as glucose-ORS or rice-ORS." There was no group in the experiment that received only water as the fluid. But two of the authors (AMM and JR) have studied a couple of patients making that sort of comparison, and their results do not contradict that hypothesis. We hope a full study will be carried out soon.

I do not wish to imply by my remarks that we should be aiming at doing away with ORS, and just using water along with food plus electrolytes: not at all. ORS provides a uniform mixture of water, electrolytes, and the absorption-stimulating substrate. Food plus salt with water would almost inescapably not be so uniform. First would come the fluid, then the food and salt - what reahed the small intestine would doubtless vary quite a bit in composition, and therefore in stimulating absorption, despite the mixing that would occur in the stomach.

Add another cosideration: using ORS keeps the user focused on rehydration, on the importance of replacing the fluid that has been lost, volume for volume. That focus, that emphasis might be lost if we switched to a food plus water approach. Using a rice-based ORS, this study suggests, would allow us to keep the emphasis on fluids and rehydration, while getting the additional anti-diarrheal benefits of a food-based approach. [RSN]

Shahid, N.; Sack, D.; Rahman, M. et al. "RISK FACTORS FOR PERSISTENT DIARRHOEA." British Medical Journal, October 22, 1988, vol. 297, 1036-1038.

Summary

Studies have shown that more than half the deaths due to diarrhea can be attributed to chronic, or persistent, diarrhea. The authors undertook a retrospective analysis of persistent diarrhea (defined as lasting more than 14 days) of a systematically sampled group of patients aged 5 years or less attending the ICDDR,B clinical research center during the period 1983-85. Of the 4,155 children who participated in the study, 10% suffered from persistent diarrhea, with no detectable differences in sex or season. In terms of treatment, 18% of the patients with persistent diarrhea required admission to the medical ward, as opposed to only 8% of those with acute diarrhea. However, patients with persistent diarrhea were less likely to be dehydrated.

In contrast to children with acute diarrhea, those with diarrhea lasting more than 2 weeks were more likely to have bloody or mucoid stools, a history of previous antibiotic use, night blindness, vitamin A deficiency, and malnutrition (weight/height F% of the median of the NCHS standard). Pathogens found in the stool were not signficantly different from those found among acute diarrhea patients. Breastfeeding was found to be less common among those suffering from persistent diarrhea.

The authors cite several limitations of the data: reliance on recall of the parents for information on duration of diarrhea, antibiotic use and dietary history; inability to separate cause from effect in many of the cases; collection of fecal specimens late in the illness; and use of patients with acute diarrhea as a control group.

Editorial Comment

A study of this sort using ICDDR,B patients may show substantial differences in the proportions of various characteristics from the actual situation in the community. This is because of the general selection bias from using patients seeking care at a health facility. It may be further skewed in this case, however, because of the perception of ICDDR,B as the "cholera hospital", a place to go if you have the acute rapidly-dehydrating type of diarrhea familar to the public as cholera.

Nevertheless, it is interesting to note that 61% of those with persistent diarrhea did have some degree of dehydration on presentation, despite the fact that only 53% had watery stools. That more of the persistent diarrhea patients than the acute were not dehydrated is easy to understand--in contrast to the acute patients, they probably came because their diarrhea was persistent, not because of dehydration and its symptoms.

I was surprised that amoebiasis was not even mentioned as an etiologic agent, and giardia was present in only 4% of the persistent patients (the same as in the acute!). Is this real, or does it result from the stool examination procedures used?

Fully 16% had evidence of vitamin A deficiency (night blindness or conjunctional xerosis) compared with only 6% in the acute group. And 8% were wasted (F% wt/ht) compared to 3% in the acute group. While the retrospective nature of the data limits the possible conclusions, it seems highly likely that pre-existing vitamin A deficiency and malnutrition played a role in the gut failing to heal, and the diarrhea persisting.

The authors note that in Matlab, where availability of treatment for dehydration is excellent, 50% of diarrhea-related deaths are now from persistent diarrhea. Certainly, this is an increase from the probable 20-30% of the general population. But, why is it not sub-

stantially higher? With excellent care, hardly any patients should die with acute watery diarrhea. Is dehydration still the cause of some of those 50% of deaths from acute diarrhea? [RSN]

Clemens, John D.; Harris, Jeffrey R.; Khan, M.R.; et al. "IMPACT OF B SUB-UNIT KILLED WHOLE-CELL AND KILLED WHOLE-CELL-ONLY ORAL VACCINES AGAINST CHOLERA UPON TREATED DIARRHOEAL ILLNESS AND MORTALITY IN AN AREA ENDEMIC FOR CHOLERA." The Lancet, June 18, 1988, 1375-1378.

Summary

"The impact of B subunit killed whole-cell (BS-WC) and killed whole-cell-only (WC) oral cholera vaccines was assessed in a randomised double-blind trial in rural Bangladesh. 62,285 children aged 2-15 years and women aged over 15 ingested three doses of one of the vaccines or placebo. During the first year of follow-up, there was a 26% reduction of all visits for treatment of diarrhoea in the BS-WC group and a 22% reduction in the WC group. The reduction of all admissions for fatal or severely dehydrating diarrhoea was 48% in the BS-WC group and 33% in the WC group. Overall mortality rates were 26% lower in the BS-WC group and 23% lower in the WC group during the first year, and reductions of mortality were observed only in women vaccinated at ages over 15 years. However, no differences in cumulative mortality were evident at the end of the second year of surveillance." [Journal abstract]

Editorial Comment

This paper takes vaccine trials in diarrhea prevention to the next logical and programmatically critical level, beyond the ability of the vaccine to prevent cases of diarrhea, to its ability to reduce the need for treatment (i.e., severity) and mortality.

From a CDD program's point of view, that is the major objective of a preventive program like vaccination. Most CDD programs are still primarily concerned with eliminating diarrhea deaths, and have not yet succeeded in that enough to switch to the objective of reducing diarrhea incidence only because it is an inconvenient nuisance.

The discussion section of this paper is particularly cogent, noting a number of reasons why these findings must be conservatively extrapolated to programs. The most obvious constraint is the limitation of usefulness to areas with lots of cholera: although the vaccine with the B-subunit of cholera toxin (BS-WC) does cross-protect against toxigenic Escherichia Coli (LT-ETEC), even it would not be likely to have nearly the impact seen in this report in an area without cholera. The incidence of cholera was particularly high in the study year.

The second constraint is the need for a perfectly run immunization program to achieve these excellent results. Three doses, and a perfectly run cold chain: how close can the usual routine immunization program, with its inevitable problems and often high drop-out rates, come to achieving these results?

Third is the fascinating finding that the mortality reduction was not among the children, the group likely to have the highest diarrhea incidence, but rather among adult women! The authors suggest that this may be due to the delays in a conservative area like Matlab in taking women for treatment of diarrhea. Without immunization, some of the women died. With vaccinating them, the reduction in diarrhea severity resulted in saved lives. Children, presumably more rapidly taken for help, did not show a significant mortality reduction from the vaccine. We might broaden that observation to note that easy access to effective diarrhea treatment, such as is available in Matlab, may eliminate any observable mortality reduction from diarrhea vaccines like these.

We should probably note that the three-dose requirement may make this vaccine rather useless as a rapid epidemic-control action. In an endemic setting, less than three doses may have a useful booster effect, at least in persons with previous exposure. Still, however, vaccination is not an appropriate response to a cholera epidemic. Ensuring easy access to effective treatment, and telling the public about ORT, are two methods much more likely to prevent mortality in such epidemics than vaccination, even with effective vaccines like these. Unfortunately, we still hear of governments wasting scarce resources on emergency vaccination programs as their major responses to a cholera epedemic. [RSN]

Levine, M.; Harrington, D.; Losonsky, G. et al. "SAFETY, IMMUNOGENICITY, AND EFFICACY OF RECOMBINANT LIVE ORAL CHOLERA VACCINES, CVD 103 AND CVD 103-HGR." The Lancet, August 27, 1988, 467-470.

Summary

In an effort to develop a new cholera vaccine that is safe, easy to administer, inexpensive, and highly protective after a single dose, researchers conducted a volunteer study of two live vaccines administered orally, strains CVD 103 and CVD 103 HgR. Taking a classic cholera bacterial strain, the authors deleted almost all of the genes (54%) responsible for making the toxic piece of the cholera toxin molecule. The resulting strain (CVD 103) was further attenuated and a marker was added, producing strain CVD 103-HgR. Given orally to volunteers in a single dose, both

strains elicited strong antibacterial and antitoxic serum antibody responses, and provided substantial protection of the volunteers against a challenge dose of pathogenic Vibrio cholerae. Strain CVD 103 caused mild diarrhea in 5 of 46 recipients, with mild cramps in only one; CVD 103-HgR bacteria lyophilized produced no side effects in 18 volunteers, and was excreted in the stool in only 28% of volunteers, less than with CVD 103.

Editorial Comment

WHO has given top priority to efforts to develop an effective cholera vaccine. These results look better than those obtained with another preparation, a killed vaccine given orally along with a purified toxin subunit (B). More volunteer challenges were done with volunteers immunized with the CVD 103 strain. Protection was good, and even in those 5 volunteers who did get clinical cholera, they did not have severely dehydrating diarrhea. So the approach was successful in preventing severe disease, while allowing infection and immunogenic stimulation to occur. The next step is to take these strains to endemic areas, first to test their safety and the incidence of side effects, such as mild diarrhea in healthy adults and children. If the results from this are good, a field trial to test protectiveness can be done.

Clearly, these vaccine strains do themselves produce diarrhea in some persons, despite the efforts to remove their toxic components. These will have to be weighed by committees first, later by volunteers, then by parents, against the protection they confer against potentially fatal cholera. In contrast to the experience with the remarkably safe and protective viral vaccines such as mumps and measles, or diphtheria or tetanus toxoids, cholera vaccine researchers are having a much more difficult time getting a strain which provides adequate immunity in the gut (the old approach of injecting killed bacteria did not), and produces enough of an infection to stimulate this immunity without stimulating diarrhea as well. It seems that the bacterial factors (toxins, adherence, etc) which make a bacterial strain able to "take," that is, to cause an immunogenic infection, may be also the factors which cause diarrhea! [RSN]

TECHNICAL LITERATURE UPDATE

ON DIARRHEA

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Brown, K.H.; Bentley, M.E. "REPORT FROM PERU: DIETARY MANAGEMENT OF DIARRHEA." Mothers and Children, **vol. 7, 1989, 1-5.**

Summary

The Dietary Management of Diarrhea (DMD) Project, an interdisciplinary project designed to reduce nutritional complications of diarrhea in children, was implemented in Peru from 1985 to 1988. The project's objectives included assessment of various research methodologies as well as implementation of program activities leading to improved feeding practices during diarrhea.

Data on dietary practices during diarrhea were collected from families of 2500 children less than 3 years old, 43% of whom came from urban and 57% from rural areas. Though breastfeeding rates were high and duration adequate, 20% of infants less than one month of age received other liquids; at 5 months of age about 80% received other liquids. Nearly all of the infants received solid food by 9 months of age. Research also showed that mothers offered their children with diarrhea the same foods they offered when the children were healthy. However, even healthy children were consuming amounts of food below the recommended levels, in part because of low nutritional density.

On the basis of these data, project planners decided

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to develop a weaning food with high caloric density, short preparation time and low cost that could be used during diarrheal episodes. The food chosen was an adaptation of a locally-popular recipe, *sanco*, It was called *sanquito*, and consisted of vegetable oil, toasted wheat flour, toasted pea or fava bean flours, grated carrot, and salt or sugar. Following recipe and clinical testing, the next step involved promotion of the new weaning food through radio spots and face-to-face demonstrations in the marketplace and at mothers' clubs. The project also developed promotional materials about the food for health professionals. An evaluation of the impact of these activities has yet to be analyzed.

In regard to research methodology, the project found that survey, direct observation, and "rapid" ethnographic techniques gave similar results regarding food intake, breastfeeding practices and treatment of diarrhea. Hence, the authors recommend the use of anthropological techniques alone when conditions allow. The authors credit the project's apparent success to its interdisciplinary nature and to the iterative nature of research activities, during which the entire multidiscliplinary team met after each phase to review the results and decide together the next phase of the investigation.

Editorial Comment

The authors promise us results from their evaluation in a future issue. I'm awaiting them anxiously, because to me their approach is the ultimate in both common sense and good research leading to effective program decisions.

The original ethnographic studies utilized a well-planned interview approach, which allowed fairly deep exploration of important cultural aspects of diarrhea and feeding, as well as providing information which would be useful in designing the educational program. Sample surveys and dietary recall added to this data base. The results were not only patterns of beliefs and behaviors, but also detailed information about the foods used and their nutritional characteristics, particularly the fact that the diet of most children was deficient generally, and especially deficient during diarrhea. A big part of this was due to the use of foods of low energy density.

This kind of information allowed candidate recipes to be designed. But the investigators didn't just start to promote their ideal recipes; rather, they conducted "recipe trials" to get data about practical aspects of mothers actually cooking up these recipes. The final recipe derived from this effort was even tested clinically to see how it affected diarrhea under observation! A big emphasis was put on dealing with the specific problem of energy density, so that the final product was about 200 calories/100 grams, which is quite effectively rich in calories per unit eaten.

These food development efforts were then linked to promotion, both to mothers and doctors/health workers.

We could question the wisdom of developing a new food, particularly one which demands preparation according to a recipe. Shouldn't they have just used whatever was in use already, locally? Perhaps, since the local food (*sanco*) wasn't bad, but I support their decision to modify the current local recipe, because the final recipe adopted was both very similar to a familiar local food, therefore not difficult to make, and also had been improved nutritionally. I'm not sure that we need to develop special "diarrhea foods" everywhere, but here it seemed reasonable.

We shouldn't have to test clinically, with stool output as well as acceptability being measured, all the foods or recipes developed by programs for diarrhea. That seems overly careful for a standard program without a well-developed research component. But it was helpful here in confirming the value of the food to be used.

All in all, Brown and Bentley have described the "Mercedes" approach to making dietary management a truly effective component of a national diarrhea control program. We may choose a smaller or simpler approach, such as a Volkswagen, but most of the parts will have the same functions, and the journey will go along the same road. Their methodological approach is an important contribution to every CDD program. [RSN]

Armitstead, J; Kelly, D.; Walker-Smith, J. "EVALUATION OF INFANT FEEDING IN ACUTE GASTROENTERITIS." Journal of Pediatric Gastroenterology and Nutrition, vol. 8, 1989, 240-244.

Summary

"Sixty-eight bottle-fed babies under 9 months of age with mild acute gastroenteritis were observed to evaluate current feeding regimens following acute gastroenteritis in infancy. All babies were fed for 24 h with a glucose-electrolyte mixture (GEM) and then randomly assigned to either a gradual reintroduction to their normal milk, i.e., slow regrade; immediate return to full-strength formula; or a rapid regrade to a hypoallergenic whey hydrolysate formula. All groups were well matched for age, sex, ethnic origin, nutritional state, and degree of hydration.

"There was no significance [sic] difference in stool frequency or reducing substances, vomiting, and duration of hospital stay between the three groups. Many infants (6/24) refused to take the whey hydrolysate formula, presumably because of unpalatability. Weight gain was

more rapid when full-strength milk was given. Clinical relapse developed in 12 (17%) of patients. An enteric pathogen was detected in eight of this group and cow's milk protein intolerance in three (one from each feeding group).

"No infant had clinically significant lactose intolerance, in marked contrast to previous experience at Queen Elizabeth Hospital. In this group of previously healthy, well-nourished babies with mild acute gastroenteritis, there was no advantage in regrading slowly to milk or a hypoallergenic formula. An immediate return to normal formula 24h after GEM feeding was well tolerated and simpler for parents." [Journal abstract]

Editorial Comment

This paper, the first of three on early feeding in this issue, adds one more bullet to our armamentarium of evidence supporting early return to full feeding with milk. I was surprised at the high failure rate (17%), and wonder if that may have been due to the very low sodium in the oral fluid used - only 35 mmol sodium per liter. This may have led to delayed rehydration and persistence of nausea and vomiting. A higher sodium content in the fluid ought to be associated with a more rapid movement of sodium and water from the gut lumen into the blood, and more rapid elimination of the stimulus to vomiting which hypovolemia seems to bring.

The authors make a big point of stressing that the rapid feeding approach may have worked well because the patients were well-nourished before they became ill, implying that a less well-nourished child should have food reintroduced more slowly. I don't believe the data supports that implication: even poorly nourished children usually do quite well on full-strength milk continuation, even beginning as soon as rehydration is completed, rather than waiting 24 hours as did these authors. A mixed diet, particularly one containing starch such as rice, however, would be better than the pure milk diet used here, with the rice mixed with the milk. This enhances fluid absorption as well as providing higher nutrient density, and dilutes any effect which lactose might cause. [RSN]

Conway, S.P.; Ireson, A. "ACUTE GASTROENTERITIS IN WELL NOURISHED INFANTS: COMPARISON OF FOUR FEEDING REGIMENTS." Archives of Disease in Childhood, vol. 64, 1989, 87-91.

Summary

Most well-nourished, well-rehydrated infants in developed countries still receive little besides intravenous fluids or oral glucose electrolyte solutions for at least the first 24-48 hours of their diarrheal illness. This study, conducted in a British hospital, compared rapid refeeding with either a standard cow's milk formula, a low-lactose formula containing some milk, or a soy-based formula with a period of fasting followed by a gradual reintroduction of full milk feeds. Two hundred well-hydrated infants aged 6 weeks to 12 months suffering from acute gastroenteritis participated in the study.

Results showed significant differences in weight change at 48 hours among the 4 feeding groups. Infants in the group with gradual reintroduction of milk lost weight, while infants in the rapid refeeding groups gained. In regard to duration of diarrhea after admission, no significant differences were found among the four groups. Additionally, there was no difference in discharge time. Eighteen infants failed to respond to treatment but experienced no long-term complications. No differences were found in failure of treatment among the four groups.

The study showed that well-nourished infants with acute gastroenteritis who had been well-hydrated gain weight faster with a rapid refeeding regimen. In this study there were no important advantages of special formulas over standard cows' milk formula when begun immediately during treatment. This was true in infants less than 6 months old, as well as in older infants.

Editorial Comment

This article supports the Armitstead et al. study already discussed, but adds full strength milk immediately, rather than after 24 hours of GES. While they note that a cautious interpretation of their data would suggest waiting 24 hours (14 of the 18 treatment failures had not received GES treatment before coming into the study, and might have done better with it) that may be overly cautious. None of those 18 failures was dehydrated on admission, despite not being treated.

I find it wonderfully gratifying to read that fully 117 of the 200 babies had received oral rehydration solution before admission. Would that diarrheic babies in the United States had such a high rate of ORT use! Only four of the 18 failures were in that group, while 14 were in the 83 patients who had not been given ORT before coming. This suggests (although certainly doesn't prove) that early preventive treatment may avoid more severe vomiting sufficient to require modification of treatment. [RSN]

Hjelt, K.; Paerregaard, A.; Petersen, W. et al. RAPID VERSUS GRADUAL REFEEDING IN ACUTE GASTRO-ENTERITIS IN CHILDHOOD; ENERGY INTAKE AND WEIGHT GAIN." Journal of Pediatric Gastroenterology and Nutrition, vol. 8, 1989, 75-80.

Summary

"Fifty-two children aged 6-46 months (mean 19 months), hospitalized for acute gastroenteritis (GE), were randomized after oral rehydration to receive 7 days of either traditional gradual refeeding (GR) or rapid refeeding (RR), the latter consisting of a full-strength lactose-limited diet, including lactose-treated whole milk. The study focused on the effect of a high energy intake, excluding possible negative effects of lactose.

"Both dietary regimens were well tolerated, the only difference in the clinical symptoms between the two regimens being a higher stool frequency within the RR group ($p<0.02$). The total energy intake, as well as energy derived from fat and protein, was significantly higher in the RR than in the GR group ($p<0.0001$). The mean daily energy intake of the latter group never reached recommended daily allowance (RDA) levels, while that of the RR group did on day 5. Moreover, during the whole period of dietary regimen, the RR group exceeded the RDA protein requirements (mean intake ranged 175-252%), while the GR group did not reach this RDA level until day 4. Milk was a major source of energy in the RR group, providing 47-59% of the daily energy intake.

"The short- and long-term weight gains in the RR group were only a little higher than those of the GR group, the difference being insignificant. The chief asset of RR compared with GR was, therefore, psychological, in the sense that after rehydration the hospitalized child with mild to moderate GE can, by and large, be offered the quality and quantity of food and drink that he/she prefers without the fear of negative effects on the outcome." [Journal abstract]

Editorial Comment

This paper puts more emphasis on the nutritional aspects of the feeding regimens, but fails to see a significant difference in nutritional impact. On the basis of other studies, that is probably to be expected in otherwise well-nourished children. On the other hand, if these kids had been in Peru rather than Denmark, as per Brown's results there (see TLU volume III, number 9), the weight gain difference in the groups might very well have been significant, as it was in both the two previous studies discussed in this issue.

These three papers should establish without question that in the ordinary diarrhea case in the developed world, treatment can begin with full refeeding immediately, with milk. The same regimen is recommended for the developing world, despite the higher incidence of malnutrition there, or perhaps because of it. [RSN]

Brown, K.H.; Black, R.E.; Lopez de Romana, G. et al. "INFANT FEEDING PRACTICES AND THEIR RELATIONSHIP WITH DIARRHEAL AND OTHER DISEASES IN HUASCAR (LIMA), PERU." Pediatrics, vol. 83, January 1989, 31-40.

Summary

"Longitudinal studies of the feeding practices and morbidity from infectious diseases of 153 Peruvian newborns from an underprivileged, periurban community were completed during their first year of life. Feeding practices were assessed by monthly questionnaires, and illnesses were identified by thrice-weekly, community-based surveillance.

"All infants were initially breast-fed, but only 12% were exclusively breast-fed at 1 month of age. At 12 months of age, 86% of children still received some breast milk. Incidence and prevalence rates of diarrhea in infants younger than 6 months of age were less among those who were exclusively breast-fed compared with those who received other liquids or artificial milks in addition to breast milk. The diarrheal prevalence rates doubled with the addition of these other fluids (15.2% v 7.1% of days ill, $P<.001$). Infants for whom breast-feeding was discontinued during the first 6 months had 27.6% diarrheal prevalence. During the second 6 months of life, discontinuation of breast-feeding was also associated with an increased risk of diarrheal incidence and prevalence.

"Upper and lower respiratory tract infections occurred with lesser prevalence among exclusively breast-fed younger infants. The prevalences of skin infections by category of feeding practice were not as consistent, but exclusively breast-fed infants tended to have fewer skin infections during the initial months of life and older infants who continued to breast-feed had fewer infections than those who did not. None of the results could be explained by differences in the socioeconomic status of the infants' families." [Journal abstract]

Editorial Comment

This study provides a powerful reconfirmation of previously published evidence that breastfeeding, particularly exclusive breastfeeding, is very effective in preventing both diarrhea and acute respiratory illness. The authors note that this is the first time that the introduction of water and other liquids alone have been implicated as increasing the risk of diarrhea. Thus, the common practice of giving a bottle of clear water or sugar water in the newborn nursery or at home between breastfeedings will be associated with a higher incidence and prevalence of diarrhea. With progressive decreases in the exclusivity of breastfeeding, the risk of illness increased.

The message to us is clear: the emphasis must be not just on breastfeeding, but on exclusivity of breastfeeding when it comes to diarrhea prevention. Non-exclusive breastfeeding does help with nutrition, but it does not contribute much to diarrhea prevention.

How should we capitalize on this information? We could talk about it with mothers coming with diarrheic children, but that will often be too late - the child has already been weaned, at least partially, in many of those cases, and it may be hard to go backwards to resume exclusive breastfeeding. More productive are efforts aimed at pregnant women, obstetricians, birth attendants or midwives, and newborn nurseries. If we can change the norms at those times, and convince the new mother of the importance and safety of exclusive breastfeeding, she may be able to persist in it throughout the first few months of life. Since those patients and those health workers and health facility sites are not the customary targets for diarrhea programs, such efforts will demand a real change in our approach and activities.

This article implies that such a change would have a big payoff. [RSN]

SURVEY RESULTS

In Fall 1988, the PRITECH Information Center conducted a survey to determine the relevance of the TLU's content to readers' work and to solicit suggestions for improving the TLU.

Since 1986, the Information Center has produced 32 issues of the TLU which is currently circulated to some 4,000 readers. These readers include USAID health officers, ministries of health personnel, health professionals, PVO and NGO staff, professors, and students.

Sixteen percent of those contacted by mail completed and returned the survey. This higher than average response rate suggested the high regard in which the TLU is held. Thirty-five percent of the respondents reported that the TLU is their main source of information on diarrheal disease contol. Three-quarters found the TLU to be very relevant to their professional responsibilities. Eighty-seven percent indicated that they share the TLU with their colleagues. More than half of the respondents appreciated the Editorial Comments of Dr. Robert Northrup and the TLU's brief and easy-to-read style.

Readers suggested that the TLU present more information on CDD programs, the dietary management of diarrhea, and the social and environmental aspects of control/prevention of diarrhea. Several readers requested French and Spanish versions of the TLU, and asked that the title be changed to reflect more precisely the TLU's content.

As a result of the readership survey, the TLU staff has implemented a number of changes. First, over 95 libraries and information centers and 182 individuals noted by respondents have been added to the mailing list; also, schools of medicine and public health worldwide will be added to the list. Second, more articles on the social and preventive aspects of CDD will be featured in future TLU issues. Third, PRITECH will soon start publishing French and Spanish versions of the TLU (a future issue of the TLU will advertise their availability). And finally, along with a more appealing layout design, the TLU will become the Technical Literature Update on Diarrhea.

We would like to thank all of you who took the time to fill out and return the survey. We greatly appreciate your comments and hope the resulting changes will make the TLU a more valuable resource for you.

TECHNICAL LITERATURE UPDATE

ON DIARRHEA

Technical Editor: Robert Northrup, M.D.
Technical Writer: Karen White, M.A., M.L.S
Managing Editor: William Amt

April 1989
Vol. IV, No. 4

PRITECH is a USAID-funded project which assist countries in implementing national diarrheal disease control programs. PRITECH publishes the TLU, a monthly bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues. Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the TLU editorial staff, and are not meant to represent USAID policies or opinions. Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Your comments are welcome.

Griffin, P.; Ryan, C.; Nyaphisi, M. et al. "RISK FACTORS FOR FATAL DIARRHEA: A CASE-CONTROL STUDY OF AFRICAN CHILDREN." American Journal of Epidemiology, 1988, vol. 128, 1322-1329.

Summary

The Lesotho Ministry of Health reported a fatality rate of 9.5% for children under 5 years of age hospitalized for diarrhea. This study attempted to identify the factors which were associated with a higher risk of dying of diarrhea. Using retrospective data from two hospitals in western Lesotho, the authors compared hospital records of 44 children aged 24 months or younger who had been admitted with non-bloody diarrhea and died, with records of 89 similar admissions who survived.

Results of univariate analysis showed that eight factors were significantly associated ($p>0.05$) with death at one or both hospitals:

- Illness for 7 days or more prior to admission
- Thrush or stomatitis on admission;
- Presence of major infection;
- Severe dehydration;
- A history of vomiting;
- Age under 6 months;
- Dehydration that had not improved after 12 hours in the hospital; and
- Fever or subnormal temperature.

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Multiple regression analysis showed an association with dying which was significant for three factors: illness for 7 days prior to admission, age under 6 months, and presence of major infection. Both case and control groups were found to be similarly malnourished by weight-for-age.

Health care workers reported that many caregivers consult traditional healers first in diarrheal cases, who may administer oral solutions or enemas. The role that these traditional remedies play in diarrheal deaths needs to be studied. In addition, the fact that many children had been sick for 7 or more days before admission points to the need for further education of caregivers and community health workers about the importance of early intervention.

Editorial Comment

We included this study not because the results are readily usable, but because it focuses on a question critical to our efforts to eliminate death from diarrhea: why do children with diarrhea die? Is it because their condition is so bad when they arrive that we cannot help them? Or are there errors or inadequacies in their management that have allowed them to die, but might be avoided in the future?

The study provides clues but no answers to these questions, in large part because the data available to the researchers is incomplete and is probably also inaccurate. Case management may have been inadequate. It does seem that dehydration was not being corrected rapidly—some patients were still dehydrated after 12 hours. There is no real excuse for that. By contrast, the association of deaths with the presence of a major infection is not so disturbing; perhaps no additional treatment could have reversed a septic process already far advanced. I was surprised at the lack of association with malnutrition. It is possible the severely malnourished children somehow missed being included due to some quirk in recording.

Perhaps the main lesson offered by this study is that in order to avoid diarrhea-associated deaths, we must determine the reasons for death when it does occur. Efforts to reduce maternal mortality related to childbirth have benefitted greatly by the death conferences and detailed reports of each case, analyzing what went wrong, when, and why, as reported regularly for Massachusetts, for example, in the New England Journal of Medicine. Perhaps we have reached a similar point in diarrhea management and thus should conduct conferences and in-depth analyses of each child who dies of diarrhea to see what mistakes were made (if any) and how we can do better in the future.

The next paper, by Ho et al., applies similar techniques to diarrhea deaths in America. [RSN]

Ho, M.; Glass, R.; Pinsky, P. et al. "DIARRHEAL DEATHS IN AMERICAN CHILDREN." Journal of the American Medical Association, Dec. 9, 1988, vol. 26, no. 22, 3281-3285.

Summary

The authors reviewed national mortality data and death certificate data in one state (Mississippi) for the period 1973 through 1983 to see if deaths from diarrhea in children might have been preventable.

About 500 deaths from diarrhea occurred annually in children aged 1 month to 4 years. Seasonal peaks in deaths among children aged 4 months to 2 years between October and February suggested that many of these cases were caused by rotavirus, although 91% of the cases did not specify an etiologic agent. The other diagnoses commonly listed on the death certificates (dehydration/electrolyte imbalance, 41%; cardiac arrest, 20%; and non-bacterial sepsis, 14%) suggest that untreated or inadequately treated cases were common. This was further suggested by the close association with race: black infants nationally were 4 times more likely to die of diarrhea than were white infants, and in some southern states were 10 times more likely to die of diarrhea than whites. The more detailed Mississippi analysis indicated that low birthweight was not likely to be the major explanation of most of these deaths. Rather, the correlation of deaths from diarrhea to the mother being young (less than 17), unmarried, less educated (had not completed high school), and having received prenatal care late in the pregnancy suggests that care was not sought early enough, or that access to adequate care was reduced. Overall, deaths from diarrhea accounted for nearly 2% of total post-natal deaths, and 10% of the potentially preventable portion of those deaths.

Editorial Comment

As the authors note, this statistical analysis primarily points to the need for a more detailed examination using actual case records of individual deaths to see which cases represented ignorance or neglect regarding care by the mother, versus inadequate care by health personnel. With 41% of deaths related to dehydration and/

or electrolyte imbalance, the role of early oral therapy at home in preventing dehydration seems obvious. Doubtless, many of the mothers of these babies were ignorant of the need to maintain fluids and feeding during diarrhea, just like many mothers in developing countries. The authors rightly stress that more detailed analyses of these deaths, as "sentinal" occurrences suggesting a breakdown in the system of care, would help to determine whether public health officials had to enhance efforts to educate mothers, or doctors, or both, about good diarrhea case management. These findings remind me of my own conviction that a good diarrhea control program in any country, developed or developing, must include both the mother knowing when to seek care and adequate access to a source of good care. Home therapy alone, or well-trained health workers alone, will not solve the problem. [RSN]

Kotloff, K.; Wasserman, S.; Steciak, J. et al. "ACUTE DIARRHEA IN BALTIMORE CHILDREN ATTENDING AN OUTPATIENT CLINIC." Pediatric Infectious Diseases Journal, 1988, vol. 7, 753-759.

Summary

"Acute diarrheal illnesses in Baltimore children younger than 2 years of age attending an outpatient clinic were studied during a 12-month period. One in five acute care visits made to the clinic by children younger than 2 years was for diarrhea, and 5% of diarrhea cases required hospitalization. With the use of comprehensive methodology, a potential etiologic agent was identified in the stool of 105 (43%) of the 246 episodes of diarrhea in cases and in 43 (28%) of the 155 controls. Viral pathogens were found in 26% of episodes, and bacterial pathogens were found in 14%. Only rotavirus, enteric adenovirus and Salmonella were significantly associated with diarrhea.

"Cases were more likely to have measures of socioeconomic deprivation, such as household crowding, low maternal educational level and low birth weight, when compared to controls. Racial differences in morbidity from diarrheal illnesses were observed but could be attributed to these specific sociodemographic factors. Despite the low mortality caused by infantile gastroenteritis in the United States, it remains an important public health problem. However, even with intensive investigation the etiologies remain largely unknown." [Journal abstract]

Editorial Comment

Coming to this report after considering the previous study, I found it raised more questions than it answered. What induced the mothers to bring their children for care? We are told nothing about the clinical characteristics of the cases. Had they withheld food, or fluids, from the children before bringing them? How were they managed by the clinic? Did the clinic staff teach the mothers about ORT?

We learn that the diarrheic children were from socioeconomically disadvantaged families. Should we accept the implication that the correlation implies a higher diarrhea incidence in that group, or rather worry about the possibility that more of that group may come to the clinic when their children have diarrhea than the other group? The authors suggest targeting the population for interventions to prevent diarrhea, such as vaccination or hygiene education. I wonder. Given the data presented, the only intervention likely to be effective would be to teach the mothers effective home therapy: fluids and food. [RSN]

Chowdhury, A.; Karim, F.; Ahmed, J. "TEACHING ORT TO WOMEN: INDIVIDUALLY OR IN GROUPS?" Journal of Tropical Medicine and Hygiene, 1988, vol. 91, 283-287.

Summary

One of the critical elements in any CDD program is educating mothers on the proper administration of ORT. The customary approach of the Bangladesh Rural Advancement Committee (BRAC) has been to send health workers from household to household, teaching mothers on a one-to-one basis how to prepare and administer a sugar-salt solution. The cost of the program is US$.72 per household.

In an effort to reduce costs without sacrificing quality of the training, BRAC experimented with training groups of five mothers in a place convenient to all of them. Health workers taught the mothers the "seven points to remember" (identification of diarrhea and preparation and use of ORT), then asked each mother to prepare the SSS under their supervision. A year later, BRAC compared the knowledge and practices of mothers in the experimental area to that of mothers who had been individually taught. Five percent of the mothers in each group were also asked to prepare SSS for the evaluators, which was analyzed at the ICDDR,B.

The findings showed that the group teaching method cost half as much as the individual method but was equally effective: SSS usage rates, knowledge and preparation among mothers were similar for both groups. It therefore seems appropriate for the BRAC program to change to a group approach to teaching mothers.

The study also showed that, compared to a 1984 study, usage of SSS among mothers has not improved, but correct preparation has improved, from 85% to 98%.

Editorial Comment

The BRAC program was facing a programmatic decision: Should we teach mothers in groups? It would probably be cheaper, and might be just as effective as individually. Rather than making that decision on the basis of opinions and impressions, they carried out a study to get the objective data needed to make the decision sensibly. As the summary indicates, the data bore out their hunches. But it might not have.

This is the kind of study that we should be doing more often—call it "decision-linked research," to use Ascher Segall's phrase, or "program problem solving studies," to use PRITECH's phrase. All too many program strategies are decided on the basis of subjective opinions based on the impressions of a few people in the capital city.

Now how do we get more of the persons involved with diarrhea research, usually pediatricians, interested in doing this important kind of research?

Links to social scientists are critical, as well as close and continuing interaction between potential researchers and program implementors. Donor support for this area, such as AID's Applied Diarrhea Disease Research Project or PRITECH, is also critical. [RSN]

FRENCH & SPANISH TLU

The English-language TLU is now available in French and Spanish. Please let us know if you currently receive the English TLU and would rather receive either the French or Spanish translation.

Also available to TLU readers are back-issues of the TLU in English, French, and Spanish. These bound sets include all of the issues from the first three volumes (through December 1988) for the English version, and those issues from the first two volumes (through December 1987) for the French and Spanish translations.

To request the new TLU translations and back-issues, please write to:

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A

TECHNICAL LITERATURE UPDATE

ON DIARRHEA

Technical Editor: Robert Northrup, M.D.
Technical Writer: Karen White, M.A., M.L.S.
Managing Editor: William Amt

May 1989
Vol. IV, Nº5

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Leslie, J. "WOMEN'S TIME: A FACTOR IN THE USE OF CHILD SURVIVAL TECHNOLOGIES?" Health Policy and Planning, 1989, vol. 4, 1-16.

Summary

The recent emphasis in the health field on child survival technologies--immunization, ORT, growth monitoring, and breastfeeding--depends on children's mothers for successful implementation. However, health planners have failed to take into account the time constraints that women, especially rural, low-income women, face. These constraints may play a significant role in deterring women from implementing the new technologies.

Time allocation studies show that women have very little free time to implement child health and nutrition technologies. Time spent on nursing sick family members or seeking health care is more difficult to estimate, since such behavior takes place on a sporadic, rather than a daily, basis.

Information on time costs to women of implementing child survival technologies is limited. Studies of mothers' use of ORT, for instance, have focused more on their ability to mix and administer the ORS properly than on the time mothers spent on administering it. The author estimates that mothers may well spend 40 days a year treating sick children with ORT, while antidiarrheal drugs take very little time to administer. The time savings and benefits that women would reap in the long run from the child survival technologies may not seem as

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important to them as the short-term savings of not implementing them in the first place.

The article calls for research on the actual time costs and savings and the degree to which they function as deterrents to implementation of child survival technologies. The author suggests that outreach programs that bring the technologies directly to the home may prove more cost-effective than current programs. Finally, while ORT prevents diarrheal deaths, it is costly in terms of mothers' time and should be improved upon as soon as possible.

Editorial Comment

This important article appropriately demands that we look beyond the clinical effectiveness of ORT, breastfeeding, or other diarrhea-related behaviors and take into account the time required to carry out these behaviors. This factor is particularly relevant in that the time needed is almost always to be given by the mother, who is the most over-worked member of the household, holding a triple work load: household chores, income generation, and activities related to reproduction and child care. And it is in the poorest households, those with the highest diarrhea incidence, that the mothers are the most overworked.

We are anxious to have mothers breastfeed exclusively, to prevent diarrhea. From the mother's perspective, however, the bottle is a timesaving device which allows her to transfer up to two hours of activity to someone else (her mother, an older child) allowing her to complete some other job.

The author points out that ORT may require many hours during a diarrhea episode, and seem a heavy, perhaps impossible burden for an overworked mother. The breastfeeding example above, however, points out that administration of ORT can be delegated to another member of the extended household, with the mother supervisoring the process. How often, however, do we as practitioners ask mothers if they will be able to give the time to do ORT, and if not, teach someone else to do it?

The consideration of time stressed here becomes particularly important in weighing the likelihood of use of ORS packets compared with a food-based home made solution such as rice water. If the home-made solution is not already available, and requires special preparation (cooking may require seeking fuel at some distance from the house), is it likely that the mother will readily use it at the first sign of diarrhea? Would she be more likely to use a convenient ORS packet, requiring only mixing with water? We have adopted a policy of encouraging use of home fluids for initial treatment of diarrhea in many countries, often suggesting specific fluids requiring cooking. In how many of these countries have we studied carefully the time and effort required of the mother to carry out our recommendations, the mother's "cost-benefit analysis"?

The authors point out that extra time demands during illness may be more acceptable to overworked mothers than the repetitive daily actions needed to prevent diarrhea: fetching extra water for handwashing, preparing freshly-cooked food for each meal to avoid spoilage, or breastfeeding.

How should we react to this information? First, by learning more about the time demands of our recommendations: more research which measures time spent on these tasks. Second, by discussing with mothers the time needed, and the problems they may encounter, at the time we make our recommendations, either preventive or curative. Mothers are more likely to follow our recommendations if they have faced ahead of time the problems they will encounter. And our recommendations will become more realistic if we too face those problems and collaborate with the mother in seeking the best solution to them, or making alternative recommendations. [RSN]

"PERSISTENT DIARRHOEA IN CHILDREN IN DEVELOPING COUNTRIES: MEMORANDUM FROM A WHO MEETING." Bulletin of the World Health Organization, **1988, vol. 66, 709-717.**

Summary

WHO defines persistent diarrhea as diarrhea that lasts at least 14 days. Studies in several developing countries have revealed that 3-20% of all diarrheal episodes in children less than 5 years old become persistent, and that most episodes occur in children less than 3. This memorandum, a product of a December 1987 meeting at WHO headquarters in Geneva, reviews the epidemiology, etiology, and pathophysiology of persistent diarrhea and makes recommendations about its clinical management.

Persistent diarrhea is defined as an episode lasting at least 14 days. Some 3% to 25% of acute episodes in children under five become persistent, but as many as half of all recorded diarrhea days in a population may be from persistent episodes. Incidence may be as high as 63% of children under 5 having at least one persistent episode over a 28-month observation period. The risk of persistent diarrhea is higher in the age group 0-11 months.

Persistent diarrhea contributes more deaths than its low proportion among diarrhea episodes would imply - as many as 36% to 56% of all diarrhea-related deaths. Case fatality was 14% in one study, compared with 0.7% for shorter episodes.

Persistent diarrhea causes substantial weight loss in most patients. At the same time, malnourished children have a higher risk of prolonged diarrhea, probably

related to delayed rates of intestinal cell renewal and recovery in malnutrition. Children with previous acute or persistent diarrhea, or a recent non-diarrhea infection such as measles, are also at higher risk of persistence of diarrhea.

Use of drugs, and inadequate feeding during diarrhea, may lead to persistence of the episode; more research is needed to prove these relationships, however. Adherent bacteria may be more likely to cause persistence of diarrhea than other organisms, but etiologic studies do not suggest any predominant microbiologic agent: most bacteria (except vibrios) have been associated with persistent episodes.

Recommendations for management remain unclear, due to the wide variety of causes of the problem. Antibiotics are rarely useful, except for dysenteric persistent episodes. The major approach is variation in feeding, using various milk and non-milk formulas and weaning foods, and stressing extra feeding during convalescence.

Lactose may be advantageously reduced in non human milks, if necessary, by fermentation (e.g., yoghurt) or use of microbial lactase, or by mixing milk with cereals. Some infants may require removal of sugars from their diet because of intolerance (evidenced by the worsening of the diarrhea with use of the sugar, a low stool pH and the presence of reducing substances in the stool). Sensitivity to dietary protein is quite rare.

Editorial Comment

The report points out the importance of persistent diarrhea - both as a cause of morbidity (half the diarrhea days!) and as a contributor to mortality. Because of this, programs should work on improving their ability to identify patients at higher risk of persistence: those with malnutrition, and those with previous diarrhea or other infections like measles, especially in the 0-11 month age group.

To do this means getting a past history from every patient with diarrhea, and defining what additional steps should be taken if a "high risk" patient is detected. These might include more careful nutritional instruction, requesting the mother to bring the baby back for follow-up to review weight gain and feeding problems, or, perhaps, stool examination.

Note that the article does not recommend diluting formula, except by mixing it with cereals. Avoiding dilution prevents the mother from getting the mistaken idea that diluted (and nutritionally inadequate) formula is better for her child.

The major approach to management is clearly controlled experimentation: different treatment approaches must be tried, their effectiveness noted on follow-up, and, if necessary, further changes in regimen tried.

Good record systems are critical to both the identification of the high-risk patient and effective follow-up management. Many PHC systems have no individual records, and both mothers and doctors forget. Programs wanting to tackle this problem should aim at a diarrheal or general record system which reminds doctors to ask about past history, keeps track of what feeding regimens have been recommended, and reminds when a follow-up visit is due. [RSN]

Sjogren, E.; Ruiz-Palacios, G.; and Kaijser, B. "CAMPYLOBACTER JEJUNI ISOLATIONS FROM MEXICAN AND SWEDISH PATIENTS, WITH REPEATED SYMPTOMATIC AND/OR ASYMPTOMATIC DIARRHOEA EPISODES." Epidem. Inf., 1989 vol. 102, 47-57.

Summary

In Mexico, stool cultures for camplobacter were obtained weekly for 1 year from 62 children under 4. Thirty-one "episodes" (positive cultures) were associated with diarrhea, while 105 episodes were without symptoms. Six children had more than one episode during the year, including one with eleven episodes. Serotypes varied widely, even in consecutive samples, and positives with more than one serotype were common (42%).

In Sweden, stool cultures were obtained from adult diarrhea patients. Only a single serotype was usually found.

Editorial Comment

The key point I took away from this article is the high incidence of asymptomatic Campylobacter infection in the developing country pediatric population. The variation in serotypes suggests an environment with multiple sources of contamination, and immunity broadening over time to cover the range of serotypes in the environment. [RSN]

Baltazar, J.; Briscoe, J.; Mesola, V. et al. "CAN THE CASE-CONTROL METHOD BE USED TO ASSESS THE IMPACT OF WATER SUPPLY AND SANITATION ON DIARRHOEA? A STUDY IN THE PHILIPPINES." Bulletin of the World Health Organization, 1988, vol. 66, 627-635.

Summary

This study had two goals: to test the usefulness of a case-control methodology in assessing the effects of improved environmental sanitation practices on diarrheal disease, and to determine the effectiveness of those practices relative to environmental sanitation program activities in Cebu, Philippines. The case-control study

subjects were taken from 16 clinics in rural and urban parts of Cebu during the warm, rainy season when diarrhea incidence increases. A case was defined as a child under 2 years of age who was brought to one of the study clinics with diarrhea; controls were similar, but presented with acute respiratory infections. The study combined clinic records with follow-up visits to the child's home to collect environmental and sanitation information and to assess the socio-demographic characteristics of the household.

The authors conclude that the case-control method can produce rapid, reliable results at low cost. The results are valid for comparing varying numbers of interventions only with large sample sizes, however. In this study, 460 cases and 460 controls were needed, but only 281 cases and 384 controls could be recruited. Thus, a valid comparison could be made only among a maximum of 2 interventions (water supply and excreta disposal, as well as no intervention). The interaction of such factors as nutritional status on these other interventions could not be addressed with a case-control study of this size.

Improved environmental sanitation practices (both interventions) were accompanied by a calculated 20% relative reduction in all episodes of diarrhea, and a 40% relative reduction in diarrhea episodes caused by enteric pathogens. The authors concluded that the combined effect of water quality and excreta disposal practices on diarrheal disease in Cebu is substantial.

Editorial Comment

The theoretical basis for use of a case-control study in this situation is that all members of the population will be exposed equally to the possibility (or odds) of "getting" one or two of the interventions. The chance of getting a diarrhea episode bad enough to require going to the clinic, however, will depend on whether or not the family or individual has "gotten" one or two or none of the interventions. Thus, in the group of patients at the clinic because of diarrhea, one would expect to have a higher proportion of patients who had not "gotten" or adopted one of the interventions, while in the patients from the control group (ARI cases) one would expect to see a lower proportion of non-intervention adopting cases. The ratio between the proportions (odds ratio) is equivalent to the ratio between the diarrhea incidence rates in the two types of patients; incidence is thus compared indirectly. The method does not allow comparison of absolute incidences, only a relative comparison. The investigators cannot tell us, for example, that the "high intervention" group had perhaps 8 cases, while the "low intervention" group had 10 cases per year: they can only say that the high group had an incidence rate 0.8 times, or 20% lower than the low group, thus showing a preventive effect of the interventions. The method is also valid only for cases of diarrhea that used the clinics.

With these limitations accepted, the study shows us that a brief (4-month), inexpensive (one visit per patient) study can provide useful results with reasonable validity for purposes of comparing the efficacy of preventive interventions. In most such cases, especially where the general incidence of diarrhea is known from other earlier studies, figures for the absolute incidence of diarrhea are not needed, only the relative comparison of incidences related to the interventions. Since the authors are running a longitudinal study (covering several years and multiple visits) in the same area, they will be able to confirm whether these "quick and easy" findings are correct.

In the meantime, I found the difference they detected between preventive efficacy against all diarrhea and efficacy against enteric pathogen-caused diarrhea to be provocative, if not unexpected. [RSN]

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TECHNICAL LITERATURE UPDATE

ON DIARRHEA

Technical Editor: Robert Northrup, M.D
Managing Editor: Karen White, M.A., M

Vol. IV, Nº6, 1989

PRITECH is a USAID-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the TLU, a monthly bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues. Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the TLU editorial staff, and are not meant to represent USAID policies or opinions. Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Your comments are welcome.

Rashad, H. "ORAL REHYDRATION THERAPY AND ITS EFFECT ON CHILD MORTALITY IN EGYPT." Journal of Biosocial Science, Supplement, 1989, vol. 10, 105-113. (2668)

Summary

This study analyzes the effects of the Egyptian National Control of Diarrhoeal Disease Project (NCDDP) on child mortality in Egypt and discusses the methodological weaknesses of the NCDDP surveys. The impact of the program on mortality was measured by two double round surveys, the first administered in 1984/85, when the program began, the second a year later. In the first round, surveyors interviewed mothers of about 11,000 children, collecting socioeconomic information on each household and asking about the use of ORT. Surveyors returned to these mothers 6 months later to collect mortality information on children. If children had died following diarrhea, the surveyors inquired about breastfeeding before and after diarrhea, use of ORS, and source of information about ORS.

The mortality data suggest a decline in diarrheal-related mortality rates for children between the two surveys. This change, however, is not much greater than previous annual declines in mortality. Also, for the 6-11 month age group, both the diarrhea-related and non-diarrheal mortality fell. Methodological problems of the NCDDP surveys are reviewed, revealing that the data are generally acceptable, although they do not seem to

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be nationally representative. In addition, the author emphasizes the difficulties of using survey data from two successive years to make conclusions about trends, due to substantial annual variation. Data on feeding during diarrhea were not collected in the 1984 survey. Also the increase in use of ORT between 1984 and 1985 was tiny: 69.9% to 78.3%. This makes it difficult to conclude definitively that the observed mortality change was in fact causually related to the program's effects on behavior, and not due to chance.

Editorial Comment

This paper is a refreshingly frank review of the problems of proving national impact of a diarrhea control program emphasizing ORT. The Egyptian NCDD Programme has achieved remarkable effects on use of ORT, reaching very high levels (68%-78%). Yet a range of problems prevents the investigators from concluding that this behavioral change is responsible for the observed decline in diarrheal mortality. Even the significance of the mortality decline is open to question as the annual variation in mortality is high, and the study provides data only on two successive years, hardly enough to establish a trend.

The central proof was to be that diarrheal mortality declined more rapidly than non-diarrheal mortality. As the authors note, the 12-23 months age group showed no greater mortality decline for 1984-85 than for 1970-79. The 6-11 month age group did have a greater decline, but the decline was similar for both diarrheal and non-diarrheal mortality.

The obvious comment on this is that, despite the hopes and demands of donor agencies and governments for immediate proof of impact of their expenditures, trends in mortality can only be measured meaningfully over multiple-year periods, not after a single year.

The author was surprised at the large number of mothers who said that their first response to diarrhea was to consult a doctor (53%), not to give ORS (only 8%). This response may be peculiar to Egypt, with its easy access to many doctors and health facilities. The three-fold increase in diarrhea consultations to government facilities which Egypt experienced, however, may be a major result of the program's stimulating greater concern about diarrhea. Mothers began to pay more attention to a disease which previously they had considered just a normal accompaniment of child growth; having learned about dehydration from television, they feared it, and acted upon that fear. Having successfully convinced most doctors of the value of ORS, the NCDDP could use this reaction by mothers to ensure adequate ORT usage as their second response, the result of consultation.

The point is that increased concern about diarrhea, and increased consultation in response to that concern, may be a critical result of ORT communication efforts, and may be essential for achieving program impact in certain countries.

Despite the difficulties in proving scientifically that the NCDDP caused a decline in mortality, I believe that it did. Egypt is economically and developmentally advanced in comparison to many other developing countries, where malnutrition is more prevalent. Reading this paper made me wonder if a program which concentrates primarily on ORT can have a similar impact on mortality in poorer situations where much of the serious pediatric diarrhea is complicated by malnutrition. As this paper illustrates, investigating that question will be even more complex and difficult (and costly!).

Mikhail, I.A.; Hyams, K.C.; Podgore, J.K. et al. "MICROBIOLOGIC AND CLINICAL STUDY OF ACUTE DIARRHEA IN CHILDREN IN ASWAN, EGYPT." Scandanavian Journal of Infectious Diseases, Vol. 21, 1989, pp. 59-65. (2715)

Summary

One hundred fifty-one diarrheic children at a rehydration clinic were investigated in Aswan, Egypt in July 1986. Enteropathogens were: E. coli (ETEC) 17%, Cryptosporidium (9%), Salmonella spp. (7%), Campylobacter (7%), and Shigella spp. (5%). Giardia was found in 20% of patients. Except for Salmonella-infected children, severe dehydration was rare; between 0% and 10% compared to 90.9% in the 11 patients with Salmonella infection. Only one-fourth of the non-Salmonella patients had received ORS before admission, while nearly two-thirds of the Salmonella patients had done so. Giardia was found as often in a control group as in the children with diarrhea.

Stanton, B.; Silimperi, D.R.; Khatun, K.; et al. "PARASITIC, BACTERIAL AND VIRAL PATHOGENS ISOLATED FROM DIARRHOEAL AND ROUTINE STOOL SPECIMENS OF URBAN BANGLADESHI CHILDREN." Journal of Tropical Medicine and Hygiene, 1989, vol. 92, 46-55. (2705)

Summary

"Few data exist in Bangladesh on longitudinal, community-based studies of bacterial or parasitic pathogens identified in routine and diarrhoeal stools of urban dwelling children. [The authors] undertook the following study on 343 children of age less than 6 years who resided in one of 51 slum settings in Dhaka, Bangladesh, between October 1984 and February 1986. Specimens

from diarrhoeal episodes and from routine stools obtained at 3-monthly intervals were examined for parasites, rotavirus and pathogenic bacteria.

"Parasites were isolated from 509 (51%) of the 1006 routine stools and from 95 (42%) of the 225 diarrhoeal stools. Isolation rates steadily increased with age. Ascaris lumbricoides and Trichuris trichiura accounted for approximately 80% of all parasitic isolates in routine and diarrhoeal stools. Giardia lamblia was isolated from 11% [of] diarrhoeal stools. Entamoeba histolytica was an uncommon isolate (<1%).

"Bacterial pathogens were identified in 55 (24%) of the diarrhoeal stools but were identified in only 164 (16%) of the 1028 routine stools examined (P<1%). Toxigenic Escherichia coli, Shigellae and Campylobacter were the most frequent isolates from diarrhoeal and routine specimens.

"This pathogen profile appears to be more in keeping with that from urban settings in other developing countries than from rural Bangladesh, suggesting that extrapolations from rural-based data should not be made for urban settings." [Published abstract]

Editorial Comment

These two papers show interesting differences--Salmonella spp. were absent in Bangladesh, but appeared to cause severe symptoms in Egypt. Giardia was more common in diarrhea cases than in controls in Bangladesh (in fact, it was the pathogen most commonly identified), but similar in both groups in Egypt. Only about 12% of patients with any enteropathogen had blood in the stool in Egypt (25% of Shigellas, 27% of Salmonellas), but 50% of the Bangladesh patient stools were described as "bloody or mucoid." Current WHO recommendations suggest ignoring mucous in stools, as not specific to any particular diagnosis, while the presence of blood is used to identify Shigella cases for antibiotic treatment.

I was surprised that the rate of home use of ORT was so low in the Egypt data, compared to the figures previously noted in the Rashad paper, but then recalled that the first action of most mothers was consultation, not ORT. These patients would subsequently get ORT treatment presribed by the clinic, and so would be counted as ORT cases in a retrospective interview as Rashad described. It is of interest that home ORT did not prevent severe dehydration in the Salmonella cases.

Stanton et al comment that Giardia seems to be an important pathogen in urban areas, though maybe not in rural Bangladesh. A CDD program in urban Dhaka thus should be prepared to deliver antibiotic treatment for Shigella and Giardia. It would still seem appropriate, however, to not use antibiotics initially in the case of acute watery diarrhea without blood in the stool, since only 30% of all stools had any pathogens, and only some of those are susceptible to antibiotics. Thus antibiotics would best be reserved for those with bloody acute diarrhea, or those whose diarrhea persisted despite ORT and continued feeding.

The Egyptian data could be re-analyzed to define the specificity of signs and symptoms in identifying bacterial etiologies (e.g., what percentage of all patients with severe dehydration, with fever, with hypotension, or with blood in the stool, had a positive culture for Salmonella? or for ETEC? or had no identifiable pathogen?) If severe dehydration could be shown to be a rather specific and sensitive indicator for diarrhea caused by Salmonella, an appropriate, effective antibiotic regimen could be recommended. Data from longer than a single three-week period would be needed to define permanent changes in policy, however. Also, a higher rate of willingness of patients to be cultured would be needed: only one-fourth of the diarrhea patients consented to stay for culture in this report.

In short, we should not move away from the current recommendations to reserve initial antibiotic treatment in acute watery diarrhea for those with blood in the stool, or where there is already epidemiologic evidence that a cholera epidemic is in progress and the patient appears to have clinical cholera. Management of chronic diarrhea, or those whose diarrhea persists on ORT and food, is another story.

Glass, R.I.; Svennerholm, A.M.; Stoll, B.J.; et al. "EFFECTS OF UNDERNUTRITION ON INFECTION WITH VIBRIO CHOLERAE 01 AND ON RESPONSE TO ORAL CHOLERA VACCINE." Pediatric Infectious Diseases Journal, 1989, vol. 8, pp. 105-109. (2693)

Summary

"The association between undernutrition and the risk of colonization and disease with Vibrio cholerae 01, concentrations of salivary IgA and the serologic response to infection and to orally administered cholera B subunit were examined prospectively in a family study in Bangladesh. Children ages 1 to 8 years who were family contacts of patients hospitalized with culture-confirmed cholera were visited within 24 hours of the hospitalization and daily for 10 days, queried for the presence of diarrhea and cultured for V. cholerae 01.

"On Day 1 each child was weighed and saliva was collected to measure total IgA. On Days 1 and 21 blood was taken to assess vibriocidal and antitoxin titers, and on Days 1 and 2 B subunit or placebo was given orally as part of a trial to look for a toxin-blocking effect. Of 412 children enrolled in the study 35% (143) became infected with V. cholerae 01 and 49% (70) of these

developed diarrhea. Undernutrition, defined in a child as weight less than 70% of the Harvard reference weight-for-age, was not associated with colonization, disease, or the duration or severity of cholera. Moreover, well-nourished children did not differ from undernourished children in their concentrations of salivary total IgA, intial serum antitoxin or vibriocidal antibodies or in their serologic response to colonization, disease or B subunit.

"The immune system in its response to cholera appears to be quite resistant to nutritional insults. The good antitoxin response to B subunit among undernourished children is of particular importance in considering the use of future oral cholera vaccines in areas where such undernutrition is common." [Published abstract]

Editorial Comment

The relationship among diarrhea, malnutrition, and immunity constantly surprises me. This paper provides strong evidence that malnourished kids are not more likely to "get diarrhea," either the infection or the disease, than better nourished kids, despite our commonsense expectation to the contrary. In these studies the level of exposure is even more assuredly similar (the studied subjects live in the same household as a proven cholera case) than in earlier studies where the subjects were merely inhabitants of the same community. This truly eliminates any possible influence of economic class, education, or access to water and sanitation on sanitary behavor or environmental contact.

The authors wonder if their results are true also for other types of diarrhea than cholera, both toxin-produced (e.g., E. coli) or otherwise (e.g., rotavirus). The time sequence of exposure-infection-disease is so brief in cholera that the major mechanism of immune protection (many of these kids were over two, and thus had probably been exposed to cholera earlier) may not be an immune response during an incubation period, but rather the presence of a preexisting antibody. In viral diarrhea, where the incubation may be longer, and the infection more systemic, an immune response may be more responsible for resistance, and resistance or its corollary incidence more related to malnutrition.

I was also surprised that there was no difference in duration or severity of diarrhea, as Black had previously reported greater duration and stool volume in children with E. coli diarrhea. The authors considered the younger age and therefore probable unprimed immune status of Black's subjects as important in that difference from these data. Malnutrition may have less influence on a secondary immune response (this study) than on a primary one (the younger subjects of Black's study). The role of malnutrition in intestinal cell turnover must also be considered.

I was struck by the high clinical disease-to-infection ratio: 49% of infected children got diarrhea. Some studies suggest ratios as low as 1% with El Tor V. cholera infection. Is the high ratio here due to the young age of the subjects, or to the investigators including even mild diarrhea as "cases," rather than only counting more typical "cholera cases" (severe diarrhea). Note that two-thirds of the cases had clinical diarrhea for less than 3 days, with no difference between malnourished or adequately nourished children.

Studies like this one should reinforce our conviction that educational level, behavior, and sanitation are more important "causes" of diarrhea than is malnutrition.

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TECHNICAL LITERATURE UPDATE

ON DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. IV, Nº7, 1989

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Patra, F.C.; Sack, D.A.; Islam, A.; et al. "ORAL REHYDRATION FORMULA CONTAINING ALANINE AND GLUCOSE FOR TREATMENT OF DIARRHOEA: A CONTROLLED TRIAL." British Medical Journal, vol. 298, 1989, 1353-1356. (2893)

Summary

An oral rehydration solution (ORS) with L-alanine added to the glucose and salts of the standard formula was compared to standard ORS to see if the added amino acid would improve the efficacy of the ORS. A double-blind, controlled study was carried out in 97 male patients ages 6 to 59 with acute and severe dehydration from diarrhea caused by V. cholerae or enterotoxigenic E. coli at the International Center for Diarrheal Disease Research in Dhaka, Bangladesh.

Median stool output per kilogram of body weight during the initial 24 hours of oral rehydration treatment was reduced in the study group compared to the control group, from 309 ml to 196 ml, a reduction of 37%, while total stool output until diarrhea stopped was reduced from 393 ml to 236 ml, a reduction of 40%. The amount of oral fluid and intravenous fluid needed for rehydration and maintenance was also reduced. The authors concluded that the ORS containing L-alanine and glucose was considerably better than the standard ORS formula in this type of patient.

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Editorial Comment

We've been awaiting these data for months, and they fully meet our hopes: the alanine-containing solution actually causes reduction of stooling by some 40%. This is exactly the kind of response which will attract mothers to use ORS, since it is stool output rather than dehydration which worries them most.

The study is a model of how this kind of comparison should be done. It was a double-blind study: the investigators and staff in Dhaka did not know which was the alanine-containing formula and which was the standard formula ORS. It used patients in whom significant stool output could be expected: severely dehydrated, cholera-like cases. The effect of the alanine might not have been visible had the study been carried out in the typical mild pediatric diarrhea cases that are so common in ambulatory clinics.

The study was conducted with male patients lying on cholera cots to facilitate the quantitative collection of feces and the separation of urine from feces. The patients were fasted for the first 24 hours to avoid the effects of food on stool output. This is very desirable for the research since it accentuates the differences between the two types of solutions. It is also quite ethical in patients who are not breastfeeding and not malnourished. Beginning at 24 hours patients were given both food and tetracycline.

The special ORS tested contained 90 mmol/L of L-alanine and 90 mmol/L of glucose, compared to 111 mmol/L of glucose in the standard ORS. Both solutions had the same standard concentrations of NaCl, KCl, and trisodium citrate salts. The special solution was thus higher in osmolality than standard ORS - 400 mmol per liter rather than 331 - but clearly this higher osmolality did not prevent the additive effects of the L-alanine on absorption from appearing.

What now? Should we shift immediately to the L-alanine solution? The answer, of course, is no, not quite yet. Confirmation in similar patients is needed, and experience in younger children with "ordinary diarrhea" is needed as well. We should not forget the experience with glycine, which looked good initially in this kind of adult cholera patient, but was less clearly advantageous in other situations. If such future studies showed that the L-alanine-glucose solution was more effective only in heavily purging, adult, cholera-like patients, it might not be worth the additional expense per packet and the need to shift production methods to the new specifications in factories making ORS.

Roesel, C.; Schaffter, T.; "RICE WATER/SALT SOLUTION FOR DIARRHOEA." (letter) The Lancet, March 18, 1989, 620-621. (2674)

Summary

Refugee agencies working in Khmer camps on the Thai border taught refugee mothers to use rice-water solution with salt, and rice-powder solution. Standard ORS was also used. They found that 99% of children were rehydrated in camps where teaching was emphasized, versus only 87% where treatment alone was given. In the camps where teaching was intensive, rice water was the best accepted (74% of those using ORT) followed by ORS (29%), traditional treatments (6%), and then rice powder (4%) . In contrast, ORS was most popular (53%) where little or no teaching was given. The rate of dehydration deaths in the camps decreased from 1983 to 1986 from 15.9 to 10.3 per 100,000 population. The decrease began in 1985, the year that the agencies began teaching about rice-water rehydration.

Editorial Comment

This brief report can only suggest, not prove anything, since careful investigative procedures were not employed. I felt it worthy of including, however, because it demonstrates once again that in certain populations a more traditional remedy, the rice water, will be preferred to a "modern" one (the ORS in this case), particularly if it is supported by the "modern" care providers. Keep in mind that rice water varies substantially in composition, from perhaps 5 to 25 grams of starch per liter, depending on the method of preparation, and thus will vary greatly in its effectiveness as a rehydrating agent. For prevention of dehydration, and as a home available solution, it is potentially very good, as these positive findings indicate.

Kenya, P.R.; Odongo, O.W.; Oundo, G.; et al. "CEREAL BASED ORAL REHYDRATION SOLUTIONS." Archives of Disease in Childhood, vol. 64, 1989, 1032-1035. (2934)

Summary

A total of 257 boys (age range 4-55 months), who had acute diarrhea with moderate to severe dehydration, were randomly assigned to treatment with either the World Health Organization/UNICEF recommended oral rehydration solution (glucose-based) or cereal-based oral rehydration solution (ORS) made of either maize, millet, sorghum, or rice to a concentration of 60g cereal per liter plus electrolytes. Children with severe dehydration were given intravenous fluids initially. After the initial rehydration was achieved (6-8 hours), patients were offered breast milk and/or traditional weaning foods. Treatment with oral rehydration solution

continued until diarrhea stopped. Accurate intake and output was maintained throughout the study period.

Efficacy of the treatment was compared between the different treatment groups in terms of intake of the solution, stool output, duration of diarrhea after admission, and weight gain after 24, 48 and 72 hours, and after resolution of diarrhea. Results suggest that all the cereal-based solutions were as effective as glucose-based standard oral rehydration solution in the management of diarrhea.

Editorial Comment

This study documents that cereal-based ORS (CB-ORS) and immediate refeeding (as soon as rehydration is accomplished) are as good as glucose-based WHO-UNICEF formula ORS and immediate refeeding. These results show us that there are no physiological disadvantages to cereal-based ORS fluids, when accompanied by early feeding. The results do not help, however, in telling us whether CB-ORS is physiologically better than glucose-based ORS, as many claim. To study that question may demand withholding feeding for a period of observation, as the influence of food on absorption of sodium and water may camouflage even significant differences between cereal and glucose detectable when studied without concomitant feeding. In undernourished children, however, withholding feeding for very long periods purely for research purposes would not be ethical.

In addition, these results do not tell us whether cereal-based fluids prepared by the mother at home would be more effective than standard glucose-based ORS packets in preventing dehydration from diarrhea in a community. The authors state that treating every diarrhea episode with standard ORS packets is "neither feasible or affordable...in Africa," and therefore, a home remedy is the answer. This may not be true.

Experience in various situations suggests that mothers are often not willing to make the extra effort necessary to cook up a special CB-ORS solution for every diarrhea episode, but may be willing to mix an "instant" glassful of ORS from a packet without cooking. Many mothers seem to put more value on remedies (including ORS) that they must buy than on home solutions. While governments in Africa or elsewhere may have logistical or budgetary difficulties in making ORS available in every home, private commercial channels have been remarkably effective in making ineffective antidiarrheal drugs or antibiotics very widely used even by poor mothers in rural areas.

With these considerations in mind, we should not jump directly from the evidence of physiological effectiveness of cereal-based solutions which this study provides to the conclusion that cereal-based, home-prepared solutions are the "ideal solution for the treatment of diarrhea" in Africa. There is a need for community-based studies to determine whether it is possible to motivate mothers to prepare and use cereal-based solutions correctly. It will also be necessary to test whether the promotion of cereal-based solutions at the community level decreases the incidence of dehydration from diarrhea.

Nalin, D.R. "COMPARISON OF ORAL REHYDRATION SOLUTIONS." (letter) Journal of Gastroenterolgy and Nutrition, vol. 8, 1989, 272-277. (2650)

Summary

The author disputes the conclusions of an article (D. Pizarro, M.M. Levine, G. Posada, and L. Sandi, "Comparison of Glucose/electrolyte and Glucose/glycine/electrolyte Oral Rehydration Solutions in Hospitalized Children with Diarrhea in Costa Rica," J. Ped. Gastro. Nutr., vol. 7, 1988, 411-6) which concluded that the addition of glycine to glucose in ORS did not enhance its effectiveness in rehydration, in comparison with standard WHO formula glucose-based ORS.

Nalin reviews several aspects of such comparative studies, in particular stressing the importance of comparing patients with similar initial rates of diarrhea and diarrhea purging rates which are moderate to severe, rather than mild. He suggests an initial period of observation (presumably with the patient on intravenous fluids) to confirm the similarity of stooling rates. He also notes the statistical dangers of drawing negative conclusions (lack of additional efficacy of the test solution) in studies with only a few patients - the report had only utilized 10 patients per group. Nalin then reanalyzes the data from the Pizarro report and finds it suggests that the glycine-containing solution was possibly better than the standard ORS, leading to a lower total stool weight despite a higher initial diarrhea rate.

Other reported findings support the conclusion that the addition of glycine to glucose in ORS increases the rate and efficiency of absorption of the solution. Patients receiving a solution containing glycine demonstrated less abdominal distension, a more rapid decline of plasma specific gravity, greater net gut sodium absorption, and higher rates of urine output than patients receiving standard ORS. Nalin also notes that the diuretic effect of glycine reported in earlier studies was not seen in the Pizarro report.

Editorial Comment

Nalin's letter reminds me of a number of important aspects of such comparative studies which must be heeded, and suggests that glycine is worth keeping in the competition for a better ORS. Glycine was effective in

the type of study we just discussed above, with heavily purging cholera-like patients. It was only when it began to be tested with less severe diarrhea that doubts began to accumulate based on some negative findings. His request for a larger-scale study, prestratified for initial stool rates, to compare glucose-only ORS with glucose-glycine ORS, seems reasonable.

This whole area remains one of intense interest, with several candidates competing for top prize as the rehydration approach which most effectively turns off the diarrhea by most effectively enhancing absorption of salt and water. Alanine-glucose seems very promising, but so did glycine at a similar stage in its testing many years ago. Feeding clearly is an important factor which must be considered in planning comparison studies, and which may be the most practical approach to enhancing standard ORS.

READERS' FORUM

Relative to the discussion of feeding and ORS, we recently received a letter from a reader disputing the author's conclusions and our comments on Molla's "Turning off the Diarrhea: The Role of Food and ORS" (J. Ped. Gastro. Nutr., vol. 8, 1988, 81-4) which we reviewed in the February 1989 TLU. The criticisms were familiar: feeding had been started in the studies after the stooling rate had dropped by 75%, to a modest rate (slightly more than 2 ml/kg/hr) not well suited to testing the question.

Moreover, the reader claimed that the data and graphs showed a gradual fall in stooling rate with feeding, not the rapid fall to a level identical to that seen with rice-based ORS which the author had claimed. The reader then cited an earlier paper by Molla which had showed a 28-34% reduction in stool output with rice-based ORS during the first 24 hours of therapy compared to standard glucose ORS, despite the administration of early feeding with rice as well as antibiotics to both groups. This would indeed suggest that the rice-based ORS is more effective than glucose-based ORS plus feeding in reducing stool output.

A subsequent letter from Jon Rohde commenting on this same article notes that concerns about the conclusions of Molla's paper may be valid analytically and statistically, but that they should not be misinterpreted as evidence against the critical importance of early feeding in the management of diarrhea. Since the benefits of cereal-based ORS over glucose-based ORS plus food are probably marginal, and quite possibly unmeasurable in the milder diarrheas, we must continue to stress that the best treatment for diarrhea is both rehydration and feeding. These disputes over studies should not lead us to the error of thinking that cereal-based ORS is any substitute for feeding during diarrhea treatment.

Technical Literature Update

on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. IV, Nº8 1989

Clemens, J.D.; Stanton, B.F.; Chakraborty, J.; et al. "MEASLES VACCINATION AND CHILDHOOD MORTALITY IN RURAL BANGLADESH." ***American Journal of Epidemiology*****, vol. 128, no. 6, 1988, 1330-1339.**
Order #2945

Summary

"To ascertain whether measles vaccination was associated with reduced mortality rates in rural Bangladeshi children, the authors conducted a case-control study in four contiguous areas, two of which had participated in an intensive measles vaccination program which began in the spring of 1982. Cases were 536 children who had died in the four-area region at the age of 10-60 months between April 1982 and December 1984. Two age- and sex-matched controls were selected from the four-area region for each case; each control had survived at least through the date of death of the matched case.

"Measles vaccination was associated with a 36% (95% confidence interval 21%-48%) proportionate reduction in the overall rate of death and a 57% (95% confidence interval 43%-67%) reduction in the rate of deaths directly attributed to measles or ascribed to diarrhea, respiratory illness, or malnutrition. The association of measles vaccination and reduced mortality remained unchanged after the authors restricted controls to children who had survived at least one year after the deaths of their matched cases. Moreover, children vaccinated in 1982 exhibited a sustained reduction in the rate of death in 1983 and 1984. The author concluded that measles vaccination was associated with a pronounced and sustained reduction in the rate of death among children in this study." [Published Abstract]

Editorial Comment

To all of us who may be accustomed to thinking about diarrhea as a disease associated with specific pathogens, and therefore preventable by dealing with these pathogens (e.g. cholera vaccine, rotavirus vaccine, prophylactic antibiotics, etc), this paper should cause a real revolution in thinking, and in program priorities. While we certainly know that measles is often accompanied by diarrhea, we do not usually think of it as one of the "diarrheal diseases." Yet, as this study shows so beautifully, preventing measles in this population was associated with a 59% reduction in diarrhea-associated mortality. That is truly astounding. It is also important to note that for the vaccinated areas, overall mortality was reduced by the measles immunization by fully 36%. This is a remarkable impact, attesting to the importance of

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measles as an underlying cause of death in children in these communities. It is similar in magnitude to the reduction of overall mortality among children seen after Egypt's extensive ORT program.

Taken at face value, these results suggest that national Control of Diarrheal Disease (CDD) programs should put as much priority on achieving high rates of measles vaccine coverage as they do on ORT and other aspects of good diarrhea case management. That bespeaks a revolution. Is it appropriate?

Note that the diarrhea treatment facilities in Matlab were available to the study populations. Were they not, the mortality from diarrhea might have been higher, and the effect of the vaccine possibly less, because more cases might have died from the more customary diarrheal diseases such as cholera.

The study population also may be particularly susceptible to death from diarrhea associated with measles. For example, high rates of malnutrition might predispose to higher rates of measles-associated diarrhea or to a larger proportion of persistent or recurring cases. Thus the dramatic effect reported from Matlab may not be seen were the vaccine used in less malnourished populations.

Perhaps other influences too might similarly lower the impact of measles vaccination on diarrhea mortality. Nevertheless, I find it hard to resist concluding that one must pay a lot more attention to the hypothesis that measles immunization may be the most cost-effective preventive intervention in certain impoverished communities.

Danzon, A.; Collet, J.P.; Duru, G.; et al. *"PRISE EN CHARGE DES DIARRHEES AIGUES NON GRAVES DU NOURRISSON: APPROCHE SOCIO-ECONOMIQUE."* (Care of infants with non severe acute diarrhea: a socioeconomic perspective) *Revue d'Epidemiologie et de Sante Publique*, vol. 35, 1987, 451-457.
Order #2369

Summary

Medically unneccessary hospitalizations occur frequently in pediatric practice. This is both harmful to the child and costly to society. To examine the economic dimensions of this problem, the authors compared various networks of care leading to hospitalization of children for an illness that can be safely treated at home: non severe acute diarrhea.

The 3-month study in and around Lyon, France documented the management of 267 infants (6-24 months) with non severe acute diarrhea. Infants were treated by one of four networks: in private practice by a general practitioner (n=58) or pediatrician (n=109), in hospital outpatient facilities (n=62) or as hospital inpatients (n=38). Some of the patients seen privately or as outpatients were also later admitted. The socioeconomic status and cost of treatment for each child was subsequently assessed.

Children treated as inpatients were mainly referred by hospital outpatient departments (47%) and general practitioners (37%). These two networks handle far more socially disadvantaged patients and ethnic minorities than do pediatricians. The main reason for admittance was diarrhea accompanied by vomiting (55%). Additional reasons included lack of confidence in the parents, difficulties in communicating with foreigners, and lack of means for surveillance and follow-up. Inexperienced interns and overworked outpatient hospital staff may also be contributing factors. None of the hospitalized infants required intravenous rehydration.

It was found that the average cost of treatment in the hospital is 60 times greater than care at home.

Technical Literature Update

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Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent USAID policies or opinions.

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Moreover, while only 5% of the infants with diarrhea overall were hospitalized, they accounted for 73% of the cost. Several measures are proposed to redefine the role of the hospital and improve cooperation with doctors in office practice. These would reduce both the number of hospitalizations and the length of hospital stays for non severe acute diarrhea.

Editorial Comment

This report from France is included because of some similarities and some contrasts with the situation in the United States. Perhaps the most remarkable fact was that none of the infants admitted to hospital were rehydrated intravenously. In the U.S., insurance regulations often require giving an IV drip for a child admitted for diarrhea, otherwise the hospital will not be reimbursed by the insurance company for the care. This means that many unnecessary IVs are given. At the Lyon hospital in this study, that irrational policy was not a problem. Nevertheless, even without IVs, the cost of care was astronomical, up to 60 times the cost of ambulatory care. The authors recommend, as Listernick did in Chicago, the establishment of a holding area in the Emergency Room, where mothers could be taught to rehydrate their children at home, and given the confidence to persist despite vomiting.

The similarity to the U.S., as well as to much of the world, is the physician reluctance to deal with diarrhea accompanied by vomiting on an outpatient basis. The response of the general practitioners was to just send the child to the ER or OPD. This may have been from ignorance, or may have been from not wanting to take the time to teach the mothers about ORT. In either instance, the challenge to the health system is to reach such practitioners and convince them that ORT is able to handle most cases of diarrhea with vomiting, on an outpatient basis, and is not overly time-consuming.

Helmy, N.; Abdalla, S.; El Essaily, M.; et al. "ORAL REHYDRATION THERAPY FOR LOW BIRTH WEIGHT NEONATES SUFFERING FROM DIARRHEA IN THE INTENSIVE CARE UNIT." ***Journal of Pediatric Gastroenterology and Nutrition*****, vol. 7, 1988, 417-423.** ***Order #2150***

Summary

In order to determine whether the ORT-early feeding approach is feasible in low birth weight (LBW) neonates, 62 patients (29 boys and 33 girls) suffering from diarrhea in an Egyptian neonatal intensive care unit were observed. The mean age was 13.89 ± 13.22 days. Average body weight was 1,500.49 ± 281.45 g. Severity of dehydration was assessed by the modified Fortin-Parent score. Infants with scores < 8 were given ORT while intravenous rehydration was used for those with scores > 8. Only 10 neonates needed intravenous fluids either solely or in combination with ORT, while 52 (84%) were successfully managed by oral rehydration alone (using the WHO formula).

Milk was stopped for 6-8 hours in the majority of cases (50), and for 12 hours or more in 12 cases. After initial rehydration, the milk amount was gradually increased, and ORT proportionately decreased. By 24 hours, virtually all infants were on full-strength and full-volume milk feeds.

One unexplained finding was a higher incidence of diarrhea among girls than boys. Despite the fact that boys constitute 73% of admissions to the unit, 53% of the neonates suffering from diarrhea were girls.

Positive results of the study included early improvements in electrolyte imbalances, briefer duration of diarrheal episodes (average < 24h vs. 3.1 days), fall in attack rate from 32% to approximately 12% attributed to concurrent preventive measures, and decrease in mortality rates from 28% to 4.6% when compared to the previous practice of intravenous therapy and fasting. ORT combined with early feeding was found to be safe, effective, and inexpensive. The newborns were also spared painful and potentially hazardous invasive procedures.

Editorial Comment

This report, added to that of Pizarro, should convince most doubters that ORT can be safely given to neonates. The authors cite the problems experienced prior to using ORT, which had led to their high 28% mortality rate: scalp abscesses and septicemia from extravasated fluid, slow rehydration and subsequent shock due to problems finding veins or lack of skilled personnel at important times, or too rapid fluid administration with circulatory overload. Undoubtedly, some of the benefit from the switch to oral fluids was due to the extra attention given the study patients because they were being studied, not to the ORT itself. This is, however, one of the benefits of ORT as compared to IV drips—you can't walk off and "let the ORT run" like you can with a drip; someone must be involved with the patient constantly. The data from this study may reflect that fact.

It was not clear from the report what indications were used for determining whether and when serum electrolytes would be measured. Hence we do not know whether the lack of observed electrolyte abnormalities during treatment (2 mild hypernatremia, one mild hyponatremia, correction of initial sodium abnormalities in 16 patients within 24 hours during which the standard treatment regimen alone was given) was due to lack of observation or to the safety of the ORT. Nevertheless it is further evidence for the safety of ORT in tiny babies.

The authors decided to dilute the formula being given the infants during the first 24 hours, on the basis of the observation that 27% of the infants fed full-strength formula had an increase in stool volume. It would have been interesting to see if the body weight of those babies was increasing or decreasing during the period their stool volume was increased. Brown's studies in Peru showed a higher stool volume with full feeds, but at the same time the patient's body weight was increasing more rapidly than the patients on diluted feeds or starvation, who did have smaller stool volumes. The point to emphasize here is that we should look at the patient, not just at the stool. The fact that the investigators saw a major decrease in duration of diarhea in comparison with the duration seen with IV rehydration and less aggressive feeding illustrates the importance, again, of feeding to enhance recovery from diarrhea, as well as to ensure better nutritional outcome.

Lastly, we should not fail to note the effectiveness of the preventive measures taken in this special unit. Previously one third of all admissions to this unit developed diarrhea. During the study they implemented a range of preventive measures: strict handwashing, use of overshoes, a new automatic kitchen, health education of staff, and isolation procedures for neonates who did get diarrhea. With these measures they reduced the diarrhea rate to 12%, an excellent result. Similar results have been obtained with rooming in for newborns. Program people should not forget this type of diarrhea, occurring in hospitals, as an important source of diarrhea deaths, and hence an important target for control efforts in many countries.

Contreras, G. "EFFECT OF THE ADMINISTRATION OF ORAL POLIOVIRUS VACCINE ON INFANTILE DIARRHOEA MORTALITY." ***Vaccine*****, vol. 7, June, 1989, 211-212.**
Order #2893

Summary

Viral studies carried out in relationship to the use of oral poliovirus vaccine (OPV) over two decades have demonstrated that OPV can both protect against polio and interfere with intestinal infection by other enteroviruses, such as live rotavirus vaccine.

Two epidemiological observations are cited as evidence that this effect may actually reduce infantile diarrhea mortality in a population receiving OPV. In Chile, a massive OPV immunization campaign was used to control a polio epidemic in 1961. For two years afterwards the diarrhea mortality rate in the population was reduced, compared to the years before and after. In Brazil, an OPV campaign in 1980 took place during a period of falling diarrhea mortality from 1978 to 1984. The trend of decreasing mortality was maintained. The author concludes that the OPV campaigns played a meaningful role in preventing diarrhea mortality, and should be used as a preventive intervention.

Editorial Comment

The idea is tantalizing, isn't it? The data presented do not convince me of the author's hypothesis, however. The Brazil data only document a continuing reduction, with no clear change in the rate of decrease of mortality after the vaccine campaign. The Chile data are more convincing, especially as diarrhea mortality was significantly lower for two years, while respiratory deaths were constant. But that's only a single observation, a sample of one, as it were, even if a whole country's population is involved. In my opinion, given the lack of significance of the Brazil data, the author's conclusions are unwarranted at this time. I wonder what further observations might show, however.

Technical Literature Update

on DIARRHEA

Technical Editor: Robert Northrup, M
Managing Editor: Lisa Dipko

Vol. IV, Nº9 1989

Briend, A.; Hasan, K.Z.; Aziz, K.M.A.; et al. "ARE DIARRHOEA CONTROL PROGRAMMES LIKELY TO REDUCE CHILDHOOD MALNUTRITION? OBSERVATIONS FROM RURAL BANGLADESH."
***Lancet*, August 5, 1989, 319-322.**
Order #2961

Summary

Rural Bangladeshi children ages 6-35 months were followed over a 3-year period (1984-87) for growth and diarrhea history. Diarrhea morbidity was assessed by weekly recall obtained from mothers by trained female community workers. Children received ORT if diarrhea occurred and were referred to a nearby hospital if severely ill. Growth was assessed by quarterly weight and length measurement. Analyses of the correlation between diarrhea morbidity and growth were made for individual 3-month intervals in which morbidity information was complete (1772 intervals).

Weight gain and linear growth were lower in intervals with a history of diarrhea than in intervals without diarrhea. However, results from intervals during which diarrhea occurred at the beginning or at the end of a period showed that after non-bloody diarrhea, the children caught up. Deficits in weight gain and linear growth were no longer apparent a few weeks later. None of the types of diarrhea—dysenteric; non-watery, non-bloody; or watery—had a significant effect on weight gain over an interval when it occurred at the beginning of the interval.

The findings suggest that the effects of diarrhea on growth are transient and that efforts to control diarrhea are unlikely to improve children's nutritional status in the long term.

Editorial Comment

This is an important report. It shows what we have long known, that diarrhea is associated with an immediate decrease in weight gain and height increment. What is new in these observations is the failure to link this transient decrease in growth and weight gain with the progress of malnutrition in children. In essence, the cause of the trend toward malnutrition in many of the children did not seem to be diarrhea, but something else. While the study does not tell us what, it seems probable that in the poor communities studied the most likely cause is inadequate food intake. Should we be surprised at these results? Or doubt them?

I wondered if good treatment of diarrhea was the explanation. The areas under study all had ORT and referral to the hospital available to anyone with diarrhea,

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and continued feeding was probably encouraged. Whatever nutritional messages were given to mothers, they did not prevent the acute decrease in linear growth and weight gain associated with diarrhea. It may be that the children suffered less of a decrease in growth than would have been the case without a strong CDD intervention. Furthermore, educational messages about giving extra food during the recovery period may have been responsible for the good catch-up growth. I continue to believe that good diarrhea management practices help to prevent malnutrition. This study, however, cannot confirm that belief because there was no control community in which good case management recommendations were not provided.

Underlying feeding patterns and/or food availability seem likely to be the most important determinants of malnutrition in these communities. My operational lesson from this report is the following: we would do well to use diarrhea episodes as a means of identifying children by weighing them when they are brought for treatment, asking about the number of meals and the type and amount of food they receive daily, and giving equal importance to nutritional advice as to teaching ORT. Good management of diarrhea, this report tells us, is only a component in the control of malnutrition.

Bhandari N.; Bhan, M.K.; Sazawal, S.; et al. "ASSOCIATION OF ANTECEDENT MALNUTRITION WITH PERSISTENT DIARRHOEA: A CASE-CONTROL STUDY." ***British Medical Journal*****, vol. 298, May 13, 1989, 1284-1287.**
Order # 2892

Summary

Seven hundred and fifty-six children were followed prospectively for 18 months to determine the effect of pre-existing malnutrition on the duration of acute diarrhea attacks and on the incidence of persistence (duration > 14 days). Children who developed persistent diarrhea (n = 30) were compared with matched controls without diarrhea and with matched controls who had acute diarrhea attacks without persistence. Weight for age that was 70% of standard or less was associated with an increased risk of having persistent diarrhea, as well as with an increased risk of an acute diarrhea episode going on to become persistent. This increased risk was not affected by analytical adjustment for several potential confounding influences.

Editorial Comment

This study provides further confirmation of the relationship between delay in healing and recovery from diarrhea and antecedent malnutrition. It serves as a nice companion to the first article in that it emphasizes the importance of preventing or treating malnutrition as a means of reducing the incidence of persistent diarrhea. It also suggests, as I commented above, that programs and care providers must make every effort to detect underweight children among the diarrhea patients coming to them for treatment. Giving these children special attention, particularly in the area of nutritional management, can help avoid persistence of the diarrhea and consequent worsening of nutritional status.

Cape, N. "GROWTH CHARTS: HELP OR HINDRANCE?" ***Health Policy and Planning*****, vol. 3, no. 2, 1988, 167-170.**
Order #2471

Summary

"The use of growth charts is being promoted world-wide, particularly by UNICEF, as one of the essential ingredients of any primary health care programme. Though they are being adopted in many countries, their effectiveness has been evaluated in very few.

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"In this analysis of the effectiveness of the use of growth charts in Papua New Guinea it is hypothesized that growth charts are used to fulfil[l] four purposes: (a) to assist health workers to *diagnose* children who are suffering from, or are in danger of suffering from, malnutrition; (b) to *select* those children that are seriously malnourished and may need referral; (c) to *evaluate* the impact of nutrition programmes; and (d) to assist health workers to *educate* mothers about child growth and nutrition. A review of research in Papua New Guinea reveals that growth charts, as they are being used at present, do not fulfil[l] any of these purposes. As such, it is questioned whether, considering the resources that are necessary to carry out growth monitoring with growth charts, it is sensible to continue promoting their use." [Published Abstract]

Editorial Comment

Regular readers of this Update know that I believe that monitoring growth and responding to growth failures is the most sensitive tool and, in most patients, almost the only tool available, to allow early detection of ill health in children and prevent it from becoming worse. I have no doubt that, if growth monitoring is appropriately used, this is true.

Yet this article provides evidence of the problems faced by Child Survival-oriented programs in trying to implement this tool. The errors in measuring and recording weight, and in interpreting both the weight and the growth trend are numerous. Additionally, action to deal with abnormalities may not be easy to determine or to implement. While this could be true because of the complexity of determining which of the multiple influences on growth is responsible for the growth failure or poor nutritional status, it also may be true because of poor communication of recommended actions to mothers aimed at bringing about behavioral change.

The author points out that even health policies may be to blame for ineffective response to poor growth. If the Department of Health defines a certain level of weight-for-age, say 80%, as malnourished and needing special attention, but the reality is that nearly all the children in a region fall into this category, then *extra* attention to this group becomes impossible. A local cut-off point which is practical for the community and for the workload of the local providers of care must be set, along with a practical set of action responses, if the approach is to be useful.

Time is an important factor. If, as was found in one study, only 2 minutes is to be allotted to each patient, then there is no possibility of carrying out the detailed dietary history and consultation that should be done when nutritional problems are detected. Unfortunately, although it is stated that only 2 minutes is allotted to 71% of the children seen, we are not told what happens to the other 29%. It may be very appropriate for the most severely malnourished children to get the most time and attention. As the author points out, non-individualized advice (e.g. "feed the child more greens" or "eat 3 meals a day") is not likely to be heeded.

The author concludes that much time is being wasted by using growth charts in Papua New Guinea and counsels throwing them out, to be replaced by health worker sensitivity to developmental milestones and improved communication with mothers, including the use of traditional, rather than western, concepts of growth. This may be appropriate if effective monitoring and guidance for health workers and reorganization of working procedures cannot be provided by the health system.

Although the results presented in the paper are disturbing, care should be taken before generalizing the conclusions. Clearly there is much to be learned about organizing and running effective growth monitoring programs. To abandon them completely would mean giving up on detecting children at risk of malnutrition and responding only to children who are already severely malnourished.

Gillam, S.J. "MORTALITY RISK FACTORS IN ACUTE PROTEIN-ENERGY MALNUTRITION." ***Tropical Doctor*****, vol. 19, 1989, 82-85.**
Order #2896

Summary

"The records of 45 children admitted to the Save The Children Fund (UK) Clinic, Dhankuta, East Nepal for nutritional rehabilitation, and who subsequently died, were compared with those of 200 survivors admitted during the same period. Children who died were more likely to have attended the clinic previously ($P<0.02$), and tended to be younger and lighter than controls. A poor outcome was associated with oedema ($P<0.02$), hepatomegaly ($P<0.01$), suspected tuberculosis

(P<0.001) and various socioeconomic factors: children who died came from larger families, 'single parent' families (P<0.01), and were more likely to have lost a sibling (P<0.01). The irrigated landholdings of dying children's families were on average approximately half the size of those of survivors' families. These socioeconomic factors were associated with more severe malnutrition at presentation.

"The identification of factors associated with a poor prognosis can help to focus admission criteria and to monitor especially high-risk children where services for the acutely malnourished are limited." [Published Abstract]

Editorial Comment

This case-control study describes a rational and systematic approach to focusing and directing limited resources in the face of tremendous need. The author recognizes that the children who are rehabilitated in in-patient facilities for the treatment of acute malnutrition are at high risk of recurrent malnutrition and death after discharge. Since the facility does not have the resources to track and follow up every child, the author tries to identify risk factors for death from malnutrition.

The most useful findings are that children who died from malnutrition were more likely to have certain socioeconomic characteristics. The sensitivity and specificities of these characteristics in predicting in advance which children in the general community are at higher risk of death cannot be determined from the information in the paper. Fortunately, the author notes that he is conducting a prospective study to test the usefulness of a risk factor score that uses these characteristics to target children for admission and for special follow-up.

There are no easy answers in this area, and we have much to learn. We have useful tools and useful technologies, but the management of human behavior, both among providers and recipients of care, remains the major unsolved problem.

Dahlstrom, K.A.; Danielsson, L.; Kalin, M.; et al. "CHRONIC NON-SPECIFIC DIARRHEA OF INFANCY SUCCESSFULLY TREATED WITH TRIMETHOPRIM-SULFAMETHOXAZOLE." Scandinavian Journal of Gastroenterology, vol. 24, 1989, 589-592.

Summary

Chronic non-specific diarrhea of infancy (CNDI) is defined as a condition in which children pass more than 3 loose stools daily for more than 3 weeks without any evidence of malabsorption, growth retardation, or dehydration. Fifteen children fulfilling these CNDI criteria were evaluated. A string test (quantitative bacterial cultures obtained from a string that is swallowed and entered into the duodenum) showed colonization of the small intestine by high concentrations of upper respiratory tract microflora, particularly alpha streptococci. Treatment of 10 children with trimethoprim-sulfamethoxazole (TMP-SMA) produced immediate cessation of diarrhea in 9, whereas a control group of 5 treated only with low lactose formula continued to have diarrhea (p<.0004).

Editorial Comment

It is important to note that this study was done in Sweden. The pathophysiology of the symptoms and the organisms involved may be very different than those associated with persistent diarrhea in developing countries. Most developing country children with persistent diarrhea who come to medical attention have growth retardation—it is the combination of diarrhea and failure to thrive that finally stimulates the mother to take action. Upper intestinal bacterial overgrowth is common in the persistent diarrhea-failure to thrive syndrome, but the organisms may be fecal rather than upper respiratory and may respond differently to TMP-SMA. Some persistent diarrhea patients may indeed respond to low-lactose diet; none did in this study.

The key points I take away from this report are: the apparently disturbing influence of bacteria on the small intestine and absorption, resulting in chronic diarrhea; the interesting conjunction of upper respiratory bacteria in the small intestine and persistent diarrhea without substantial nutritional effect; and the positive response to TMP-SMA. Also, where cultures are feasible, the string test-culture procedure used seems practical and not traumatic.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº1 1990

Alam, N.; Wojtyniak, B.; Henry, F.J.; et al. "MOTHERS' PERSONAL AND DOMESTIC HYGIENE AND DIARRHOEA INCIDENCE IN YOUNG CHILDREN IN RURAL BANGLADESH." ***International Journal of Epidemiology*****, vol. 18, no. 1, 1989, 242-247.** ***Order #2881***

Summary

This study examines the effect of providing clean water and health education on the hygienic practices of mothers and the consequent incidence of diarrhea in children aged 6-23 months from rural Bangladesh. The intervention area received augmented clean water supply through hand pumps (one for every 4-6 households) as well as health education provided by female health visitors through home visits, group discussion, and demonstrations. The control area received no project inputs.

From July 1980 to June 1983, diarrhea incidence was recorded weekly, while mothers' personal and domestic hygiene was observed for one day annually during the dry season. Personal hygiene referred mainly to rinsing hands before serving food, and rubbing hands in ash or mud after cleaning the anus of herself and her child. Domestic hygiene referred to use of handpump water for household use, and absence of feces in the yard on visual inspection.

Annual incidence of diarrhea in 314 children from the intervention area and 309 children from the control area was analyzed in relation to the maternal hygiene information, controlling for education and occupation of household head and household size.

Results show that use of handpump water for drinking and washing, removal of child's feces from the yard, and maternal handwashing before handling food and after defecation of self and child, *observed together*, decreased yearly diarrhea incidence in children by more than 40% compared to households where none or only one of these practices was observed. Significant differences were found in hygiene practices between the control and intervention areas, indicating the success of health education in promoting positive changes in hygiene-related behavior among mothers.

Editorial Comment

This is an exciting paper about some interventions that worked. First, the provision of pumps and education did change behaviors. In the intervention area, 85% of families used the clean pump water, compared with only 47% in the control area. The differences for the other behaviors were smaller although consistent. The overall distribution of hygiene practices was significantly different between the two areas ($p<.001$).

Second, the changed behaviors led to a significant reduction in diarrhea incidence between the two areas. The interesting additional aspect here was that it was the number of hygienic behaviors that was important, not the area where the family lived. In either the control or

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intervention area, children in families that practiced 3 or 4 behaviors were at lower risk of diarrhea than children in families that practiced 1 or no hygienic behaviors.

From the point of view of one trying to control diarrheal disease, the conclusions are clear. Just putting in pumps won't work. The educational efforts are also necessary to have an impact. And promoting a single behavior isn't enough; a quantitative as well as a qualitative change in practices is needed.

Esrey, S.A.; Habicht, J.P.; Latham, M.C.; et al. "DRINKING WATER SOURCE, DIARRHEAL MORBIDITY, AND CHILD GROWTH IN VILLAGES WITH BOTH TRADITIONAL AND IMPROVED WATER SUPPLIES IN RURAL LESOTHO, SOUTHERN AFRICA." *American Journal of Public Health*, vol. 78, no.11, 1988, 1451-1455.
Order #2677

Summary

Studies have shown that improvements in drinking water alone do not always produce strong positive impacts on health. A major cause of the variation in outcome of studies may be the extent to which families use only the clean, newly provided water, as opposed to using a mixture of clean and contaminated water.

This study in Lesotho focused on villagers who had access to a continually functioning tap or hand pump for at least one year prior to data collection. Data were collected in three five-week periods between July, 1984 and February, 1985. Information was recorded from length and weight measurements, stool samples, and mothers' reports on the presence or absence of diarrhea. Children were classified according to whether the family reported in an interview that they relied exclusively on the improved water supply for drinking and cooking(exclusive users) or also used traditional water sources(mixed users). They were also classified according to the quantity of water used per person in the family and whether per person water use decreased, increased, or remained the same between rounds 1 and 3 of the study.

Of the 247 children compared in the study, 125 were exclusive users and 122 were mixed users of the improved water supply. After adjustment for confounding factors, it was found that exclusive users gained 235 g more and grew 0.438 cm longer than mixed users. When results were not controlled for changes in water quantity, the differences were less pronounced: 226 g and 0.404 cm. Differences were greater among older children than among infants, probably because almost all infants were breastfed.

Stool isolation rates were 33% lower for *G. lamblia*, 53% lower for enteropathogenic *E. coli*, and 49% lower for coronavirus-like particles among exclusive users when compared with mixed users. *Campylobacter* was only slightly less common among infants in the exclusive group.

Reported diarrhea rates were actually higher for exclusive users than for others. This may be due to subjective recall bias of the mothers. Although exclusive users grew better than mixed users, children from non-improved villages grew better than both groups. Selection bias in the comparison of villages with and without improved supplies may be a possible explanation.

The authors suggest that future studies of health impacts from improved water supply focus on factors such as distance to the tap, number of families per tap, and reliability of water supply. They stress the importance of health education in encouraging people to use only improved water for cooking and drinking.

Editorial Comment

The most obvious observations which this report provokes are that the network of factors which influence child growth and diarrhea incidence is extremely complex, and that research which successfully incorporates all such influences is rare, if not impossible.

Technical Literature Update

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Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

This study suffers from the kinds of limitations which practical considerations force on researchers. Behavioral data were limited to water use alone; the other hygienic behaviors described in the Alam et al paper above were not studied. These behavioral data were by report alone; one must expect that some of the mothers said they were using clean water exclusively to please the interviewer when, in fact, they were not. Data on food or energy consumption were not collected, despite the fact that nutrition as well as infection is very likely to influence child growth. Had more and dependable data been available, an explanation for the higher diarrhea rates yet better growth rates among the exclusive users might have emerged. As it is, we are left confused and doubtful about the value of water-oriented interventions.

Indeed, from the point of view of persons who believe in the value of water provision, this paper is very upsetting, as it says that programmers cannot guarantee to the Minister of Health that investment in clean water provision will have certain health results such as reduction of diarrhea, even in carefully selected villages. The children in exclusive-user families did grow better, but the report does not allow me to conclude confidently that this better growth was actually caused by the provision of water. Even the microbiologic data are at cross purposes: how should we interpret the lower prevalence of Giardia and ETEC among exclusive users when the diarrhea incidence is not similarly lower?

It is this sort of confusing and complex data which keeps governments from being willing to commit themselves to water programs. This is unfortunate, because I believe personally that ample provision of clean water is an important component of health as well as quality of life.

Esrey, S.A.; Feachem, R.G. "INTERVENTIONS FOR THE CONTROL OF DIARRHOEAL DISEASES AMONG YOUNG CHILDREN: PROMOTION OF FOOD HYGIENE." World Health Organization, 1989.
Order #2952

Summary

This paper, one in a series of reviews exploring potential diarrhea control measures, focuses on the role of food hygiene promotion in controlling childhood diarrhea in developing countries.

Although firm proof is scant, the limited available evidence suggests that a substantial proportion of diarrhea episodes among children in developing countries is linked to deficiencies in food hygiene, including handling, preparation, and storage of food. For example, all of the major infectious diarrheal agents have been isolated in a variety of foods. Well-investigated outbreaks of diarrhea in developed countries have been traced to pathogens found in food. In most countries, the incidence of bacterial diarrhea is highest during the warmer months when bacteria multiplies more rapidly in stored food. Finally, diarrhea rates tend to rise at the time when weaning foods are introduced.

In order to design appropriate interventions relating to food hygiene, studies are needed to identify practices which are risk factors for fecal contamination of food. It will also be important to identify those practices which can feasibly be targeted by diarrheal disease control programs.

Based on the results of these design studies, intervention studies should then be carried out to determine the impact of promoting the specific behaviors identified on the reduction of fecal contamination and diarrheal morbidity.

Editorial Comment

Anyone who has ever been involved in studying or carrying out field epidemiology has probably dealt with outbreaks of diarrhea caused by food-borne pathogens. Traveler's diarrhea is in large part due to the ingestion of contaminated food by persons who are immunologically much like infants in the countries they are visiting.

The most pernicious and important type of diarrhea caused by food-borne pathogens is that associated with the use of feeding bottles. Ample evidence documents the high bacterial counts in milk formula taken from bottles in homes and clinics. Exclusive breastfeeding has been clearly shown to avoid the diarrhea problems associated with dirty bottles, and interventions which bring about exclusive breastfeeding (i.e. reducing availability of bottles in hospitals, public education campaigns, making bottles a prescription-only item as in Papua New Guinea) are being implemented widely.

Babies eventually reach the point at which they must be given ordinary food, and the morbidity data from every country indicate the rising incidence of diarrhea associated with weaning. For many of these episodes, the chain of causation is no different than that of a full-fledged outbreak. We might well think of such episodes as "mini-outbreaks" produced in the home by certain food-handling practices.

The review points out the many points at which behaviors can potentially lead to contaminated food and consequently to diarrhea: improper temperatures, either too low during cooking to kill bacteria, or too high during storage to prevent their growth; contaminated spoons or containers from inadequate sterilization or dirty water being used for cleaning; contaminated food to begin with, or contaminated water being used in food preparation; infected food preparers or servers, or failure of food handlers to wash hands; use of leftovers, often related to the preparation of too large a quantity of food.

The review points out, however, that we have little objective data to demonstrate that educational (or other) interventions can improve food-handling practices, or that these improved practices result in decreased diarrhea incidence. The Alam et al paper reviewed in this issue, and the Stanton et al paper reviewed earlier (Volume III, Number 10), are exceptions to this lack of evidence, but studies of this type and quality are all too rare.

The authors urge donors and governments to sponsor intensive programs of research in this area. Such research will be useful not only to provide the experience in various environments and evidence needed to mount programs, but also because getting academic doctors and diarrhea program people involved in such behavioral studies will appropriately shift attention away from the microbiological and pharmacological aspects of diarrhea which usually occupy doctors' attentions, toward the behavioral aspects which are often more important in diarrhea causality. We too urge your support and participation in such studies.

Briscoe, J.; Baltazar, J.; Young, B. "CASE-CONTROL STUDIES OF THE EFFECT OF ENVIRONMENTAL SANITATION ON DIARRHOEA MORBIDITY: METHODOLOGICAL IMPLICATIONS OF FIELD STUDIES IN AFRICA AND ASIA." ***International Journal of Epidemiology*****, Vol. 17, No. 2, 1988, 441-447.**
Order #2514

Summary

Based on two case-control studies, the authors draw preliminary conclusions on the prospects for employing a case-control design to assess the impacts of environmental sanitation improvements on diarrhea morbidity. The field studies took place in a rural African setting (Zomba, Malawi) and a peri-urban Asian setting (Cebu, Philippines).

Participants were recruited from clinics; cases were children brought there because of diarrhea, while controls were children who had not had diarrhea in the past 24 hours and were brought to the clinic because of other specific diseases. Data were collected both at the clinic and at home. Children were considered "exposed to good environmental sanitation" only if the family both used an improved water supply and had adequate excreta disposal practices.

Results suggest that the combination of improved water supply and improved excreta disposal practices is associated with a reduction in diarrheal disease of about 20%. The studies also indicate the substantial potential advantages, in terms of resources and time saved, of the case-control method.

Prospects of using a more simplified case-control protocol are also examined. The authors suggest that home visits could be eliminated, except for a validating sub-group, by development of a short hygiene questionnaire based on an anthropological assessment done before the study. Clinic personnel could then collect all the neccessary information. Also, data do not need to be collected on confounders since many of the confounders affect the control diseases as well as diarrhea.

The authors conclude that the design used is adequate for assessing the effects of improved environmental sanitation on diarrhea morbidity. If more complex interactions are to be examined, sample sizes will have to be substantially increased. Applicability of the proposed simplified protocol will have to be tested in future field studies.

Editorial comment

Briscoe has been a leader in developing simplified approaches to studying the impact of water and sanitation interventions, and the case control methodology is an important innovation. As the earlier reports discussed show, we need convincing data, which means that we need close attention to methodology so that studies produce definitive results. These development efforts are to be encouraged.

From a practical point of view, the methodology is ready to use, so long as care is taken to respect its limitations, especially the need to keep sample sizes appropriate to the complexity of studies planned. It is also practical and comparatively quick, especially relative to the longitudinal observational studies which have been the norm in this field.

Technical Literature Update

on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº2 1990

Elder, J.P.; Pradesaba, M.E.; Pineda, O.P.; et al. "A BEHAVIOR ANALYSIS OF THE PROMOTION OF ORAL REHYDRATION THERAPY (ORT) IN GUATEMALA." ***International Quarterly of Community Health Education*****, vol. 9, no. 2, 1988-9, 139-150.**
Order #3007

Summary

In this study behavior analysis was used to examine and plan oral rehydration promotion in four localities in the department of San Marcos, Guatemala. Behavioral observations and interviews were carried out in one large health center, two smaller centers, and one health post, analyzing the specific behaviors of health workers (doctors, auxiliaries) in examining babies with diarrhea and in communicating with the mothers. The observations and interviews were conducted by four trained observers, with assistance from three consultants. One observer was assigned to each clinic and its catchment area.

In the health facilities, observations included:

- the time mothers had to wait (up to four hours!),
- whether and how children were weighed (with or without clothes, directly, or held by mothers, then subtracting the mother's weight),
- the number of vital signs actually measured (six signs were supposed to be measured),
- whether certain areas were covered in taking a history of the illness (duration, urination, liquids and foods given, etc.).

Mothers' behaviors and skills were then observed in their own homes to evaluate the effectiveness of the centers' health education efforts. A checklist with six items was used to evaluate the mothers' ability to correctly prepare ORS (handwashing, measurement of a liter of clean water, use of a clean container, total dissolution of the solution, testing of the solution by tasting it, administering ORS at room temperature, indicating that a new packet should be prepared the next day).

Subsequently, health education sessions in the clinics were observed to determine the quality of interpersonal communication and skills training. Observations included whether common, understandable words were used; whether communication was two-way; whether there was a demonstration of ORS mixing; whether mothers were given opportunities to practice mixing ORS; whether workers checked knowledge by asking questions; whether feedback was given to mothers on how well they did; and whether all the steps of proper ORS preparation and use were covered.

In the two final steps, health worker outreach activities were observed and conversations were conducted with teams of health workers (focus group sessions) to determine what problems they faced and how to best promote effective health education activities.

Results indicate that in none of the health facilities were all six recommended diagnostic questions asked. The average number of the six prescribed vital signs

actually measured ranged from 1.2 in one facility to 4.8 in another. Most workers explained ORT, but only one of three workers representing different centers actually demonstrated the preparation sequence and then asked mothers to practice it. All three health workers observed conducting actual ORT training failed to mention several steps. Words used by health workers were often too sophisticated (e.g. "rodents" instead of "rats") to be easily understood by mothers.

Despite these shortcomings, mothers in the community understood the health messages they were given, and retained the appropriate behavioral skills over a long period of time. Common mistakes included failing to taste the solution after preparation or to make sure it was at room temperature. Many mothers used baby bottles to administer ORS because they could do other things while the baby was drinking, and because wastage was reduced.

Health workers indicated they would do more outreach if they could get paid for their expenses, and if they had sufficient materials. They had problems carrying equipment and printed materials, and urgently needed some type of carrying device, such as a large backpack.

Recommendations to improve current practices include having supervisors accompany outreach workers on their visits to ensure that field work gets at least as much supervision as clinical work. "Booster education" should be given to refresh mothers' understanding and skills in the area of ORT or other child survival behaviors. This could be done by changing the child's health card or booklet (on which vaccinations are recorded) to include the date of a mother's training in a specific health promotion/primary health prevention behavior such as ORT, and specifying when the training should be repeated or reinforced (a "booster promotion" of ORT).

Editorial Comment

We provided a very detailed summary of the ideas in this article because they demonstrate directly the value of this kind of information in improving the behaviors of both mothers and health workers. When ORT efforts were first begun, mothers were usually only asked whether they had given ORT during the last diarrheal episode. We learned that we needed more details, and began asking about how they had prepared it, and how much they had given, as well as about feeding. Now, and increasingly, it has become apparent that we must do more than just ask; we must observe directly what mothers and health workers are doing. In addition, we must take steps to learn about the positive and negative aspects for the worker, or the mother, of the behaviors we are promoting. By understanding the benefits and the costs, the reinforcing and the punishing consequences of recommended behaviors ("adaptive behaviors") and also of those which are less desirable ("maladaptive behaviors"), we can take appropriate steps to support the adaptive ones.

This kind of behavioral information collection and analysis has recently become a major component of many child survival programs. It should be clear from the above data that these types of studies should be incorporated into both planning and intervention phases, as well as into evaluation studies. Indeed they should be the core of "formative" evaluation aimed at improving our child survival efforts and making them more effective.

The following articles address the subject of persistent diarrhea in developing country settings. The articles add to our understanding of the complex relationship between host risk factors (for example age, nutritional status and immunological status) and characteristics of the etiologic agent that lead to an acute episode becoming prolonged (longer than 14 days). The ultimate objective of this research is to develop rational protocols for the empiric management of children with persistent diarrhea. The following questions are investigated:

1) *Are certain organisms more likely to lead to episodes of persistent diarrhea than other organisms?*
2) *Is colonization of the small bowel with fecal bacteria associated with persistent diarrhea?*

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3) *How important is lactose intolerance or other monosaccharide intolerance in causing an acute diarrheal episode to become persistent? What is the appropriate dietary management of children with persistent diarrhea?*

Bhan, M.K.; Bhandiri, N.; Sazawal, S.; et al. "DESCRIPTIVE EPIDEMIOLOGY OF PERSISTENT DIARRHOEA AMONG YOUNG CHILDREN IN RURAL NORTHERN INDIA." ***Bulletin of the World Health Organization*****, vol. 67, no.3, 1989, 281-288.**
Order #2957

Summary

"In order to determine the descriptive epidemiology of persistent diarrhoea in rural northern India, a cohort of 963 children aged 0-71 months was followed prospectively for 12 months through weekly household visits. The incidence of persistent diarrhoea was 6.3 per 100 child-years among those aged 0-71 months, and was highest (31 per 100 child-years) among those aged 0-11 months. There were no significant sex-related differences in the incidence of the disease, and the overall seasonal distribution of acute and persistent diarrhoea was similar. The persistence of diarrhoeal symptoms was significantly correlated with a higher initial mean stool frequency (P <0.01) and passage of gross blood with stools (P <0.001). Persistent diarrhoea was an important problem among children during the first 2 years of life.

"Established enteric pathogens were isolated during the initial illness in 46.4% of persistent and 55.4% of acute episodes. Pathogens isolated during persistent episodes included enterotoxigenic *Escherichia coli* (ETEC 9.3%), *Salmonella* spp. (4.7%), as well as campylobacter(4.7%), *Shigella* spp. (2.3%), *Entamoeba histolytica*(2.3%), and rotavirus (2.3%). Similar proportions of these pathogens were isolated also during episodes of acute diarrhoea. Multiple pathogens were isolated in 7% of the persistent and 5% of the acute episodes. *E. coli* that manifested aggregative adherence (EAEC-A) was more common (34.9% versus 12.3%) in persistent than acute episodes (P <0.01), and initial faecal excretion of EAEC-A was significantly associated with the persistence of a diarrhoeal episode." [Published Abstract]

Editorial Comment

I found this report useful, but at the same time unsatisfying. We learn about the incidence, duration and other descriptive factors, but only get a taste of the important additional information which would help in understanding causation of persistent diarrhea.

We are informed, for instance, that the peak incidence is in children aged 3-5 months compared to other periods in the first year, and for infants (aged 0-11 months) compared to children up to 6 years of age. We are not informed regarding the breastfeeding and weaning food status of the infants, however, nor are we given any information about the nutritional status of either the infants who had persistent diarrhea, or the 963 infants as a whole, even though the authors inform us indirectly that they have the data. The same is true for antibiotic intake.

It is also important to note that the definition of diarrhea used (4 or more loose or watery stools per 24 hours) will affect the peak prevalence. Although the authors attempted to correct for this (by requiring that mothers of breastfed infants under 3 months of age define the loose stools as "diarrhea" before classifying them as such) it is important to remember that infants normally have stools that are looser and more frequent than the stools of older children.

We are informed that a substantially higher proportion of persistent cases had grossly bloody stools: 20.8% compared with 7.3% for acute episodes. But when we look to see what agents were isolated from the bloody cases compared to the non-bloody ones, to see if *Shigella* is still the predominant cause of the dysentery as it is in acute diarrhea, we are not given the data. I am left feeling like a dehydrated child, my mouth open with thirst, seeing the spoon with ORS, but forced to wait until my mother gives me another drink. Surely we'll have it soon.

If this is an area with a low prevalence of malnutrition, or a high prevalence of exclusive breastfeeding in infancy, we could understand better the relatively low incidence figures for persistent diarrhea as well as acute diarrhea, compared to other developing country communities. There is an additional reason for taking these rather low incidence figures with a note of caution. Ethically the investigators had to ensure that acute diarrheas, in particular dysentery, were getting adequate treatment. Thus all children with bloody diarrhea or persistent diarrhea were referred to the local primary health center and were given antibiotic treatment (cotrimoxazole). Those with simple acute diarrhea were instructed in ORT and feeding. It is quite likely, based on other data, that good treatment for acute diarrhea will substantially lower the incidence of persistence and shorten the duration of the persistent cases. Thus, in an unobserved, and therefore less consistently treated population, we might reasonably expect a higher proportion of persistent cases than the reported 10%. We might also expect a higher proportion of persistent cases lasting more than 21 days

than the one-third that was observed in the study. The antibiotic treatment of the dysenteric acute cases also may have changed the etiologic pattern from stool culture analysis in the persistent cases. If there were few *Shigella* recovered from the persistent cases, for example, it would probably not be appropriate for us to conclude that *Shigella* was not the cause of the higher incidence of bloody stools in the persistent cases.

In examining the data on etiology, it is important to note that stool specimens were only collected from children less than 36 months of age. The patterns may be different in older children. Since there is no control group, it is impossible to determine how often the organisms isolated are found in the stools of children without diarrhea. Clearly the data do not support the empiric treatment of persistent diarrhea with antibiotics since no one organism can be targeted. It is particularly of note that the isolation of *G. lamblia* from the stools is low, and is the same for acute and persistent cases. Thus, the common practice of treating persistent diarrhea episodes with metronidazole is not justified without further evidence.

The authors point out that their threshold of four or more liquid stools per day, compared with the more usual three or more used by other investigators, may also have reduced the apparent incidence of diarrhea and persistent diarrhea, and the apparent duration of the persistent cases. We look forward eagerly to the subsequent reports from this study, with both more data, and more analysis of risk factors.

Bhan, M.K.; Raj, P.; Khoshoo, V.; et al.
"QUANTITATION AND PROPERTIES OF FECAL AND UPPER SMALL INTESTINAL AEROBIC MICROFLORA IN INFANTS AND YOUNG CHILDREN WITH PERSISTENT DIARRHEA." ***Journal of Pediatric Gastroenterology and Nutrition*****, vol. 9, 1989, 40-45.**
Order #2993

Summary

Duodenal and stool aerobic bacterial flora were examined in 54 patients (age <2 years) with persistent diarrhea (≥21 days), weight for height <80% of international standard, with more than 5 watery stools during the previous 24 hours at the Pediatric Gastroenterology Service of the All India Institute of Medical Sciences. Patients who had gross blood in the stool or who had taken antibiotics or antidiarrheal agents during the current illness were excluded. The median age of patients at the onset of diarrhea was 7 months. Median preadmission duration of diarrhea was 24 days and median stool frequency was 13 per 24/h period. Ten age-matched children without gastrointestinal symptoms but with malnutrition (weight for height <70% of standard) were included as controls.

Duodenal intubation was performed in all 54 patients and 10 controls on the morning after admission following 6-8 hours of abstinence from oral fluids and food. Duodenal aspirates of 28 (51.9%) of the 54 diarrhea patients yielded an overgrowth of aerobic microflora ($>10^5$ organisms/ml). Established enteric pathogens were isolated from the duodenal aspirates of only 12 (22.2%). These included enteroadherent *Escherichia coli* (EAEC) (5), enterotoxigenic *E. coli* (ETEC) (3), enteropathogenic *E. coli* (EPEC) (1), nontyphoidal *Salmonella* (1), and *Giardia lamblia* (2). Six of the 10 controls had no growth in their duodenal fluid. Four had bacterial growth (gram-positive cocci, *Enterobacter* and *Klebsiella*) in colony counts of $\leq 10^3$/ml.

Klebsiella bacterial strains isolated from the duodenum of two patients were tested for presence of factors associated with pathogenicity in other bacteria: toxin production, producing fluid accumulation in a rabbit ileal loop, and adherence to cells (HEp-2). The *Klebsiella* strains did not adhere to HEp-2 cells and were negative in the rabbit ileal loop assay, suggesting they were not pathogens.

Stool samples from 28 of the 54 children with persistent diarrhea (51.9%) yielded bacterial enteric pathogens. These were: *Salmonella* (8), *Shigella* (2), *Campylobacter* (1), ETEC (4), EPEC (2), EAEC (15)[1], *Giardia* (1) and *Entamoeba histolytica* (2). Pathogens were more frequently isolated from stool specimens than from duodenal aspirates, with the largest differences in the isolation rates of *Salmonella* and EAEC. Rotavirus was not detected in any of the patients.

Overall, 24 of the 54 diarrhea patients yielded *E. coli* with a potential virulence factor, either from stool or duodenal aspirate. The virulence factor detected in 17 of these 24 was enteroadherence to HEp-2 cells in various patterns, aggregative (Agg), localized (L), or diffuse (D). This echoes recent studies elsewhere which have suggested that HEp-2 cell adherence is a virulence factor and that this property classifies a group of diarrheagenic *E. coli*. However, only 30% of the diarrhea patients harbored *E. coli* as part of the duodenal microflora, and only half of these isolates produced an enterotoxin or HEp-2 cell adherence. Therefore, further studies are needed to establish if and how other similar aerobic bacteria or anaerobes contribute to the occurrence of diarrhea and malabsorption.

[1] *The author's abstract indicates that only 7 patients yielded enteroadherent* E.coli *from the stool, but the*

data presented in the report's Table 2 indicates 15 patients (compared with only 5 patients having EAEC in the duodenal aspirate). The authors' discussion suggests that the higher number is correct.

Editorial Comment

This report is another step forward in reaching greater understanding of why acute diarrheas persist in some patients. Host factors such as decreased resistance or slowed healing of the intestine because of malnutrition may be the reason in some patients. This study explores two other possibilities, both based on the principle of a special outside agent causing the disease. The first is that the diarrhea persists because bacteria start to grow and reach high concentrations in the upper intestine. Normally, fluid from the duodenum is either sterile or has only a few bacteria. The second theory is that special properties of certain bacteria, such as the ability to produce toxin or stick to intestinal cells (tested *in vitro* by the ability of bacteria to stick to HEp-2 cells) allow them to cause disease. Children with persistent diarrhea are, in fact, more likely than controls to be infected with bacteria that adhere to the gut (enteroadherent) which suggests that this "sticky" property of certain bacteria may be important in leading to persistent diarrheal episodes.

The most puzzling finding is the large proportion of these patients with no clear explanation for the persistent diarrhea. Almost half had no or few bacteria($<10^4$) in the duodenum, and in only 22% were established "pathogens" (including the enteroadherent *E. coli*) isolated. Fifty-two percent of stool specimens yielded a "pathogen," a higher figure, but still far from one hundred percent. It is unfortunate that anaerobic bacteria were not studied. They may well be important in causation, particularly when growing in the upper intestine.

We should note that the symptoms of the patients in this study, as compared to the community study by the same group discussed above, were more severe, and more prolonged, than in most persistent diarrhea cases. This strongly affects our ability to draw conclusions about persistent diarrhea in the community. The author helps by citing evidence from a community study that enteroadherent *E.coli* (EA-Agg EC) are more prevalent in persistent diarrhea cases than acute (34% vs. 12%) in that setting.

It will still be some time before these data can be applied to the management of children who present with persistent diarrhea. If some of the enteroadherent bacteria are a cause of the persistent episode (as opposed to a marker for another underlying process), some cases may respond to antibiotic treatment directed against the infecting organism. However, only a third of the children studied were documented to have these "sticky" *E. coli* (either in the duodenum or stool) and it has not been determined whether antibiotic treatment will influence the course of the illness. We must await further studies before any empiric intervention other than feeding can be recommended.

Roy, S.K.; Alam, A.N.; Majid, N.; et al. "PERSISTENT DIARRHOEA: A PRELIMINARY REPORT ON CLINICAL FEATURES AND DIETARY THERAPY IN BANGLADESHI CHILDREN." ***Journal of Tropical Pediatrics*****, vol. 35, April 1989, 55-59.**
Order #2894

Summary

Twenty-four infants and two children aged 2-24 months suffering from diarrhea of at least two weeks' duration were studied at ICDDR,B's Dhaka Treatment Centre. Although 25 of 26 had been breastfed at birth, 17 were currently receiving inadequate amounts of excessively diluted milk formula, and 2 were receiving only rice gruel. Twenty subjects were below 80% weight for age of the NCHS standard. A stool pathogen was isolated in only one infant.

Severely dehydrated cases (six) were corrected initially with intravenous fluid, and hydration was maintained with WHO oral rehydration solution. Patients were fed every two hours with liquid diets. A range of therapeutic diets was given according to the clinical progress of the patients' diarrhea, starting with a milk-based formula, and shifting to subsequent diets as necessary. Three children improved with a milk-based diet, two with an expensive commercial soya-based formula, and eight with a rice-based diet. Of the 13 remaining who had failed to improve, 12 improved with a diet of chicken, soy oil (30 ml/L) and glucose (25g/L}. The thirteenth child improved with a yoghurt diet. Subjects who improved with a rice-based diet were significantly older than those who improved with the chicken-based diet.

Systemic infections co-existed in half the subjects and included urinary tract infections, pneumonia and septicemia. The 11% case fatality rate that occurred (despite improvement in the diarrhea) was due to septicemia and bronchopneumonia. Twenty-one of the 26 subjects (81%) failed to gain weight during hospitalization despite a dietary intake ranging from 90-110 kcal/kg per day, and eventual reduction of their diarrhea. The patients were discharged on the final successful diets. Five were later readmitted for recurrence of diarrhea, but improved eventually. This

study confirms that locally prepared diets can be effective in the management of many persistent cases even when a specific diagnosis cannot be made.

Khoshoo, V.; Bhatnager, S.; Bhan, M.K. "MONOSACCHARIDE INTOLERANCE COMPLICATING PROTRACTED DIARRHEA IN INFANTS," *Journal of Pediatric Gastroenterology and Nutrition*, vol. 9, no 1, 1989, 131. (Letter)

Summary

A subgroup of 8 of 160 persistent diarrhea patients admitted to the All India Institute of Medical Sciences (AIIMS) was studied. These eight (5% of the overall group) were diagnosed as having intolerance to monosaccharides, as determined by: (1) presence of ≥0.5% reducing sugars (RS) in the stool while being given WHO-ORS (2% glucose) or the standard chicken-oil-glucose diet (1% glucose - 10 g/L) (the standard initial regimen for all the persistent diarrhea patients); (2) disappearance of RS on substitution of intravenous glucose for the oral glucose, along with a decrease in diarrhea; and (3) reappearance of RS along with worsening of diarrhea on reintroduction of WHO-ORS or the glucose-containing diet.

These patients were put on intravenous fluids (10% glucose) for 24 hours, after which a glucose-free chicken and oil diet was given, with stool fluid losses being replaced intravenously. When the patient's clinical condition stabilized, fructose was gradually added, beginning with 1% and progressing to 7.5%. Thereafter glucose was gradually substituted for fructose and intravenous fluids gradually discontinued, once blood glucose and hydration were maintained on oral feeds.

Two patients died of infections, although their diarrhea had responded. Of the six remaining patients with monosaccharide intolerance, glucose could be restarted within three weeks in all.

Editorial Comment

These two reports illustrate the complex challenge to the clinician which persistent diarrhea presents, particularly the task of getting adequate absorption of nutrients, electrolytes, and fluids across a gut epithelium that has been damaged, usually by a combination of infection and malnutrition.

The Roy *et al* paper, from ICDDR,B, Dhaka, utilizes the step-wise approach which is natural to most clinicians: if the first thing you try doesn't work, try something else. They changed the protein from milk to soya or chicken, and experimented with rice starch as a substitute for sucrose or glucose. Note that all their patients received carbohydrates in some form. The report did not indicate that they used a standard set of criteria for shifting from one diet, or one type of carbohydrate, to another.

Khoshoo *et al* began all persistent patients on a single, non-milk diet with glucose, and were very scientific about diagnosing monosaccharide intolerance, including a rechallenge step (step 3). Their most drastic diet eliminated glucose entirely, giving only chicken and oil by mouth.

That so few of the patients in the Dhaka study had gained weight by the time of discharge shows dramatically how important it is to observe the whole patient as well as the diarrhea. Ultimately, unless the patient does begin to gain weight, he will die, either from diarrhea or another infection. This is part of the "replacement mortality" which faces those of us who work in Child Survival. We may handle the current set of clinical symptoms with ORT or other therapies, but if the patient emerges from the episode with decreased nutritional status, overall mortality will not decrease. For this reason, it is critical to emphasize that the child has not recovered from an episode of diarrhea *until growth has resumed*. To be sure of that, health workers must follow up the case with a return appointment to demonstrate weight gain. While this may be difficult for the health care system because of overload, or for the mother because of poverty or distance, we should aim at doing such follow-up examinations for all malnourished children with diarrhea as a performance target to be gradually achieved in every CDD program. This is particularly critical in cases of persistent diarrhea.

From a practical perspective, both these studies show that local, comparatively inexpensive food may be more effective than expensive, "high-technology," commercial soya-based formulas in the management of most persistent diarrhea patients. They also show that food, not drugs or antibiotics, is the heart of treatment of these cases. We keep hoping for a single magic bullet like penicillin which will cure all persistent diarrhea patients. The evidence is nearly inescapable now that dietary management is the bullet which works, although it isn't magic and, as these studies demonstrate, often takes more than a single step. Antibiotics may help in a few cases, but these studies indicate that no single antibiotic will cover all the causative organisms, and many facilities treating these cases will not have laboratories like ICDDR,B or AIIMS capable of identifying specific organisms and sensitivities. Chicken and oil may be the answer.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº3 1990

Briend, A.; Bari, A. "BREASTFEEDING IMPROVES SURVIVAL, BUT NOT NUTRITIONAL STATUS, OF 12-35 MONTHS OLD CHILDREN IN RURAL BANGLADESH." ***European Journal of Clinical Nutrition*****, vol. 43, 1989, 603-8.**
Order #3192.

Summary

"The association between breastfeeding, nutritional status and survival was investigated in a cohort of 1087 children aged 12-35 months from rural Bangladesh followed monthly during 2 years. Mean weight-for-age (%NCHS) of breastfed children was 69.6 per cent (s.d.: 9.3 per cent) compared to 70.6 per cent (s.d.: 10.7 per cent) ($P<0.001$) for non-breast fed children. This confirms that after 1 year of age, breastfed children tend to be more malnourished than non-breastfed children. Despite this difference in nutritional status, risk of dying, after adjusting for age, was 6 times higher in non-breastfed malnourished children than in similarly malnourished breastfed children. This suggests that breastfeeding beyond 1 year should be encouraged in communities with a high prevalence of malnutrition, despite the frequently observed association between prolonged breastfeeding and malnutrition." [Published Abstract]

Brakohiapa, L.A.; Yartey, J.; Bille, A.; et al. "DOES PROLONGED BREASTFEEDING ADVERSELY AFFECT A CHILD'S NUTRITIONAL STATUS?" ***The Lancet*****, August 20, 1988, 416-18.**
Order #3138.

Summary

"In 202 children who visited a children's hospital in the city of Accra, Ghana, breastfeeding beyond the age of 19 months was found to be associated with malnutrition. The effect of weaning on food intake was then studied in 15 breastfed malnourished children in a rural community. Before weaning (complete cessation of breast-feeding) protein and energy intakes of all the malnourished children were about half those of 5 normal children. 10 of the malnourished children were weaned, and their intakes rose to the levels of the normal children; the 5 who continued breastfeeding maintained their low intakes. These results indicate that prolonged breastfeeding can reduce total food intake and thus predispose to malnutrition. They also suggest that in Ghana and other developing countries the proper weaning age may be about 18 months." [Published Abstract]

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Editorial Comment

It is quite clear from multiple studies that exclusive breastfeeding during the first 6 months of life protects infants from diarrhea and supports growth of babies from every genetic heritage and environment at close to the standard rate of growth for babies in developed countries (e.g. National Center for Health Statistics 50th percentile). What is less clear is the role of breastfeeding after 6 months of age in disease and mortality prevention and in nutrition.

Both of the papers summarized above have their origins in the hypothesis that breastfeeding after 1 year of age or so "causes" malnutrition, rather than protects against it as it does in the first 6 months of life. It has been assumed that this happens because children are given or consume inadequate amounts of weaning foods while still on the breast.

Alternate explanations are that malnutrition and prolonged breastfeeding are both associated with a third factor, such as low socioeconomic status or high rates of illness. As Briend and Bari note, women of low socioeconomic status in Bangladesh tend to breastfeed longer and there is some suggestion that mothers tend to delay weaning when their children are malnourished. Thus the association between prolonged breastfeeding and malnutrition may not be causal, but due to the confounding factor of either poverty or recurrent illness. If these alternative "causes" were important, we would respond to an association between prolonged breastfeeding and malnutrition, not by discouraging breastfeeding, but rather by encouraging handwashing to prevent diarrhea, for example, or by some intervention other than encouraging weaning.

At first appraisal the conclusions from the Briend/Bari paper seemed exaggerated. While the use of a large sample (1087 children) might make the difference between 69.6 and 70.6% weight-for-age significant statistically, from a clinical point of view both groups are equally malnourished. A graph suggests, however, that the difference is greater at least during the period 12 to 21 months. A couple of data points show a difference of up to 78 vs. 70% NCHS (National Center for Health Statistics).

The potential importance of confounding factors such as those mentioned above is referred to by the authors. Unfortunately, although the data were gathered in conjunction with a diarrhea study, the results were not adjusted for diarrheal incidence or socioeconomic status. Attention is focused on the higher mortality among weaned, severely malnourished, children, compared to equally malnourished, breastfed children. Here the implication is just the opposite of the earlier weaning-malnutrition correlation: breastfeeding is better, not worse.

Briend and Bari urge, because of this large difference in mortality, that mothers *not* be advised to wean malnourished children over 12 months of age in hopes of improving nutrition. They argue that the slightly lower nutritional status of breastfed children should be regarded as of little importance given the marked impact on survival associated with breastfeeding. We certainly agree, but wonder if that is all we should do. Had they carried out a broader analysis, they might have been able to determine why the breastfeeding correlated with poorer nutrition, and to recommend other positive actions such as those already mentioned (handwashing, more food, more frequent feeding, etc.) for either additional study or intervention.

The lower risk of dying which they observed in severely malnourished, breastfed children, compared to similarly malnourished, non-breastfed children, may be due to the anti-infective effect of breast milk (see the paper by Glass & Stoll discussed next). It could also be due to the beneficial effects of continued breastfeeding in such children during diarrhea, although I doubt that that mechanism would have the 6-fold power observed by the authors.

Technical Literature Update

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Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent USAID policies or opinions.

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The Ghana study did what Briend/Bari recommended against; weaning malnourished children. The authors found that the weaned children improved their energy and protein intakes nearly 2-fold, to a level almost that of normally nourished, already weaned children.

Would this same increase in intake have occurred if the children had not been in a study and under observation? Were the control children (who continued breastfeeding) encouraged to eat in the same way as the children who were weaned? In other words, if weaning such children was made standard policy, but there was no study team which followed up the recommendations with home visits, would we see the consistent (9 of 10 children) and dramatic increases in intake reported here? The study cannot answer that question, but my guess is that the visits of the home visitors kept the mothers' attention on the children's food intake, made them face squarely the need for additional food in the absence of breastfeeding, and led them to give more food. The study also does not inform us whether the mortality in the newly weaned children increased over those who continued on the breast. The authors assume that it would not, given the likelihood of their malnutrition decreasing with the increased food intake. However, if *Shigella* or cholera infections are important in Ghanaian mortality (see Glass below) this might not be the case.

What can we take away from these somewhat conflicting papers? I am inclined to focus on the status of nutrition and the food intake. If a child is adequately nourished, the type of food, breastfeeding or not, may be less important. If a child is malnourished, then it behooves us to examine the quality, amount, and frequency of feeding through asking detailed questions of the mother when the child comes to the clinic, or at the time of weighing. For those breastfed, malnourished children whose intake of weaning food seems insufficient, stopping breastfeeding may be an effective stimulus to increase the intake of weaning foods. In view of the protective effect of breastfeeding on infections and on mortality, however (see Glass & Stoll below), we might explore whether education, support, food supplements, or other alternative interventions could be used to enhance nutritional intake while continuing breastfeeding.

What should we do in response to these studies? Briend/Bari command us never to advise the mother of a malnourished child to stop breastfeeding. The Ghana study suggests just the opposite. My contention is that we need to know more than just breastfeeding status, nutritional condition, and mortality data before we can make recommendations about interventions, and about whether to recommend continuing or stopping breastfeeding in children over 12 months. (See discussion of Glass/Stoll paper below.)

Glass, R.I.; Stoll, B.J. "THE PROTECTIVE EFFECT OF HUMAN MILK AGAINST DIARRHEA: A REVIEW OF STUDIES FROM BANGLADESH." *Acta Paediatrica Scandinavica*, vol. 351, 1989, 131-36.
Order #3028.

Summary

Although it is commonly accepted that breastfeeding confers protection against diarrheal disease, the mechanisms by which this occurs, and the organisms against which it offers protection, are unclear. This paper reviews field and laboratory studies of these topics conducted in Bangladesh.

A surveillance study was done at the Dhaka hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) from 1980 to 1982, on 4% (4,001) of the 80,000 to 100,000 children under 5 seen for diarrhea each year. The distribution of diarrheal illness was described by age, etiologic agent, and breastfeeding status. By comparing breastfeeding prevalence among cases of different etiologies, the data could suggest which organisms breastfeeding protects against, at least for the generally more severe cases which come to hospitals (no conclusions would be possible regarding milder cases). The results showed that breastfeeding is protective in the first few months of life for all pathogens. After 6 months it protects against severe cases of cholera and shigellosis, and not against rotavirus, ETEC, or *C. jejuni*. On the basis of these results, further studies were done on the mechanisms of protection afforded by breastfeeding against *V. cholerae*, *Shigella*, rotavirus, *C. jejuni*, and *G. lamblia*.

Family studies on *V. cholerae* showed different levels of cholera-specific IgA antibodies contained in breast milk. Measurements of the incidence of diarrhea and colonization with *V. cholerae* in siblings of cholera cases suggested that IgA antibodies protect children against the development of diarrhea, but not against colonization with *V. cholerae*. Neither lactoferrin nor lysozyme levels correlated with protection. Low breast milk antibody production in newly infected mothers raised doubts about the feasibility of immunizing mothers as a way to protect children against cholera.

Studies on *Shigella* showed that breastfed children were less likely to get shigellosis severe enough to bring them to ICDDR,B. Among those who came with

shigellosis, breastfeeding was significantly correlated with milder symptoms. Thus breastfeeding appeared to reduce the severity of shigellosis.

Rotavirus data suggested that breastfeeding does not affect disease rates or the age at which illness occurs. Studies from Finland, however, suggest that breast milk antibodies may interfere with the effectiveness of oral rotavirus vaccines by neutralizing the vaccine viruses.

Studies of breast milk antibodies and sibling illness in families of *C. jejuni* patients confirmed the surveillance data showing that breastfeeding was not protective against *C. jejuni* and that there was no correlation between breast milk antibody levels and the risk of infection, illness, or duration of shedding organisms.

Because of the possibility of low exposure to giardiasis, the low rate of giardiasis in breastfed children under the age of 6 months could not be interpreted as showing protection afforded by breastfeeding against giardiasis.

The authors recommend that further efforts to examine the protection afforded by breastfeeding should focus on diarrhea of specific etiologies and be conducted in community settings in order to assess the impact on mild disease. Future efforts to delineate the biologically active components in breast milk should be directed at factors in breast milk consumed by younger children. Finally, as rotavirus vaccines develop, exploration of the interaction between orally administered, live rotavirus vaccines and components of breast milk holds great potential.

Editorial Comment

We see from these studies of breastfeeding that the effect of the intervention is not constant, but varies according to the etiology of the diarrhea. This is not surprising since it is also the case with other "interventions."

The lack of protection against ETEC diarrhea is surprising, as the mechanisms of the illness are similar to cholera. It may be that a bias was introduced into the observations by involving only a hospitalized population in the basic surveillance studies. Perhaps a community study would show protection by breastfeeding against colonization or against milder disease. This is supported by studies referred to by the authors showing protection against challenge with ETEC of volunteers fed immunoglobulin concentrates from ETEC immunized cows.

The point which struck me most strongly from this review was the impact of breastfeeding on the severity of illness in cholera and *Shigella* infections, both of which are of major importance in childhood mortality in Bangladeshi children. Recalling the 6-fold protective effect of breastfeeding against mortality from the Briend/Bari paper discussed above, it seems likely that the impact of breastfeeding on severity described in this paper (also from ICDDR,B) is an important mechanism in the effect of breastfeeding on mortality in severely malnourished children that Briend and Bari observed. This effect argues strongly for the prolonged continuation of breastfeeding as an important measure for keeping children alive, even though it could interfere with food intake as suggested by the Ghana studies. In an environment where cholera or shigellosis are less prevalent, however, the effect of breastfeeding on severity of diarrheal illness, and thereby on mortality, might be much less. In such environments, prolonged breastfeeding might have a much smaller effect, or even no impact at all on mortality, in contrast to what was found in Bangladesh.

For the program implementer, we see once again that a universal recommendation regarding the promotion or discouragement of prolonged breastfeeding (after 12 months) is not appropriate. Local studies on causes of mortality, including the incidence of shigellosis, cholera, and severe malnutrition, as well as quantitative studies of nutritional intake before and after weaning, will help significantly in setting effective policy regarding prolonged breastfeeding. Fortunately we do not need such studies for the first 6 months of life; we can recommend breastfeeding during that period unreservedly, anywhere.

Wittenberg, D.F.; Loening, W.E. "DIARRHOEA IS A NUTRITIONAL DISEASE." *South African Medical Journal*, vol. 76, November 4, 1989, 476-78.
Order #3164

Summary

The nutritional status of all children admitted to the diarrhea ward at a Durban, South African hospital in 1986 was compared to that of children admitted with diagnoses not including diarrhea. A retrospective study of patients under 2 years of age admitted more than once for diarrhea (but more than 2 weeks apart) was compared with a similar analysis of patients admitted more than once for bronchopneumonia.

Results showed that 34.2% of patients admitted with diagnoses other than diarrhea were below the third

NCHS weight-for-age centile, as compared to 53.5% of diarrhea patients. Better-nourished diarrhea patients had a shorter hospital stay than those who were malnourished. Patients readmitted for diarrhea had significantly lower weight-for-age at the second admission and had experienced a greater decrease in weight than readmitted bronchopneumonia patients: 62% of the readmitted diarrhea patients had a weight-for-age less than 80% of expected, as opposed to 50% of patients with recurrent bronchopneumonia.

Editorial Comment

In a 1985 study done in Haiti, J. Rohde and I described the increasing proportion of children with diarrhea who were malnourished, from 3% of cases in the community, to 10% of clinic patients, 35% of hospital admissions and, finally, 65% of diarrheal deaths.[1] We concluded, as did these authors, that diarrhea is indeed a nutritional disease. This study adds a comparison with bronchopneumonia. The authors apparently believe that their data demonstrate that diarrhea is generally more closely associated with malnutrition than is bronchopneumonia. They also conclude that patients with recurrent diarrhea suffer more nutritional damage than those with recurrent bronchopneumonia.

I suspect that they are right. Unfortunately their data do not allow them to draw those conclusions. The study has the fatal flaw inherent in all analyses of hospitalized patients: it does not control for biases in admission criteria, and does not examine a whole population. The greater prevalence of malnutrition among the diarrhea admissions may reflect the possibility that in 1986, when the study was being carried out, most patients with diarrhea were treated as outpatients with ORT. Thus it is possible that many of those patients with diarrhea who were admitted were judged to need admission *because* they were malnourished, or had recurrent or continuing diarrhea accompanied by weight loss. This may have happened less often with pneumonia, where admission criteria, even with recurrent cases, might emphasize fever, respiratory difficulty, or other criteria other than malnutrition. Because of the research approach used, the authors can give us no information about patients in the community who had diarrhea or pneumonia, both acute and recurrent, who did not come to the hospital at all or who came and were sent home.

As a result, it is impossible to learn much about the natural course of a disease from a study which is biased by the choice of the study population. I am reminded of the Briend study we discussed in a previous *TLU* in which Briend et al concluded that diarrhea was relatively unimportant as a cause of malnutrition in a Bangladeshi population.[2] A number of letters to *The Lancet* were subsequently published emphasizing that ORT use in Bangladesh, as well as early and post-episode feeding (the therapeutic environment of the study) may well have reduced or eliminated the nutritional impact of diarrhea.[3] Briend and co-authors disagreed. They wrote that growth faltering is fundamentally different than a deficit in weight-for-age, and is not likely to need special attention; it disappears by itself without any adverse effects.[4] I was unconvinced by their argument, and still feel that both the prevalence of cholera in Bangladesh (a less invasive diarrhea) and the likely prevalence of more appropriate diarrhea case management in that environment, makes it inappropriate to draw the conclusion that diarrhea is not important as a cause of malnutrition in environments outside of Bangladesh. One needs to be quite aware of the powerful influence of the study environment on the conclusions one is brave enough to draw.

Returning to this article, I continue to believe, as do Wittenberg and Loening, that diarrhea is a nutritional disease which calls for close attention by doctors and by mothers to feeding as well as to ORT. The complexities of the interaction between diarrhea and nutrition, however, limit the usefulness of simplistic studies and conclusions that ignore the environment in which the data are generated.

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[1]See "Diarrhea is a Nutritional Disease," ICORT II Conference Presentation. (PRITECH Order #1222)

[2]See "Are Diarrhoea Control Programmes Likely to Reduce Childhood Malnutrition? Observations from Rural Bangladesh" reviewed in *TLU* Vol. IV, No.9. (PRITECH Order #2961)

[3]See letters entitled "Diarrhoea and Malnutrition" in *The Lancet*, Vol. 2, No. 8664, 691-92 by Greenough, Cutting, and Hirschhorn. (PRITECH Order #3079 and 3081)

[4]See letter entitled "Diarrhoea and Malnutrition" in *The Lancet*, Vol. 2, No. 8672, 1150). (PRITECH Order #3037)

Nwankwo, M.U.; Offor, E.; Okolo, A.A.; et al. "BACTERIAL GROWTH IN EXPRESSED BREAST-MILK." *Annals of Tropical Pediatrics*, vol. 8, 1988, 92-95.
Order #3070

Summary

The nutritional and anti-infective properties of breast milk are well-documented. Therefore, under

circumstances where breastfeeding would otherwise be difficult, it is often desirable to feed infants with expressed breast milk (EBM). This study addressed the concern that the need to store EBM for hours in places without refrigeration may allow bacterial overgrowth to occur, making the EBM less advantageous.

Twenty nursing mothers in Benin City, Nigeria were studied to determine the bacteriostatic quality of expressed breast milk either refrigerated at $4^{o}C$ or stored at room temperature in a tropical environment with high ambient temperatures and humidity ($24\text{-}32^{o}C$). Ten mothers had preterm deliveries (28-36 weeks) and the other ten delivered at term (37-42 weeks). Colostrum was obtained within 6 days of delivery and mature milk at 6 weeks or more postpartum. Breast milk was obtained by manual expression after cleansing the areola with a sterile gauze soaked in sterile water. Sterile bottles were used to store the milk over the 24-hour study period. Breast milk was divided into 4 study groups: preterm colostrum, preterm mature milk, term colostrum, and term mature milk. Counts of bacteria in the samples were performed at 0, 2, 4, 6, 12, and 24 hours. Counts below 10^4 cfu (colony forming units)/ml were considered to be safe for consumption.

Bacterial isolates were similar in all groups and represented normal skin flora. Initial bacterial counts were slightly higher in colostrum than in mature milk (about 1 log higher). However, bacterial growth occurred more rapidly in milk than in colostrum.

Prematurity was the factor that appeared to be most closely associated with bacterial multiplication. At room temperature, mature milk from term mothers could be stored for 6 hours, and term colostrum for 12 hours without a significant increase in bacterial growth, while preterm milk could be stored for only 4 hours and showed significant bacterial growth even with refrigeration.

Editorial Comment

While this study would have been more helpful had the investigators included a comparison with commercial milk formula, it does show us that growth of contaminants in expressed breast milk is slow enough to allow keeping such milk even at room temperature for some hours.

Whether EBM is a feasible intervention in environments where resources are so scarce that facilities lack refrigeration is another question. I wonder if we could expect many health workers to be able to convince mothers who are already heavily burdened by the demands of work, household management, and child care, to take the time to express and save breast milk even for a short period of time. Would health workers take the time to do the convincing? If doing so meant that we could keep a breastfeeding mother from shifting to formula, it would certainly be worth the time needed.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº4 1990

Mahmood, D.A.; Feachem, R.G.; Huttly, S.R.A. "INFANT FEEDING AND RISK OF SEVERE DIARRHOEA IN BASRAH CITY, IRAQ: A CASE-CONTROL STUDY." ***Bulletin of the World Health Organization*****, vol. 67, no. 6, 1989, 701-706.**
Order #3528

Summary

Cases (597 infants aged 2-11 months) admitted to the Basrah Pediatric Hospital in 1983-84 because of acute diarrhea (<5 days) were compared to 723 healthy controls brought to the 7 maternal and child health clinics in Basrah for compulsory immunization or routine check-up. Potential controls who were admitted to the hospital for diarrhea during the month before or the month after the interview were excluded. Analysis of data from interviews with mothers, hospital records, and diagnostic laboratory tests was controlled for various potentially confounding variables.

Results showed that for infants 2-5 months of age, exclusive breastfeeding and breastfeeding plus food were safe and highly preferable to all feeding modes that included bottlefeeding. The risk of hospitalized diarrhea was 55 times greater among exclusively bottlefed infants aged 2-3 months, and 37 times greater among exclusively bottlefed infants aged 4-5 months, than among infants who were exclusively breastfed. For infants 6-11 months of age, the risks of hospitalized diarrhea did not differ significantly among different partial breastfeeding modes. Not breastfeeding at all, however, especially exclusive bottlefeeding, was dangerous: hospitalized diarrhea was 5 to 9 times more frequent in exclusively bottlefed infants aged 6 to 11 months than in those infants given breast milk plus food (the recommended feeding mode in this age group).

It was concluded that supplementing the diet with food rather than with bottle milk was safer, probably due to less bacterial contamination. Further findings included a lack of association between the risk of severe diarrhea and the method of bottle cleaning, and a lack of current protection conferred by previous breastfeeding.

The authors calculated that the proportion of hospitalized diarrhea cases that would not have occurred if the risky feeding practices were eliminated could theoretically reach 60%. Based on experience elsewhere, however, realistic expectations of the outcome of breastfeeding promotion projects of high impact might be a reduction in diarrheal admissions of

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25% in the first year of life, while projects of low impact might lead to a reduction of only 7%. These reductions in diarrheal admissions would be greater among younger infants (2-3 months), high impact projects producing a 47% decline, low impact projects a 12% decline.

Editorial Comment

Three points from this study struck me:

1) The magnitude of the impact. The 55-fold decrease in diarrhea hospitalizations associated with exclusive breastfeeding is consistent with the impact of breastfeeding on severity of diarrheal disease reported in the article by Glass and Stoll (reviewed in the previous issue). If children who are breastfed experience milder episodes, they will be less likely to be admitted to the hospital for diarrhea. However, the results of this study are perplexing in light of the findings from Bangladesh that, after six months of age, breastfeeding protects against severe cases of cholera and shigellosis, but not against rotavirus, ETEC, or *C. jejuni*. Cholera and shigellosis are unlikely offenders in the majority of these Iraqi cases. Thus, my bet is that the mechanism is an overall decrease in incidence, even of less severe diarrhea.

2) The safety of giving food. The authors comment on the likelihood of lesser bacterial contamination in food, and on spoons and cups used in feeding, compared to that on bottles and rubber teats. That makes sense, but I was still surprised, and pleased, to see that there was no significant difference in risk of hospitalized diarrhea between exclusive breastfeeding and breastfeeding plus food. Obviously it is the bottles that make the difference. This goes along with my continuing belief that *campaigns against* the bottle are just as important, perhaps more important operationally, than *campaigns for* breastfeeding.

3) The apparent lack of influence of the method of cleaning bottles - even sterilization did not seem to help. The authors believe that this may not reflect the true situation, and that the results may be due to their method of analysis, which controlled for the mother's education. They cite another study which showed a sizeable difference in bacterial contamination of teats between educated and illiterate mothers, even when they used the same cleaning method. I still believe that we health workers have a duty to teach mothers how to clean bottles and teats correctly; we should not just give up on mothers who have chosen not to breastfeed, or have chosen to supplement breastfeeding with bottlefeedings.

I was surprised to find no clear comment on the role of supplemental water, or water and sugar, in otherwise exclusively breastfed infants. Perhaps the lack of comment relates to the possibility that in this population the drinking water was quite clean during the seasons studied. Alternatively there may have been no infants who were truly exclusively breastfed without any supplemental water, thus making it impossible to analyze water's role.

Popkin, B.M.; Fernandez, M.E.; Avila, J.L. "INFANT FORMULA PROMOTION AND THE HEALTH SECTOR IN THE PHILIPPINES." ***American Journal of Public Health*****, vol. 80, no. 1, 1990, 74-75.**
Order #3313

Summary

Data were collected from 73 (1984), 78 (1986), and 72 (1988) public and private Metropolitan Cebu health facilities that provide prenatal and obstetrical care to assess the adoption of the International Code of Marketing of Breast Milk Substitutes issued by the World

Technical Literature Update

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Health Organization in 1981 and of a more restrictive national code (the GOP Code) issued in 1986. The GOP Code forbids infant food manufacturers from giving free supplies to the general public, hospitals, and other health facilities or medical personnel.

The proportion of facilities receiving infant formula as gifts from manufacturers remained basically unchanged between 1984 and 1986 (58% and 53%) but fell to 3% in 1988. However, receipt of gifts of formula for older babies ("follow-up" or "weaning" formula), which is not covered by either code, rose from 11-15% in 1984-86 to 28% in 1988. The proportion of facilities that allowed manufacturers' representatives to visit patients rose from 30 to 40% between 1984 and 1986, but had dropped to only 3% by 1988. In 1988 only 7 of 72 facilities still supplied clients' names to manufacturers' representatives. The effect of these changes on the rate of breastfeeding among Filipino mothers was not studied.

Editorial Comment

This short report appeared the same month as a news commentary in Africa Health (vol. 12, no. 2, 1990, 20-21, PRITECH order #3472) regarding the British government's measures relating to breast milk substitutes. The government was reported to have first implemented the WHO 1981 Code by issuing a Food Manufacturer's Code of Practice in 1983 (a modified WHO Code). In 1988, at the government's request, the manufacturers agreed to discontinue supplying free samples for distribution to mothers, and local health authorities were no longer allowed to accept free samples of liquid formula; hospitals had to buy it for those babies who needed it, just like any other supply. The British Code does not permit any advertising of formula at places where formula is sold, or use of any other promotional devices to induce sales directly to the consumer. Only health professionals may give information on artificial feeding to mothers.

The British and Filipino examples should be a real stimulus for developing country diarrhea programs to look carefully at the details of their governments' and local manufacturers' codes, and to survey health facilities to determine what is currently happening. The hospital practice of routinely starting babies on formula feeds during the first few hours after delivery discourages babies from suckling vigorously at the breast. If free milk supplies are accepted by hospitals, they are more likely to be used in this fashion. Making it costly, inconvenient, and difficult for both hospitals and mothers to give formula to newborns gives an important message to everyone, including health professionals: bottlefeeding is dangerous, and should be avoided!

All national diarrhea control programs should carefully and objectively evaluate what is actually happening regarding formula promotion and provision of free formula to health facilities and mothers. We must recognize and take action against the dangerous seductiveness of formula and bottlefeeding. The first article in this month's issue documents again just how dangerous bottlefeeding is.

Kennedy, K.I.; Fortney, J.A.; Bonhomme, M.G.; et al. "DO THE BENEFITS OF BREASTFEEDING OUTWEIGH THE RISK OF POSTNATAL TRANSMISSION OF HIV VIA BREASTMILK?" *Tropical Doctor*, vol. 20, 1990, 25-29.
Order #3375

Summary

The U.S. Centers for Disease Control (CDC) and the British Department of Health and Social Services recommend that mothers with human immunodeficiency virus (HIV) should not breastfeed in order to avoid postnatal transmission of HIV to children not yet infected. The advice of the World Health Organization is aimed at women in developing countries and recommends that breastfeeding continue to be the feeding method of choice where there are no safe alternatives. In this paper, the infant mortality associated with breastfeeding is compared to that of withholding breastfeeding in a hypothetical population of 100,000 uninfected, developing country infants born to HIV-infected mothers.

In their calculations the authors used 4 different probabilities of HIV transmission by breastfeeding: 1, 5, 10, and 20%. Their calculations assumed that 95% of babies with HIV infection would die before age 1, although they recognized that this would overstate the effect of HIV infection on infant mortality, since many infected infants die in their second or third years. They used 4 different risks of death from diseases of infancy for bottlefed babies (based on other studies): 3, 4, 5, and 6 times that of breastfed babies. Finally, they compared 3 overall levels of infant mortality - 5, 10 and 15%, or 5,000, 10,000 and 15,000 deaths per 100,000 uninfected births.

Their calculations indicated that for countries with 10 or 15% infant mortality, bottlefeeding would lead to uniformly higher levels of infant mortality than breastfeeding, even at the highest level of transmission of HIV through breast milk (20%) Even in the calculations for populations with infant mortality of only 5%, bottlefeeding would still be more dangerous than breastfeeding except for the situation of a 20% HIV transmission rate.

The authors concluded that HIV-infected mothers in developing countries should be encouraged to breastfeed as usual, as the dangers of diarrhea, ARI, and other problems associated with bottlefeeding are greater than the danger of HIV transmission through breast milk.

Editorial Comment

This report presents estimates obtained from a model rather than from data collected in the field. It incorporates the reality that bottlefeeding is very dangerous to babies, both because of the potential for contamination of artificial formula, and because of its failure to provide the antibodies present in human milk. The authors wisely ran the model for situations of varying general danger to the child, as exemplified by the three IMR (Infant Mortality Rate) levels. This enabled them to see that as the general risk of death falls, the relative danger to a newborn of HIV infection transmitted through breast milk will rise. Therefore, it is appropriate to have different recommendations for countries with low infant mortality rates than for countries with high infant mortality rates.

The authors note appropriately that information regarding the mother's or newborn's HIV status will not be available in countries (or portions of the population) with IMRs of 10 or 15% where resources to test mothers and babies are lacking. Thus, most recommendations about whether or not to breastfeed will have to be made without knowing whether the mother or the newborn is seropositive. The majority of seropositive mothers with uninfected babies live in about 10 African nations, they note, precisely those where the advice not to breastfeed would be the most damaging. In such countries, this study says, it would be wise to follow the CDC recommendations only if one could ensure that the mother has enough money to buy adequate amounts of formula, is able to clean bottles in uncontaminated water, and can provide the formula with a minimum of contamination from bacteria and other disease-causing agents. I think this is wise advice. As most of the population in these countries cannot meet these criteria, the general recommendation there is to encourage breastfeeding.

This report is not able to tell us whether the benefits of breastfeeding would be the same for breast milk from a HIV-infected mother as it is from HIV-negative mothers. Perhaps the protection provided by antibodies to *E.coli* or viruses would be lower in breast milk from an HIV-infected mother, and thus the benefits of breastfeeding less. We need more research to clarify such issues. In the meantime this report suggests that we should continue to recommend breastfeeding even when there is a potential for transmission of HIV, except where the dangers of bottlefeeding are very low.

An important final point: CDC, the British agency, and other developed country agencies making pronouncements such as these, should be aware of their wider influence and should make recommendations which include clarification of their applicability to developing countries, and to the similar populations within their own borders. Not to do so, as was the case here, is irresponsible.

Haffejee, I.E. "COW'S MILK-BASED FORMULA, HUMAN MILK, AND SOYA FEEDS IN ACUTE INFANTILE DIARRHEA: A THERAPEUTIC TRIAL." ***Journal of Pediatric Gastroenterology and Nutrition*****, vol. 10, 1990, 193-98.**
Order #3478

Summary

This article reports on a therapeutic trial conducted with 316 hospitalized diarrhea patients of ages ranging from 3 days to 28 months. Patients who were previously breastfed with or without supplement continued on this diet, while those who were previously bottlefed were randomly given cow's milk formula or soya formula. The composition of the "supplement" and information on the provision of solid food is not provided by the authors. All children received ORS.

There was no significant difference in the duration of diarrhea in any of the 4 groups. When rotavirus patients were analyzed separately, however, patients given milk formula had a significantly longer duration of diarrhea than those fed breast milk exclusively (106.3 ± 70.6 and 65.1 ± 38.5 hours respectively), while those

receiving soya formula or breast milk plus supplement had diarrhea of an intermediate duration. These differences were not statistically significant.

Editorial Comment

In this study the soya formula conferred no clear advantage, either in the overall group of patients or in the rotavirus patients. This hospital routinely uses full-strength, milk-based formula for children who were already on formula prior to diarrhea. The authors interpret these results as indicating that they should continue patients on that regimen initially, switching to soya formula only when there has been no reduction of stooling after 3-4 days and if reducing sugars are found in the stools. That seems a sensible recommendation in most settings for acute episodes.

The authors exclude 2 patients who died (1 formula patient, 1 soya) and 5 cases of diarrhea continuing more than 14 days (3 formula, 1 soya, 1 breast) from the analysis. It is unfortunate that we are not given more information about these exclusions, as there is much concern about infrequent but severe reactions to lactose occurring in children with diarrhea. We can't tell from the information if any of the excluded children had severe lactose intolerance. Nonetheless, the data are encouraging. In many developing countries, soya formula is either extremely expensive or unavailable. It is reassuring to know that continuation of full-strength, milk-based formula (often the only alternative in non-breastfed children) has no adverse effects in the majority of children.

El-Rafie, M.; Hassouna, W.A.; Hirschhorn, N.; et al. "EFFECT OF DIARRHOEAL DISEASE CONTROL ON INFANT AND CHILDHOOD MORTALITY IN EGYPT: REPORT FROM THE NATIONAL CONTROL OF DIARRHEAL DISEASES PROJECT." *The Lancet*, vol. 335, February 10, 1990, 334-38.
Order #3462

Summary

This paper assesses the impact of the National Control of Diarrheal Diseases Project (NCDDP) on infant and overall childhood mortality in Egypt from the Project's inception in 1983 through the end of 1987. Information was gathered through a variety of approaches: Ministry of Health service statistics, civil registration of deaths, household and Knowledge-Attitudes-Practices surveys, and local-area studies.

Results indicate that between 1982 and 1987, overall infant mortality decreased by 36% and childhood mortality by 43%. Decline in diarrheal mortality accounted for 82% and 62% of this decrease respectively. Factors other than the NCDDP that could have contributed to such a dramatic decrease in mortality, such as a change in diarrheal incidence or in nutritional status among the general population, were not noted. These positive changes correlate closely with improved care of diarrheal cases by both the medical system and by mothers at home brought about by the NCDDP. ORS is now widely available and readily accessible. ORT is regularly prescribed in over half of diarrheal episodes and is used correctly by mothers. Mothers continue feeding their children during diarrheal episodes and are more likely to take their severely dehydrated children to a clinic.

The authors conclude that the NCDDP's success was possible in Egypt because of moderate levels of malnutrition and immunizable disease mortality, a well-structured health system, and good access to the media. Absence of these factors could hamper success in similar programs in other countries.

Editorial Comment

We've been discussing these findings for some time on the basis of preliminary communications. Now we finally have the formal publication. No doubt there will continue to be those who doubt the ability of the methods used to *prove* that the NCDDP caused the reduction in mortality reported, just as there continue to be those who argue that proof that cigarette smoking causes lung cancer and increased cardiovascular mortality is lacking. I recognize the validity of such arguments, but from a pragmatic, program-oriented perspective I am sufficiently convinced by the evidence, gathered in a variety of ways, to conclude that NCDDP and other CDD programs can have an objective impact on mortality, and thus are worthwhile investments of our resources.

One of the factors not mentioned in the above summary was the relative independence of the NCDDP from the bureaucratic constraints that hinder many diarrhea control programs. This allowed quick responses to problems, the essence of good management, which may have been critical to the effectiveness and thereby

the impact of the program. With many of the original team members gone, with changing relationships between NCDDP and the other components of the MOH, with substantial reductions in funding of the program, in short, with the program coming to more closely resemble CDD programs in other countries, many are asking if NCDDP will be able to maintain the quality of care in health facilities, the level of early ORS use by mothers, and the continued recommendation of ORS use by medical practitioners and pharmacists. Will diarrhea mortality rebound to higher levels? I hope that there will be sufficient resources available to the program to support continued monitoring of its effects. The remarkable success of the Egyptian program makes adequate longer-term follow-up even more important.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº5 1990

Bhutta, T.I.; Tahir, K.I. "LOPERAMIDE POISONING IN CHILDREN." ***The Lancet*****, vol. 335, no. 8685, February 10, 1990, 363. (Letter)**
Order #3467

Summary

During November and December 1989, a Pakistani pediatric unit saw 18 infants (1.6-2.6 months) and 1 child (2 years) suffering from severe abdominal distension and paralytic ileus associated with the administration of loperamide ("Imodium") drops (2 mg/ml). Of these, 6 died, 4 left the ward to die at home, and 9 recovered. The dose of loperamide given had varied from 2 to 15 drops after each stool and from 6 to 30 drops per day.

The authors argue that although the packaging warns that the drug should not be used in children less than 1 year, the warning is useless in a country where drugs are freely available over the counter, where unqualified practitioners (quacks and Hakim) use drugs without knowing the side-effects, and where 99% of patients are illiterate. They ask that Johnson and Johnson withdraw Imodium from Pakistan.

Gussin, R.Z. "WITHDRAWAL OF LOPERAMIDE DROPS." ***The Lancet*****, vol. 335, no. 8705, June 30, 1990, 1603-4. (Letter)**
Order #3844

Summary

A corporate vice president of Johnson & Johnson describes the company's difficulties in withdrawing loperamide drops from the Pakistani market, a step which they had taken voluntarily in response to Professor Bhutta's reports of fatalities resulting from misuse. They have used letters, personal visits and incentives to chemists and distributors, newspaper advertising appeals, Government notices, and warnings against further illegal dispensing. They have withdrawn the drops from other developing countries, and have halted sale of the drops worldwide.

In addition, the company has withdrawn Imodium syrup (0.2 mg/ml) in developing countries, despite their conviction that the syrup is a valuable formulation for treating acute diarrhea. They will continue to distribute the syrup, as well as capsules and tablets, in countries where control of distribution and proper use exist.

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Editorial Comment

Although Dr. Bhutta's data alone do not prove that the 10 deaths were caused by use of loperamide, the weight of evidence supports withdrawal of loperamide drops and liquid from the market. This sequence of letters documents the importance of suspecting and reporting adverse drug reactions, whether they result from problems with the drug itself, or problems with misuse of the drug. Johnson & Johnson's response to reports of misuse of their drug in the community is to be commended. Having clear evidence of the safety as well as the efficacy of loperamide when used properly (the abdominal distension described by Professor Bhutta is not a significant problem in older children and adults), the company could have taken the position that misuse of the drop and syrup formulations was the responsibility of the drug control agencies in the involved countries, not Johnson & Johnson's. They did not, and in Pakistan have taken an admirably active role in withdrawing the drop formulation and attempting to bring about immediate cessation of misuse in infants. To be even more sure, they went the next step, and have withdrawn the syrup formulation as well in all countries "where WHO has a diarrhea control program."

Wellcome recently took similar action in Kenya and 4 other countries, withdrawing its product "ADM" (antidiarrheal mixture) from the market after a television documentary in the UK cited widespread inappropriate use. In a world where economic profit seems all too often to have become the highest goal no matter what the cost in human suffering, these ethical actions deserve our commendation. Pharmaceutical manufacturers and distributors of the world, take note, and do likewise!

Nahar, S.; Uppal, R.; Mehta, S.; et al. "PRESCRIBING FOR DIARRHEAL DISEASES." ***Indian Pediatrics*****, vol. 25, August 1988, 754-56.**
Order #3291

Summary

Drug prescriptions in 105 diarrhea cases from the Pediatric Gastroenterology Clinic and in 54 diarrhea cases from the Pediatric Gastroenterology Ward in Chandirgarh, India were studied to assess prescribing habits. Researchers obtained information from medical records in the clinic cases and from follow-up throughout each patient's entire stay in the hospital ward. Etiologic studies suggested that bacterial diarrhea was comparatively more prevalent in the hospital, while non-specific diarrheas predominated in the clinic.

Seventy-eight per cent of all cases were treated with "drugs", while 21% and 22% of cases seen in the clinic and hospital respectively were given non-drug treatment such as ORS, dietary advice, and vitamins. The average number of drugs used per case was 4.4 in the hospital and 2.3 in the clinic. Trade name (rather than generic) drugs were more often prescribed in the clinic than in the hospital. The authors deemed drug choice "appropriate" in 98% of both clinic and hospital cases. However, they deemed drug dosing inappropriate in 13% of clinic and 1% of hospital cases. Dosing interval was inappropriate in 10% and 3%, and duration of administration was incorrect in 17% and 12% of clinic and hospital cases respectively.

Editorial Comment

This report is a clear example of the misinformation, misunderstanding, and misuse of drugs against which CDD programs must wage battle. No details are presented regarding the criteria used to make judgments of appropriate or inappropriate treatment, so that our criticisms in turn are based on inadequate

Technical Literature Update

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Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent USAID policies or opinions.

Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

information. Nevertheless, the remarkably low use of oral rehydration (only 21-22% in a postgraduate teaching hospital!) is distressing. The article does not specify which drugs are being used and amazingly does not even differentiate between antibiotics and other drugs. It is abundantly evident from this that the authors are completely unaware that WHO recommends no antibiotic treatment except for a few specific types of diarrhea, and no antidiarrheal treatment for any diarrheal episodes in children. Yet in their judgment, the use of an average of 4 or more drugs per case for inpatients, and 2 or more drugs for outpatients, was "appropriate." Note that an average of 4 drugs means that many patients must have received 6, 7, or 8 drugs!

The saddest point, and the one that shows how huge a task lies ahead of us, is the authors' comment on their data: "This study shows a remarkable restraint on polypharmacy in the ward and clinic as well as very judicious use of drugs. The prescriptions for treatment of pediatric diarrhea are highly scientific and drug use has been restricted." Clearly these authors are quite unaware of up-to-date research results and treatment guidelines for diarrhea. Yet they are faculty members at a Postgraduate Medical Education and Research Institute, passing on this pattern of drug misuse and this misinformation to waves of specialist pediatric trainees! Unfortunately, this is true in many countries, including the United States. Is it any wonder that drug misuse by practitioners is so high?

Haak, H.; Hardon, A.P. "INDIGENISED PHARMACEUTICALS IN DEVELOPING COUNTRIES: WIDELY USED, WIDELY NEGLECTED." ***The Lancet*****, no. 8611, September 10, 1988, 620-21.**
Order #3843

Summary

The authors refer to research on self-medication practices in Brazil and the Philippines. In both countries, Western pharmaceuticals are increasingly "indigenised," which means they are used as readily as local products to treat a wide range of medical problems. Antidiarrheals, penicillin tablets, and tetracycline capsules, all containing antibiotics, are used in various ways. Crushed antibiotic tablets and powder removed from the capsules are often applied directly to wounds or skin lesions in addition to being taken internally for conditions thought to arise "from within." Tetracycline is combined with herbal medicines and, in Brazil, has even given its name to an herbal preparation used in a similar fashion. Local cultural concepts are used to explain the mechanism of action of these agents, and they are sold in small local shops, such as sari sari stores in the Philippines, along with other common items.

Editorial comment

Clearly it is not only practitioners who may misuse drugs. In many developing country locations, drugs and antibiotics are supposed to be available only by prescription but are in fact easily available in neighborhood shops. This article points out that over time, such drugs become widely known and are used as readily as remedies of truly local cultural origin, often for inappropriate purposes. The next 2 articles point out the disastrous result of this process.

Lamikanra, A.; Ako-Nai, A.K.; Ola, O.; "INCIDENCE OF MULTIPLE ANTIBIOTIC RESISTANCES IN ORGANISMS ISOLATED FROM CASES OF INFANTILE DIARRHOEA IN A NIGERIAN ORAL REHYDRATION THERAPY CLINIC." ***Annals of Tropical Paediatrics*****, vol. 9, 1989, 256-60.**
Order #3241

Summary

Bacterial isolates were obtained from 247 diarrhea outpatients, 0-60 months of age, at a pediatric hospital in Ibadan, Nigeria. Fifty age-matched children attending the hospital's well-baby clinic for routine examinations or immunizations were used as healthy controls. Bacterial isolates from cases and controls were tested for sensitivity to 11 antibiotics using the disc diffusion method.

Editorial Comment

This article carefully documents the antibiotic sensitivities of bacterial isolates from a large number of stool specimens. The authors conclude that "there is a high incidence of multiply-antibiotic-resistant isolates within the sample environment." However, they fail to ask the critical question: "Compared to what?"

Antibiotic resistance occurs in all populations—even in populations that have never been exposed to antibiotics. Without comparing the rates of antibiotic resistance with those in other populations, there is no basis for stating that the Nigerian rates are high. The

next article provides an example of how this methodologic problem can be addressed.

Lester, S.C.; del Pilar, M.; Wang, F.; et al. "THE CARRIAGE OF *ESCHERICHIA COLI* RESISTANT TO ANTIMICROBIAL AGENTS BY HEALTHY CHILDREN IN BOSTON, IN CARACAS, VENEZUELA, AND IN QIN PU, CHINA." *The New England Journal of Medicine*, vol. 323, no. 5, August 2, 1990, 285 -89.
Order # 3845

Summary

"*Background and Methods.* The healthy members of a community represent its largest reservoir of bacteria resistant to antimicrobial agents. We compared the resistance to eight agents of *Escherichia coli* in stool samples from untreated, healthy children in cities on three continents.

"*Results.* When screened by a selective method that detected 1 resistant colony in 10,000 colonies, nearly half the children in Boston (18 of 39) had no resistant colonies—a finding consistent with the findings of other surveys performed in developed countries. However, all but 1 of 41 children screened in Caracas, Venezuela, and all but 2 of 53 in Qin Pu, China, carried resistant strains. Only 1 child in Boston but 25 in Caracas and 34 in Qin Pu carried strains resistant to trimethoprim. None of the children in Boston or Caracas but 17 in Qin Pu carried strains resistant to gentamicin.

"Among 10 colonies selected randomly from each stool sample, the average frequency of resistance in Caracas was 3.6 times greater than in Boston, and that in Qin Pu was 5.3 times greater. There was resistance to five or more antimicrobial agents in 20 percent of the Qin Pu strains and in 6 percent of the Caracas strains but in none of the Boston strains.

"*Conclusions.* In addition to clinical isolates, as reported previously, the bacteria that colonize healthy children in the community may be resistant far more often in some regions than in others. A low rate of carriage of antimicrobial resistance in the community should become a public health goal." [Published Abstract]

Editorial comment

This study clearly demonstrates that the antibiotic sensitivities of fecal flora vary significantly from population to population. Unfortunately, the authors do not directly address the relationship between rates of antimicrobial use and the emergence of antibiotic resistance. They correctly state that there are probably multiple causes for the variation in rates of resistance, including crowded living conditions, suboptimal sanitary practices, and extensive use of antimicrobials in the community. Although they recommend that "a low rate of carriage of antimicrobial resistance in the community should become a public health goal," they don't specify how this goal might be achieved!

I am convinced that one of the crucial factors in achieving this goal is the development and implementation of policies to support the rational use of antibiotics. Frequent, indiscriminate use of these drugs favors the emergence of resistant strains within a population. Transmission of resistant strains from one person to another may be accentuated in environments where fecal contamination of water or food is common. Recall the epidemics of multiply-resistant bacillary dysentery and typhoid fever in Central America, where we had no effective antibiotics to use in treatment. We seem to be moving in that direction with regard to other illnesses as well.

These papers indicate the immensity of the communication job ahead of us—teaching practitioners about the potential side-effects and the risks of inappropriate and indiscriminate drug use. Perhaps only a disaster—an epidemic in which many people die because no effective antibiotics are available—will succeed in focusing enough attention on the problem to be convincing. For years, CDD programs have been content with the objective of adding ORT to current treatment and have not actively campaigned against antibiotic and antidiarrheal misuse. It is time for a new strategy: active campaigns against inappropriate drug use, directed towards both practitioners and the public.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

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Washington, DC International Development

Okhuysen, P.C.; DuPont, H.L.; Flores Lopez, J.F.; et al. "A COMPARATIVE STUDY OF FURAZOLIDONE AND PLACEBO IN ADDITION TO ORAL REHYDRATION IN THE TREATMENT OF ACUTE INFANTILE DIARRHEA."*Scandinavian Journal of Gastroenterology*, vol. 24, suppl. 169, 1989, 39-46. *Order #3238*

Summary

"Between July and October 1987 an outpatient study of 191 children with acute diarrhea was undertaken in two rural communities in Mexico. Through a double-blind randomization we compared the efficacy of a combination therapy of furazolidone, 7.5 mg/kg/day, plus standard oral rehydration therapy (ORT) (96 patients) versus a placebo plus ORT (95 patients), each given for 5 days. Diarrheal stool samples were collected from all patients before therapy. By means of a two-vial transport media system the samples were sent to a university laboratory and examined for viral, bacterial, and parasitic organisms. The most commonly isolated organisms were enterotoxigenic *Escherichia coli* (13%) and *Giardia lamblia* (13%). Patients who received furazolidone plus ORT showed a greater reduction in duration of diarrhea when compared with those receiving placebo plus ORT (63.4 h versus 71.44 h). There was also a trend toward shorter duration of diarrhea in patients with *Giardia* who were treated with furazolidone/ORT compared with *Giardia* patients in the placebo/ORT group. When fecal leukocytes were present in the stool, the furazolidone/ORT-treated patients had a significantly higher percentage of clinical cures (79% versus 54%, p=0.03) and an overall shorter duration of diarrhea (62.0 h versus 80.6 h, p=0.055) at the end of 5 days of therapy than did the placebo/ORT-treated group." [Published Abstract]

Editorial Comment

At first glance, this paper seems to provide evidence supporting the routine use of antibiotics in the management of acute watery diarrhea. Should these results convince us to change policy, and recommend giving furazolidone to all patients with uncomplicated diarrhea?[1] I don't think so. The investigators did not describe the feeding given the children in the two groups, we do not know how many were on breast milk or lactose-containing formula, or even what advice regarding feeding was given. Knowing how important different diets are to duration of diarrhea, I find it hard to accept any study of diarrhea treatment efficacy which ignores this area completely.

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Secondly, the decreased duration of diarrhea in the furazolidone treated group is not statistically significant. More important, the decreased duration is not *clinically* significant either—63 and 71 hours are both about three days. I would guess that the placebo group had one more loose stool than the furazolidone group. Is this almost imperceptible benefit of giving the antibiotic sufficient to justify its dangers: the inescapable rise in resistant organisms, increased costs, and drug side-effects? I say no.

We can be sure that the mother, just like the investigators, will pay a lot more attention to the drug than she will to feeding her sick child. If the practitioner were to give extra attention to the diet and fluid treatment the child should be receiving rather than to the drug, it is quite likely that the duration could be shortened a similar or greater amount. In this way, the adverse nutritional impact of the diarrhea on the child would be reduced as well. Thus in my opinion there would have to be a much more dramatic reduction in duration to justify using furazolidone routinely.

The authors apparently seek to seduce us with the *Giardia* data. But the number of patients with *Giardia* is small (only 23 total). Most (16) have only cysts, not the active trophozoites, and the difference in duration, though large (39 vs. 66 hours) is not significant, that is, it can be attributed to chance variation.

It is important to note that only 4 of the 173 patients cultured were infected with rotavirus. Most populations have much higher rates of rotavirus infection, which would not be susceptible to furazolidone. Therefore, routine treatment of all cases with furazolidone would be even less effective.

The differences these investigators observed with furazolidone treatment of the patients with fecal leukocytes are significant. However, it is not at all likely (and certainly not something that I would recommend) that practitioners will assess all patients with diarrhea for fecal leukocytes before treatment. Such a recommendation would be impractical in most settings and impossible in many settings in which there is simply neither the equipment nor the personnel for such examinations.

So from a practical point of view, this special subgroup—patients with leukocytes in the stool—just doesn't exist. We must consider all the patients together, since exams for fecal leukocytes will never be done routinely on a large scale. For the overall group, the data just do not justify routine use of furazolidone.

[1]The study excluded patients who had diarrhea for more than 72 hours, severe dehydration, or (apparently) chronic or recurrent diarrhea.

Steffen, R. "WORLDWIDE EFFICACY OF BISMUTH SUBSALICYLATE IN THE TREATMENT OF TRAVELERS' DIARRHEA." *Reviews of Infectious Diseases*, vol. 12, suppl. 1, January - February 1990, S80-S86. *Order #3426*

Summary

"So far four randomized studies, three of them double-blind and placebo-controlled, have investigated the role of bismuth subsalicylate (BSS) in the treatment of travelers' diarrhea. When compared with placebo BSS significantly reduced the number of unformed stools and increased the proportion of patients free of symptoms at the end of the trial. In the two studies that compared BSS with loperamide, the latter agent brought significantly faster relief. Diarrhea accompanied by dysenteric symptoms was influenced most favorably by administration of systemic antimicrobial agents. In all four studies only minor adverse effects were noted with

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BSS or the other active agents. One may include loperamide and a systemic antimicrobial agent in one's travel kit; however, loperamide should not be used for dysentery, and the antimicrobial agent should not be used in uncomplicated cases. As an alternative, although it is less effective, BSS has the unique advantage of being safe enough to use for all patients with travelers' diarrhea." [Published Abstract]

Graham, D.Y.; Evans, D.G. "PREVENTION OF DIARRHEA CAUSED BY ENTEROTOXIGENIC *ESCHERICHIA COLI*: LESSONS LEARNED WITH VOLUNTEERS." *Reviews of Infectious Diseases*, vol. 12, suppl. 1, January - February 1990, S68-S72.
Order #3424

Summary

The effectiveness of bismuth subsalicylate (BSS) in the prevention and treatment of enterotoxigenic *E. coli* (ETEC)-induced diarrhea was studied in a 2-phase trial with healthy male and female volunteers. All patients were challenged with a standard size inoculum of ETEC. In the prophylactic stage, patients were randomized to receive either BSS or a placebo. BSS patients received 600 mg of BSS 8 and 2 hours before, and 2 and 4 hours after the *E. coli* challenge. The same dosage was continued 4 times daily for up to 3 additional days. In the second phase, patients who developed diarrhea were again randomized to receive either BSS or placebo. Beginning 1 hour after onset of illness, patients received 300 mg of BSS or placebo every 30 minutes, for a total of 8 doses. Diarrhea developed in 9 (56%) of the 16 patients receiving placebo and in 2 (13%) of the 15 patients receiving BSS ($P<0.03$). The latter patients experienced markedly milder illness.

Results confirmed the effectiveness of BSS in preventing ETEC-induced diarrhea, but failed to confirm any therapeutic benefit of BSS once diarrhea develops. *In vitro* experiments demonstrated that BSS and its active compounds were antibacterial in concentrations ranging from 12.5 to 50 mg/ml. The authors discuss the influence of dosage form (liquid or solid) and timing of drug administration on the effectiveness of BSS as a prophylactic remedy for travelers' diarrhea.

Editorial Comment

The efficacy of BSS in travelers' diarrhea is increasingly well-documented, although the appropriate conclusions regarding its usefulness remain hazy. The problems associated with use of BSS in travelers are documented by the fourth study reviewed in the Steffen paper: 19% of possible recruits dropped out, 18% of those with diarrhea did not take the medication given them, and 10% of the remainder took it ineffectively and were excluded from analysis. A medication like BSS requiring dosage every 30 minutes at onset even in the middle of the night, 4 or more doses daily for prophylaxis, and taking up a lot of room in the suitcase, may just not be practical enough to win many proponents. Loperamide is clearly more rapidly effective than BSS, with observable impact within 4 hours in many. BSS is safer, in that it can be used in dysentery, while loperamide should not be.

Keep in mind that travelers' diarrhea refers to diarrhea in adults travelling to foreign countries where they are exposed to different organisms than those they are exposed to at home. Conclusions drawn from these studies should *not* be applied to the more important problem of pediatric diarrhea in which exposure to pathogens is long-term. In the latter situation, vastly different medical and social considerations affect treatment recommendations. (See the next article.)

Soriano-Brücher, H.E.; Avendaño, P.; O'Ryan, M.; et al. "USE OF BISMUTH SUBSALICYLATE IN ACUTE DIARRHEA IN CHILDREN." *Reviews of Infectious Diseases*, vol. 12, suppl. 1, January - February 1990, S51-S56.
Order #3423

Summary

A total of 123 hospitalized children, 4-36 months of age, with acute diarrhea of < 72 hours' duration were admitted to a randomized, double-blind clinical trial. Of these, 58 received bismuth subsalicylate (BSS) at a dosage of 100 mg/kg per day divided into 5 doses for 5 days, while 65 received a placebo. All children were rehydrated and were fed orally according to hospital recommendations. The treatment groups were comparable with respect to age, sex, weight, and baseline disease parameters.

Compared with the placebo group, the BSS group had significantly lower stool weight sooner; improved stool consistency sooner; shorter hospital stay; lower number of stools; decreased need for intravenous fluids; and better evolution of clinical condition. The

authors conclude that BSS has a profound beneficial effect on children with acute diarrhea who need hospitalization. They call for studies on ambulatory patients to determine efficacy in less severe diarrhea cases. They also suggest that analysis of the response of different pathogenic agents to BSS *in vivo* would help identify patients for whom BSS is most useful.

Editorial Comment

The data here are quite provocative. I would be more convinced, however, if the authors had told me that they used ORT and gave a full diet as soon as rehydration was completed. Instead they report that "all moderately dehydrated children were given intravenous fluids," suggesting that they were not using oral rehydration for patients who should have been treated with oral fluids. In addition, they report that the patients "were fed orally according to clinical evolution and tolerance," which suggests that they probably gave little or no food early in treatment.

These deficiencies make it impossible for me to accept these data as proving the usefulness of BSS in children. Perhaps if the patients had been given oral fluids and frequent full feeds there would have been little difference between the placebo and BSS groups.

In short, I'm intrigued, but not convinced. I await a study where standard case management policies are followed, with BSS added.

PRITECH announces two new papers available for distribution:

"TRADITIONAL HEALERS AND DIARRHOEA: RESULTS OF A RECENT SURVEY IN ZAMBIA" by Paul Freund (24p.) reviews a KAP study of 192 Zambian traditional healers in terms of their general knowledge of correct diarrhea treatment practices, advice given to mothers, and knowledge of and willingness to prescribe ORS/SSS.
(PRITECH Order #3065)

"DIARRHEAL DISEASE CONTROL: WHERE HAVE WE BEEN AND WHERE WE ARE GOING" by Martita Marx (12p.) examines the evolution, present status, and future of CDD activities within the context of the broader health care picture.
(PRITECH Order #3304)

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Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. V, Nº7 1990

Viswanathan, H.; Rohde, J.E. "DIARRHOEA IN RURAL INDIA: A NATIONWIDE STUDY OF MOTHERS AND PRACTITIONERS (ALL INDIA SUMMARY)." New Delhi, Vision Books, 1990, 192p.
(This publication is not available from PRITECH. To order, please contact: UNICEF/India, UNICEF House/Department of Publications, 73 Lodi Estate, New Delhi 110003, INDIA).

Summary

This summary volume of a 5-volume publication presents the results of a nationwide study undertaken on behalf of the Indian Ministry of Health and Family Welfare by the Indian Market Research Bureau, and the implications of the results for the National Plan on Diarrhea Management. The other 4 volumes present detailed data from the East, West, South and North zones of the country.

The survey was carried out in 2 phases. The first was a qualitative study in which open-ended focus group and individual interviews were conducted with mothers of children less than 5 years of age to document the range and diversity of knowledge, practices, and attitudes related to diarrhea in their children. Rural practitioners and chemists were also interviewed.

Based on the results of these qualitative studies, a quantitative survey was developed and administered in almost 10,000 households with children under 5 who had experienced diarrhea in the last 2 months. Two further field surveys were also carried out: a rural "doctor" study of 266 rural practitioners consulted by the mothers for diarrhea, and a "salt-to-taste" test of 400 rural mothers to test the possibility of taste as a determinant of the appropriate amount of salt in a home-made SSS solution. All of the various survey instruments and questionnaires used are included as appendices to the summary volume.

It was found that most mothers recognize the potential danger of diarrhea, although they often postpone seeking or giving treatment until too late in the illness, or until severe symptoms have already developed. Virtually all mothers continue to give fluids during illness, particularly responding to thirst; and continue breastfeeding, although many fail to recognize irritability as a sign of thirst. The majority continue feeding but change the diet.

In 65% of cases, mothers consult a health practitioner outside the home. Of these, more than 80% go to private practitioners while only 10% go to government health facilities. The private rural practitioners are generally called "doctors" but 62%

have no formal medical qualifications and only 8 of the 266 interviewed held medical degrees (M.B.B.S. in India). Allopathy is either the sole or main type of medicine practiced by 65% of private rural practitioners. Only the most severe cases are sent by these practitioners to government health centers for treatment.

Diarrhea is a major component of the rural practitioner's business: of the previous 10 cases, an average of 4.6 were diarrhea cases. These rural "doctors" treat diarrhea mainly with medicines and injections. All are aware of ORS in one form or another, but few prescribe it routinely. Government health workers prescribe ORS in 13% of cases, private practitioners in only 7%. The major influence on the prescribing practices of these practitioners is their regular interaction with the chemist from whom they purchase medications.

Mothers are generally willing to pay for medical care for their child's diarrhea, spending $2.60 on the average for an episode. This is more than 20% of total monthly per capita expenditures for all of India. They suspect free service and free medicine (such as free ORS) of being of low quality and weak. Mothers consult practitioners with the expectation of receiving a product, such as a medicine. In fact, the payment of the practitioner is considered to be for the drug, not for the consultation. Providing only advice on how to prepare a home-made solution (such as sugar-salt solution) is considered by both mothers and practitioners as not acceptable in this context. However, mothers who had tried ORS in packet form viewed it as effective, both in overcoming weakness and lethargy, and in stopping diarrhea.

The report concludes, in response to these results, that major strategic emphasis of the CDD program will be shifted to promoting ORS packets as the most important and first medical response to diarrhea ("Modern doctors start with ORS"), along with reinforcing the early use of home fluids and foods. Sugar-salt solution should be de-emphasized, because it is not very feasible within the context of the mother-private practitioner relationship. Recognizing the overwhelming importance of the private practitioner in diarrhea management, national efforts should shift towards activities aimed at reaching non-government rural practitioners and chemists through mass media and marketing techniques.

Editorial Comment

This brief summary hardly touches the wealth of information from this remarkable study. The most dramatic findings to me are the very high proportion of mothers who seek medical care for their child's diarrhea, much higher than I would have thought in a rural environment; the large amount of money mothers are willing to pay for diarrhea treatment; and the predominance of the private practitioner as the preferred care provider. Mothers prefer the private practitioner not only because of convenience and personalized service, but also because they have faith in the effectiveness of his medicines. They are not sure that the worker in the government health facility will be present nor do they trust the power of the free government medications or ORS.

We have stressed in previous commentaries the importance of the private sector. While some countries may not have similar utilization patterns, due perhaps, to a lack of private practitioners or to a greater trust in government health services, it is more likely that utilization patterns in other countries are similar to the ones found here. CDD programs which aim primarily at government health workers may do so because of lack of true field data on what mothers actually do, or because they prefer to ignore such data. This study shows clearly the

Technical Literature Update

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Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent USAID policies or opinions.

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results of such strategies: little impact on the treatment of diarrhea either by mothers or health workers.

Ministries of health often seem uncomfortable working with drug companies, chemists, or practitioners who have to sell their services or products for profit in order to stay in business. I have had the impression in many conversations with government officials that companies or practitioners who make a profit (i.e. their salaries) from helping sick people are somehow immoral, and that only free medical care is "good." This study gives telling evidence of the symbiotic partnership between the rural mother and her local practitioner, one seeking a service, the other providing it. The chemist and drug manufacturers support that partnership. All parties to the partnership want resolution of the diarrhea. If we wish "our remedies" - rehydrating fluids and continued feeding - to influence the course of diarrhea in the majority of children, we must influence all those parties, not just the government health workers who see only a tiny fraction of the cases.

Were you surprised that mothers did not believe in free medicine? How many of us have paid a premium price for a radio or suit of clothes because we believed that the higher price was an indicator of higher quality, not because we could objectively demonstrate that higher quality? While we must make provision for families who truly cannot afford to pay, we must take into account in planning CDD programs that mothers "prefer" - i.e. put greater trust in - treatment for which they have paid. Such marketing "tricks" as using two types of packaging and charging more for the fancier type (market segmentation) respond to this human characteristic, and lead to greater satisfaction.

If we are providing a high quality product, such as ORS, which is effective in both packages, is it wrong to seek to satisfy the mother, and to help the practitioner satisfy her? In my opinion, it is not: in fact, it is necessary if we wish to influence the behavior of the mothers and practitioners. Where the system we seek to influence is in the open marketplace, we must begin to think like marketers as well as medical professionals if we wish to have an impact. Given the strength of the existing distribution system, we need to work through it until the network of ORS suppliers becomes a source of information and influence on prescribing practices as well as the source of the product.

The information from the study provides a solid basis for the design of messages aimed at mothers as well. Future communications should focus on recognizing the signs of thirst in young children (irritability, crying), the need to give more fluids, which fluids to use based on local practices, and the important role of feeding.

Touchette, P.E.; Elder, J.; Nagiel, M. "HOW MUCH ORAL REHYDRATION SOLUTION IS ACTUALLY ADMINISTERED DURING HOME-BASED THERAPY?"
***Journal of Tropical Medicine and Hygiene*, vol. 93, 1990, 28-34.**
Order #2196

Summary

The focus of this field study is a methodology capable of directly measuring the quantity of oral rehydration solution administered by mothers at home. Observations began in a primary care clinic in northern Mexico. Clinic staff obtained intake data on all mildly dehydrated children presenting over a 10-week period. Permission was obtained from mothers for a follow-up staff visit to their homes. Clinic personnel instructed each mother in ORS-mixing and supervised her as she prepared the initial dose in a clean 1-litre container of local origin, which she was given to take home. Administration instructions were to give "a cupful of ORS for each loose stool."

About 24 hours after the clinic assessment, an observer visited the home to measure the amount of ORS remaining in the container and to obtain information such as other fluids and foods given, palatability of ORS to the child, changes in stooling, and presence of vomiting. The interviewer then gave the mother additional ORS packets and supervised her as she mixed a fresh batch.

In most of the 44 cases measured, the amount of ORS consumed was far below what was available. Only 2 of the children received close to the WHO-recommended dose of 100 ml/kg body weight/day. The mean amount consumed was 44 ml/kg/day; 41% gave less than 30 ml/kg/day. Most (86%) gave other fluids in addition to ORS, although the quantity could not be accurately assessed.

One explanation suggested by the authors for the small amounts given was that mothers did not understand or agree with the instructions and therefore did not follow them. Another possibility was that the recommended "cup of ORS per loose stool" did not

approximate 100 ml/kg/day because of infrequent or unobserved stools. There was no indication that refusal by the child to drink the fluid was an important problem: 80% readily accepted the prepared solution. This study provides quantitative evidence that home-based rehydration programs may frequently not deliver an adequate amount of ORS.

Editorial Comment

This study provides a methodology which produces accurate quantitative information on the actual amount of ORS consumed after the usual type of brief encounter of a mother with a health worker. In fact, the amount of education given and the attention to detail in instructions may have been better than in the usual encounter. Yet mothers gave their children only a small amount of ORS, a mean of about 4% of body weight over 24 hours, scarely enough to rehydrate a mildly dehydrated child with barely observable signs of dehydration, and certainly not enough to replace further losses.

Clearly the method could be quite useful as an approach to assessing the comparative effectiveness of different methods of giving instructions to mothers. The authors suggest that a specific 24-hour consumption target would be better than the current "one cup for one stool" message used. For example, the mother of an 8 kg child would be told that she should give 800 ml or 4 cups of 200 ml over the next 24 hours. The method reported here would provide accurate testing of whether this target approach produces better compliance than the more flexible approach. If the target approach proved more effective in achieving the desired 100 ml/kg/day intake, it would then have to be weighed against the potential that a child could develop more severe purging (more than 100 ml/kg/day) and therefore would not get enough fluid. It seems there is no simple answer in this game.

Chowdhury, A.M.; Vaughan, J.P.; Abed, F.H. "USE AND SAFETY OF HOME-MADE ORAL REHYDRATION SOLUTIONS: AN EPIDEMIOLOGICAL EVALUATION FROM BANGLADESH." ***International Journal of Epidemiology*****, vol. 17, no. 3, 1988, 655-65.**
Order #3240

Summary

Female oral rehydration workers (ORWs) from the Bangladesh Rural Advancement Committee (BRAC) visited over a third of all households in Bangladesh to teach the preparation and use of lobon-gur solution (LGS), an oral rehydration solution made from lobon (common salt) and gur (unrefined sugar), as well as other aspects of diarrhea home case management. In a portion of the country, an ORW team remained in the working area for 6 months carrying out promotional and group health educational activities to reinforce the individual house-to-house teaching. This was known as the Concentrated Reinforcement Program or CRP.

A 2-part evaluation was carried out in 1984 to determine the usage and safety of LGS being prepared at home. The first part was a qualitative study in two typical villages to determine people's perceptions, beliefs, and customs concerning diarrhea and its treatment, including LGS. The second phase was a large-scale household survey designed to look at the usage and safety of LGS.

The village study revealed 4 types of diarrheal illnesses, each with its own name: "dud haga" caused by polluted breastmilk; "ajirno" caused by indigestion or food poisoning; "amasha" with mucous-containing stool but of unknown cause; and "severe diarrhea" or "cholera," which was considered the most dangerous, with dehydration and death as possible outcomes. Based on the village study, separate questions were asked about the 4 types of diarrhea during the household survey.

Survey results showed an annual rate of 1.8 to 3.8 episodes per year (in all age groups). Of these, about half were "ajirno," 30% were "amasha," 12% were "dudhaga," and 5% were "severe diarrhea"/"cholera." The annual number of episodes in children 0-4 ranged from 3.3 to 7.2 episodes per year, constituting approximately 30% of all episodes per year.

From 53% to 62% of all diarrheal episodes in the previous 2 weeks had received some form of treatment. LGS usage rates varied from 4% to 10% for all diarrheal episodes, but were much higher for episodes of "severe diarrhea," ranging from 26% to 52%. LGS was used from 4 to 10 times more often than ORS packets, but was only third in popularity after allopathic (western) drugs and a local herbal remedy. Children 0-4 were given LGS about twice as frequently as adults 45 years of age or older.

In a sample of the households interviewed, mothers were also requested to prepare LGS. Solutions

considered safe and effective (30-99 mmol salt/l) were prepared by 50%-71% of mothers. From 14% to 26% of the prepared solutions were considered dangerous (120+ mmol salt/l). This was high compared to error rates of only 3% up to 6 months after the first phase of the program ended in 1983. Although the cost of the Concentrated Reinforcement Program activities was 10 times that of the standard approach, the rates of use and errors were similar in the standard and CRP areas.

Editorial Comment

Many studies have documented the various names which cultures use for various types of diarrhea. This study took the next and obvious step of using that information in evaluating usage rates for LGS individually for the 4 types of diarrhea, as well as in all age groups. They also applied the BRAC definition of a diarrheal episode of 1 loose stool daily, an admittedly low threshhold.

We might be discouraged at the low overall LGS usage rates (4%-10%). But by noting that the type of diarrhea more likely to result in dehydration ("cholera") received LGS from one quarter to one half of the time, we may be more encouraged. Given the very low threshhold of 1 loose stool daily, perhaps these usage rates are adequate. It would seem, however, that for "severe diarrhea" our true target rate would be nearly 100%, because by definition the mothers already consider this kind of diarrhea to be dangerous. Thus the usage rates still seem far from satisfactory even for this sub-type and we must be concerned that the other types could become serious and dehydrating in a portion of cases.

In short, it would be dangerous for us to assume that the folk typology and names have direct, or even nearly direct, correspondence to our own medical typology and level of concern. Prospective observation of diarrheas of each of the 4 types would clarify the "sensitivity" and "specificity" of the folk diagnoses.

Similar to what was found in India, allopathic drugs were the most popular form of treatment for diarrhea, while LGS was third in popularity (after Boneji, an herbal remedy). This is consistent with the similar cultures in India and Bangladesh and perhaps also with the local perception of the value of the government health services. It surprised me, however, given the intensive personal attention and training given in each household related to LGS preparation and use. No doubt it surprised and discouraged the BRAC program planners as well, leading to their decision to shift away from the single focus of their field workers' activities on ORT/LGS toward a broader and more integrated set of interventions related to child survival in the future.

The accuracy of LGS mixing is impressive in comparison to that in other studies. Program managers, however, faced with dangerous solution rates of 26%, must question whether they might be doing more harm than good. Unfortunately, we really do not know, as those children whose diarrhea and dehydration are minimal will probably handle a solution of over 120 mmol/l sodium with no difficulty, and those with heavy purging, who might have died from dehydration, may very well be saved by the hypertonic "dangerous" solution, even if they have transient hypernatremia. The necessary prospective experiment will never be able to be done, so we must draw conclusions based on theoretical rationales. Clearly, where an alternative approach to promoting "dangerous" solutions is available - e.g. use of ordinary home fluids, especially those containing cereals, or even plain water - it is preferable. This, in fact, is the current WHO-UNICEF policy. One must be sure that the home solutions recommended are indeed not themselves dangerous. Commonly used solutions in certain cultures, such as chicken soup with lots of salt, or heavily sugared tea (which is hyperosmolar with sugar but lacks sodium) may be just as dangerous as the "dangerous" sugar-salt solutions.

BRAC's program is an astounding managerial and supervisory triumph. As a private organization covering most of one of the world's largest countries, BRAC is one of the few examples of very effective teaching outside a pilot project, brought about because of effective educational design and supervision. What we see in this evaluation is that even extremely effective programs must face the realities of people's inability to remember perfectly forever, of mothers responding to *their* perceptions of their child's diarrhea, not the trainer's or the program's perception, and ultimately, of the wide variety of diarrheas and diarrhea cases we must manage. I look forward to continued learning from BRAC's new strategies for improving child survival.

Killewo, J.Z.J.; Smet, J.E.M. "MOTHER'S DEFINITION OF DIARRHOEA IN A SUBURBAN COMMUNITY IN TANZANIA." ***Journal of Diarrhoeal Disease Research*****, vol. 7, nos. 1 and 2, March and June 1989, 21-23.**
Order # 3259

Summary

A study was conducted in a suburban area of Dar-es-Salaam, Tanzania to assess the effectiveness of using each mother's own definition of diarrhea for identifying and subsequently managing diarrhea in her child, rather than an arbitrary definition such as "3 loose stools per day." Researchers asked 630 mothers what number of loose or watery stools their children under 5 would have to pass during the 12 hours of daylight for them to seek any form of treatment for diarrhea. This number was accepted as the mother's definition of diarrhea.

Each mother was also asked whether any of her children had had diarrhea in the week preceeding the interview, based on her definition. To establish normal frequency of stools in children in the study area, 246 different mothers were questioned about the number of stools normally passed by their children under 5 during the day.

Results showed that 92% of the 630 mothers would take remedial action if their child passed 3 or more loose or watery stools in the 12-hour period. There were no significant differences in the mothers' definitions of diarrhea between households where there had been a case of diarrhea during the previous week and households where there had not. Of the 246 mothers questioned about normal stool frequency, 70% reported that their healthy children passed 2 or fewer stools in a 12-hour period, although 30% passed 3 or more, and some passed as many as 7 stools normally. The authors suggest that leaving the definition of diarrhea to the mother rather than defining it arbitrarily, can reduce confusion during surveys, and still produce fairly consistent results.

Editorial Comment

While this conclusion seems to make sense, it would not work in evaluation studies. We must keep in mind that the mother's perception of diarrhea may change under the influence of new input from the media, health workers, or other sources. We saw in Egypt that an intense media campaign promoting the concept of dehydration as a dangerous effect of diarrhea led to a 3-fold increase in the numbers of mothers seeking care. Certainly the nature of diarrhea in the population did not change, but if we had used the mother's definition of diarrhea as recommended by this study, it would appear as if diarrhea itself had increased threefold because of the campaign.

Perhaps the best response to this situation is to combine the two approaches. We need to learn about the characteristics of diarrhea which will lead most mothers to act in order to plan appropriate targets for ORS use and for consultations at health facilities for diarrhea. We must, however, fix an objective definition (e.g. 3 watery or loose stools per day) to evaluate whether our target has been met.

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Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº1 1990

Taylor, S.M.; Hayes, M.; Frank, J.; et al. "THE RISK APPROACH IN DIARRHEAL DISEASE INTERVENTION IN GRENADA." *Social Science and Medicine*, vol. 30, no. 10, 1990, 1089-95.
Order #3772

Summary

In a previous paper (*Social Science and Medicine*, vol. 23, 1986, 995-1002), the authors described the development of a risk assessment method which seemed capable of accurately predicting diarrhea incidence in several communities in Grenada. Households with a lower frequency of boiling water, less domestic cleanliness, poorer infant feeding practices (especially use of bottlefeeding), and a non-hygienic kitchen facility were significantly more likely to have had a high incidence of infant and child diarrhea in the preceding 3 months, as reported by the mother.

This paper reports the results of a follow-up study designed to replicate the first, using data on diarrhea incidence and risk factors collected in a different set of communities in Grenada. Sample size and survey methods were similar in the two studies. The results, however, were different: risk factors that were strong predictors of diarrhea incidence in the first study showed no association at all in the second.

The authors pose 4 possible explanations for this unsuccessful attempt to replicate results: both studies were false, both were true, the first was false and the second true, and vice-versa. The possible reasons for each of these outcomes are discussed, with the authors favoring the theory that the results of both studies were true. They propose that the situations in the different communities and studies were in fact different, rather than that the study methodology used was faulty (the necessary explanation for the other 3 possibilities). They admit, however, that their evidence is not adequate to support confidently any of the 4 possibilities. Whatever the explanation, the study casts doubt on the practicality of identifying households at highest risk of diarrheal disease.

Editorial Comment

Both this paper and the one which follows deal with the risk approach, a strategy of targeting interventions toward individuals with a higher probability of disease, with the hope that the intervention will be both more effective (the individuals with the potential for a bad outcome will be helped), and more efficient (services will not be wasted on individuals who were not likely to have a bad outcome). They give us the opportunity to question whether this risk approach actually would be more effective and efficient under practical, real-world

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circumstances. This study looks only at the ability of interventionists to accurately select individuals at higher risk for diarrhea. Although the authors' first study (used here only for comparison) concluded that this was possible, this second study did not, even though the methods used were as similar to the first as is possible.

I agree with the authors' suggestion that the methodology—a cross-sectional survey of self-reported diarrhea episodes over the previous 3 months—may not be an accurate measure of diarrheal morbidity. It might be that the risk factors studied could predict diarrheal morbidity measured prospectively, using twice weekly home visits. Many studies have shown the increasing inaccuracy of mothers' recall of diarrhea episodes over time. Because of this, the maximum recall period usually used is the previous 2 weeks. This problem, however, probably does not explain the different findings in the 2 studies.

An additional problem noted by the authors is the difference in season for the 2 studies: July-February for the first study, June-August for the second. This certainly could explain the inability to predict children at risk in the second study. The factors assessed by the survey relate to diseases spread by the fecal-oral route, primarily bacterial diarrhea. Seasonal diarrheas such as rotavirus or Norwalk virus spread by other mechanisms, making them less likely to be predicted by factors related to fecal-oral spread. In short, it may be possible to predict risk of certain diarrheas, but not others, by this type of survey methodology.

These authors chose diarrheal morbidity as their risk outcome variable. But we know that in most developing countries nearly all children will have some diarrhea, most of it benign. What is important is severe, potentially fatal diarrhea. The identification of children at risk for life-threatening diarrhea may require much more demanding and expensive methods, such as measurement of nutritional status. The authors acknowledge that anthropometric measures have been used to identify children at high risk of mortality but reject the idea of assessing nutritional status at the community level "because of the complexity of training workers to obtain accurate anthropometric measures." An alternative method would be to identify children at risk by measuring their nutritional status when they come to a clinic for diarrhea or another illness. Although this method would "miss" children who are not brought to health facilities, it may be a practical alternative to community-based risk assessment.

But the more fundamental question is: is the identification of children at risk worthwhile? Will it help control diarrhea? Even if morbidity or mortality risk prediction were possible, would it then be practical to survey the community to identify such children? Would it be cost-effective?

We must take into our calculations of efficiency not only the cost of identifying the high-risk child, but the cost of the intervention. In addition, we must compare the cost and effectiveness of targeted interventions (extra individual attention and services) to that of mass education (a television or radio campaign), general person-to-person community education, or a limited approach of providing ORT and teaching at a health facility for all who come with diarrhea. Clearly it would require substantial cost data as well as effectiveness data, including both the identification and intervention phases, before concluding that targeting of services is appropriate. This Grenada study suggests that the identification phase may be both costly and ineffective.

Technical Literature Update

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Sauerborn, R.; Nougtara, A.; Sorgho, G.; et al. "ASSESSMENT OF MCH SERVICES IN THE DISTRICT OF SOLENZO, BURKINA FASO. III. EFFECTIVENESS OF MCH SERVICES IN DETECTING OF AND CARING FOR MOTHERS AND CHILDREN AT RISK." ***Journal of Tropical Pediatrics*****, vol. 35, June 1989 Supplement, 14-17.**
Order #2903

Summary

This study examined the degree to which risk factors were detected and acted upon during routine clinic visits in 5 MCH facilities in the district of Solenzo, Burkina Faso. Two types of patients were included: children in "under-fives'" clinics, and pregnant women in antenatal clinics. First, a list of risk factors used by the local health teams and the actions which should be taken in response to these risk factors were identified through discussions with the staff in the clinics. Each patient-staff contact in the under-fives' clinics and in the antenatal clinics was then observed to determine what risk factors were looked for, what risk factors were identified, and whether or not the appropriate actions were carried out.

Only 2 risk factors were named by staff in the under-fives' clinics: weight loss in comparison to the previous visit, and weight below the lower line of the Road to Health Chart. The number of at-risk children identified was high. Of 576 children examined, 54% had 1 of the 2 risk factors and 10% had both. Action taken, however, was deficient. The vast majority of mothers of these at-risk children were simply given an appointment for the next visit and then sent home without any advice or referral. In fact, care given to these children was no different from that given to low-risk children. Seventy-seven percent of the mothers of low weight-for-age children went home without any sort of advice at all.

At the antenatal clinics, many more risk factors were sought and found. However, action was only rarely taken and, with the exception of response to edema (recommending a low salt diet) and to anemia (giving iron and folic acid), the actions taken did not correlate with the risk factors detected.

Three possible explanations are discussed for this lack of association between risk identification and action: 1) lack of agreement regarding the specific interventions or actions to be taken; 2) unwillingness of both staff and patients to act on the basis of possible risk (something that has not yet happened) as opposed to an identified illness; and 3) cut-off points for risk identification that were too high, leading to an unmanageably high proportion of clients needing special attention. The authors suggest: 1) involving all members of the team in developing and encouraging acceptance of standardized instructions; and 2) research to identify cut-off points for risk factors that are both valid and feasible for particular operational situations.

Editorial Comment

Here we see the implementation side of a facility-based risk assessment approach. This study assumes that the risk factors are valid. It even limits attention to those factors that the staff actually sought to identify. Despite this, it was clear that risk identification did not lead dependably to appropriate action.

In this setting— the MCH clinic—the additional cost of looking for risk factors is minimal, but the lack of consequential action makes looking for those factors a waste of time. This is the usual argument against growth monitoring programs: since nothing happens when weight loss is detected, why bother to seek it out?

Given the limited resources in most health systems, we cannot treat or provide special services to everyone. Selection is imperative in such clinic settings, while it may not be imperative or efficient in the community setting studied in Grenada. As such, the authors here are right on target. We must set the threshold for taking action at a point that is locally appropriate, that is, where the staff will have the time and facilities to give special services to clients who will be selected out by the risk-screening process. Then, when the volume of selected clients is manageable, we must make sure that we have clearly defined, specific responses to each identifiable risk factor. Then, and perhaps most importantly, we must consistently supervise health workers to make sure the called-for actions are being implemented. It may well be that the health workers in the under-fives' and antenatal clinics studied here neither knew what to do nor had anyone check on what actions they were taking when a risk factor was identified.

In short, although many primary health care activities, such as growth monitoring, may suffer from too much emphasis on identifying risk factors and not

enough on taking action, this is not justification for discarding the activity altogether. We should not throw out the baby with the bath water!

Toole, M.J.; Waldman, R.J. "PREVENTION OF EXCESS MORTALITY IN REFUGEE AND DISPLACED POPULATIONS IN DEVELOPING COUNTRIES."*Journal of the American Medical Association*, vol. 263, no. 24, June 27, 1990, 3296-3302.
Order #3836

Summary

"More than 30 million refugees and internally displaced persons in developing countries are currently dependent on international relief assistance for their survival. Most of this assistance is provided by Western nations such as the United States. Mortality rates in these populations during the acute phase of displacement have been extremely high, up to 60 times the expected rates. Displaced populations in northern Ethiopia (1985) and southern Sudan (1988) have suffered the highest crude mortality rates. Although mortality rates have risen in all age groups, excess mortality has been the greatest in 1- through 14-year-old children. The major causes of death have been measles, diarrheal diseases, acute respiratory tract infections, and malaria. Case-fatality ratios for these diseases have risen due to the prevalence of both protein-energy malnutrition and certain micronutrient deficiencies.

"Despite current technical knowledge and resources, several recent relief programs have failed to promptly implement essential public health programs, such as provision of adequate food rations, clean water and sanitation, measles immunization, and control of communicable diseases. Basic structural changes in the way international agencies implement and coordinate assistance to displaced populations are urgently needed." [Published Abstract]

Editorial Comment

This paper is an excellent review of the epidemiology of health problems in refugee situations, and of the appropriate and inappropriate responses to those problems. It is a "must" for health workers and organizations dealing with refugees. Perhaps the most important message from the article is that refugee situations do not demand extraordinary or unique health services. Rather, they demand prompt and well-organized, basic public health action. The article recommends the following specific interventions:

1) Provision of food containing adequate calories, proteins, and essential micronutrients;
2) Provision of adequate clean water and good sanitation;
3) Prevention of specific communicable diseases, such as measles, through immunization;
4) Establishment of an essential drug list and standardized treatment protocols to ensure effective treatment of common illnesses: diarrhea, respiratory infections, malaria;
5) Establishment of a health information system to track nutritional status, illness, and mortality;
6) Establishment of an effective outreach program to provide adequate access to health services.

Perhaps those in developed countries have become so accustomed to taking such actions for granted at home that they have forgotten how necessary and how effective these services are. This may be the explanation for the tendency of many emergency refugee responses to include such items as mobile hospitals, subspecialist physicians, unnecessary drugs, and the like.

This is not to say that implementing the recommended interventions is easy, especially in situations in which resources are scarce and the host country itself is impoverished. Some recommended strategies for ensuring prompt implementation of these public health measures include:

1) Strengthening host country capacity to provide technically sound assistance;
2) Strengthening the technical resources of the UNHCR (United Nations High Commission for Refugees);
3) Involving the displaced communities in the relief program;
4) Providing relief supplies that reflect the real needs of the refugees rather than the surplus food commodities of the donors;
5) Exploring alternatives to closed refugee camps, such as living in local villages;
6) Systematically evaluating refugee relief programs and doing operational research to identify the most effective methods of intervention.

Siddique, A.K.; Mutsuddy, P.; Islam, Q.; et al. "MAKESHIFT TREATMENT CENTRE DURING A CHOLERA EPIDEMIC IN BANGLADESH." ***Tropical Doctor*****, vol. 20, April 1990, 83-85.**
Order #3822

Summary

In February 1986, the local diarrhea surveillance system reported an epidemic of cholera in Putikhali, Bangladesh, with 94 cases and 13 deaths. The nearest area health center was over 10 km, or 3 hours, away. Therefore, on March 2, a field treatment center was set up in Putikhali. It was staffed by a physician from the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), a government health inspector, and 3 local assistants until March 16. Local community volunteers, most importantly the families of the patients, provided nursing care, facilities, food, and some supplies, such as palm leaf mats which were used as disposable beds.

Only severely dehydrated patients were given intravenous fluid initially, then switched to ORS. Moderately dehydrated patients were managed entirely with ORS. Information was collected not only from patients who came to the center but also, through the daily diarrheal disease surveillance system, from all those who experienced diarrhea during the epidemic.

Prior to opening the makeshift center, only 1 of the 94 reported cases had sought treatment at the area health center. All of the 13 fatal cases had died at home, presumably of severe dehydration. Of the 263 cases reported while the field treatment center was operating, 233 sought treatment at the center, with only 1 death. It is estimated that the field treatment center averted 32 deaths and reduced the fatality rate from 13.8% to 0.4%.

Editorial Comment

The obvious lesson from this article is that recommended diarrhea case management saves lives. The outside team provided clear standards of care, leadership, and teaching, while the community itself did everything else.

The first field trials of ORT consisted of giving diarrhea patients ORT during their trip to the Matlab field hospital in Bangladesh. This resulted in a significant decrease in the degree of dehydration present on arrival at the hospital in those who received ORT. Remembering this experience, it seems surprising to me that apparently no attempt was made to inform the people of the subdistrict about giving ORT—either ORS or "lobon-gur" (sugar-salt solution)—as soon as diarrhea started. No mention was made in the report of attempting to do any education or preventive intervention outside the makeshift treatment center, although the government diarrheal disease surveillance system was apparently active in collecting information about diarrhea cases and deaths.

I am convinced that an epidemic like this one should be used as an opportunity to convert all the people involved into true believers in and early practitioners of ORT. Indeed one should measure the effectiveness of the response to the epidemic not only by showing the dramatic reduction in mortality reported here, but also by measuring the proportion of patients showing up at the treatment center who have already used ORT, and by documenting the proportion of cases over the subsequent months who use ORT prior to, or even instead of, seeking medical attention.

The authors report that local unqualified practitioners had treated all of the 13 cases who had died at home, and that such practitioners participated subsequently in running the makeshift treatment center. They, as well as the general populace, should be considered important targets of this outreach education component of the epidemic response, which I am proposing. The effectiveness of the epidemic response should be measured by the proportion of such local practitioners who treat diarrhea patients with ORT *after* the epidemic is over.

Alvi, M.F. "USE OF ORAL REHYDRATION SALT IN DIABETIC KETOACIDOSIS" (Letter). ***The Lancet*****, vol. 336, October 20, 1990, 1009-10.**
Order #4155

Summary

Two severely dehydrated, insulin-dependent, adult diabetics with acute diabetic ketoacidosis were successfully treated with ORS and insulin at a rural clinic in Pakistan. One patient was rehydrated with ORS alone (WHO standard formula), 2 liters in the first hour, followed by 1 liter per hour subsequently over a total of 10 hours. Insulin was also given hourly until, by 10 hours, urine

glucose and ketones were no longer detectable. The other patient received 1 liter of normal saline intravenous infusion in the first 1/2 hour, followed by the same treatment as the first patient. His urine returned to normal in 9 hours. The author emphasizes that ORS provides effective, practical, low cost, and accessible treatment for this life-threatening complication of diabetes, particularly for populations living far from hospitals.

Editorial Comment

How medically reasonable, how effective, and how clearly feasible this new application for ORT appears, from this brief report! It deserves broader trial in other isolated areas and countries.

A recent newspaper article in the *Washington Post* "Health Section" (January 22, 1991) described another new application for ORT: treatment of dehydration and diarrhea in the elderly, especially in nursing home patients. Proponents William B. Greenough and Richard G. Bennett, staff physicians at Francis Scott Key Medical Center in Baltimore, state that older people are at particular risk from diarrhea. In those with hardening of arteries to the brain, heart, or kidneys, loss of fluids can lead to stroke, heart attack, or kidney failure. A bout of diarrhea can also lead to a severe electrolyte imbalance, especially in elderly patients taking diuretics. It seems likely that other appropriate uses for this technology are there if we are receptive to them.

Further information on ORT use in the elderly can be found in the following sources:

"Diarrhea: Etiology and Treatment with Oral Rehydration Therapy." Senior Medical Review, *vol. 2, no. 3, July 1988, 1+.*

Greenough, W.B.; Bennett, R.G. "Diarrhea: A Ubiquitous Disease in Older Persons." Clinical Report on Aging, *vol. 1, no. 6, 1987, 1+.*

Greenough, W.B.; Bennett, R.G. "Diarrhea in the Elderly." in Principles of Geriatric Medicine and Gerontology, *2nd ed., ed. W.R. Hazzard, (NY: McGraw Hill, 1990), 1168-76.*

ANNOUNCING FREE MATERIALS

MEDIA PROMOTION OF BREASTFEEDING: A DECADE'S EXPERIENCE, by Cynthia P. Green, Ph.D., Nutrition Communication Project, Academy for Educational Development, July 1989, 81p.

This publication is intended to provide program managers with practical information on planning and implementing mass media programs promoting breastfeeding. Drawing from the experience of breastfeeding promotion programs in more than 25 countries, this guide discusses what works and what does not, how to develop cost-effective media campaigns, how to determine whether a program is effective, and how to ensure that promotional efforts continue. No special expertise in communication is assumed. Readers seeking information on how to conduct a mass media campaign are referred to Appendix A, which lists a number of excellent guides available at little or no cost.

*This publication **is not** available from PRITECH. Please contact the Nutrition Communication Project, Academy for Educational Development, 1255 23rd St., NW, Washington, DC 20037 directly for a free copy. (Available only in English.)*

A GLOBAL SOLUTION, Creative Associates International, Inc. in cooperation with the Educational Film Center, 1986, (15-minute slide/audio cassette educational program).

This program examines the current issues and key lessons learned from the development and implementation of diarrheal disease control programs. It features highlights from the Second International Conference on Oral Rehydration Therapy (ICORT II) held in December 1985 in Washington, DC, and examines selected case studies from various programs worldwide. Critical areas of effective ORT programming discussed at the conference are investigated. The program offers an important summary of insights gained with regard to ORT programming today, providing an overview of current accomplishments and future challenges.

Slides and tapes are available from the PRITECH Information Center on a limited basis in French, English, Spanish, and Arabic.

Special Anniversary Issue

Technical Literature Update

on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº2 1991

To commemorate the end of the first decade of a coordinated, global effort to control diarrheal diseases, PRITECH requested the staff of the World Health Organization's Diarrhoeal Disease Control Programme to edit a special issue of the TLU. The eight papers reviewed in the following pages are landmark articles that have significantly influenced the activities of WHO and of many others involved in diarrheal disease control efforts worldwide. These watershed reports provide incontrovertible evidence which serves as the basis for key WHO/CDD policies: the central role of oral rehydration therapy; the importance of focused preventive actions, especially exclusive breastfeeding; the continuation of adequate feeding during diarrhea and convalescence; and the very limited and rational use of drugs for diarrhea. These key concepts will continue to provide the framework for CDD priorities and activities during the next decade.

Snyder, J.D.; Merson, M.H. "THE MAGNITUDE OF THE GLOBAL PROBLEM OF ACUTE DIARRHOEAL DISEASE: A REVIEW OF ACTIVE SURVEILLANCE DATA." ***Bulletin of the World Health Organization*****, vol. 60, no. 4, 1982, 605-13.**
Order #0158

Summary

In order to estimate the annual morbidity and mortality from acute diarrheal disease in developing countries, an analysis was undertaken of data from 24 published studies conducted in Africa, Latin America, and Asia. In 22 of the studies, morbidity and mortality surveillance was carried out on a frequent basis at the community level for at least 1 year. The other 2 studies were multi-country mortality surveys in which information was gathered from death certificates.

In all studies, the incidence of diarrhea was highest in children under 2 years of age. In the 15 studies in which age groups were further delineated, median morbidity rates were highest in the 6-11 month age group. When all studies were combined, the median incidence of diarrhea in children under 5 was 2.2 episodes per child per year. The highest median incidence rates occurred in the 5 studies with smaller and more frequently observed populations, where a median rate of 3 episodes per year was found.

As with morbidity, the highest mortality rates were found among children under 2 years of age. In those studies where children over 1 year were distinguished from infants less than 1 year old, mortality was highest in infants. In the active surveillance studies, median annual mortality was about 20 deaths per 1,000 children under 2 years of age and 13.6 per 1,000 in children under 5. No differences in mortality rates were found between regions (Africa, Asia, and Latin America) or when the definition of diarrhea, frequency of surveillance, size of population, urban or rural location,

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and climate conditions of the study area were taken into consideration.

Using the 1980 population totals for children under 5, the total number of acute diarrheal episodes in Africa, Asia (except China), and Latin America was estimated to be 744 million, with 4.6 million deaths. Eighty percent of these deaths occurred in children 2 years old or younger. For children under 5, a case-fatality ratio of 0.6 deaths per 100 illnesses was calculated.

Comment

This review of the information on the magnitude of diarrheal diseases, as presented by studies published between 1955 and 1980, is still one of the most often quoted references on this topic. Among its outstanding characteristics are the careful selection for analysis of predominantly: (i) longitudinal, prospective, community-based studies of stable populations with low migration rates; (ii) studies in which morbidity surveillance was carried out at least once every 2 weeks, and mortality surveillance once a month (with the exception of 2 multi-country mortality studies); and (iii) studies that involved at least 1 full year of surveillance. In addition, attention was paid by the reviewers to the definitions of diarrhea used in the studies, the age of the groups under surveillance, and their area of residence, whether urban or rural. This review is also a unique source of information on case-fatality rates prevalent before oral rehydration therapy was introduced.

In the light of more recent analyses of childhood mortality in the last decade, the estimate made in the article of 4.6 million diarrhea deaths in 1980 appears to have been an overestimate. The United Nations now estimates that in 1985 there were13.5 million deaths in children under 5 in developing countries *(World Population Prospects 1990*, United Nations, New York, in press). WHO estimates that 3.5 million (25.2%) were associated with diarrhea.

Pizarro, D.; Posada, G.; Villavicencio, N.; et al.
"ORAL REHYDRATION IN HYPERNATREMIC AND HYPONATREMIC DIARRHEAL DEHYDRATION."
***American Journal of Diseases in Children*, vol. 137, August 1983, 730-34.**
Order #0009

Summary

In a study at the National Children's Hospital in San José, Costa Rica between 1978 and 1982, 61 hypernatremic and 33 hyponatremic infants were treated for diarrhea-related dehydration. These patients were well-nourished and mostly bottlefed. Rehydration was achieved by orally administering a volume of twice the estimated fluid deficit during a period of 6 hours or less. In all 61 hypernatremic and 25 hyponatremic infants, two-thirds of the fluid volume was given as glucose-electrolyte solution containing 90 mmol sodium/liter, and one-third as plain water. The other 8 hyponatremic patients were rehydrated with glucose-electrolyte solution alone. Successfully rehydrated infants were then placed on a maintenance therapy of half-strength milk formula.

Of the 61 hypernatremic patients, 2 required some intravenous (IV) therapy. Serum sodium levels returned to normal in all infants who were successfully rehydrated by the oral route. Only five patients (8%) had convulsions during rehydration. This number is low when compared to data gathered in 1977, when IV therapy was in use; 14% of 43 hypernatremic infants experienced convulsions during rehydration. Convulsions were also seen in 9% of hyponatremic patients treated with oral rehydration.

Three of the 33 hyponatremic infants required IV therapy. Sodium gains were greater in those who received only glucose-electrolyte solution. However, all those who were successfully treated with oral rehydration achieved normal serum sodium levels.

Technical Literature Update

PRITECH is a USAID-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the *TLU*, a bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues.

Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent USAID policies or opinions.

Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

The report concludes that oral rehydration can safely and effectively be achieved in dehydrated infants using a regimen of glucose-electrolyte solution at 90 mmol sodium/liter irrespective of the serum sodium level at admission. When this same solution is used to maintain hydration or prevent dehydration, it should be alternated with free water.

Comment

Dr. Pizarro's studies have played a key role in establishing the wide range of conditions under which oral rehydration therapy with ORS solution is effective for children with acute diarrhea. In this study he clearly shows that treatment with ORS and water rapidly and safely corrects both hypernatremic and hyponatremic dehydration. The important message in this report should not be missed. It is this: when a child with diarrhea is given sufficient amounts of water and salts, as provided by ORS solution, fluid and electrolyte balance will be restored irrespective of how disordered it may have been initially. This is because renal and other homeostatic mechanisms retain the required amounts of salt and water and excrete any excess. No laboratory studies are required, the diagnosis of hypernatremia or hyponatremia need not be made, and a single treatment regimen is effective. In subsequent studies Dr. Pizarro went further by showing that the same results could be achieved using ORS solution alone, without any free water, for rehydration. Studies such as this underpin the CDD strategy of using ORS solution to treat all dehydrated children, except those with severe dehydration.

Patra, F.C.; Mahalanabis, D.; Jalan, K.N.; et al. "IS ORAL RICE ELECTROLYTE SOLUTION SUPERIOR TO GLUCOSE ELECTROLYTE SOLUTION IN INFANTILE DIARRHOEA?" *Archives of Disease in Childhood*, vol. 57, 1982, 910-12.
Order #0333

Summary

This report describes a randomized trial which compared rice-based oral electrolyte solution (ORS) to the standard glucose ORS as treatment for infants and children with acute diarrhea. The rice-based ORS was given to a group of 26 infants and children aged 3 months to 5 years with moderate to severe dehydration. This group was compared with a matched control group.

Rice-based ORS was found to be more effective, leading to significantly lower stool output during the first 24 hours, significantly less intake of rehydration fluid during the first 24 hours, and significantly shorter duration of diarrhea. The larger quantity of carbohydrate and the protein content of rice-based solution also provided a nutritional advantage.

Comments

Patra and his colleagues were the first to report that an ORS solution containing 50 g/l of cooked rice powder, in place of the usual 20 g/l of glucose, caused both the rate of stool loss and the duration of diarrhea to be appreciably decreased. This probably occurs because the rice starch and protein, when digested, release a greater amount of organic carriers (glucose, amino acids) to promote sodium and water absorption than are present in standard ORS solution. This causes absorption of the water and salts in the ORS solution *plus* the reabsorption of at least part of the water and salt secreted into the bowel as part of the diarrheal process, thus reducing stool output.

The practical role of oral solutions that contain a cooked cereal, or another starchy food, has not yet been defined. Further clinical trials have shown that the benefit of rice-based ORS, relative to standard ORS, is far greater in patients with cholera than in those with acute, non-cholera diarrhea. In the latter group it appears that rice-based ORS may not have a sufficient advantage to warrant its use in place of standard ORS, although further research is needed in this area. On the other hand, these studies emphasize the potential utility of familiar home fluids that contain cooked starch or protein for early home therapy of diarrhea. Such fluids, if readily available and culturally acceptable for children with diarrhea, may be more easily promoted and more widely used than specially prepared fluids, such as sugar-salt solution. It should be stressed, however, that home fluids should be used that do not interfere with concurrent efforts to maintain adequate nutrition. Specifically, home fluids should not be prepared by diluting usual weaning foods.

Feachem, R.G. "PREVENTING DIARRHOEA: WHAT ARE THE POLICY OPTIONS?" *Health Policy and Planning*, vol. 1, no. 2, 1986, 109-17.
Order #1392

Summary

Oral rehydration therapy (ORT) is a dramatically effective and relatively inexpensive method for reducing mortality caused by acute watery diarrhea. However, its

effect on diarrheal mortality in dysenteric and chronic cases may be limited. In addition, ORT has little or no impact on morbidity rates for any type of diarrhea. Therefore, ORT must be complemented by other diarrhea control interventions.

A systematic study initiated by the World Health Organization's Diarrhoeal Disease Control Programme identified 7 interventions that are likely to be highly effective and feasible in combating childhood diarrhea: breastfeeding promotion, improvement of weaning practices, rotavirus and cholera immunizations (when available), measles immunization, improvement of water supply and sanitation facilities, and promotion of personal and domestic hygiene. This paper explores each of these options in terms of potential impact on diarrheal morbidity and mortality in children under 5 and in terms of cost-effectiveness. Intervention-focused research is recommended to test these interventions in the field and provide needed information about design and implementation. Each country will need to decide which package of interventions is most appropriate to its specific circumstances.

Comment

This article summarizes a series of articles reviewing 18 potential interventions for reducing both the incidence of diarrhea and, indirectly, diarrheal mortality. This work has had a profound influence on the recommendations of WHO as well as of other organizations on priorities for both national CDD programs and necessary additional research. The revision of the WHO program managers' training course in 1987 reflected these new recommendations; the course now includes a module, *Working Toward Prevention*, which helps senior level staff select and plan for priority preventive activities.

The methodology utilized by Feachem and his colleagues in this series of studies involved assessment of the relative impact, feasibility, and cost of different interventions. This could well serve as a model for comparing potential choices among strategies and interventions in other areas of public health, including the prioritization of potentially competitive child survival initiatives.

Victora, C.G.; Smith, P.G.; Vaughan, J.P.; et al. "EVIDENCE FOR PROTECTION BY BREAST-FEEDING AGAINST INFANT DEATHS FROM INFECTIOUS DISEASES IN BRAZIL." *The Lancet*, no. 8554, August 8, 1987, 319-22.
Order #4004

Summary

A population-based, case-control study was carried out on infants under 1 year of age in the metropolitan areas of Porto Alegre and Pelotas in southern Brazil. Investigators gathered information from hospital records, death certificates, necropsy reports, and home visits in order to examine the relation between infant-feeding patterns and mortality due to infectious diseases. Two controls were selected from the community for each case in which a child had died of either diarrhea, respiratory infection, or another infectious disease. Detailed feeding histories were obtained from the caretakers of all 357 cases and 714 controls.

Risk of death from diarrhea was most closely associated with feeding patterns. Compared with infants who were exclusively breastfed, those also given formula milk or cow's milk had 4.2 times the risk of death from diarrhea, and non-breastfed infants receiving only supplementary milk had a risk 14.2 times higher. Non-milk supplements (mashed fruit and vegetables, soup, etc.) were associated with smaller risks. The relative risk associated with not breastfeeding was greatest for infants under 2 months of age (RR=23.3).

Breastfeeding was also associated with a reduced risk of death from respiratory infections, although less of a reduction in risk than that seen for diarrhea. Breastfed infants receiving a milk supplement had a 1.6 times higher risk of respiratory death, while those fed only supplementary milk had a 3.6 times higher risk. Risk of death from infections other than diarrhea or respiratory infection was less clearly associated with breastfeeding status.

Comment

This well-designed case-control study conducted in 1985 is a most valuable source of epidemiological information on the risks of diarrheal mortality associated with different modes of infant feeding. Two of its qualities made it outstanding. First, it is unique, as nearly all preceding studies on this subject were conducted before 1950, i.e., before significant developments in the production of infant formula. In addition, these earlier

studies suffered from considerable methodological pitfalls. Second, it brings attention to the strongly protective effect of exclusive breastfeeding in early infancy. The strong effect of exclusive breastfeeding against diarrheal mortality demonstrated here challenges us to find ways to increase rates of exclusive breastfeeding.

Brown, K.H.; Gastañaduy, A.S.; Saavedra, J.M.; et al. "EFFECT OF CONTINUED ORAL FEEDING ON CLINICAL AND NUTRITIONAL OUTCOMES OF ACUTE DIARRHEA IN CHILDREN." *The Journal of Pediatrics*, vol. 112, no. 2, 1988, 191-200.
Order #2354

Summary

In order to determine the nutritional and clinical effects of different diets during diarrhea, 138 male children aged 3-36 months were randomly assigned to 4 dietary groups at the Instituto de Investigación in Lima, Peru. Patients who had diarrhea for more than 60 hours, who received more than 1 breastfeeding per day, or who were malnourished were excluded from the study. Children in groups 1-3 were orally rehydrated with standard ORS solution, while children in Group 4 were intravenously rehydrated with a glucose-electrolyte solution of a slightly different composition.

After initial rehydration, maintenance diets or solutions were offered. Children in Group 1 received CSO-110 formula, composed of casein, sucrose, dextrin with maltose, soybean oil, and cottonseed oil, and providing up to 110 kcal/kg body weight/day. Group 2 received the same formula, diluted to half-strength for the first 2 days (CSO-55), and then at full-strength starting on the third day. Group 3 received an oral glucose-electrolyte maintenance solution (GES-O) for the first 48 hours (50 g glucose, 20 mEq sodium, and 20 mEq potassium per liter) and then switched to CSO-110 and CSO-55 during each of the following 48 hours. Group 4 received the same GES intravenously for the first 48 hours, then followed the same regimen as Group 3. The GES formula provided approximately 24 kcal/kg/body weight/day.

Clinical success rates were similar in all groups, ranging from 91.5% to 97.1%. Recovery from dehydration and duration of diarrhea were also similar among groups. Children in Group 4 had reduced stool output during the first 24 hours, but the level became similar to the other groups as soon as oral feeding was started on day 3.

Nutritional differences between groups were substantial. Increased early feeding resulted in improved nutritional status during and after recovery. All groups gained weight during the first 12 hours, and all but Group 2 continued to do so during the second 12 hours. However, thereafter only Group 1 maintained a continuously positive trend. When the combined groups 1 and 2 were compared to the combined groups 3 and 4 at 2 weeks after admission, a significant difference was found: children in the first 2 groups had gained approximately 140 g more than the others. Significant differences were also found in arm circumference and skin-fold thickness.

The findings suggest that continued feeding during illness is safe and nutritionally beneficial. However, since a synthetic diet was used here, additional research is needed to determine the effects of lactose-containing, non-human milk, staple foods, or both on clinical and nutritional outcomes during diarrhea.

Comment

This study is important because it clearly demonstrates the beneficial effect of continued feeding with a full-strength diet during diarrhea. The weight gain 8 days after starting treatment was greatest in patients who received a normal caloric intake (II0 cal/kg/day) throughout their illness, and smaller in patients whose food was reduced (55 cal/kg/day) or withheld during the first 2 days of treatment. Moreover, there was no appreciable difference in the amount of diarrheal stool passed when children were fed half-strength or full-strength diets. This study makes it evident that there is no basis for reducing food intake during diarrhea. Instead, full-strength feeding should be continued so that growth faltering and worsening of nutritional status can be prevented or at least minimized.

"THE RATIONAL USE OF DRUGS IN THE MANAGEMENT OF ACUTE DIARRHOEA IN CHILDREN." Diarrhoeal Disease Control Programme, World Health Organization, Geneva, 1990, 71p.
(This document should be ordered directly from Distribution and Sales, WHO, 1121 Geneva 27, SWITZERLAND)

Summary

This review begins by briefly summarizing the circumstances under which specific drugs (antibiotics and antiparasitics) may be correctly used to treat

diarrhea in children. It then focuses on drugs commonly used to treat childhood diarrhea which fit the following description: "...oral formulations of drugs without established benefit in any field of paediatric practice." These include antimotility drugs (diphenoxylate hydrochloride and loperamide), antimicrobial agents (neomycin, streptomycin, hydroxyquinolines and nonabsorbable sulfonamides), and adsorbents (kaolin and pectin, activated charcoal, attapulgite, and smectite). The documented pharmacology, mechanism of action, efficacy, adverse effects, and drug interactions are reviewed for each of these drugs.

Comment

This WHO document was prepared in response to health policy-maker and health worker requests for documentation of the scientific basis for a rational approach to the treatment of acute diarrhea in children. It dispels many of the misconceptions about "antidiarrheal" drugs and antibiotics that lead to diversion of attention and resources away from proper rehydration therapy and feeding. Use of these drugs also contributes to antibiotic resistance and increases the risks of serious adverse reactions in children.

The most common pharmaceutical agents that have been—and continue to be—promoted for the treatment of diarrhea are reviewed based on experimental and clinical experience. Extensive evidence is cited in support of the conclusions that the use of antimotility drugs and adsorbents cannot be justified for the treatment of children with acute diarrhea and that the use of antibiotics and antiparasitic drugs should be strictly confined. The review is an important document in support of educational, managerial, and regulatory actions to improve rational drug use in countries worldwide.

Claeson, M.; Merson, M. "GLOBAL PROGRESS IN THE CONTROL OF DIARRHEAL DISEASES." *The Pediatric Infectious Disease Journal*, vol. 9, no. 5, May 1990, 345-55.
Order #3903

Summary

This review article summarizes the extent of diarrheal disease as a health problem in children and the progress that has been made to combat it. The authors discuss the etiology and epidemiology of diarrhea, proper case management for acute and persistent diarrhea, research on improved ORS, misuse of antidiarrheal drugs, preventive strategies, vaccine development, and the impact of diarrheal disease control programs since 1980.

They conclude that rates of access to ORS and use of ORT have increased considerably during this time. Admission rates and case-fatality rates at health facilities have decreased following introduction of ORT. It has been estimated that 1 million deaths were averted in 1988 alone. Future efforts will need to focus on training of public and private providers in order to increase access to proper case management.

Comment

The purpose of this review is to describe the status and content of activities at the end of the first decade of a coordinated global effort to control diarrheal diseases. There have been major developments in diarrheal disease research in the decade that have had significant programmatic implications, such as confirmation of the important role of feeding as part of correct case management and identification of key preventive interventions. In recent years, studies have identified and confirmed the contribution of persistent diarrhea and dysentery to overall childhood mortality and identified risk factors for persistent diarrhea. This overview article includes an extensive bibliography providing the references in support of the rationale for diarrhea case management and prevention as promoted by WHO and implemented by many national CDD programs.

National CDD programs have made significant progress that has been monitored and evaluated through household surveys, health facility studies and program reviews, with particular reference to a set of key indicators. This article summarizes the findings of these evaluative efforts and draws attention to key factors that contribute to successful implementation of diarrheal disease control efforts in countries: political commitment, careful planning, and serious efforts at health worker training. Interventions such as curbing inappropriate drug use and training other types of health care providers in both the public and private sectors are emphasized. They will be part of the major thrust in CDD over the next decade.

Once is not enough... RECYCLE

Technical Literature Update on DIARRHEA

Guest Editor: Jon Rohde, M.D.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº3 1991

Bari, A.; Rahman, A.; Molla, A.M.; et al. "RICE-BASED ORAL REHYDRATION SOLUTION SHOWN TO BE BETTER THAN GLUCOSE-ORS AS TREATMENT OF NON-DYSENTERIC DIARRHOEA IN CHILDREN IN RURAL BANGLADESH." ***Journal of Diarrhoeal Disease Research*****, vol. 7, nos. 1 and 2, March and June 1989, 1-7.**
Order #3266

Summary

A 2-year longitudinal study followed households in 3 adjacent areas of rural Bangladesh to compare the use rates and efficacy of rice-based ORS with that of standard glucose ORS in treatment of non-dysenteric diarrhea in children less than 5 years of age. Sixty mothers in 2 of the study groups were given stores of ORS packets to distribute to 8-12 neighboring households. Packets of rice ORS were provided to mothers in one study area (Group A) while standard WHO glucose ORS was provided to mothers in a second study area (Group B). Mothers were shown how to prepare the solutions. In a third study area (Group C), mothers were advised to use locally available facilities for diarrhea treatment (primarily unlicensed practitioners), and were not provided with ORS. Mothers in all 3 areas were advised to continue breast milk and feeding during diarrhea and were given advice about personal hygiene. Households were visited weekly by a field worker, and daily for up to 7 days if diarrhea was present. Incidence and duration of diarrhea were recorded. Outcome was deemed to be a failure if the child died or was admitted to the hospital.

When non-dysenteric episodes were analyzed, it was found that all but 15 of 8,130 ended in recovery regardless of the treatment used. In the rice-ORS group, more than 60% of children recovered within 3 days, and less than 1% of the episodes lasted more than 14 days, significantly better outcomes than in the other 2 groups. About 15% of all episodes of diarrhea in Group C persisted beyond 14 days. Median duration of diarrhea was 3, 5, and 7 days in Group A, B, and C, respectively. In Group A, 70.9% of mothers used only rice ORS to treat diarrhea. This was a higher exclusive ORS-use rate than among mothers in Group B where only 60.1% of mothers exclusively used glucose ORS to treat diarrhea. When children given drugs along with ORS were included, total ORS-use rates were 89.6% in the rice-ORS area, and 84.8% in the glucose-ORS area, but only 15.7% in the control area. Drugs, particularly antibiotics, were the main treatment given to children in Group C (55.1%) followed by no treatment (28.6%).

The authors caution that mothers' acceptance of rice ORS may reflect the fact that rice is a staple food in

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Bangladesh, and that preparations of rice are traditionally used to treat diarrhea. These findings may therefore not apply to other communities.

Editorial Comment

This study has been cited to advocate a wider role for cereal-based ORS, so the report deserves close attention. This study is one of the first *field*-level tests of the effects of cereal-based ORS. The results showed that the duration of diarrhea was significantly shorter in the rice-ORS group (3 days) compared to the glucose-ORS (5 days) or the non-ORS (7 days) groups. Also, fewer cases of acute diarrhea became persistent.

However, these field results need to be interpreted with caution because of the remarkably high levels of ORS use in both the rice and the glucose groups - 90% and 85%. I do not recall such high use rates of any kind of ORS in any other study in any country. For example, unpublished studies in Pakistan, where packets were actually put in every household, only reached a maximum of 70% use. The rates are particularly remarkable when one remembers the much lower use rates for home-made lobon-gur solution in the BRAC evaluation (see *TLU* Vol. V, No. 7) in the same country and culture.

What might account for the high rates noted in this study? No doubt the convenience (and lack of cost) of having both types of ORS supplied free and in ready-for-use packets was one contributing factor. Weekly home visits by workers who were present daily in the village were certainly a strong encouragement. I can imagine that a mother, expecting a visit from the field worker, would pay more attention to diarrhea episodes in her child than she would under normal, non-study circumstances. Indeed, the worker may well have urged ORS use during daily visits.

Could the use rates measured be artificially high because a group of non-users was excluded? This may be the case because children with "dysentery," very broadly defined as diarrhea with blood or mucous, were excluded from the analysis. Between 32% and 38% of all episodes of diarrhea were categorized as dysenteric, a remarkably high number even for Bangladesh. The incidence of "dysentery" was also significantly higher in the rice-ORS villages than in the glucose-ORS villages. Therefore, more non-users may have been excluded from the rice-ORS group. Whatever the reason, the remarkably high use rates for both types of ORS make me suspicious of the conclusions; the study conditions may be too artificial, too far from reality, to confidently apply the results to non-study situations.

The authors emphasize that the use of rice ORS was greater than the use of glucose ORS. While agreeing that the difference is statistically significant, I would argue that a difference of only 5% (90% vs 85%) is not meaningful from a programmatic perspective. Furthermore, without additional data I cannot accept the authors' conclusions that rice ORS was used more frequently because it was preferred to glucose ORS. The field workers were not blinded to the type of ORS distributed. They may have been more enthusiastic in promoting rice ORS, or mothers may have been more willing to try rice ORS because it was perceived as a "newer" product than glucose ORS.

The authors also suggest that mothers having the rice-ORS option may have been more satisfied, in that fewer of them used drugs or traditional medications than did the B group (24.3% vs 32.4%), and fewer of them used no treatment at all (4.1% vs 7.4%). In comparison, the control area (Group C) had the highest rate of no treatment (28.6%). Mothers in this group also used

Technical Literature Update

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drugs in 65.2% of cases overall and in 91.4% of the cases where any treatment was given.

The main problem with applying the conclusions of this study is that providing cereal-based packets presents the same obstacles to programs that providing glucose-ORS packets now poses. It has been difficult for most governments to sustain the provision of ORS packets to every household. For example, the Pakistan CDD program tried to do so, but when faced with the cost of resupply in the second and later years, decided to shift away from packets to a policy stressing home fluids as the first step in the household management of a child with diarrhea. The program in West Java, Indonesia attempted to supply ORS to a network of village-level distributors. There was 1 supplier for 100-150 families. Resupply with packets became very difficult, as the suppliers were reluctant to go long distances to the health center to replenish their supplies. There was no ready mechanism for getting the replacement ORS packets out to them, or even of knowing that they had run out.

What is needed, then, is a further test of rice ORS under field conditions that are more realistic. Until this is done, I am reluctant to conclude that the remarkable results seen are sufficient justification for a policy shift to rice ORS. My reluctance is due first to the difficulties most countries have in paying for and delivering free packets down to the household level. Second, the regular visits of the field workers may have strongly influenced the mothers' behavior in ways difficult to determine. I cannot predict whether the preference for rice ORS and the high treatment rates seen here would hold in a situation where packets were not provided free and where mothers were not expecting to be checked on by a field worker. Nevertheless these are important data, and provide strong field evidence that rice ORS can reduce the duration of diarrhea.

Santosham, M.; Fayad, I.M.; Hashem, M.; et al. "A COMPARISON OF RICE-BASED ORAL REHYDRATION SOLUTION AND 'EARLY FEEDING' FOR THE TREATMENT OF ACUTE DIARRHEA IN INFANTS."
***Journal of Pediatrics*, vol. 116, no. 6, 1990, 868-75.**
Order #3926

Summary

Two hundred infants (3-18 months of age) hospitalized for the treatment of acute, watery diarrhea at Abu El-Reeche Hospital in Cairo, Egypt, were randomly assigned to 1 of 4 groups: G-ORS (glucose ORS) + SF (soy-based, lactose-free formula); G-ORS + RF (rice-based formula); G-ORS + rice (boiled rice); or R-ORS (rice-based ORS) + SF. Severely dehydrated infants from all groups were given intravenous fluids until they could tolerate oral fluids. Rehydration was then completed (in all infants) with the use of G-ORS or R-ORS as assigned. During the maintenance phase, infants were given the appropriate fluids. Those in the R-ORS + SF group continued to receive R-ORS alternated with plain water for the first 24 hours of therapy; no other food was given during that time. In all groups, ongoing stool losses and vomitus continued to be replaced on a 1:1 basis with the appropriate ORS.

During the rehydration phase, differences in stool output were not statistically significant among the 4 groups. During the maintenance phase, however, stool output was significantly higher in the G-ORS + SF group (the control group) than in the other groups for both the first and second 24-hour periods. The R-ORS + SF group had a significantly lower stool output than the control group during the first 24 hours of the maintenance phase and for the total course of illness (by 33%). During the second 24 hours the G-ORS + rice group had a significantly lower stool output than the control. Other than these differences, stool output did not differ *significantly* among the other 3 groups during the first or second 24 hours of the maintenance phase, or during the overall course of illness, although there were some differences. Since the sample size was calculated to show 50% differences, the lack of significant differences in stool output among the other groups should not be overinterpreted since smaller variations would not have been detected.

Total ORS intake was higher in the control group than in the other 3 groups. Mean duration of diarrhea was also significantly longer in the control group ($p=0.02$) than in the G-ORS + RF group.

The authors conclude that feeding of boiled rice or rice formula immediately after rehydration was as effective as treatment with rice ORS alone for 24 hours followed by feeding with soy formula. The authors draw attention to the practical difficulties associated with use of rice ORS in countries where glucose ORS has been the main rehydration policy. They recommend feeding of boiled rice after rehydration in countries where rice is widely available, instead of promoting rice ORS or rice formula. In countries where rice is not available, the

effects of other locally available foods should be investigated.

Editorial Comment

This report provides more information to address the question "Is glucose ORS + rice as effective as rice-based ORS?" A previous study by Molla reported that feeding with rice and chicken along with use of glucose ORS produces results similar to the use of rice ORS. (See "Turning off the Diarrhea: The Role of Food and ORS" in *J. Ped. Gastroent. Nutr.*, vol. 8, 1989, 81-4, reviewed in *TLU* Vol. IV, No. 2, PRITECH Order #2658.) The investigators here used a different preparation of rice than Molla, adding extra water and using a blender to produce a uniform suspension more liquid than ordinary boiled rice. The authors do not mention whether this suspension was thicker than the rice formula they used. The caloric content of the rice was only 17 g of dry rice per 100 ml of final mixture, essentially identical in caloric content to the rice and soy formulas used (67 calories per 100 ml). The viscosity also may have been similar. From the point of view of stimulation of sodium and water absorption, the dilution of cooked rice at this concentration (17 g/100 ml) would have almost no fat, and about two-thirds as much protein and twice as much carbohydrate as the 2 formula preparations. While exclusively breastfed infants were excluded from the study, it is assumed that many of the study infants received breast milk, though this was not mentioned in the report.

While ordinary cooked rice is slow to spoil at tropical room temperatures, a rice preparation such as the one used in the study might readily ferment and hydrolyze in a few hours, especially if diluted with contaminated water. If an inadequately cleaned bottle were used, that process would be speeded. Although liquification may be necessary in infants who have never had solid food, would it not be preferable to use a non-diluted rice preparation in older children, to avoid spoilage?

The report confirms the greater effectiveness of rice-based ORS + soy formula compared to glucose-based ORS + soy formula, in reducing stool output by 33%. Certainly this difference is smaller when adequate feeding is added to glucose ORS, such as the rice preparation used. Yet the data clearly show the greater effectiveness of rice ORS.

The authors question the adoption of rice ORS by diarrhea control programs because of practical considerations, despite this greater efficacy. They raise these questions because they found that "feeding of boiled rice or rice water after rehydration was as efficacious as treatment with R-ORS solution for 24 hours followed by feeding with soy formula." The concerns they raise include:

- the need to cook rice for rice ORS, a problem in part because of the extra work required.;
- difficulties in communication because instructions for cooking/preparing rice ORS would be different than those for preparing/ feeding rice after rehydration;
- the need to discard rice ORS after 12 hours, because of spoilage; and
- difficulties in retraining health care workers and mothers in countries already using glucose ORS.

It appears to me, however, that these issues need further clarification and exploration. First, the rice ORS used in the study did not apparently require cooking, but was prepared in the same fashion as the glucose ORS, by merely adding water to dry ingredients, including a pre-cooked rice powder. Such an "instant" preparation might be as convenient as glucose ORS.

Second, to address the problem of spoilage, rice ORS could be packaged for preparation in 200 ml quantities, as is the standard packaging for ORS in Egypt. Rapid usage of such small amounts might avoid the problem of spoilage completely.

Third, retraining of health workers would be a problem if uncooked rice powder, as in the Molla report discussed above, or ordinary rice were the material used, because of the need for special cooking instruction. However, with a pre-cooked rice powder or instant rice ORS such as that used in this study, the primary requirement for change in instructions would be in the treatment of diarrhea in infants under 3 months, as the efficacy of rice ORS in this group is still unclear. It seems that otherwise the instructions for use would be identical.

So in my opinion, as long as we are talking about an instant rice-ORS preparation packaged in small quantities, the practical difficulties they discuss may not be great and the benefit could be substantial. Their reservations are relevant, however, to a program involving rice powder which needs cooking. Nevertheless, there are other important issues with rice ORS, such as difficulties in manufacturing an instant rice

ORS in some developing countries, and the likelihood that it would cost more. There may be additional technical concerns as yet undocumented (see the summary of Behrens' letter which follows). These considerations may indeed validate the authors' suggestions that diarrheal disease control programs promote ORS plus rice (or the appropriate locally available food).

All of these concerns must be weighed against the potential for much greater acceptance and use of a rice-based ORS product by doctors and mothers. Pending further research, such a product may allow programs and manufacturers to promote rice ORS as a product that will reduce stool output and not just treat dehydration. Because such a product responds to the mother's and the doctor's desire for an "antidiarrheal" effect, use of an instant rice ORS may have the potential for being more sustainable in the long term.

In view of this, should we accept the authors' recommending glucose ORS plus rice or cereal food, aiming for a combined effect similar to that of rice ORS in reducing stool output? The authors state that there was no significant difference in stool output between the R-ORS + SF group and the G-ORS + rice group, although the trend to lower stool output and duration might have reached significance had more patients been studied. The rice ORS showed a 33% reduction in stool output compared to the control, while the glucose ORS + rice showed only a 20.4% reduction. Variations in the rice feedings - a more or less concentrated rice food, rice given continuously, or given at widely-separated "meals" - might show important differences in stool-output reduction. It is possible that rice ORS combined with rice feedings, either dilute, as in this case, or more concentrated, may be even more effective. It is unclear what the result of such variations would be.

I do agree with the authors, however, that glucose ORS + rice or other cereal food is a simple and practical alternative to rice ORS. At least a similar stool reduction effect to that of rice ORS has been demonstrated. This is probably at a lower cost than packets of instant rice ORS. While we are awaiting further studies, diarrheal disease control programs could take the important results of this study and incorporate strong messages to promote the feeding of boiled rice immediately following the rehydration phase of the treatment.

"CEREAL BASED ORAL REHYDRATION THERAPY FOR DIARRHOEA: REPORT OF THE INTERNATIONAL SYMPOSIUM ON CEREAL BASED ORAL REHYDRATION THERAPY." Aga Khan Foundation, Geneva, Switzerland, and International Child Health Foundation, Columbia, Maryland, February 1990, 99p.
Order #3672

Summary

This document outlines the proceedings of the symposium on cereal-based ORT held in November, 1989 in Karachi, Pakistan. The 4 major themes discussed are: (1) biomedical aspects of ORT; (2) integrating ORT and feeding; (3) implementing ORT programs at community and district levels; and (4) strategic planning at the national and global levels. The conclusions and recommendations of the symposium participants are also presented. The report was edited by K. Elliott and K. Attawell of AHRTAG, R. Wilson of the Aga Khan Foundation, N. Hirschhorn of John Snow, Inc., and W. Greenough and Khin-Maung-U of the International Child Health Foundation.

Behrens, R.H.; Tomkins, A.M. "FOOD-BASED ORAL REHYDRATION SALT SOLUTION FOR ACUTE CHILDHOOD DIARRHOEA." *The Lancet*, no. 8667, October 7, 1989, 868-69. (Letter)
Order #3084

Summary

This letter refers to a Molla et al article which provided evidence of the efficacy of cereal-based ORS in rehydration of children 1-5 years of age with acute diarrhea. (See "Food-Based Oral Rehydration Salt Solution for Acute Childhood Diarrhoea" in *The Lancet*, August 19, 1989, 429-31, PRITECH Order #2972.) Behrens and Tomkins assert that the possibly negative, long-term effects of cereal-based carbohydrates need to be considered. They cite studies showing that protein-containing infant feeds may sensitize intestinal mucosa to proteins when given during acute diarrhea, perhaps leading to persistent diarrhea. Long-term follow-up is recommended to determine whether dietary antigen sensitization occurs in children treated with different types of cereal-based ORS.

"FOOD-BASED ORAL REHYDRATION PREPARATIONS." ***WHO Drug Information*****, vol. 3, no. 3, 1989, 124-25.**
Order #3324

Summary

This WHO note cites the basic advantages of cereal-based ORT, and also draws attention to the issue of sensitization of the intestinal mucosa to cereal proteins.

Editorial Comment

The 3 items summarized above represent commentary, not new information. The Karachi meeting on cereal-based ORT (CB-ORT) helped to more clearly define the diversity of opinion and perspectives on CB-ORT, and raised some important issues:

- Would food-based rehydration solutions be confused with weaning foods and lead to poorer feeding during diarrhea?
- Would mothers be willing to make the additional effort to prepare home-made CB-ORT if more convenient packets of ORS, or pills and other drugs, were available as alternatives?
- Should concern for affordability by the poorest families prevent commercial firms from marketing packets of CB-ORS?
- How do efforts to improve the technical aspects of diarrhea treatment affect the self-sufficiency of families and communities in diarrhea management?
- In our concern for providing the best clinical approach to treatment, how can we ensure that treatment will be available to those who need it most?

The document lays out important challenges for the future in this important area.

The letter from Behrens and Tomkins raises an entirely new issue, the possible sensitization of the intestine to the proteins present in rice or other cereals when these are given during acute diarrhea. This would be more likely to occur in younger infants. Such sensitization, if it occurs, could lead to persistence of the diarrhea. The authors quote one study that found that 55% of infants fed soy protein during diarrhea developed evidence of soy protein sensitization, and another that reported a 26% incidence of delayed recovery due to cow's milk protein intolerance in infants fed cow's milk during diarrhea. We must indeed implement monitoring mechanisms to detect such sensitization if and when use of cereal-based ORT becomes widespread.

INTRODUCING OUR GUEST EDITOR:

Dr. Jon Eliot Rohde received his M.D. from Harvard with specialty training in pediatrics. His early research in the late 1960's in Dhaka contributed to the understanding of cholera and the development of oral rehydration therapy for diarrhea. He has long been concerned about the close association between diarrhea and nutrition and has therefore worked to promote understanding of the beneficial role of feeding during and after diarrhea. He has published many articles on the subject.

Dr. Rohde has also been closely involved in the current debate about cereal-based ORT, especially in terms of its possible nutritional effects. In recent years he has participated in several international forums addressing these issues, including the 1989 International Symposium on Cereal-Based ORT at the Aga Khan University in Karachi and a 1990 symposium entitled *Household Management of Diarrhea and Acute Respiratory Infections* at Johns Hopkins University in Baltimore. Dr. Rohde currently works in India as Senior Advisor on health and nutrition to UNICEF.

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, MD
Managing Editor: Lisa Dipko

Vol. VI, Nº4 1991

Rahmathullah, L.; Underwood, B.A.; Thulasiraj, R.D.; et al. "REDUCED MORTALITY AMONG CHILDREN IN SOUTHERN INDIA RECEIVING A SMALL WEEKLY DOSE OF VITAMIN A." *The New England Journal of Medicine*, vol. 323, no. 14, October 4, 1990, 929-35. *Order #4056*

Summary

This study was designed to test conclusions from previous studies that reductions in mortality among children with vitamin A deficiency occurred after the provision of vitamin A supplements. The communities chosen for this study were drought-prone, economically and environmentally deprived areas in southern India. A randomized, placebo-controlled, masked clinical trial was conducted among 15,419 preschool-aged children for 1 year using a cluster-sampling design (206 clusters of 50-100 children each). Community health volunteers delivered weekly vitamin A supplements directly into the mouths of the children, recorded illnesses, and checked for any deaths. Subjects received a dose containing vitamins A and E, while controls received only vitamin E. Each dose of vitamin A was small (8,333 IU) and relatively similar to the amount that would be obtained from levels of food consumption of the vitamin recommended by international groups.

There were no substantial baseline differences in sex, age, xerophthalmia status, serum retinol level, or nutritional status between subjects and controls. Baseline prevalence of xerophthalmia was 11%, and serum retinol levels were ≤0.70 micromol per liter (≤ 20 micrograms per deciliter) in 37% and ≤0.35 micromol per liter in 21%, thus exceeding the WHO criteria for a public health vitamin A deficiency problem. Anthropometric measurements determined that 72% were undernourished. At the initial 6-month and final medical examinations, all children with symptoms of xerophthalmia were treated with a large-dose combination of vitamin A and vitamin E. Study data were analyzed both including and excluding these children. At least 88% of all children were contacted during each of the 52 weeks.

Vitamin A supplementation reduced mortality by 54%; mortality rates were 10.5/1,000 in the control group as compared with 4.8/1,000 in the treatment group. The effect was most pronounced in children under age 3, especially in infants. Treated infants had a mortality rate 28% the rate of control infants. Even when the children receiving the special large-dose treatments were excluded from analysis, these same effects were seen. Among nutritional groups, the effect of treatment with vitamin A was most pronounced and significant in the stunted group. Mortality of treated stunted children

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was 11% that of control stunted children while the reductions seen among wasted, stunted and wasted, and normal children were not statistically significant. Vitamin A protected against death due to diarrhea, convulsions, and other infection-related diseases with statistical significance, and also protected, although not significantly, against measles mortality. The risk of mortality was more greatly reduced among girls than among boys, although not significantly so. The authors conclude that in an area where vitamin A deficiency and chronic undernutrition are common, ensuring a constant consumption of vitamin A equivalent to the recommended dietary allowance enhances children's survival.

Editorial Comment

This issue of the TLU deals with recent data and commentary regarding the potential value of vitamin A supplementation in reducing childhood mortality and morbidity. The subject is exceedingly complex because of a variety of factors:

- the association between vitamin A deficiency and general undernutrition is very close, confounding attempts to ascribe mortality or morbidity specifically to vitamin A status;
- both the demands of delivering the vitamin A to all the study children and the demands of following huge numbers of children reliably for months without losing track of any of them, make this kind of research a very difficult management task for the researchers and field supervisors; and
- the ethical aspects of such studies, which require that children with xerophthalmia or acute infections identified during studies be treated, as well as the potential influence on morbidity and mortality of just being visited by a health worker on a regular basis, lead to concerns about the validity of the morbidity and mortality rates obtained.

As a result, the design and methods used and the effectiveness of performance and supervision during field activities have been more intensely criticized, and the conclusions less accepted, in such vitamin A studies than in almost any other field.

This report from India provides sufficient detail about all these concerns and has convinced me that the authors' conclusions are valid. The area studied had more xerophthalmia, and a wider prevalence of general malnutrition, than did the areas studied by Sommer in previous studies in Indonesia. This seems a reasonable explanation for the greater reduction of mortality resulting from vitamin A supplementation than was seen in those Indonesian studies. The weekly administration of small doses in this study, compared to the very large, widely-spaced doses in the Indonesian studies could have made this approach more effective as well. The fact that no one in the field, including the investigators, knew which clusters were receiving vitamin A and which were receiving only vitamin E avoided the potential for bias present in studies in which one group receives capsules and the other does not. The presence of a simultaneous control group also makes concern about the potential impact of visits on outcome unnecessary, since the comparison is within the study, not with baseline or national data (see the Gopalan paper below); from the report it appears that all persons studied were handled in an identical fashion. The data presented are quite convincing regarding the effectiveness of the field management; doses of supplement were given as planned, and morbidity and mortality data were collected systematically. In addition, the treatment of xerophthalmia cases did not affect the conclusions, since the results were the same even when the treated cases were excluded from analysis. The finding of disease-specific protection against mortality due to diarrhea, convulsions, etc. further strengthens the case. Although protection against measles mortality did not

Technical Literature Update

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reach significance, it seems likely that an increase in the sample size would have allowed clear demonstration of the protective effect of vitamin A against that disease.

Thus I conclude from the study that vitamin A supplementation did reduce mortality in this profoundly deficient and malnourished population. I also conclude that the study supports previous study conclusions that vitamin A deficiency leads to higher mortality among children.

Hussey, G.D.; Klein, M. "A RANDOMIZED, CONTROLLED TRIAL OF VITAMIN A IN CHILDREN WITH SEVERE MEASLES." ***The New England Journal of Medicine*****, vol. 323, July 19, 1990, 160-64.**
Order #3920

Summary

To test the effect of vitamin A therapy on measles-related morbidity and mortality, a randomized, double-blind, placebo-controlled trial was conducted at a regional hospital in Cape Town, South Africa. Patients were 189 children under 13 years of age suffering for <5 days from acute measles which required hospitalization for treatment of associated complications (diarrhea, pneumonia, croup).

Baseline blood samples revealed markedly depressed serum retinol levels (92% were <20 micrograms/deciliter). Children in the group receiving vitamin A (200,000 IU followed by 200,000 IU more a day later) had markedly diminished mortality and morbidity compared to those receiving placebo. Of the 12 children who died, 10 were in the placebo group. In this group, cases of pneumonia lasted almost twice as long, diarrhea continued for a third longer, and postmeasles croup and herpes stomatitis were more common than in the vitamin A group. Sixty-six percent of chronic pneumonia cases and 72% of chronic diarrhea cases were in the placebo group. The hospital stay of the vitamin A group was a third shorter and the overall risk of an adverse outcome was half of that in the control group.

The authors recommend that all children who are seriously ill with measles be given vitamin A at a dose of 400,000 IU. Where resources are scarce, efforts should focus on children under 2 years of age, the group at highest risk.

Editorial Comment

The low serum retinol levels and the dramatic reduction of a range of complications by vitamin A treatment seen in this study seem even more impressive when one considers that vitamin A deficiency was not felt to be a public health problem in the surrounding community. This underlines the fact that measles (similar to some other illnesses) appears to cause acute vitamin A deficiency, at least as manifested by hyporetinemia. The mechanism may be either acute depletion of vitamin A stores or, more likely, failure to mobilize otherwise adequate vitamin A stores.

WHO measles-treatment guidelines suggest limiting use of vitamin A supplements in measles to areas where there is evidence of widespread vitamin A deficiency or where the current fatality rate of measles is 1% or higher. This report suggests strongly that those guidelines should be changed, and vitamin A supplementation given to all children seriously ill with measles, especially those under age 2 who are at highest risk of complications and mortality. The dose used here—400,000 IU—was effective as well as safe, while lower doses—100,000 to 200,000 units—have not been established as efficacious.

This study looked at the effect of vitamin A used as treatment for children already sick with acute infections. Such a study cannot be used as proof that vitamin A, used prophylactically, will reduce the future incidence of infections and death in a population, since the dynamics of vitamin A metabolism might lead to very different short-term versus long-term effects. It can demonstrate, however, that vitamin A affects the course of illness, preventing, for example, complications of measles. Such a study thus does support the concepts upon which community-wide supplementation is based.

Vijayaraghavan, K.; Radhaiah, G.; Prakasam, B.S.; et al. "EFFECT OF MASSIVE DOSE VITAMIN A ON MORBIDITY AND MORTALITY IN INDIAN CHILDREN." ***The Lancet*****, vol. 336, no. 8727, Dec. 1, 1990, 1342-45.**
Order #4277

Summary

From 1987 to 1989, a double-blind, prospective study was done in a rural Indian community to assess the effects of vitamin A supplementation on morbidity and mortality in preschool children (1-5 years). In the treat-

ment area, children were supposed to receive 2 doses of vitamin A (200,000 IU), while children in the control area were to receive 2 doses of placebo. Trained medical officers examined the children for ocular signs of vitamin A deficiency during the baseline survey and at 6-month intervals. Children with corneal xerophthalmia were treated immediately and dropped from the study while children with night blindness or Bitot spots were handled in the same way as normal children. Investigators collected morbidity and mortality data from mothers every 3 months. Anthropometric data were also gathered.

There were 7,691 subjects and 8,084 controls examined in the baseline survey. Night blindness and Bitot spots were present in 6% of all children at baseline. These symptoms were present in 1.3% and 2.9% of all children in vitamin A-treated and placebo-treated areas respectively after vitamin or placebo administration. The planned treatment—2 doses of vitamin A or placebo—reached only 58% and 57% of the subjects and controls respectively; 34% and 32% received only 1 dose, and 8% and 11% received no dose.

Risk of respiratory infection was significantly higher in children with mild xerophthalmia than in those with normal vitamin A status. Diarrheal morbidity was slightly higher in children with xerophthalmia than in those with normal eyes, but the difference was not statistically significant. The relative risk of mortality was 2.27 times higher in children with xerophthalmia than in normals, but this difference was not statistically significant.

Compared with placebo, vitamin A supplementation provided no beneficial effect on morbidity. For mortality determination, data on only 7,076 subjects and 7,006 controls were reported, 92% and 87% respectively of the original groups. Among those children observed, there was no difference in mortality associated with vitamin A supplementation. However, being visited did appear to have an effect on mortality; those who got 2 doses of either vitamin A or placebo had a significantly lower risk of mortality than those who received 1 or no dose. Mortality rates observed in the study area as a whole were also low compared with national averages. Younger children and scheduled tribes had higher mortality rates.

Editorial Comment

If we accept this study at face value, it contradicts the other 2 reports and previous studies by concluding that vitamin A supplementation does not affect morbidity or mortality. I am reluctant to accept these conclusions, however, because of signs in the report that the study was not well performed, and possibly because of the design.

Regarding morbidity, no actual figures on numbers of cases successfully interviewed at the planned 3-month intervals are given. But if we estimate that the rates of contact for those interviews were similar to those for the vitamin A or placebo administration (42%-43% missed doses), and add in the 8% to 13% children lost completely to follow-up, it appears as if the conclusions regarding morbidity may have been drawn from data on as few as 50% or less of the children. In addition, the 3-month interval between scheduled interviews, the fact that only the previous month was to be asked about regarding morbidity, and the known unreliability of memory regarding diarrhea episodes occurring more than 2 weeks from the time of interview, all mean that, at a maximum, morbidity data were being collected for only one-third of the months under study. We also do not know the reliability of these data. In short, it may well be that differences in morbidity were missed because sufficient data were not collected.

Regarding mortality, I find it hard to accept the authors' conclusions when so many children were lost to follow-up. I calculate from the data presented that there were 39 deaths detected in the vitamin A group, and 41 in the placebo group, rates of 5.5 and 5.9 per 1,000 children actually observed. Compare these with the Rahmathullah study discussed above, where from an essentially identical number of children (a total of 15,419 vs. 15,775) there were 117 deaths, 37 in the vitamin A group and 80 in the placebo, 39 more than were detected in this study. Note that in this study, apparently 1,078 children (13%) were lost to follow-up from the placebo group, fully 463 more than the 615 children (8%) lost from the vitamin A group. I believe it is quite possible that there could have been 39 or more deaths among those 1,078 lost children, which would have made the results more like those of the Rahmathullah study. After all, a common reason for being lost to follow-up in such longitudinal studies is death!

I agree with this study's conclusions supporting previous observations that vitamin A deficiency, as manifested by xerophthalmia, does lead to a higher risk of respiratory infection. However, because of the low frequency of morbidity observations and the large number of children apparently lost from the study, I cannot accept the authors' conclusions that there was no effect

of xerophthalmia on diarrheal morbidity and no effect of vitamin A supplementation on morbidity or mortality.

Keusch, G.T. "VITAMIN A SUPPLEMENTS—TOO GOOD NOT TO BE TRUE." (Editorial) *The New England Journal of Medicine*, vol. 323, no. 14, October 4, 1990, 985-87.
Order #4059

Summary

After reviewing the first 2 studies above, the author supports the conclusion that vitamin A supplementation does reduce mortality and urges implementation of vitamin A supplementation programs in 3 situations: populations with vitamin A deficiencies, populations with widespread protein-energy malnutrition, and populations with an excess of measles deaths. He calls upon the international community to support the annual cost of $1.64-$2.20 per recipient for such programs. Future vitamin A research should focus on determining whether vitamin A does affect morbidity from meningitis, as suggested by the decrease in convulsions seen after vitamin A treatment in the Rahmathullah study, and on determining the molecular mechanisms responsible for the beneficial effect of vitamin A in measles.

"VITAMIN A AND MALNUTRITION/INFECTION COMPLEX IN DEVELOPING COUNTRIES." (Editorial) *The Lancet*, vol. 336, no. 8727, Dec. 1, 1990, 1349-1351.
Order #4276

Summary

This editorial reviews previous studies of the relation between vitamin A deficiency and morbidity and mortality from diseases such as diarrhea and measles. Regarding the Vijayaraghavan study, it is noted that the investigators had problems ensuring that the children received the planned doses of vitamin A or placebo. The lower mortality rate among the participators (those who received both of the planned 2 doses) suggests that early treatment of infection or immunization resulting from the field workers' visits may have "muted" the expected impact of vitamin A on mortality. Future research should assess the effects of vitamin A supplementation in communities where xerophthalmia is not common, and also should compare the effectiveness of different strategies to improve vitamin A status; i.e., use of vitamin A capsules versus improving children's dietary intake of the vitamin.

Gopalan, C. "VITAMIN A AND CHILD MORTALITY." *NFI Bulletin*, vol. 11, no. 3, July 1990, 1-3.
Order #4133

Summary

The author suggests that the international interest in studies of morbidity and mortality relative to vitamin A supplementation is primarily stimulated by commercial motives. He rejects the conclusions of earlier studies showing that vitamin A supplementation reduces child mortality, citing as evidence the Vijayaraghavan study reviewed above. He notes that the mortality rates in the study area (5/1,000) were lower than the national average (20/1,000). He attributes this result to the repeated home visits by trained health workers, and suggests that such visits, along with efforts to increase dietary intake of vitamin A from natural food sources, should be the focus of health services, rather than the temporary "crutch" of vitamin A supplementation with capsules. The author supports future research on methods to promote the use of locally available, carotene-rich foods and epidemiological studies relating keratomalacia to dietary carotene intake.

Editorial Comment

These 3 papers illustrate the range of opinion and disagreement in this area, from the strongly enthusiastic editorial of Keusch to the negative comments of Gopalan about vitamin A capsule supplements. It is unfortunate that Gopalan depended so much on the data from the Vijayaraghavan study as the basis for his conclusion that supplementation did not work; the weaknesses of that study have already been discussed. Gopalan's emphasis on improving the consumption of carotene-rich, local foods has the same flaw as his stress on "regular systematic contacts between the communities and middle level health workers." Both depend on having a well-managed system of dedicated health workers making visits to homes and delivering education which then produces changes in behavior. With a few notable exceptions, this has been nearly impossible for developing countries to achieve on a large scale, perhaps because it demands so much of the system and of the health worker. In contrast, the process of delivering vaccinations or vitamin A supplements can be organized more like a military campaign; it does not

require the same responsiveness of the worker. Such campaigns have been successful in many areas at achieving high coverage levels of immunization. The Vijayaraghavan study, however, shows that the delivery process can fail even in a research study, as evidenced by the large proportion of missed doses. How much more difficult to achieve in a large-scale public health system where the effort must be sustained over months and years!!

From a practical perspective, I believe that there is adequate evidence now to support vitamin A capsule supplementation programs in areas with high xerophthalmia rates, such as the study areas used for the 2 field studies, and for patients with measles. This is not to say that vitamin A programs should be mounted everywhere. We do not know whether vitamin A supplementation will reduce overall child mortality or morbidity in areas where clinically evident vitamin A deficiency is not prevalent. Research in such areas is needed.

Research is also needed, as the *Lancet* editorial urges, to ascertain whether efforts to increase the intake of vitamin A-rich foods will be as effective as capsule administration, as Gopalan hopes. I doubt that they will be, but it would be inappropriate to implement only a vitamin A capsule distribution, without any attention to diets. Such studies will require a method for quickly assessing vitamin A dietary intake in the field from interviews. A rapid dietary assessment methodology has, in fact, been developed by Underwood et al and is available from the International Vitamin A Consultative Group. (*Guidelines for the Development of a Simplified Dietary Assessment to Identify Groups at Risk for Inadequate Intake of Vitamin A* can be ordered from the IVACG Secretariat, The Nutrition Foundation, Inc., 1126 17th St., NW, Washington, DC 20036, USA. Single copies are available free of charge to developing countries, and for $3.50 to all others.)

RESPONSE TO READERS' COMMENTS

One of the difficulties of commenting on published articles is that the reports often do not adequately describe the situation under study. Since our reactions, like those of other readers, must be based on what is reported, and we are not in a position to obtain additional information whenever we have negative comments to make, it can be expected that our comments will, at times, be off the mark with regard to the actual situation from which the report was derived.

Drs. Uppal and Mehta, from Chandigarh Postgraduate Institute of Medical Education and Research, were disappointed in our review of their report, "Prescribing for Diarrheal Diseases" (*TLU* Vol.5, No.5), and have kindly provided information in addition to their published report. We had criticized their high rate of drug use and low rate of ORT, presuming that their data represented the range of diarrhea patients seen at their hospital. In fact, they had reported only on the patients seen in their Pediatric Gastroenterology unit which receives a large percentage of complicated diarrhea cases, while General Pediatrics handles the majority of predominately ordinary, mostly ambulatory diarrhea cases.

Many of the patients in the special unit received antibiotics for accompanying infections such as tuberculosis. In addition, nutritional supplements were included as drugs in the authors' enumerations. This made their drug use levels appear to be unusually high but, in fact, did not represent inappropriate drug use for diarrhea. The low rate of ORS use can be attributed to their stress on giving home fluids (dietary fluids) to ambulatory, non-dehydrated patients to maintain ongoing losses. Their letters indicate that they have given substantial attention to limiting the use of IVs and drugs, recognizing the unit's role as a model teaching center.

We lament with the authors the difficulties of communicating complex situations in short articles, and apologize for misunderstandings created by this problem.

Once is not enough... RECYCLE

Special Cholera Issue

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº5 1991

Late in January 1991, cases of voluminous watery diarrhea with vomiting, sometimes including muscle cramping, were investigated in Peru. *Vibrio cholerae* biotype El Tor was isolated from the stool. From the initial outbreak along the Peruvian coast, the epidemic of cholera spread inland, and to a number of other Latin American countries. As of the first of June, 209,546 probable cases had been reported in Peru, with 1,802 reported deaths. Neighboring countries have experienced smaller numbers of cases (20,188 in Ecuador, 1,780 in Columbia, 40 in Chile, 16 in Brazil, and 17 in Mexico) and a few cases have even been reported in the United States (from illegally imported crab meat). In Peru's capital of Lima, many cases were found to be correlated with drinking from the public water system, which was in disrepair, often contaminated by leakage from neighboring sewage pipes, and inadequately chlorinated.

The governments of Peru and the other countries, along with the Pan American Health Organization (PAHO), A.I.D., WHO, and other agencies, mounted an aggressive cholera control and monitoring program. This has succeeded in keeping the overall case-fatality rate in Peru to 0.86%, an entirely appropriate figure, and has limited the number of cases in neighboring countries to substantially less than that in Peru.

During the current Seventh Pandemic, El Tor cholera, despite various efforts to control it, has spread from its origins in Indonesia to countries throughout South Asia, as well as to many places in Africa (e.g. Zambia and the Senegal/Gambia region) which had been free of cholera for years. This recent history suggests that the disease will very likely spread to other countries in the Americas, and may well become endemic in locations where poverty, poor sanitation, and lack of clean water facilitate its survival.

With this in mind, this issue of the *TLU* is devoted to cholera. We have attempted to emphasize the differences between clinical cholera and the "ordinary" diarrheas which are the usual targets of national CDD programs.

Amidst the excitement and fear of a cholera outbreak, it should be stressed that more children die from other causes—from "ordinary" diarrhea—than from cholera. As WHO/CDD has noted, although 120 persons died from cholera in the first 3 weeks of the Peruvian epidemic, during the same time period, 10 to 20 times more Peruvian children—and some 200,000 children globally—died from non-cholera diarrheas, unnoticed by the press or television. Cholera actually presents us with an opportunity to prevent these unnecessary deaths in the future. During the epidemic, public attention to diarrhea and its treatment and prevention will increase dramatically. This attention can be used to generate support for long-term efforts to improve water supplies and sanitation, and to enhance the acceptance of ORT as the best and most effective treatment for all diarrhea.

PRITECH

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World Health Organization/Programme for the Control of Diarrhoeal Disease. "GUIDELINES FOR CHOLERA CONTROL." (Draft) WHO/CDD/SER/80.4 REV.2(1991), Geneva, World Health Organization, 1991.
(This publication should be ordered directly from the World Health Organization: Ave. Appia, 1121 Geneva 27, Switzerland, ATTN: Anna Martinez.)

Summary

Cholera is a diarrheal disease. Most cases are mild "ordinary" diarrheas; only 10% or less are characterized by the large, rapidly-dehydrating stool losses usually associated with the name "cholera." With good treatment in a well-organized health facility, case-fatality rates may be as low as 1%.

The disease is spread principally through water which has been contaminated with feces containing the *Vibrio cholerae* bacteria. Vehicles for such spread may be contaminated water drunk directly, fish or shellfish from contaminated water, vegetables "freshened" with such water, or foods contaminated by infected water or hands, especially when stored and used again.

Long-term preparations for a potential cholera outbreak are, in fact, the regular activities of most national CDD programs:

1) training of health workers in clinical diarrhea case management;
2) education of the public on hygiene, excreta disposal, food handling practices, and safe water supplies;
3) government action to ensure safe disposal of human waste, provide a safe water supply, and improve food safety; and
4) establishment of a surveillance system to detect early cases of excessive watery diarrhea, especially an increase in persons over 10 years of age. Bacteriologic and epidemiologic investigations can then confirm the etiology of the outbreak.

The **early response** to a cholera outbreak consists largely of intensifying these preparatory activities. Organization and logistics become critically important and the following actions are vital:

1) establishing a national coordinating committee;
2) setting up mobile control teams;
3) taking steps to ensure the availability of rehydration supplies, antibiotics, and disinfectants; and
4) establishing treatment centers with adequate supplies and equipment for the potential flood of cases, either in existing facilities, or temporary ones.

The objective is to ensure that treatment is within immediate reach of most patients.

Rehydration and treatment of cholera in health facilities can usually be accomplished with oral rehydration alone (80-90% of cases), although an estimated 10-20% of cases will require initial intravenous fluid administration. Ringers' Lactate Solution is recommended for this; normal saline is less effective, but may be used. After intravenous rehydration, most cholera patients can be maintained using oral rehydration solution (ORS or rice-based ORS). Plain water and food should also be given. Continued breastfeeding should be encouraged.

Antibiotics are useful in cholera to reduce the volume and duration of diarrhea, to shorten the period during which the patient excretes infectious vibrio organisms (to prevent spread), and to reduce the volume of rehydration fluids required. Tetracycline 4 times per day for 3 days, or doxycycline (a single dose) are preferred. Where the *V. cholerae* organisms have become resistant to tetracycline, furazolidone or trimethoprim/sulfamethoxazole may be substituted.

Technical Literature Update

PRITECH is an A.I.D.-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the *TLU*, a bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues.

Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent A.I.D. policies or opinions.

Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

Prevention of spread of the disease in the short term is achieved primarily through education of the community, emphasizing the effectiveness of treatment, the benefits of reporting cases promptly, sources of infection, and ways to avoid becoming infected. More specifically, health education efforts should focus on the proper handling of the deceased, disinfection of patients' clothing and surroundings, proper preparation and storage of food, the importance of handwashing, and correct methods of making drinking water safe (boiling or using chemicals). In the longer term, or in the short term if at all possible, efforts to improve the quality and quantity of water supply and to promote sanitary sewage disposal should be intensified.

Chemoprophylaxis of whole communities with antibiotics has been disappointing in practice, and is not recommended since it not only diverts attention and resources from effective measures, but also can contribute to the emergence of antibiotic resistance. Treatment with antibiotics of members of the household of a cholera patient may be useful in some circumstances, as such persons are more likely to have had contact with cholera bacteria from the patient, or from the same source of the patient's infection (water, food, etc.). Vaccination is not useful and distracts health services and the public from effective means of prevention as well as treatment. Travel and trade restrictions are also not effective and are not recommended.

Early **epidemiologic investigations** (from culture of stool specimens) are essential to confirm that cholera is present and to follow the spread of the epidemic. Case-control studies may help to define how the infection is spreading. Reliable laboratory facilities with special media and antisera are needed to isolate and identify *V. cholerae*, both from patient stools and from environmental sources.

Emergency control measures should lead to the development of long-term efforts. Cholera will be fully controlled only when water supplies, sanitation, and personal hygiene practices are safe enough to prevent its transmission.

Editorial comment

This new revision of WHO's cholera control guidelines provides an excellent overview of the range of activities which are needed to control cholera epidemics, and also includes useful lists, such as what supplies are needed, how to make glucose ORS from raw ingredients, steps to build a pit latrine and to chlorinate water, and common sources of infection in cholera epidemics. In its effort to be brief yet comprehensive, the document does not explore in depth the differences between standard CDD and cholera approaches. Because understanding these important differences is so crucial to successful management of an epidemic, I have outlined them below.

Clinically, cholera is often much more dramatic and more severe than other diarrheas. Ten to twenty percent or more of patients seeking care may have life-threatening, severe dehydration, especially in the early days of an epidemic. The period from onset to severe dehydration and vascular shock in severe cases may be very brief, as few as 2-3 hours, demanding increased concern about getting treatment started as quickly as possible.

Many cholera cases are adults. Therefore, the volumes of fluid needed may be staggering; 4-6 or more liters to rehydrate an adult in shock over 2-4 hours. Since the patient is in shock, oral rehydration is frequently not possible, or too slow, and therefore intravenous rehydration is preferred in such cases.

Rapid referral is of the utmost importance. In cholera, compared with other types of diarrhea, the severe cases are more numerous, seem to deteriorate more rapidly, often appear in adults, and, during an epidemic, all seem to happen at the same time. This means that bringing cholera patients to treatment facilities quickly must be emphasized in the communications messages to the public. Yes, ORT should be begun at home, and pushed hard. But in the severe and therefore potentially fatal cases, family members usually will not be brave enough to give the volumes required, or patients will not be able to drink oral fluids at home fast enough to both rehydrate and keep up with continuing losses. Therefore, rather than emphasizing home therapy, cholera control efforts must focus on setting up treatment facilities close to where cases are occurring, where both the fluids and the people who know how to administer them in the volumes needed are ready for action.

Special emphasis must be placed on techniques for inserting intravenous needles or catheters. This is especially important in children with no blood pressure and invisible veins. Typical CDD clinical training programs do not provide adequate experience in such skills. For example, they may not even mention the possibility of using the femoral vein and a needle held vertically to give a large initial amount of fluid. After this initial procedure, other peripheral veins will become visible. Such extraordinary techniques may become critical to saving lives during a cholera

epidemic when treatment facilities must handle many patients in shock.

Accurate measurement of stool losses is crucial. The large volumes of stool increase the possibility of failing to administer fluid as rapidly as it is being lost, resulting in serious fluid electrolyte deficits. This makes measurement of fluid intake and stool output highly desirable. Fluid requirements normally can be managed on the basis of careful monitoring of pulse, skin turgor, urine output, and the like. However, such a clinical approach is less sensitive at picking up sudden bursts of stooling that are common in cholera. In cholera, therefore, the actual measurement of stool output using a cholera cot with a hole in the mattress and a graduated bucket to collect stool is highly advisable. Where possible, programs should make arrangements to provide such equipment, prepare appropriate forms for recording fluid output and input, and train health workers in their use.

Disinfection is important. The large volumes of stool also demand that supplies of disinfectant and instruction in how to disinfect and dispose of these large volumes of infected material be provided in order to avoid having the hospital or treatment center become a source of infection.

Laboratory facilities and logistics systems must be ready to respond quickly. The need to isolate the bacterium from early patients in each new location demands much more attention to laboratory facilities than is the case in usual CDD efforts. The need to communicate lab results and requests for restocking supplies back and forth quickly demands a more rapid and trustworthy information system than usual, perhaps based on telex, fax, or radio communication rather than paper reports. Programs also must set up special logistics systems both to store the large numbers of intravenous fluid bottles and administration sets needed with the right kind of fluid (Ringer's Lactate, not saline), and to move these and other supplies to the sites of new outbreaks in a hurry.

Antibiotics are essential. CDD programs and training customarily emphasize that antibiotics are not needed, or even useful, in the treatment of the majority of acute diarrheas. With cholera, just the opposite is true: antibiotics typically halve the volume and duration of diarrhea. Thus, they must be provided to treatment centers along with fluid supplies. Note that once the presence of a *V.cholerae* epidemic has been proven by positive stool cultures, it is not necessary to culture all subsequent patients in order to decide whether or not to give antibiotics. WHO recommends that during the course of a proven epidemic, patients presenting with typical symptoms of cholera should be treated as cholera patients without awaiting culture confirmation.

In summary, because of the clinical and epidemiological differences, cholera demands treatment and control efforts which are also different in important ways from those used with the majority of diarrheas. By recognizing and acting upon the differences between cholera and the usual pattern of diarrhea, programs can be successful in keeping mortality from this remarkable disease close to zero.

One note of caution, however. Programs should not focus so much on these differences that they forget that cholera is a diarrheal disease. While the emergency represents a challenge to the entire health care system, it can be an opportunity for the CDD program to attract attention and resources as well as to make advances in the understanding of oral rehydration and appropriate diarrheal management which would not be possible under non-epidemic circumstances. This means that an important effort should be made to prevent cholera control programs from taking on a life of their own as separate, parallel programs. Health ministries need to develop links between their cholera coordinating committees and CDD programs in order to avoid duplication of efforts and to build on existing CDD program resources. The extra support and energy generated by the cholera epidemic should be used to strengthen long-term efforts to control all diarrheal diseases.

Siddique, A.K.; Mutsuddy, P.; Islam, Q.; et al. "MAKESHIFT TREATMENT CENTRE DURING A CHOLERA EPIDEMIC IN BANGLADESH." *Tropical Doctor*, vol. 20, April 1990, 83-85.
Order #3822

Summary

Staff from the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in collaboration with local public health staff and the community, established a temporary cholera treatment facility in a primary school shed. An ICDDR,B physician, a government health inspector, and 3 local health assistants ran the treatment center. Local volunteers (usually relatives of patients) provided nursing care and food, and local village practitioners also assisted in operating the center. WHO standard treatment methods were used in patient assessment and rehydration. Epidemiologic data from government

health assistants visiting households daily were used to assess the role and effectiveness of the temporary center.

The center treated 233 (89%) of the 263 cases of diarrhea reported while it was operating. Forty-eight (21%) of the cases seeking treatment were severely dehydrated according to WHO criteria. Prior to opening the center, only 1 of 94 cases of diarrhea had sought treatment at a health center. Thirteen of those 94 cases died, all at home, after treatment by unqualified village practitioners. Only 1 of the 263 later cases died. The presence of the center reduced the case-fatality rate among cases from 14% before the center to 0.4% during its operation.

Editorial Comment

This report shows dramatically the importance of quick access to care in reducing case fatalities. Although the article does not describe the steps taken to spread information about the center throughout the community, the dramatic increase in consultations (from 1 in 94 to 233 of 263 cases) is clear evidence that families had become aware of its location and the usefulness of its care, and sought it out. The results of this are obvious.

Families of the patients provided nursing care. It is crucial that both clinicians and health authorities understand the importance of actively including the family in caring for the patient. In almost every epidemic situation, small numbers of professional staff just cannot provide the level of involvement with the patient needed to ensure adequate ORS intake, keep IVs running rapidly enough, and help with feeding. I recently heard about a hospital in another country that did not allow the families of cholera patients to stay with them, for fear that the relatives would spread infection outside the hospital. Since they were probably already infected from their contact with the patient, this rule made little sense, and I wonder if the small hospital staff could provide adequate care themselves. I doubt it.

The strategy of involving the local practitioners is a good example of planning for a long-range effect. By their involvement with ORT—their hands-on experience in using it—I am sure they must have become convinced of its usefulness. While patients were ineffectively treated by these unqualified practitioners before the center opened, it is likely that patients will be managed much more effectively, with emphasis on ORT, by those same practitioners in the future.

Alam, A.N.; Alam, N.H.; Ahmed, T.; et al.
"RANDOMISED DOUBLE BLIND TRIAL OF SINGLE DOSE DOXYCYCLINE FOR TREATING CHOLERA IN ADULTS."
***British Medical Journal*, vol. 300, June 23, 1990, 1619-21.**
Order #3991

Summary

A total of 261 patients over 15 years of age and presenting with acute watery diarrhea and stools positive for *V. cholerae* by dark field microscopy were treated with standard rehydration treatment and either a single dose of doxycycline (200 mg or 300 mg) or 8 doses of tetracycline (500 mg 4 times daily for 2 days). Patients receiving the 300 mg dose of doxycycline had stool outputs during the first 24 hours and until diarrhea stopped which were no different than patients receiving tetracycline (first 24 h: 226 ml vs. 242 ml per kg body weight; until diarrhea stopped: 255 ml vs. 254 ml per kg body weight). Patients receiving only 200 mg doxycycline, however, had significantly higher stool outputs (275 ml and 296 ml per kg body weight for first 24 h and until end of diarrhea respectively); they also required more ORS during treatment. Almost equal numbers of patients in all groups required unscheduled intravenous fluids for dehydration which developed during oral maintenance therapy: 10%-12% of patients. More patients in the groups receiving doxycycline, however, had infectious vibrios in their stools at 24, 48, 72, and 96 hours after taking the antibiotic than in the group receiving tetracycline, and more had recurrence of positive cultures after having had a negative one.

Editorial comment

The good news is that the 300 mg dose of doxycycline worked quite well clinically in these adult patients. A single dose would avoid the problems of patients not continuing to take their pills, or taking them incorrectly (for example 12 hours or more between doses instead of 6 hours). It's also cheaper: $0.17 for doxycycline vs. $0.49 for a course of tetracycline, according to this study from Bangladesh.

The bad news is that the vibrios persist longer, or return more often, in patients treated with the single dose. This may have been responsible for the greater stool output and ORS requirement in the low-dose doxycycline group. The presence of these vibrios may pose dangers to the community in that these "treated" patients could still potentially spread cholera to their children or neighbors. An aspect not noted by the

authors is that this would very likely be a more potent stimulus to the development of doxycycline or tetracycline resistance than would the more bacteriologically effective tetracycline given over 2 days.

In addition, for patients being treated in a treatment center, a single-dose drug has little advantage, since the patient will be available for 6-hourly tetracycline administration for at least 1 or 2 days, and longer in more severe cases. Thus this study may be incomplete: the ideal study would include patients with milder cases who are rehydrated for only a few hours at a center and then sent home. Perhaps the lesser degree of dehydration in such mild cases is related to a higher degree of immunity, which would itself shorten the excretion of vibrios. It would be important to include children as well. Since they have less pre-existing immunity to begin with, they might excrete vibrios longer with the single-dose treatment. I would also like to follow the levels of resistance in communities where the single-dose approach was being used, to see if resistance began to develop more rapidly. (None of the patients had resistant organisms in this study.)

My own conclusion is that the doxycycline single-dose approach, although clinically effective, is second best and should continue to be tested. This report does raise the question of the use of either tetracycline or doxycycline in children, because of the dangers of bone and tooth staining. WHO's draft cholera policy (see discussion above) does recommend tetracycline syrup for young children with cholera. The short duration of treatment lessens the likelihood of damage. Given the long, benign experience with tetracycline in children with cholera at ICDDR,B and elsewhere, WHO's recommendation seems reasonable.

Fule, R.P.; Powar, R.M.; Menon, S.; et al. "CHOLERA EPIDEMIC IN SOLAPUR DURING JULY-AUGUST, 1988." *Indian Journal of Medical Research (A)*, vol. 91, January 1990, 24-26.
Order #3490

Summary

During a cholera epidemic in Solapur, India, 233 patients with acute gastroenteritis were studied at a local hospital. Seventy-six of the 77 *Vibrio cholerae* strains isolated from these patients' stool were of the El Tor biotype. These strains were tested for sensitivity to antibiotics using disc diffusion methods. All of the vibrios showed resistance to one or more antibiotics: 43% were resistant to tetracycline, 78% to ampicillin, and 88% to trimethoprim/sulfamethoxazole.

Editorial comment

Ample experience has shown that disc diffusion methods for determining the presence of resistance do not predict reliably the effectiveness of certain antibiotics in the patient. Sulfa testing is particularly inaccurate using the disc technique, making the high level of resistance to trimethoprim/sulfamethoxazole in this sample difficult to interpret.

Nevertheless this report does warn us that resistance of *Vibrio cholerae* to tetracycline and to other antibiotics is on the rise. Data from Latin America indicate a substantial amount of tetracycline resistance in isolates in that epidemic as well. The operational implication is that sensitivity testing must be done during early investigation of cholera epidemics, and samples should be monitored later for the emergence or increase of resistance.

Clemens, J.D.; Sack, D.A.; Harris. J.R.; et al. "BREAST FEEDING AND THE RISK OF SEVERE CHOLERA IN RURAL BANGLADESHI CHILDREN." *American Journal of Epidemiology*, vol. 131, no. 3, 1990, 400-11.
Order #3452

Summary

During a field trial of killed oral cholera vaccines, rural Bangladeshi children under 36 months of age were studied using a case-control method. Each of 116 cases treated for severe cholera was matched with 4 age-matched community controls (total 464) who did not have severe cholera. The analysis showed a 70% reduction in the risk of severe cholera among breastfed children (odds ratio 0.30, $p<0.0001$). The protective effect was stronger among families who lived next to a river than for families who did not (odds ratios 0.16 vs. 0.26, both significant), for families who had a tubewell in the compound compared to those who did not (odds ratios 0.18 vs. 0.38, both significant), and for families without a latrine compared to those with one in the compound (odds ratios 0.39, $p<0.001$ vs. 0.49, $p=0.67$), although the differences between these odds ratios were not significant.

Receipt of a cholera vaccine by the mother appeared to reduce the risk of severe cholera by 47%, although this was barely statistically significant ($p=0.57$). Breastfeeding plus vaccine in the mother was

associated with a slightly greater reduction in severe cholera than breastfeeding plus placebo (74% reduction vs. 63% reduction), although again the difference in odds ratios was not quite significant (p=0.57). The results indicate that breastfeeding was associated with reduced risk of severe cholera among children under 36 months of age.

Editorial comment

This study suggests strongly that breastfeeding protects against severe cholera, although careful analysis demands that we limit our conclusions to noting the association between these 2 factors, not their causal linkage. As the authors discuss in great detail, a number of related factors could, in fact, be responsible for the observed association, rather than antibodies in the breast milk, decreased contact with contaminated water, or the other mechanisms by which breastfeeding may protect a child from cholera. We must also be careful *not* to conclude that breastfeeding differentially reduces severe cholera as compared to mild or asymptomatic cholera. In a case control study which begins with treated cases of severe cholera, no conclusions are possible about protection against lesser degrees of illness.

I include this article here because it represents an example of how programs can use a cholera epidemic to dramatize and reinforce messages related to general diarrhea control. By starting with information specific to cholera, a health program could emphasize the protective effect of breastfeeding against cholera and then expand the message to other diarrheas and even to other infections such as ARI. Cholera serves to get the public's attention, to make them more open to such ideas. What remains is for the program's communications activities to take advantage of that opportunity.

Clemens, J.D.; Van Loon, F.; Sack, D.A.; et al. "BIOTYPE AS DETERMINANT OF NATURAL IMMUNISING EFFECT OF CHOLERA." *The Lancet*, vol. 337, no. 8746, April 13, 1991, 883-84.
Order #4778

Summary

"To test the hypothesis that clinical *Vibrio cholerae* 01 infections protect against recurrent cholera, treated cholera episodes in a rural Bangladesh population of 188,153 people who were followed between 1985 and 1988 were analyzed. Of the 2214 people with initial episodes of cholera, 7 had a second episode. The incidence of cholera was 61% lower in subjects who had had an earlier episode than in those without such an episode. Whereas initial episodes of classical cholera were associated with complete protection against subsequent cholera, initial episodes of El Tor cholera were associated with negligible protection." [Published Abstract]

Editorial comment

This very interesting report suggests that El Tor and classical cholera infections differ substantially in some aspect associated with stimulation or response of the intestinal immune system. The study used treated cholera episodes only, thus avoiding the possible concern that a very mild case or a subclinical infection may not provide an adequate immunogenic stimulation. The study's puzzling finding should draw our attention to more detailed exploration of the immunogenicity of various *V. cholerae* antigens in interaction with intestinal immune responses. It should also, as noted by the authors, enhance our caution in selecting and assessing various strains of *V. cholerae* as candidates for oral vaccine.

Clemens, J.D.; Sack, D.A.; Harris, J.R.; et al. "FIELD TRIAL OF ORAL CHOLERA VACCINES IN BANGLADESH: RESULTS FROM THREE-YEAR FOLLOW-UP." *The Lancet*, vol. 335, February 3, 1990, 270-73.
Order #3360

Summary

"The protective efficacy (PE) of B subunit killed whole-cell (BS-WC) and killed whole-cell-only (WC) oral cholera vaccines was assessed in a randomised double-blind field trial among children aged 2-15 years and women over 15 years in rural Bangladesh. Among the 62,285 subjects who received three doses of BS-WC, WC, or *Escherichia coli* K12 strain placebo, cumulative PE at 3 years of follow-up was 50% for BS-WC and 52% for WC. PE was similar against severe and non-severe cholera, but was significantly lower in children who were vaccinated at 2-5 years (26% for BS-WC; 23% for WC) than in older persons (63% for BS-WC; 68% for WC). Among persons vaccinated at 2-5 years, protection at 4-6 months of follow-up was similar to that for older persons, but rapidly waned thereafter and was not evident during the third year of follow-up. In contrast, persons vaccinated at older ages were protected even in the third year of follow-up (PE 40% for BS-WC; 62% for WC). PE was

substantially higher against classical cholera (58% for BS-WC; 60% for WC) than against El Tor cholera (39% and 40%)." [Published Abstract]

Holmgren, J.; Clemens, J.; Sack, D.A.; et al. "ORAL IMMUNIZATION AGAINST CHOLERA." *Current Topics in Microbiology and Immunology*, vol. 146, 1989, 197-204.
Order #3959

Summary

A review of the efforts to develop an oral vaccine against cholera, focusing on the B-subunit killed whole-cell vaccine (BS-WC) tested in Bangladesh, describes the protective effect of the vaccine against both cholera (see above summary) and enterotoxigenic *E.coli* (ETEC) diarrhea. During the first 3 months of follow-up, a greater protective effect was observed against severe ETEC diarrhea than against less severe illness caused by the same organism (86% vs. 54%). Data indicated that use of the BS-WC vaccine led to a reduction in overall morbidity from diarrheal disease: 26% fewer visits during the first year for treatment of diarrhea, 48% fewer visits for severely-dehydrating, life-threatening diarrhea. In the group receiving only the whole cell vaccine without the B-subunit of the cholera toxin (WC vaccine), reductions in visits were smaller (22% and 32%, respectively).

There was also a reduction in overall mortality among women over 15 years of age, 45% and 33% during the first year in those receiving BS-WC and WC vaccines, respectively. This effect was particularly evident during the cholera epidemic season, when mortality rates in the placebo group increased three-fold, with the cause of death being non-dysenteric diarrhea as determined by "verbal autopsy."

The major barrier to widespread availability and use of the BS-WC vaccine has been the sophisticated and intricate procedure required to produce large amounts of the B-subunit from cholera toxin. By using genetic recombination, the production of the B-subunit has been enhanced dramatically (50-100 times), making possible a simplified procedure for vaccine manufacture using classical biotype organisms.

Editorial comment

The bottom line on vaccines is that at present we have no vaccine ready for use in dealing with cholera epidemics, either oral or injectable.

However, these reports, all of which refer to the same, large-scale field trial in Bangladesh, keep me enthusiastic about the possibilities of developing an effective vaccine in the not-too-distant future. The poor past performance of injected cholera vaccines, and their failure to stimulate effective intestinal immunity, have encouraged investigators to explore the oral route, the same route used by the natural infection. Candidate vaccines using attenuated ("tamed") live organisms have unfortunately caused diarrhea themselves, shifting attention to killed oral vaccines. The Clemens et al report (#4778) on biotype differences in stimulation of natural immunity after infection provides a note of concern that this approach may not be easy.

The Clemens et al 3-year follow-up report (#3360) indicates that 3 doses of vaccine provided substantial protection for 3 years in persons over 5 years of age. For those under 5, protection was similar during the first 6 months, but then fell to 31% for WC vaccine and 38% for BS-WC vaccine for the first year as a whole. Protection for those over 5 was 67% and 78% respectively. By the third year, neither vaccine provided any protection for the under-5 group. This makes the vaccine *as used* (3 doses given at 6-week intervals) not cost-effective for the group with the highest incidence of cholera, those under 5. Perhaps, the authors offer, later booster doses could maintain the original acceptable levels of immunity. Could the system provide, in a cost-effective manner, boosters at 3- to 6-month intervals? Would one booster work? Would multiple booster doses substantially improve the response? The complexity and cost of obtaining the answers to these and many other potentially important questions is what makes progress in this area so slow.

The detail most immediately applicable to the control of cholera epidemics is the remarkable reduction in mortality among women over 15 given either of the oral vaccines, as noted in the Holmgren report. What shocked me was that so many women died of watery diarrhea/cholera in the placebo group, not that the vaccine was protective. Matlab, the location of the trial, is the birthplace of ORT, and has had effective facilities for treatment of cholera in place for years. That large numbers of women in the area did not seek care when they were struck by cholera, but instead died at home, tells us how important it is to encourage people to respond quickly to the onset of cholera by taking the patient to an appropriate treatment center, as well as starting ORT at home. Stimulating such rapid referral through aggressive communication efforts should be a major priority of cholera control efforts.

Technical Literature Update on DIARRHEA

Guest Editor: Sandra L. Huffman, Sc.D.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº6 1991

Hogan, R. and Martinez, J. "BREASTFEEDING AS AN INTERVENTION WITHIN DIARRHEAL DISEASES CONTROL PROGRAMS: WHO/CDD ACTIVITIES." ***International Journal of Gynecology and Obstetrics*, vol. 31, suppl. 1, 1990, 115-19.**
Order #3760

Summary

The World Health Organization's Control of Diarrhoeal Diseases Programme (WHO/CDD) encourages country CDD programs to place their primary emphasis on efforts to assure good diarrheal case management, particularly the prevention and management of diarrhea-induced dehydration, the promotion of continued feeding, and the use of antibiotic therapy for dysentery and cholera. These 3 aspects of case management are the most rapid and effective means of reducing mortality from diarrheal episodes. Prevention of diarrhea, although less dramatic than case management and requiring a longer time to implement and demonstrate an effect, is an important second objective of the Programme. The promotion of breastfeeding has been shown to be one of the most effective preventive interventions against both diarrheal morbidity and mortality.

A review of published research shows that exclusively breastfed infants are at lower risk of becoming ill with diarrhea than partially breastfed infants, and those who are partially breastfed are at lower risk than those who are not breastfed. When infants receiving no breast milk are compared with exclusively breastfed infants, median risk of diarrhea is 3.4-4.9 times greater in non-breastfed infants in the first few months of life. Breastfeeding also reduces the severity of diarrheal illness and can lower the risk of death from diarrhea. Risk of death from diarrhea among exclusively breastfed infants is a median of 25 times lower than among those who receive no breast milk.

From the Technical Editor:

As CDD programs have become increasingly successful in improving the treatment of diarrhea in their countries, many have begun to seek effective interventions to prevent diarrhea. Most preventive strategies are the responsibility of programs other than CDD; the Expanded Program on Immunization (EPI) is responsible for measles immunization in most countries, and the Public Works Ministry may be primarily responsible for safe water supply and sanitation. Breastfeeding promotion, however, is emerging as a preventive strategy in which CDD programs should themselves take an aggressive role.

This issue of the *TLU* is devoted to breastfeeding and breastfeeding promotion programs. We are fortunate to have as Guest Editor for the issue Dr. Sandra Huffman, President of the Center to Prevent Childhood Malnutrition in Bethesda, Maryland, and a leading expert in breastfeeding issues.

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The review found that breastfeeding-promotion efforts usually consist of 3 elements: changing hospital routines around the time of birth, giving information to mothers, and giving support to mothers during initiation and maintenance of breastfeeding. The calculated impact of such promotion is an 8%-20% reduction in diarrheal morbidity, and a 24%-27% reduction in mortality in the first 6 months of life.

In 1987, WHO/CDD revised both of its management training programs, one for national program managers and senior staff (CDD Programme Managers Course), and the other for middle-level and first-line supervisors (Supervisory Skills Course). Through a separate diarrheal prevention module, students learn the specifics of breastfeeding promotion activities. The courses specify what mothers should do (e.g. breastfeed exclusively for the first 4-6 months, start as soon as possible after delivery, breastfeed on demand, etc.). They suggest that CDD programs find out what families are currently doing by using simple investigative methods, then select specific promotional activities based on what is learned.

The diarrheal prevention module also makes specific recommendations about what health workers should and should not do when attending a birth, prescribing drugs for the mother, or helping mothers who are having difficulty breastfeeding. WHO/CDD expects that in addition to emphasis on training, it will be desirable to make a major investment in communications related to breastfeeding.

In 1988, WHO/CDD identified 2 areas for further breastfeeding research: 1) trials of hospital and community-based interventions that aim to promote exclusive breastfeeding in the first 4-6 months of life, and 2) evaluation of approaches for implementing tested breastfeeding promotion interventions within national CDD programs.

Editorial Comment

Despite its emphasis on diarrheal case management, the WHO/CDD program has played a major role in supporting breastfeeding promotion as a means to reduce both diarrheal incidence and mortality in infants. This is certainly appropriate, as the impact of exclusive breastfeeding on both morbidity and mortality is remarkable.

Unfortunately, the policies and practices of CDD programs can sometimes inhibit a woman's ability or desire to breastfeed. Programs should assure that these unintentional obstacles to, or discouragement of, breastfeeding are removed. For example:

- Sometimes mothers are not allowed to remain with their children who have been hospitalized for diarrhea. This means that breastfeeding cannot take place, perhaps for many hours, which may reduce subsequent milk output or even prevent effective resumption of breastfeeding. Programs must determine whether hospitals are barring breastfeeding mothers from diarrheal wards, and urge change if they are.

- Using baby bottles in hospitals or health facilities sets a bad example. Their use should be eliminated in ORT corners, DTUs, and pediatric wards, and ORS should be given with a cup and spoon, never a bottle.

- Health workers treating infants for diarrhea should always ask how the infant is being fed, although this opportunity is sometimes missed. If the mother is breastfeeding, but not exclusively, she should be encouraged to breastfeed her infant exclusively throughout the first 4-6 months of life. If milk insufficiency is given as a reason for adding food or other liquids to a child's diet, health workers should recommend a return to exclusive breastfeeding along with an increase in the frequency of breastfeeding, since suckling frequency is the major determinant of breast milk output. All breastfeeding mothers should be encouraged to continue breastfeeding through at least the first 2 years of life.

Health workers concerned with diarrhea who work in hospitals should try to improve maternity practices in their own institutions, so that breastfeeding is supported among all

Technical Literature Update

PRITECH is an A.I.D.-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the *TLU*, a bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues.

Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent A.I.D. policies or opinions.

Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

postpartum women. Research is also needed to determine the proper role of home fluids for diarrheal treatment in exclusively breastfed infants, especially in those countries which promote the use of cereal-based solutions. Some country policies recommend simply continuing to breastfeed exclusively if an exclusively breastfed child becomes ill with diarrhea. Others, in contrast, suggest the use of ORS once diarrhea starts. Certainly once the child becomes dehydrated, immediate use of ORS is essential. Before that happens, however, what should we recommend?

The following article further illustrates the benefits of breastfeeding in preventing diarrhea. The subsequent 3 articles discuss interventions to increase breastfeeding and how they were evaluated.

Popkin, B.M.; Adair, L.; Akin, J.S.; et al.
"BREAST-FEEDING AND DIARRHEAL MORBIDITY."
***Pediatrics*, vol. 86, no. 6, 1990, 874-82.**
Order #4480

Summary

To determine the effect of breastfeeding on diarrheal morbidity, researchers followed 3,080 mother-infant pairs in 17 urban and 16 rural communities in Cebu, Philippines. Data were obtained in 3 ways: baseline surveys of the mothers at the sixth or seventh month of pregnancy, a questionnaire and measurements taken at birth, and longitudinal household surveys carried out bi-monthly. Diarrheal morbidity was determined by asking mothers whether their infants had had a diarrheal episode in the prior 7 days. They were also questioned about breastfeeding patterns and what foods and liquids they had given their infants on the day preceding the interview and on the seventh day before the interview.

Percent of Infants with Diarrhea Within 7 days Preceding Survey

Age	% With Diarrhea
2 mo	7
4 mo	12
6 mo	20
8 mo	24
10 mo	24
12 mo	23

Infants were grouped into 4 feeding categories based on feeding practices 7 days prior to the survey:

1) exclusive breastfeeding,
2) breastfeeding + non-nutritive liquids (tea, water; 95% of the time it was water),
3) breastfeeding + nutritive liquids (juice, milk) or foods, or
4) no breastfeeding.

At the age of 2 months, only 31.1% of infants were exclusively breastfed, and by 8 months, essentially all breastfed infants received some sort of supplement. Rural infants were exclusively breastfed for longer durations than urban infants and had longer durations of any breastfeeding. Rates of diarrhea were quite high: 60% percent of infants experienced at least 1 diarrheal episode during the first year of life.

The investigators analyzed the data using longitudinal multivariate analyses to control for factors other than feeding practices that may influence the incidence of diarrhea. These include water quality, use of soap, food hygiene, excreta disposal practices, and presence of animals in or under the house. The results showed that during the first 6 months of life, exclusively breastfed infants had the lowest risk of diarrhea, up to 17.3 times lower than the other groups. Among 6-month old urban infants, the risk of diarrhea was 3.2 times higher in the breastfed + non-nutritive liquids group, 10.6 times higher in the breastfed + nutritive liquids or foods group, and 13.5 times higher in the non-breastfed group than in the exclusively breastfed group. For the rural group of infants, the differences were smaller. Risk of diarrhea was 2.2 times, 4.7 times, and 4.7 times higher, respectively, for the 3 feeding groups. The protective effect of breastfeeding was less pronounced after 8 months of age.

Editorial Comment

This study provides strong evidence of the positive impact of breastfeeding on the prevention of diarrhea among infants. The importance of this impact can be seen from the high rate of diarrhea that occurred among non-breastfed infants. As reported by the authors, during any week, between one-fifth and one-third of infants who were not breastfed had diarrhea.

The results here support the results of a study by Brown et al (*Pediatrics*, vol. 83, no. 1, 1989, 31-40) in Lima, Peru which also showed a positive association between the addition of even non-nutritive waters and teas and increased risk of diarrhea during the first 6 months of life. An especially interesting finding in this study from the Philippines was the higher relative risk of diarrhea for infants in urban compared to rural areas, suggesting that the poor urban environment is especially dangerous for children, both because of poor environmental conditions and lowered rates of breastfeeding.

Breastfeeding Patterns by Age

Age	Breastfeeding pattern(%)			
	Excl BF	BF+Non-nutr liq	BF+Nutr	No BF
2mo	31.1	18.9	34.4	15.7
4 mo	20.1	19.0	40.4	20.3
6 mo	3.2	5.1	65.6	24.0
8 mo	0.2	0.9	71.4	27.5
10 mo	0.1	0.5	67.7	31.7
12 mo	0.1	0.1	61.8	38.0

Another insight provided by this study is the need to define breastfeeding practices clearly. The investigators found that infants may move in and out of exclusive breastfeeding. Foods may be added at one point, and then later the infant may be exclusively breastfed again. For example, 5.3% of urban and 3.6% of rural infants were supplemented at 2 months, but returned to exclusive breastfeeding at 4 months. This should encourage health workers to ask about current feeding practices and to strongly recommend a return to exclusive breastfeeding for infants less than 4-6 months of age.

Rea, M.F. and Berquó, E.S. "IMPACT OF THE BRAZILIAN NATIONAL BREAST-FEEDING PROGRAMME ON MOTHERS IN GREATER SAO PAULO." ***Bulletin of the World Health Organization*****, vol. 68, no. 3, 1990, 365-71.**
Order #4089

Rea, M.F. "THE BRAZILIAN NATIONAL BREASTFEEDING PROGRAM: A SUCCESS STORY." ***International Journal of Gynecology and Obstetrics*****, vol. 31, suppl. 1, 1990, 79-82.**
Order #3788

Summary

Faced with the alarmingly low weaning age of only 3 months in many urban areas, the Brazilian Ministry of Health and the local UNICEF office launched a breastfeeding promotion program in 1981 to try to increase the incidence and duration of breastfeeding. The program relied heavily on mass media campaigns (radio, television, and print media) and other strategies, including:

1) training health professionals,
2) encouraging research,
3) training primary school and literacy teachers,
4) convincing administrators to facilitate rooming-in and other institutional changes,
5) creating a Brazilian Code of Marketing of Breast-Milk Substitutes,
6) implementing supportive labor laws to protect working mothers, and
7) forming mothers' self-help groups.

An evaluation of the program compared 1981 breastfeeding statistics from both the greater São Paulo and the Recife Metropolitan areas with statistics gathered from these areas by similar procedures in 1987/1988, after implementation of the program. In the later study, information was gathered from mothers with infants aged 0-12 months attending health services that covered all economic brackets. A recall questionnaire was used to determine the breastfeeding status of all children born to these mothers since the start of the program in 1981.

The first article reports in some detail the results from São Paulo, while the second summarizes the results from both cities. Analyses of breastfeeding rates were based on current status information for infants 0-8 months of age included in the baseline survey (1981) and for infants 0-8 months of age in 1987/88. Additional analyses were conducted based on the past breastfeeding experiences for mothers interviewed in 1987/88 for their preceding infants born in the years since 1981.

Since the intensity of the breastfeeding campaign varied, 4 separate "waves" were identified:

1) 1981-82: Campaign organized by Ministry of Health.
2) 1982-83: Campaign organized by MOH and UNICEF.
3) 1984: No systematic airing of any breastfeeding promotional material but reinforcement of other activities.
4) 1985-86: No nationwide coordination of the program.

The proportion of mothers who initiated breastfeeding increased from 91.3% in 1981 to 94.7% in 1987/88 in São Paulo and from 88.0% to 93.8% in Recife. The prevalence of breastfeeding among children 0-8 months rose from 41.2% to 63.0% in São Paulo and from 32.2% to 51.0% in Recife. (Information about age distribution in these groups of infants was not provided in the reports.) Among São Paulo mothers, the average duration of breastfeeding increased from 3.0 months in 1981 to 4.3 months in 1987/88, among Recife mothers from 2.2 to 3.5 months. The average period of exclusive breastfeeding (supplemented by only tea, water, or juice) increased from 1.4 to 2.2 months in São Paulo, and from 0.5 to 1.1 months in Recife.

The proportion of mothers' previous children identified in the 1987/88 interview in São Paulo who were breastfed for more than 6 months was 24.4% for those born in 1981, compared to 37.7% in 1984, followed by a decrease to 27.6% in 1985-86. The proportion of infants breastfed for more than 3 months also followed this same pattern, going from 38.5% in 1981, to 60.6% in 1984, and falling to 46% in 1985-86. The authors discuss various reasons for the greater success of the program during the second and third "waves" of the campaign. These include stricter controls on advertising by infant food manufacturers, better coverage of breastfeeding in medical school curricula, and implementation of rooming-in policies.

The second article discusses the broad range of promotional activities in greater detail. The integrated approach of the national program is credited for much of its success. The author calls for further studies to determine the influence of the increases in breastfeeding on infant mortality during the same time period. Preliminary results from São Paulo are promising in this regard. Both reviews conclude that the program was successful in improving breastfeeding practices.

Editorial Comment

Brazil is one of the largest developing countries to develop an intensive breastfeeding promotion program with integrated activities throughout the country. Note particularly that the breastfeeding promotion program was an independent program. This programmatic focus on breastfeeding promotion was critically important to the success of the program, by permitting the effective integration of a broad range of activities.

The situation in Brazil at the onset of the program was similar to that in most developing countries: the initiation of breastfeeding is high, but the duration (especially of exclusive breastfeeding) is too low and declining. These papers offer hope that not only can the trends toward decreased duration of breastfeeding be stopped, but that they can actually be reversed through program interventions.

Given the amount of effort that went into the program, it is surprising that little funding was provided for a systematic monitoring and evaluation of program activities. These 2 papers are excellent attempts, with limited resources, to assess the impact of the program in 2 cities in Brazil.

The results indicate an increase in the mean duration of breastfeeding by about 1 month in both cities. While this result is encouraging, one might have expected a greater impact given all the integrated interventions that were going on. This raises questions about the actual activities conducted by the program and about the evaluation design. It would have been extremely helpful both for program purposes and evaluation reasons to have had ongoing monitoring of activities in the same sites as the evaluation. This would have allowed an assessment of changes if, in fact, they did occur.

For example, it would be helpful to know about the hospital practices where women in the study delivered in 1981 and 1987/88 to see if there were any changes. Information on frequency of viewing of the media campaign and interpretation of the messages seen would also strengthen the evaluation. Whether mothers who were interviewed had participated in mothers' support groups or whether they received any information on breastfeeding from local clinics is also important. Such information would be useful for the program managers who, for example, could have reinforced activities that were not reaching their intended audiences and could use the information to make better sense of evaluation results.

The evaluation technique of comparing breastfeeding patterns for all the births occurring to women interviewed at one point (in this study, in 1987/88) is an innovative means of collecting retrospective data where no prospective data are available. However, because of the biases involved with such data (recall information of breastfeeding may be less reliable for earlier births, women with more births during the interval are by definition more likely to have short durations of breastfeeding), this technique is less than optimal for evaluating activities. Thus, this points to the need to ensure that any programs include evaluation designs from the onset.

Canahuati, J. "ONE COUNTRY'S STORY: THE PROALMA PROGRAM IN HONDURAS." ***International Journal of Gynecology and Obstetrics*****, vol. 31, suppl. 1, 1990, 17-24.**
Order #3779

Summary

PROALMA was a pilot project developed from an inter-institutional agreement among the Honduran Ministry of

Health, the Social Security Institute (IHSS), the National Welfare Board, and the U.S. Agency for International Development. During the Project's first 2-year phase, which was conducted in 3 hospitals and the country's largest health center, over 1,500 health workers were trained in how to support breastfeeding. Essential features of the program included a coordinating committee, establishment of hospital norms, postpartum education for mothers, 24-hour rooming-in, suppression of routine bottlefeeding, milk banks for premature or sick infants, and direct assistance to mothers with breastfeeding problems. Evaluations of the project reported increases in the duration of breastfeeding as a result of the intervention.

In the second 2-year phase, the program was expanded to give technical back-up to all of the health regions. In the original pilot hospitals, second-phase goals included extending the model to the community and increasing the technical expertise of hospital staff. In San Pedro Sula, one of the original pilot hospitals, staff identified several areas needing improvement despite the progress made in breastfeeding promotion. The problems were:

1) little integration of breastfeeding education into hospital routines,
2) lack of focus on breastfeeding and family planning issues in educational messages,
3) lack of up-to-date information on breastfeeding management among staff,
4) early introduction of other fluids and early discontinuation of breastfeeding in infants, and
5) little effective use of family planning methods and unavailability of temporary family planning methods acceptable to breastfeeding mothers.

An operational research project was developed to tackle the breastfeeding-education and family-planning promotion problems. Flipcharts and a special pamphlet were prepared for prenatal and postnatal talks with mothers given by specially trained professionals or auxiliary nurses. Staff nurses helped prepare the educational materials and supervised the talks. Both a Family Planning Clinic and a Breastfeeding Clinic were established as part of the intervention. At discharge, mothers were given literature which reinforced the messages given in the talks, a sample of family planning materials (10 condoms and either contraceptive foam or tablets), and appointments at 8 days postpartum for the Breastfeeding Clinic and at 6 weeks for the Family Planning Clinic.

A knowledge, attitudes, and practices survey was administered to all health personnel at San Pedro Sula before the intervention. Based on the needs detected in the survey, a retraining course was developed and training was given to over 225 doctors, nurses, and allied health workers. The course emphasized practical aspects of breastfeeding promotion such as correct positioning of the newborn, the importance of frequent feeds to increase milk output, the negative effect of adding water to the newborn's diet, and how to give an educational talk. In the special course for physicians, emphasis was placed on the physiology of lactation, the interaction between medications and lactation, and the impact of breastfeeding on fertility and infant health, all needs detected in the survey.

Comparison between a pre-intervention control group and a post-intervention group of mothers showed the positive effects of the new interventions. Results included an increase in the proportion of women exclusively breastfeeding for more than 3 months from 13.9% to 23.1%, in the proportion of women breastfeeding at 6 months from 58.3% to 73.4%, and in the use-rate of effective family planning methods at 6 months postpartum from 54.0% to 67.8%. Aside from these beneficial impacts, the project helped to focus attention within the hospital on improved quality of care and integrated service delivery.

Editorial Comment

In phase one at San Pedro Sula, major improvements were made in hospital policies and practices that led to improvements in breastfeeding indicators. This study illustrates the important lesson that even after a successful intervention, additional effort is usually needed to institutionalize changes. Prior to the second phase, there had been an ad hoc breastfeeding clinic that had seen patients on demand or on referral from the growth and development clinic, usually after bottlefeeding had already been firmly established. The second intervention helped to formalize the clinic, establish it as a medical specialty clinic, and make scheduling of a follow-up postpartum visit to the clinic a routine procedure. As with formal ORT units in hospitals, the status associated with formalizing the Breastfeeding Clinic and providing services at a more appropriate time (early in the postpartum period) can make a major difference.

Another important lesson is the important of integrating service-delivery activities, even if services are provided at different sites. While the initial plan was to have one clinic providing both breastfeeding consultation and family planning services, logistical problems necessitated 2 different clinics. Because training of workers was consistent, similar information was provided to mothers, and referrals were facilitated. Similar integration of activities is possible for breastfeeding promotion activities within child health programs such as CDD.

Once is not enough... RECYCLE

Theme: Traditional Healers

Technical Literature Update on DIARRHEA

Guest Editor: Elizabeth Herman, M.D., M.P.H.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VII, Nº1 1992

Anokbonggo, W.W.; Odoi-Adome, R.; Oluju, P.M. "TRADITIONAL METHODS IN MANAGEMENT OF DIARRHOEAL DISEASES IN UGANDA," ***Bulletin of the World Health Organization*****, vol. 68, no. 3, 1990, 359-63.**
Order #3993

Summary

A total of 292 traditional healers from five representative districts of Uganda were interviewed to learn about their personal profiles, work routines, and management of diarrheal cases. There were at least two healers in each village. Treatment of diarrhea accounted for 43% of the healers' case loads. Overall, 42% of healers were women and 64.4% had been in practice for over 10 years. Excluding traditional birth attendants, 14 distinct categories of healers were identified. Cases of diarrhea were usually handled by herbalists and spiritualists.

Diarrhea was treated with oral administrations of herbal extracts for which water was the main vehicle. Healers recognized the importance of supplementary fluids: 70.5% recommended that patients drink as much fluid as possible and only 3.1% either limited or did not advise fluid intake. While 52% of healers recommended plain water, other fluids were also suggested, such as sugar and salt solutions (17.2%). Continued food intake was also encouraged, with 73.6% of healers placing no restrictions on food.

The most commonly-cited causes of diarrhea were unclean or improper foods (by 50.7% of healers), unclean water (39.7%), and poor sanitation (30.2%). The majority of healers recommended that their patients seek alternative treatment (generally at hospitals) if the diarrhea did not subside within 1-3 days.

Guest Editor: Elizabeth Herman, M.D., M.P.H.

Dr. Elizabeth Herman is an Adjunct Assistant Professor in the Department of International Health at the Johns Hopkins University School of Public Health, and a Medical Officer for the PRITECH Project. Her interest in the interaction between biomedicine and traditional cultures dates back to her undergraduate training in anthropology and to a 3-year assignment with the (Native American) Indian Health Service. She worked for WHO's Diarrhoeal Diseases Control Programme in 1987-88, and has conducted research in Asia and Africa on the cultural context of diarrheal diseases and acute respiratory infections. She is currently the project manager for PRITECH's Traditional Healer Initiative.

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Editorial Comment

There are many reasons, in addition to the ones listed in this article, to recommend working with traditional healers to control diarrheal diseases. It is estimated the there are over a million traditional healers in sub-Saharan Africa. This gives a traditional healer-to-population ratio of 1:500, which stands in marked contrast to the physician-to-population ratio of 1:40,000. Even though this physician-to-population ratio does not reflect the existence of many other (non-physician) types of health-care workers who provide biomedical services, it is clear that access to biomedical services is extremely limited in many places and that traditional healers greatly outnumber biomedical practitioners in this part of the world.

This study confirmed that there were at least two traditional healers in every village. The number, popularity, and wide distribution of traditional healers in Uganda and other parts of Africa would indeed seem to argue for trying to enlist them in efforts to reduce mortality from diarrheal as well as other diseases.

The idea of collaboration with traditional healers is not new. In 1977, the World Health Assembly of the World Health Organization adopted a resolution launching a worldwide promotion of traditional medicine by urging member states to give "adequate importance to the utilization of their traditional systems of medicine." The 1978 WHO/UNICEF primary health-care conference in Alma-Ata recognized the importance of traditional medicine and recommended the incorporation of traditional healers into health-care systems. Yet collaborative efforts have, to date, been relatively small scale and slow to develop. Very few traditional healer pilot projects have been expanded or institutionalized. Why has this great potential not been realized? Some possible reasons are explored in the following article.

Green, E.C. "CAN COLLABORATIVE PROGRAMS BETWEEN BIOMEDICAL AND AFRICAN INDIGENOUS HEALTH PRACTITIONERS SUCCEED?" *Social Science and Medicine*, vol. 27, no. 11, 1988, 1125-30.
Order #3499

Summary

This paper explores the factors that appear to constrain the establishment of working relationships between indigenous health practitioners and government health programs in sub-Saharan Africa. The discussion focuses on traditional healers as distinct from traditional birth attendants, recognizing that the latter group has been incorporated more easily into efforts to improve maternal and child health than the more heterogenous group of traditional healers.

One constraint is the tendency of government officials and their foreign advisors to direct training efforts toward the workforce that is most available and supervisable, namely government employees, and to give a lower priority to training other providers. Second, the cultural distance between traditional healers and biomedically-trained individuals working in ministries of health makes communication difficult: these two groups embrace different and often incompatible world views that include beliefs about illness. Third, competition between the two sectors for patients and prestige can discourage collaboration. This may become a particularly important factor as traditional healers organize into professional groups that try to achieve official recognition and increased influence. Fourth, biomedical practitioners are often reluctant to cooperate with traditional healers because of a genuine concern that traditional healers practice in a way that may be harmful to patients. There may be a tendency to view traditional healers as backward, primitive, and even illegal. Last, foreign donors, planners, and administrators usually have little or no understanding of or access to traditional healers.

Technical Literature Update

The *TLU* is produced by the PRITECH Project under Contract #DPE-5969-Z-00-7064-00, Project #936-5969 with the Office of Health, Bureau for Research and Development, of the United States Agency for International Development (A.I.D.). The summaries and editorial comments represent the opinions of the *TLU* editorial staff and are not meant to represent A.I.D. policies or opinions. Inclusion of an article in the *TLU* does not denote endorsement or validation of the article cited, but rather indicates that it is worthy of attention and further critical appraisal.

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Despite the problems inherent in working with traditional healers, they offer several advantages over biomedically-trained health-care personnel. They are "accessible, affordable, and culturally appropriate and acceptable, thereby fulfilling the major criteria for effective service delivery." Because they are recognized as healers and have their own sources of income, they are unlikely to face the problems with community acceptance and lack of motivation that plague health-care programs based on community-chosen volunteers. Perhaps the most powerful argument in favor of collaborative programs is that given the limited reach of the biomedical sector in Africa, public health goals cannot be realized in the foreseeable future without the participation of traditional healers.

Editorial Comment

This paper does an excellent job of outlining the main cultural and motivational issues that constrain collaboration between the traditional and biomedical health sectors. The list is not complete, however, without recognition of some very real logistical limitations. Given the large numbers of healers, the diversity of their practices, and great variations in the type and number of patients that they care for, it is very difficult to identify those healers who are most likely to have an impact on morbidity and mortality. How can a program select the best healers to train? Even assuming that this can be done, reaching those healers with a training program and providing follow-up or supervision will be no easy task.

Traditional healers tend to be good business people and to work with free market assumptions. They are likely to make more money selling expensive treatment than teaching mothers about appropriate home management. Training alone will not necessarily change incentives. The challenge to CDD programs, therefore, is to convince traditional healers that use of ORT and appropriate case-management recommendations are in their best interest.

Competition and jealousies between traditional healers themselves further complicate matters. Providing a course for herbalists may alienate the spiritualists. Different kinds of healers or healers of different religions may refuse to attend the same training course. The plurality of practices is another problem. Note that in the Anokbonggo paper reviewed above, the researchers identified over 250 herbs for treatment of diarrhea! This complicates the task of learning about current practices in order to identify opportunities to improve them. There may, in fact, be traditional healers working under basic assumptions that are so contradictory to appropriate case management that it is not feasible to work with them.

Despite these problems, I certainly would support the idea of working with traditional healers to control diarrheal diseases in sub-Saharan Africa. The ultimate objectives of CDD efforts are to improve preventive and case-management behaviors at the household and community levels, as well as in health facilities. In many situations, collaboration between sectors may be not only helpful, but also necessary to achieve these objectives. It is true that working with traditional healers is very difficult, but working with the biomedical sector is also difficult—and for many of the same reasons. Although not often studied or acknowledged, there is often a cultural distance between biomedical providers and the trainers or training materials to which they are exposed. Many biomedical providers hold cultural assumptions and beliefs that are similar to those of traditional healers and that impede their adoption of recommended practices. The ultimate recipients of many messages are caretakers of children with diarrhea. A cultural distance often exists between these caretakers and biomedical providers as well. At some point, the cultural gap has to be bridged; choosing not to work with traditional healers does not avoid the issue.

There is an expressed reluctance to work with traditional healers because some have practices that are clearly dangerous. These include the administration of purging enemas, the extraction of teeth, and other invasive procedures for the treatment of diarrhea. Many biomedical personnel, however, practice dangerous polypharmacy, give injections indiscriminately (often with contaminated needles), and recommend withholding food during diarrhea. Frankly, I don't understand the concern that, by training and collaborating with traditional healers, ministries of health will appear to condone dangerous practices. I agree with the author of this article that there is a responsibility to work on improving current practices—in both the traditional and biomedical sectors.

Boerma, J.T.; Baya, M.S. "MATERNAL AND CHILD HEALTH IN AN ETHNOMEDICAL PERSPECTIVE: TRADITIONAL AND MODERN MEDICINE IN COASTAL KENYA." *Health Policy and Planning*, vol. 5, no. 4, 1990, 347-57.
Order #4254

Summary

This paper presents the results of an operational research project in Kwale District in coastal Kenya. During household surveys, mothers were asked about the presence of a series of symptoms in their children and about the utilization of medical services for those symptoms. Of the 396 children who had had diarrhea lasting less than 2 weeks, 37% reportedly were taken to traditional healers and 54% to the clinic. Both sources were consulted in 23% of cases. Among the 42 persistent diarrhea cases(lasting more than 2 weeks), 60% were taken to traditional healers, 74% to the clinic, and 48% to both.

The beliefs and practices of the traditional medical system were explored through interviews with traditional birth attendants and traditional healers. The number of traditional healers was high (about 10,000 for a population of 400,000 people). They reported seeing an average of four patients per week. There was enormous diversity in treatments given, with each traditional healer using different methods and herbs.

During three 2-day workshops with traditional healers and biomedical health workers, several areas of potential conflict were identified. For example, traditional healers named *nyuni*, an illness characterized by convulsions, as the leading cause of death in children. It is believed to be of supernatural cause, but most of the traditional healers acknowledged that modern health services can play a role in its treatment. Traditional treatment includes giving the child a charm to wear, drinking and bathing in traditional herbs, and preventing anything that might frighten the child. There is, therefore, a conflict in taking a child with *nyuni* to a health facility because health workers often cut the charm and give an injection (which frightens the child), meaning that the traditional healer has to start treatment all over again.

There is a similar problem in the management of *nyongoo*, the set of complications and illnesses associated with childbirth. Women commonly visit healers at 6-7 months of pregnancy for *nyongoo* prevention which, among other practices, involves wearing a charm, adhering to food and behavioral restrictions, and avoiding injections. Women who undergo *nyongoo* prevention avoid attending the antenatal clinic, as tetanus toxoid injections are given there.

Some of these areas of conflict might be overcome by teaching biomedical health workers to respect traditional treatment practices whenever possible. Training of healers should focus on child-survival interventions (such as ORT), some diagnostic principles, and discussion of areas of conflicting treatment. Since the research found that many healers have a very small patient load, effective training efforts will need to focus on the most popular healers and those who act as trainers or as consultants for other healers.

Editorial Comment

This is an excellent article for a number of reasons. First, it demonstrates that collaboration with traditional healers is not an objective in itself, but one possible component of a community-based intervention. The decision to train or collaborate with traditional healers should not be based on an ideological commitment to working with them, but on information about patterns of utilization and care-seeking behavior in the population. In this case, background research for a primary health-care project indicated that traditional healers are frequently consulted for cases of diarrhea, particularly for persistent diarrhea. Many cases receive treatment from a traditional healer as well as from the health center. Given this high rate of consultation, it would be very helpful if the advice given by traditional healers reinforced messages to increase fluids and continue feeding. Working with traditional healers in this setting makes programmatic sense.

The second reason I like this paper is that it demonstrates that although healers are quite anxious to learn about biomedicine, they are not interested or likely to become community health workers. In the study area, none of the communities had selected a healer to be their CHW. Traditional healers tend to be pragmatic business people who will adopt new practices that make sense to them and that seem to work.

Finally, this paper makes a contribution by demonstrating the importance of negotiation and

flexibility in working with traditional healers. Perhaps the conflict over the management of *nyuni* could be resolved by health workers agreeing to leave the charms on the children if traditional healers agree to put the charms around the waist or wrist rather than the neck (to avoid the risk of strangulation). Perhaps attendance at antenatal clinics could be improved if biomedical workers and traditional healers could agree on a time to administer tetanus toxoid that is acceptable to both. These compromises can only be reached through the kind of dialogue that is reported in this paper. Successful collaboration will require flexibility on the part of the biomedical workers as well as the traditional healers.

Warren, D.M.; Bova, G.S.; Tregoning, M.A.; et al. "GHANAIAN NATIONAL POLICY TOWARD INDIGENOUS HEALERS: THE CASE OF THE PRIMARY HEALTH TRAINING FOR INDIGENOUS HEALERS (PRHETIH) PROGRAM." *Social Science and Medicine*, vol. 16, 1982, 1873-81.
Order #3602

Summary

The majority of the Ghanaian population regard both the traditional and biomedical systems as acceptable and viable alternatives, and patronize both freely. The Ministry of Health has made a cautious move toward cooperation with indigenous healers by working with traditional birth attendants, supporting the construction and operation of the Centre for Scientific Research into Plant Medicine, and recognizing the Ghana Psychic and Traditional Healers Association (GPTHA).

The PRHETIH (Primary Health Training for Indigenous Healers) program, supported by staff of the Techiman District's Holy Family Hospital, was designed to augment the knowledge and skills of traditional healers and to foster collaboration and understanding between the healers and biomedical providers. The program was built on relationships nurtured over the years by staff members who attended festivals of the healers and by healers who came to the hospital for conditions that they could not manage themselves. It was comprised of several rounds of a 14-week training program for selected healers from Techiman Township. The training covered a variety of primary health-care topics including the preparation, preservation and storage of medicinal herbs; the management of diarrhea; vaccination; basic nutrition; family planning; and first aid. The multidisciplinary teaching team included both biomedical and traditional health-care providers. Classes were held in selected homes of the healers. All participating healers were given personal follow-up visits after each of the weekly training sessions to test and reinforce their grasp of the material.

Use of a standardized questionnaire indicated that the trainees retained over 60% of the basic materials that they were taught. Sessions that dealt with the preparation and preservation of herbs were the most popular. Rated second were those sessions that taught a particular health technique or medical treatment (such as oral rehydration therapy or first aid). Of least interest were sessions that consisted solely of advice or description (themes such as basic nutrition and leprosy).

Editorial Comment

This article and the project it describes are classics in the traditional healers literature. The model of building an intervention on existing institutions and relationships is a good one. The processes of achieving consensus for the intervention and of coordinating the interests of a number of organizations are well described. The article also contains a long list of useful recommendations that should be read by anyone embarking on a project involving collaboration with traditional healers.

Unfortunately, the article contains very little and rather non-specific information on evaluation of the PRHETIH project. With the limited data that are presented, it is difficult to assess what this very labor-intensive effort actually achieved. This is a common problem with initiatives to collaborate with traditional healers. Not many are well documented, and fewer have been credibly evaluated.

PRITECH has obtained more recent information on the PRHETIH project. Approximately 120 traditional healers completed the 14-week training curriculum. During the 1980s the project expanded beyond Techiman Township to outlying villages, and coordinated with other primary health-care projects such as nutrition clinics and environmental sanitation activities. Former trainees continued to meet periodically. The project suffered setbacks in 1983-85 due to a turnover in leadership at both the Holy Family Hospital and the Peace Corps. As problems were resolved during 1986, traditional healers continued to show interest in more training sessions. Two other

districts developed their own traditional healer training sessions based on the PRHETIH model.

It does not appear that the Ministry of Health has developed or implemented a national-level strategy for collaboration with traditional healers, although there are indications of continued interest. In 1990, the Secretary for Health appointed a senior-level deputy director who was to be responsible solely for developing traditional and herbal medicine. The University of Amsterdam's Department of Cultural Anthropology was scheduled to undertake a year-long study of the impact of the PRHETIH project for the purpose of making practical recommendations for its replication.

Thus, the PRHETIH story continues. I hope that, at a minimum, a thorough evaluation will be completed. There are still many lessons to be learned from PRHETIH. I would be particularly interested to know whether the training had a lasting impact on the practices of the trained traditional healers. As was the case with PRHETIH, training activities are often interrupted -- by changes in personnel, political unrest, budgetary crises, changes in government, etc. Theoretically, training traditional healers may provide a protective buffer against the negative effects of these unforeseen interruptions because traditional healers usually remain in their communities and because they do not depend on government salaries.

Steele, C.; Pacenta, N. "RENDEZVOUS IN RHAMU: TEACHING AND LEARNING WITH TRADITIONAL BIRTH ATTENDANTS IN RURAL KENYA." ***Journal of Nurse-Midwifery*****, vol. 35, no. 1, January/February 1990, 53-58.**
Order #3750

Summary

In 1983, a nurse-midwife took up a post with a project to improve maternal and child health care in a town of 6,000 people in northern Kenya. She worked with two female community health workers (who were native to the area) to implement a basic midwifery course for local traditional birth attendants.

Initial interviews with TBAs revealed that most of their practices were good, and a few (namely leaving the mother's end of the cord untied after birth and delaying breastfeeding for 3 days) were harmful. TBAs knew very little about the health center and discouraged mothers from delivering there because of male staff members. A 12-session course was developed for the TBAs; it included a description of the procedures and policies of the antenatal clinic, identification of high-risk deliveries and complications that require prompt referral, practical solutions to problems, and the role of the TBA as a health teacher.

Use of the health center for antenatal care and high-risk deliveries continued to be discouragingly low following the two initial trainings. This seemed to be due to a rumor that the trained TBAs received payments of food or money to refer women to the health center. This rumor was addressed though home visits during which background information was collected from pregnant women and the role of the TBA was explained. Following this campaign, both attendance at the antenatal clinic and the number of deliveries at the health center increased substantially. Other indications of the success of the program were an increase in the percentage of new babies brought to the health center for immunization, increased referral of obstetrical emergencies, and requests for training from neighboring villages.

Editorial Comment

This is a good example of a small-scale intervention that worked—largely because of the efforts of a committed individual. This tends to be the pattern of collaboration with traditional healers; I have been unable to find any examples of large-scale collaborative efforts. It is encouraging that, in this article, an evaluation conducted 15 months after the author's departure confirmed the program's continued effectiveness. The author concludes, however, that "this kind of process takes dedication, commitment, and vision; deep-rooting cannot be hurried." What are the implications of this statement for regional or national CDD programs? This kind of model does not lend itself to duplication on a large scale or to centralized management. Should CDD and other national disease-control programs leave the task of collaborating with traditional healers to interested individuals or to NGOs?

I would answer yes and no. It seems clear to me that the typical pattern of national CDD training efforts—development of standard training materials at the central level, training of senior-level health workers by a centralized team, and trickle-down training of workers at the district and community levels—will not be effective with traditional healers. As is clear from this paper and

the Boerma paper reviewed above, collaboration with traditional healers requires a process of negotiation and problem solving, not only a transfer of information and skills. (I would suggest that training biomedical practitioners requires this as well, but that's a different topic!)

CDD programs and other disease-control efforts may do well to consider alternative models for interacting with traditional healers. For example, the program might designate a traditional healers' coordinator to work with interested institutions, communities, or projects. The central program's role might be to encourage local consideration of the option to work with traditional healers, to help assess the potential effectiveness of working with traditional healers, to provide technical review of curricula, to facilitate the process of negotiation and problem solving, and possibly to offer modest financial support. Goals should be realistic and modest; for example, decreasing barriers to referral of patients (as in the Boerma article); addressing misunderstandings about what goes on in biomedical health facilities (as in this article); and encouraging traditional healers to reinforce messages and recommendations given by the biomedical sector.

The bottom line is that most disease-control efforts require fundamental behavior change at the household and individual level, whether that change involves giving fluids and food during diarrhea, using condoms, or bringing children to health facilities for immunizations. Behavior change is a slow and difficult process. Traditional healers can be powerful influencers—either to impede behavior change or to promote it. Working with them offers great potential but also requires significant effort. In my opinion, collaborative efforts should only be undertaken after careful consideration of local health-care-utilization patterns, and should follow an approach that permits negotiation and problem solving.

TLU READERS SURVEY

We hope you will take the time to fill out the enclosed survey and return it to the PRITECH Information Center. We look forward to reading your responses! Look for survey results in an upcoming issue of the *TLU*.

FREE PUBLICATION

PRITECH has recently completed a literature review of efforts to collaborate with African traditional healers in the implementation of primary health-care activities. The results are contained in a document entitled *Prospects for Collaborating with Traditional Healers in Africa*. You can receive this document at no cost simply by filling out and returning the Readers Survey (by checking the appropriate box in the enclosed letter). PRITECH will also be pleased to send the document separately to readers who are working with or who are particularly interested in traditional healers. Please indicate how you plan to use the document in your request and direct the request to the PRITECH Information Center.

Theme: Sustainability

Technical Literature Update on DIARRHEA

Guest Editor: William Jansen, Ph.D.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VII, Nº2 1992

Guest Editor: William Jansen, Ph.D.

As national control of diarrheal disease programs around the world approach or pass their tenth anniversary, it may well be time to consider again some of the issues surrounding the sustainability of such programs. The articles discussed in this issue of the *TLU* do not deal specifically with diarrheal disease programs. However, they do discuss how health care services (including those addressing diarrheal diseases) generally can be delivered effectively and economically. The editorial commentary relates the more general themes of the articles to diarrheal disease control efforts.

This issue was jointly authored by Technical Editor Dr. Robert Northup and Guest Editor Dr. William Jansen. Dr. Jansen is the Chief Technical Officer at the PRITECH Project. A behavioral scientist by training, Dr. Jansen has worked on public health programs for developing countries for over 15 years. This experience has included extended periods of time living and working in the Philippines, Bangladesh, Pakistan, and Jordan.

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Streefland, P.; Chowdhury, M. "THE LONG-TERM ROLE OF NATIONAL NON-GOVERNMENT DEVELOPMENT ORGANIZATIONS IN PRIMARY HEALTH CARE: LESSONS FROM BANGLADESH." ***Health Policy and Planning*****, vol. 5, no. 3, 1990, 261-66.**
Order #4123

Summary

Since Independence in 1971, indigenous national non-government development organizations (NGDOs) have played an important role in the development of Bangladesh. Health-related work by groups such as Gonoshasthaya Kendra (GK), Bangladesh Rural Advancement Committee (BRAC), and Christian Commission for Development in Bangladesh (CCDB), has contributed to the formation of a national health-care-delivery system in three major ways: 1) efforts toward the country's rehabilitation when the state was too weak to carry out this task alone; 2) development and testing of new options for rural health care in areas which the government could not handle; and 3) training of a large number of community-oriented health-care staff, particularly women. International donors have been supportive of NGDOs for five reasons: 1) they can reach the community level; 2) they are more efficient (less bureaucratic and politicized); 3) they are innovative; 4) they provide reliable and efficient channels for emergency relief; and 5) they are able to provide better coverage in some locations where the government is unable to provide sufficient support, such as peripheral rural areas.

The authors review the development of NGDOs in Bangladesh and some of the health projects these organizations have carried out. They examine the relationship of NGDOs to the government health system. They conclude that NGDOs will continue to grow in size and professional capacity and suggest future roles and tasks for these organizations in the development of primary health care in Bangladesh. Lessons learned in Bangladesh may be relevant to other countries where state involvement in health-care delivery is hampered due to economic problems.

Editorial Comment

Historically, the global effort to control diarrheal diseases has been concentrated within the public sector. Most donor resources for diarrheal disease control are directed toward governments and the health-care delivery systems operated by governments. One can conclude from this article that the ability of government health-care systems to extend services to all portions of a population in need is limited. Another possible conclusion is that the full achievement of national health objectives may not be possible within the public sector alone and that NGDOs can play a significant role in helping to achieve these objectives.

Such conclusions are particularly relevant for diarrheal disease control programs. Although some progress has been made through CDD programs, one is led to wonder whether there are limits to the future growth of programs which rely primarily upon government service-delivery systems. The experience the authors report upon from Bangladesh suggests that there are indeed limits or constraints to growth if hopes for future CDD gains are based solely on efforts within the public sector. National CDD objectives should be reexamined to see how NGDOs or other private sector entities can contribute to the achievement of these goals.

In many countries, the health-care source of first choice for most households is not a government clinic. Data from some countries indicate that fewer than 20% of the population regularly utilize public sector health facilities. Alternatives to public sector health systems should be more extensively explored to expand the range of CDD services available to those households most at risk from diarrheal diseases.

The authors remind us that NGDOs have several characteristic strengths which make them a valuable alternative source of basic health care for populations in need. Therefore, NGDOs can complement the efforts

Technical Literature Update

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of public sector CDD programs and share some of the implementation burden in achieving specific CDD targets. NGDO strengths may actually be better suited than those of public sector health-care systems to deal with some of the perplexing barriers to improved diarrheal case management.

For example, barriers to improved case management in the home are proving to be one of the greatest constraints to achieving further reductions in diarrheal mortality. BRAC, one of the remarkable Bangladesh NGDOs discussed in the article, operates a nationwide program which teaches ORT to mothers in their homes. This is one extraordinary example of a specific contribution which NGDOs can make in CDD.

Vogel, R.J.; Stephens, B. "AVAILABILITY OF PHARMACEUTICALS IN SUB-SAHARAN AFRICA: ROLES OF THE PUBLIC, PRIVATE AND CHURCH MISSION SECTORS." ***Social Science and Medicine*****, vol. 29, no. 4, 1989, 479-86.**
Order #3944

Summary

Both curative and preventive health care depend heavily on the availability of pharmaceuticals (drugs, vaccines, other medical supplies). The availability of such supplies is thus an important proxy measure of the quality of medical care; it is also critical to establishing credibility of health services among users. Observation has shown that religious missions and the private, for-profit sector have been far more successful than the public sector (governmental health facilities) at obtaining and distributing pharmaceuticals in sub-Saharan Africa.

Public-sector constraints to running an effective pharmaceutical-supply system include inexperienced employees who cannot be fired, low wages, poor incentives for doing well, and substantial cultural and structural pressures leading to corruption and drug leakages. Effective management is often lacking. Lack of foreign exchange to purchase drugs or raw supplies for local manufacturing is also a critical systemic deficiency. This deficiency is magnified by the reluctance of donors to provide foreign exchange for these purchases because they do not wish to subsidize "recurrent" costs.

Explanations for the better operation of church-mission and private, for-profit pharmaceutical-distribution systems are reviewed. Church-mission operations have been advocated as models of quality of care and cost recovery. They succeed in cost recovery with equity by not charging the very poor, by using income from not-so-poor patients to subsidize the very poor, by identifying the very poor through personal knowledge, by purchasing only essential drugs and pharmaceuticals, by charging prices which are commensurate with the level and sophistication of care and cost of pharmaceuticals used, and by receiving subsidies from abroad. This foreign exchange allows them to fill the gap between total operating costs and the revenues obtained through cost recovery. The better management displayed by mission health-care operations may be related partly to scale; a single mission is easier to manage than a widespread system with many facilities and employees.

For-profit pharmaceutical-supply systems are inherently self-correcting because of profit and loss incentives. The private sector already has a widespread distribution network of consumer goods, and, in many countries, drugs are also available even in rural areas through private peddlers, small stalls, and shops. While privatization of health care could limit access by poor and rural populations, the for-profit sector may present an appropriate model of efficient pharmaceutical distribution.

Efforts by international donors to improve public provision of pharmaceuticals through such mechanisms as revolving drug funds, managerial reform, and local production of pharmaceuticals, have been largely unsuccessful. The Bamako Initiative, presented by UNICEF in 1987, proposes an internationally-financed fund to provide essential drugs for the poorest countries in Africa. This system too is unrealistic because of high estimated costs to donors, impractical financing and subsidization mechanisms, and lack of governmental administrative capacity.

It is suggested that distribution of pharmaceuticals be turned over to the private sector due to its existing widespread distribution networks, built-in incentives to make high-demand items available, intrinsic cost-recovery mechanisms, financial self-sufficiency, and lack of constraints found in government administration. Government would have a critical role, however, in ensuring the availability and proper use of affordable pharmaceuticals. The public sector would thus be appropriately involved in importing, licensing, regulating, and bulk purchasing; subsidizing the poor; bringing about cost sharing between richer and poorer segments of the population; informing private vendors

and the public about the appropriate use of drugs; and establishing standardized treatment protocols. Long-term donor provision of foreign exchange in low-income countries, in a manner similar to the continuing provision of support from the church-mission home-country donors, will be necessary to ensure continuing viability of the system. It can be justified as critical to ensuring the development and effectiveness of health-care systems until such time as the overall economic development in low-income African countries makes hard-currency purchases affordable.

Editorial Comment

ORS supply and the supply of drugs needed for dysentery, cholera and parasite-related diarrheas are integral parts of an effective diarrhea-treatment system. Maintaining effective logistics and supply systems for CDD programs is costly and can be fraught with difficulties. Some of the common drug- and ORS-supply concerns for CDD programs include: lack of foreign exchange; difficulties in acquiring the chemical components and appropriate packaging materials necessary for local manufacturing; problems with inventory management, both for central stocks and in health-care facilities; and, difficulties in paying the recurrent costs of the ORS and drugs needed to fuel a nationwide CDD effort.

To what extent do constraints on existing drug-supply systems limit the achievement of CDD-program objectives? We know that in many countries, ORT awareness is relatively high, while usage rates are low. Some people may know about ORS, but may not use it because it is unavailable. Efforts to improve the supply of ORS and drugs needed for CDD programs will probably require addressing impediments in the general drug-supply system. We have found that efforts to improve diarrheal case management have led indirectly to improvements in general supervisory and training methods within health-care systems. Should we expect, therefore, that attempts to improve the supply of ORS and diarrhea-related pharmaceuticals will contribute to improvements in the general drug-supply system?

The article suggests that the for-profit private sector offers an attractive, well-functioning mechanism for making ORS and other drugs more widely and more regularly available. Admittedly, the private sector mechanism also can distribute widely drugs which are inappropriate for optimal diarrheal treatment in children. Nevertheless, private sector drug-distribution systems usually work well (with a lack of supplies being an uncommon event). This private sector mechanism for distribution has not been adequately explored or utilized by CDD programs. Only a few CDD initiatives have gone beyond the common approach of supporting local ORS manufacturing simply to supply public sector needs and explored a greater role for the commercial private sector in making ORS more widely available.

The strengths of the commercial private sector in making available a range of consumer and pharmaceutical products, without the need for recurrent government or donor financing, are well known. The potential impact of applying some of the commercial sector's strengths to help achieve CDD objectives, however, is not well understood. More experience is needed to test how commercial private sector activities can complement national CDD efforts. Just as important will be the careful examination of this experience to assess and document impact upon CDD goals.

Donor investment will be needed to help fund research on the impact of the efforts of the commercial private sector on CDD. Although several subjects deserve attention, one topic that certainly should be explored is the behavior of small vendors or shopkeepers who often provide the majority of the pharmaceuticals used in treatment of diarrheal cases in many countries. This research should include the identification of mechanisms which influence shopkeeper selling and consumer-counseling behavior.

The article also makes the interesting point that there are important roles for governments to play in public health initiatives involving the for-profit private sector. Such roles could include: establishing supportive policies; defining regulatory guidelines; monitoring compliance; and, possibly, modifying taxation systems to encourage the commercial availability of the best diarrhea-control products.

Diarra, K.; Coulibaly, S. "FINANCING OF RECURRENT HEALTH COSTS IN MALI." ***Health Policy and Planning*****, vol. 5, no. 2, 1990, 126-38.**
Order #3976

Summary

A 1987 study of health-sector financing and expenditures in Mali reviewed all existing data on each of the country's districts and regions. The review began

with institutional financing, that part of the health system that enters the accounts of public or private institutions. Government expenditures for recurrent health costs were allocated as follows: 57% pharmaceuticals, 30% personnel, and 13% other. However, because 90% of these are, in fact, purchases by households from government-run pharmacies, actual government expenditures on recurrent costs items for its own health-care services totaled 13% for pharmaceuticals, 61% for personnel, and 26% other. Although the proportion of government expenditures allocated to personnel costs is lower in Mali than in other African countries, it is of note that the largest part of government expenditures are for personnel costs, which usually cannot be reduced.

Recurrent costs made up an average of 84% of total institutional health expenditures, while investment costs (buildings, equipment, vehicles) made up 16%; breakdown of the government contribution was 92% and 8% respectively, because the majority of investment funds were from external aid. External aid provided only 14% of total health-sector funding, but 64% of investment costs. The largest proportion (49%) of investment costs was spent on administrative sections of the system (for purchase of vehicles and other non-medical equipment) while only 25% went to district health facilities. Institutional health-sector resources were concentrated in the capital (55%) and in regional capital cities (22%), with only 23% of the resources going to the rest of the country.

Families' health expenditures were also examined. These included traditional practitioners' services and medicines, fees paid for drugs both to the government pharmacy and to other sources, transportation to health services, and private fees for medical services, many of which were illicitly paid to public sector or unregistered practitioners. Households were found to have paid 74% of overall recurrent health costs, while the government assumed 23%, and external aid 3%. The actual amount paid for drugs by households appeared to be from two to seven times the amount registered as being paid to the government pharmacies, making the total amount spent on drugs by Malian households nearly equivalent to the total government health budget.

Data also showed that the proportion of the government's budget allocated to the health sector had declined from about 9% in the early 1970s to below 4% in 1986. The state contribution to total health expenditure fell concomitantly from 37% to 32% between 1983 and 1986.

It seems improbable that the extra resources needed to finance health-care costs adequately will come from increased levels of government funding or from foreign donors. The authors suggest that the needed increases in resources be obtained by increasing collections from service fees and pharmaceutical sales, and by improving utilization of existing resources through such measures as better control over national personnel distribution, purchase of fewer types of drugs, purchase of exclusively generic drugs by competitive tender, and reduction of wasteful construction of health facilities which cannot be staffed or maintained.

Editorial Comment

This fascinating analysis uses existing household survey data as the basis for national estimates of total private expenditures for health care, including in-kind payments to practitioners. While such extrapolations are often subject to error, they do offer us some idea of how health services are utilized by the general population. It is remarkable that the amount of private (household) expenditure on recurrent health-care costs is about 3 times that financed by the public sector. Household expenditures on drugs alone are nearly equal to the total government health budget, while non-government health expenditures are nearly twice those of the government.

These findings are consistent with household data from other countries which also show significant levels of household investment for health care. Such findings tell us that people in developing countries are often willing to and actually do pay appreciable amounts for health care. Nevertheless, many health-care interventions (including CDD programs) in the developing world have been based on the premise that health-care services, particularly primary health-care services, should be provided free of charge.

For CDD programs, it can be argued that diarrheal diseases are largely a product of poverty and that those children most at risk of dying from a diarrheal disease episode live in the poorest households. Such households are probably the least able to pay for services. Time, however, is also a cost and the time needed for the poor to reach public facilities, or to wait for care once there, can be considerable. Furthermore, the dynamics of the global marketplace and past efforts to understand the behavior of consumers suggest that free goods or services can be viewed by the public as being inferior or of low quality. Is it possible, therefore, that free CDD services or free ORS packets are

perceived by some caretakers as less "effective" than higher-priced alternatives?

Fee-for-service is one mechanism which health systems use to help recover costs and to become more sustainable. The article tells us about a system Mali has in place to help with cost recovery within the public health-care network. It includes drug sales through government pharmacies and user fees for medical consultations and hospital services. The authors suggest that this system could be improved by imposing such fees on district health centers which are currently exempt. At the same time, however, they recommend a method for providing free care to the poor within that system and for ensuring that free services are not provided to users who are able to pay.

Underlying these topics, however, is another issue: quality of care. One reason why many people in developing countries are willing to pay for health-care services (of the curative variety), even when free or nearly free care is also available, is a perceived difference in the quality of care. Users who pay for health-care services are more likely to demand quality care from their health-care provider than those who receive free care. CDD programs already strive to improve the quality of diarrhea-case management by trying to upgrade the services supplied within a health-care system. Perhaps instituting even a modest fee-for-service system for CDD services would actually be an indirect way to reinforce quality of care while also helping on the financial sustainability front.

Stanton, B.; Clemens, J. "USER FEES FOR HEALTH CARE IN DEVELOPING COUNTRIES: A CASE STUDY OF BANGLADESH." *Social Science and Medicine*, vol. 29, no. 10, 1989, 1199-1205.
Order #3945

Summary

"In designing country health care programs to achieve the goals of the Alma [Ata] declaration of 'Health for All', developing countries have been confronted with the problem of increased health care needs and decreased available resources. Health economists have [proffered] several possible solutions to this fiscal shortfall, including cost-recovery measures through the imposition of user fees for curative services at government health facilities. Health care providers have been noticeably absent from discussions of the many possible implications of these fees; consequently, resultant programs and policies may be economically sound but may fail to place a sufficient emphasis on features designed to maintain and improve the health of the population.

"In the present paper we examine the possible impact of user fees on the health of individuals residing in Bangladesh, one potential candidate country for user fees. We note evidence that the existing government health care system appears already to be providing care to two of the most medically vulnerable groups in Bangladesh, the poor and women, and provide evidence that such fees may seriously interfere with maintaining this patient profile. We discuss the significant public health role that curative care provides for the individuals, their families and the wider community. We suggest that additional questions should be asked by health care providers, anthropologists and economists prior to institution of user fees in the government system and that such measures should first be introduced in an experimental format with a rigorous and comprehensive impact evaluation." [Published Abstract]

Editorial Comment

This paper presents a detailed and well-organized exploration of some of the possible results of the introduction of user fees within a public sector health-care system. The paper concludes that user fees can produce unintended negative results: a decline in use of government health-care facilities by those most at risk (the poor and women). The authors argue that the poor may have a faulty knowledge of appropriate types of health care and that they also do not understand the value of government health-care services. They also explain that pain alleviation is often a primary motivating factor for seeking health care and that poor people are less likely to seek care than those with higher incomes for conditions accompanied by similar levels of pain. According to this line of reasoning, would a change in the user-fee situation raise or lower the "pain threshold" beyond which health care is sought?

In CDD terms, what might an application of the arguments presented in this article to CDD issues suggest? Diarrheal diseases are common in most lower socio-economic communities in developing countries. Perhaps the initiation of user fees within a primary health-care system could raise the "discomfort level" for more common complaints like diarrhea to the point at which the number of times care is sought outside the home would decline. Sole reliance on home case

management for diarrhea might increase which, in turn, could prevent or delay the referral of more severe cases to health-care facilities.

However, these are mainly suppositions. There are other possible variables associated with user fees which the authors do not explore. They note, for example, that women and the landless in Bangladesh receive some care from public sector facilities but they do not explore what proportions of all care sought by these disadvantaged groups is provided by the government, by "non-qualified" practitioners, and by alternative health-care providers. The dynamics of user fees paid by the poor for alternatives to public sector health care need to be better understood.

Perhaps most importantly, the authors do not weigh the issue of quality of care in their deliberations about the potential impact of user fees. The low utilization of government clinics cited in this article is possibly very significant. This situation may be a result, in part, of a perception among potential users that the health care to be found there is of low quality. Instituting user fees within a system that is perceived to offer low quality of care could well produce a further decline in utilization. The quest for quality health care well may be a powerful motivation for poor households.

Overall, the article succeeds in making us think about the impact of cost recovery on populations at most risk from diarrheal diseases. The authors wisely recommend that any implementation of user fees should proceed cautiously and experimentally if possible.

Waddington, C.J.; Enyimayew, K.A. "A PRICE TO PAY: THE IMPACT OF USER CHARGES IN ASHANTI-AKIM DISTRICT, GHANA." ***International Journal of Health Planning and Management*****, vol. 4, 1989, 17-47.**
Order #3939

Summary

This paper examines utilization of public health services in the Ashanti-Akim district of Ghana in order to determine the impact of the patient fees introduced in 1985. Researchers looked at utilization rates at the government-supported, mission-run district hospital in Agogo, and at four governmental health centers, two in rural areas, and two in small towns. Use of private providers—drugstores, traditional practitioners, "quacks", and private clinics—was also examined. For the government facilities, attendance data were gathered through out-patient returns and registration books. Other information was gathered through focus group discussions.

In the urban health centers, utilization regained its pre-1985 levels after an initial negative reaction to the fees. In contrast, utilization in the rural centers declined and remained substantially lower after 1985. There was also a significant decrease in the proportion of females using both rural and urban centers. Utilization steadily increased at the mission-administered, government-supported hospital during the same period. Because government charges do not apply at the hospital, there was no dramatic and sudden increase in 1985, and although there was a steady increase in fees over time, this did not adversely affect utilization.

Interviews suggested that the increased cost of services caused a drop in utilization at the rural public facilities, with a concomitant shift toward obtaining drugs and services from the private sector—drugstores, traditional practitioners, and quacks—where the price of drugs and services was lower. This trend was especially pronounced in the early stages of illness. Negative results of this shift would include fewer checks on quality of care and increased use of dangerous practices, such as the buying of expired drugs. However, focus group interviews revealed that in addition to price, perceived quality of services provided was of great concern to those interviewed and seemed to be an important determinant in the choice of a provider.

Thus, although the target of recovering 15% of recurrent Ministry of Health expenditures was achieved, accessibility to regulated health care by rural users seems to have decreased. Extra revenues were not used, as hoped, to improve access for those in need, resulting in a less equitable provision of public health services.

Editorial Comment

This is a fascinating article. Not only do the authors consider cost-recovery issues surrounding the initiation of user fees in a public health-care system, they also explore basic aspects of the choices made by the users when they seek health services. The article tells us that applying a system of user fees, in itself, does not necessarily lead to a given outcome. In fact, varying results occurred. Utilization rates declined in rural centers; dropped initially in urban centers, but then grew back to earlier levels; and, continued to grow in a mission-run facility! Why these different responses?

The authors try to give us an idea by identifying some of the factors users of health facilities consider in selecting a source of health care. Obviously, people make choices every day concerning what to do about an episode of disease in the household. Interestingly, Ghanaian respondents rated perceived quality of care even higher than cost as an element in this decision-making process. One probable reason the mission-run facility continued to experience growth in utilization rates, even with an increase in fees, was that the perceived quality of care was high. Convenience (measured in terms of proximity to service outlet, hours of operation, and drug availability) also represented an important theme for users.

An interesting finding was that in response to the public clinic fees, some people shifted their patronage to private sector outlets. One reason cited by respondents for this shift was that prices were lower at private outlets! This is surprising and suggests that the pricing rationale for public sector services could have been better. The authors suggest that the user-fee system may have reduced the use of government health centers for "frivolous" purposes. Some of these lost "frivolous" visits may also have been shifted to private sector outlets or treated at home with purchases from drug sellers. Hopefully, the reduction of visits to public facilities did not result in increased cases of diarrhea-related dehydration due to caretakers' delay in bringing in their children.

These findings suggest that users did not perceive that the services or quality of care at rural public health centers increased after the initiation of the user-fee system. Perhaps, if the imposition of fees had been accompanied by improved staff training, convenient hours of operation, better supervision, and a secure supply of needed drugs, there would not have been a drop in utilization at these facilities.

For diarrheal disease programs, this article reminds us that quality of care in health facilities is not just an important clinical objective. It is also an essential ingredient of more sustainable CDD efforts. The article also helps to teach us about some of the factors that may be considered by the caretaker when decisions are made about where to go for help during a diarrheal episode. Caretaker decision-making during a diarrheal episode is not well understood and demands greater attention. A better understanding of the consumer of diarrheal disease services is essential to improving CDD programs and the services they provide.

Once is not enough
RECYCLE

Theme: Nutrition

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VII, Nº3 1992

Dickin, K.L.; Brown, K.H.; Fagbule, D.; et al. "EFFECT OF DIARRHOEA ON DIETARY INTAKE BY INFANTS AND YOUNG CHILDREN IN RURAL VILLAGES OF KWARA STATE, NIGERIA." ***European Journal of Clinical Nutrition*****, vol. 44, 1990, 307-17.**
Order #4169

Summary

Quantitative studies of dietary intake by 45 5- to 28-month-old Nigerian children were conducted in homes during episodes of diarrhea and subsequent periods of convalescence and health. Intake was measured over a 12-hour period during 2 days of each stage. Mean energy intakes during diarrhea (85.3 kcal/kg/day) were slightly lower than during health (95.9 kcal/kg/day, $p < 0.05$). No differences were found in energy intake from breast milk or liquid pap when comparing days of sickness, convalescence, and health. While there were no differences in frequency or duration of breastfeeding by illness status, pap was provided more frequently and in smaller amounts during illness. Energy intake from other foods, including solids, was greater during health than during diarrhea ($p < 0.05$), with an increase in the number of servings per day. There was no evidence of caretakers either withholding food during illness or providing extra food during the convalescent phase.

The differences in daily intakes associated with illness status were small in comparison to the much larger difference between intakes on healthy days and the nutrient intakes that are recommended for children of this age group. Therefore, it is possible that interventions to improve the overall weaning diet of young children would be more effective in reducing diarrhea-associated growth failure than interventions which focus on the diarrheal episode.

Bentley, M.E.; Stallings, R.Y.; Fukumoto, M.; et al. "MATERNAL FEEDING BEHAVIOR AND CHILD ACCEPTANCE OF FOOD DURING DIARRHEA, CONVALESCENCE, AND HEALTH IN THE CENTRAL SIERRA OF PERU." ***American Journal of Public Health*****, vol. 81, no. 1, January 1991, 43-47.**
Order #4630

Summary

Mothers' feeding patterns and acceptance of food by their children were studied in a Peruvian village to see if changes occurred on days when children had diarrhea as compared to days of convalescence and health. Home visits every 48 hours were used to identify 40 children, aged 4-36 months, with diarrhea. The sick children and their mothers were then observed carefully in the home over 12-hour periods, using structured observational methods, during 2 to 4 days each of diarrhea, convalescence, and health.

Results showed that mothers encouraged their children to eat about half as much during convalescence as they did while the children had diarrhea (using logistic regression analysis the Odds Ratio was 0.54, with a 90% Confidence Interval of 0.35 and 0.82) and about two-thirds as much during health as compared to periods of illness (OR: 0.65, 90% CI: 0.46,

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0.93). In contrast, child acceptance of food was about one and a half times greater during health than during diarrhea (OR: 1.55, 90% CI: 1.02, 2.35).

These results illustrate the importance of carefully examining the behavioral aspects of nutritional intake. Decreases in intake during diarrhea were due to anorexia, not to withdrawal of food by mothers. In response to reductions in children's appetites during illness, mothers were more likely to encourage children to eat, while they tended to become more passive feeders after the diarrhea had stopped. Diarrhea-control program messages should therefore encourage mothers to actively feed their children both during and after diarrhea, and especially during the period after diarrhea has stopped, when children's appetites increase.

Editorial Comment

These two reports, both from the Dietary Management of Diarrhea (DMD) project, address the issue of the nutritional consequences of diarrhea. When the child loses weight during diarrhea, how much of the loss is due to decreased intake? Does the decrease occur because the mother doesn't offer food, or because the child doesn't want to eat? These two studies examine these questions in detail.

Yes, intake is down. But clearly, it is not because of lack of attention or effort by mothers. Rather, it is due to lack of appetite. In fact, the Bentley paper confirms that the less willing children are to eat, the more their mothers encourage them to do so. I suspect that many or even all mothers use appetite as a major sign of whether their children are healthy or not. Thus, generic or simplistic messages such as "feed more during diarrhea" are unlikely to be effective. This message is not wrong, but it will not be seen as helpful by a mother already trying to do so, but failing because of her child's anorexia.

These papers present yet another argument in favor of breastfeeding. Breastfeeding seems to be exempt from the tendency of children to decrease their intake during diarrhea. Breastfeeding is generally maintained during diarrhea, except in circumstances where children are admitted to a hospital and separated from their mothers. Thus, breastfeeding helps to protect the nutritional status of the child even when intake of other foods has decreased.

Beyond supporting breastfeeding, what are the programmatic implications of these studies? The studies indicate that a) mothers actively encourage their children with diarrhea to eat, b) intake goes down because the children's appetites are decreased, and c) the nutritional deficit from diarrhea is real, but small compared to the deficit from the generally inadequate diet during health. How should programs respond to these findings?

Bentley et al suggest we concentrate on feeding during convalescence, at least in the Peruvian population, because mothers become passive feeders and may not be giving their children the extra food they need at that time. Program messages should thus encourage mothers to feed actively both during and after diarrhea, and particularly during convalescence, stressing the idea of "catch-up growth."

In contrast, Dickin et al suggest that concentrating on the diet during health may be the most effective approach to addressing the growth failure that occurs during diarrhea. They refer to a recent report (Lutter et al, *Am. J. Clin. Nutr.*, vol. 50, 1989, 1-8) stating that nutritional supplementation during health may reduce the growth impact of diarrhea in young children. In personal discussions, Brown (second author of article one) has posed the idea that adequate nutrition during health gives the child a kind of reserve that can be drawn upon during diarrhea or other disease. Justification of this hypothesis comes largely from recognition that in malnourished children, the deficit in energy intake from an episode of diarrheal illness is quite small compared to the much larger deficit which accumulates over time because the daily intake is less than the recommended intake.

Whatever the mechanism, implementing the recommendation to improve the daily diet poses problems psychologically and bureaucratically. It is easier for both health workers and mothers to focus on actions during diarrhea than during health. Motivating mothers and health workers to work on improving the basic diet involves modifying actions which take place every day, in all the children in a particular age group and population. While this is already a difficult proposition, doing so without the opportunity for health-worker intervention provided by illness will be even more difficult. Certainly CDD-program managers should use these data to promote ministry of health efforts to improve basic

Technical Literature Update

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weaning diets. However, Bentley et al's recommendation to focus on convalescence is more directly attainable through diarrhea programs since it builds on the mother's awareness of the child's anorexia during diarrhea. Messages could draw attention to the likely negative impact of diarrhea on growth, and the need for compensation during convalescence.

These papers reinforce my conviction that local studies are necessary to develop effective programmatic interventions. The Bentley paper shows how programs can benefit from a detailed dissection of the components of behavior, of both mother and child, during the different phases of diarrhea and health, and with regard to different kinds of food (breast milk, liquid foods, solid foods). Dickin et al have focused more on the composition and actual intake, also necessary to developing appropriate messages. Clearly the stress must be on developing culturally feasible recommendations regarding both foods and behaviors.

De Kanashiro, H.C.; Brown, K.H.; de Romana, G.L.; et al. "CONSUMPTION OF FOOD AND NUTRIENTS BY INFANTS IN HUASCAR (LIMA), PERU." ***American Journal of Clinical Nutrition*****, vol. 52, 1990, 995-1004.** ***Order #5429***

Summary

"Consumption of breast milk, liquids, and foods by 131 poor Peruvian infants was measured on 1661 child-days of observation during their first year of life. Breast-milk intake was estimated by 12-h test-weighing; macronutrients were analyzed in samples of milk. Other foods and liquids were weighed at preparation and consumption; nutrient contents were estimated from food composition tables. Mean energy intakes increased with age but declined from 95% to 78% of recommended amounts during the year. Mean protein intakes were generally above recommended amounts but more than one-third of infants received <80% of the suggested safe intakes in the second (6-mo) semester. Breast milk was the major source of energy and protein during the first semester. Breast milk and cow milk together contributed more than half the energy and protein during the second 6 mo, when cereals were also an important source of energy and protein. Mean intakes of calcium, thiamin, and ascorbic acid were less than recommended at some ages but mean intakes of other selected micronutrients exceeded recommendations." [Published Abstract]

Editorial Comment

This study carefully documents the point that growth faltering during the second 6 months of life is caused primarily by inadequate nutrient intake, both energy and protein. The authors believe that diarrhea and other illness also contribute to the growth faltering ("high rates of morbidity . . . would have elevated their energy needs above those of healthy infants"), but the Dickin et al paper previously discussed suggests that this negative contribution could be lessened by a more adequate basic diet. Thus the inadequate nutrient intake documented here becomes doubly important, both in failing to sustain a normal growth pattern during health and also in facilitating or enhancing the negative effect of illness on growth.

I was surprised to read that more than 40% of energy intake and about 30% of protein intake were provided by breast milk even in the last few months of infancy. On the one hand, this suggests that the child who is **not** breastfeeding at this point might have an even greater nutrient deficiency, unless other milks and complementary foods are provided in much larger quantities than "customarily" given, i.e. given to the breastfeeding child. This being the case, health workers probably should give special messages regarding quantity and frequency of feeding to help the non-breastfeeding mothers.

On the other hand, the breastfeeding mother may be too complacent regarding her child's diet during the second 6 months of infancy; she can't see readily his failure to grow, and his hunger-caused cries may be quieted by putting him to the breast without providing him the nutrition he needs. This is obviously the period during which a growth-monitoring program could show the mother the child's faltering growth, and motivate her to feed more aggressively. Growth monitoring would be even more important for the mother who gives supplementary cows milk during early infancy, or who stops breastfeeding early, as the child would both be at higher risk of infection from contaminated feeds, and have a greater risk of inadequate nutrient intake.

Abiodun, P.O. "USE OF SOYA-BEANS FOR THE DIETARY PREVENTION AND MANAGEMENT OF MALNUTRITION IN NIGERIA." ***Acta Paediatrica Scandinavica Supplement*****, vol. 374, 1991, 175-82.** ***Order #5241***

Summary

"Protein-energy malnutrition is still highly prevalent in the developing countries due to the decline in breast-feeding and early introduction of overdiluted and often contaminated commercial milk products, use of weaning foods which are low in energy and nutrients, [and] a high prevalence of diarrhoea and infections. An ideal food for the prevention and management of malnutrition should be of high nutritive value, acceptable to the children and their mothers, readily available at a cheap rate, easy to prepare and well tolerated both in health and disease. Soya-beans fulfill these conditions. [They are] furthermore easily processed and can be combined with a variety of foods to increase nutritive value [which

makes] them ideal both as a staple and as a weaning food. Soy-milk as well as a combination of soya-beans with maize pap 'soyogi,' have been found to be valuable in the management of malnutrition. In our preliminary results, home made 'soyogi' was found to be as good as the more expensive commercial soy-milk product in the dietary management of acute diarrhoea in children. The children on 'soyogi' tended to have a shorter duration of diarrhoea, decreased number of stools, and increased weight gain. The use of soya-beans both as soy-milk and as 'soyogi' among other formulations in the homes is recommended for prevention and management of malnutrition." [Published Abstract]

Editorial Comment

While this report is clearly preliminary, I wanted to include it as an example of one approach to achieving the objective of enhancing the basic weaning diet. Abiodun, recognizing the deficiency of the basic Nigerian weaning food (*ogi* pap, a thin gruel made from corn, millet, or sorghum), has focused on a fortified *ogi*. *Soyogi* is supplemented with soya-bean paste as well as sugar and palm oil, and is inexpensive and readily made at home.

According to the author, *soyogi* has, in recent years, become widely accepted culturally as a weaning food, despite the fact that it is "new" and different from the traditional foods. Clearly, this example shows that change in a traditional behavioral pattern and cultural practice can occur. The new food is clearly quite suitable, and is already being used by families as a weaning food. Abiodun chose to test this food, and stress its applicability during childhood diarrhea, by comparing it with a commercial formula promoted for the same purpose. This seems to me an ideal approach to getting mothers to try a new food, see that their children do well on it, and, one hopes, continue using it after convalescence. With appropriate promotion and follow-up by the practitioner treating the diarrhea, this therapeutic intervention could lead to *soyogi* becoming the child's subsequent weaning staple. The diarrhea episode thus becomes an opportunity for a nutrition intervention to improve the basic weaning diet as well as the diet during diarrhea. To be most effective for this purpose, a follow-up visit to document by weight gain that the new food has been effective, and to reinforce the idea that it should be continued after convalescence, should be helpful.

The *soyogi* diet did have a tendency, although not a statistically significant one, to reduce the diarrhea in comparison with the commercial soy formula used. We were not told how the children's fluid- and electrolyte-replacement needs were managed (ORS? SSS?), or even how much of the *soyogi* was given. Doubtless this will be provided in a later report of the study. I see this preliminary result, however, as consistent with and supporting the idea that good feeding during diarrhea can contribute substantially to fluid and electrolyte absorption, improving the effectiveness of the rehydration fluid in addition to providing better nutrition.

Brown, K.H.; Perez, F.; Gastañaduy, A.S. "CLINICAL TRIAL OF MODIFIED WHOLE MILK, LACTOSE-HYDROLYZED WHOLE MILK, OR CEREAL-MILK MIXTURES FOR THE DIETARY MANAGEMENT OF ACUTE CHILDHOOD DIARRHEA."
***Journal of Pediatric Gastroenterology and Nutrition*, vol. 12, 1991, 340-50.**
Order #4797

Summary

"A randomized, double-masked clinical trial was completed to compare the effects of four dietary regimens for the nutritional management of 116 Peruvian children between 3 and 24 months of age with acute diarrhea. Diets consisted of a modified whole milk formula (group M), a lactose-hydrolyzed milk formula (HM), wheat noodles and whole milk (N-M), or wheat noodles and lactose-hydrolyzed whole milk (N-HM), all offered in amounts up to 55 kcal/kg body weight/day for the first 2 days of treatment and up to 110 kcal/kg/day for 4 days thereafter. The clinical characteristics of the patients in each group were similar initially. Treatment failure rates in the two milk groups combined (M = 14.3%, HM = 20.0%) were greater than in the two noodle-milk groups combined (N-M = 3.4%, N-HM = 3.4%), $p = 0.03$. The average stool outputs by children in both M groups (range 40-66 g/kg body weight per day on all study days) were consistently greater than those by children in both N-M groups (range 29-50 g/kg/day). The differences by dietary group were statistically significant on days 3 and 4 ($p < 0.04$, analysis of variance). The estimated median durations of illness {and 95% confidence limits (CL)} in each milk group (M = 138 h, CL: 88-214; HM = 113 h, CL: 75-170) were significantly greater than in each noodle-milk group (N-M = 52 h, CL: 35-76; N-HM = 67 h, CL: 45-100), $p<0.001$-0.071. In this group of patients, noodle-milk mixtures produced fewer treatment failures, lower fecal outputs, and shorter durations of diarrhea than did milk alone, regardless of the lactose contents of the respective milks or mixed diets. Small differences in intestinal absorption and changes in body weight by dietary group that were identified were of minor clinical importance during the short duration of study. Thus, the noodle-milk diets employed during this study were safer than the milk diets for the dietary management of children with acute diarrhea." [Published Abstract]

Editorial Comment

This study tests another diet, in this case (in contrast to Abiodun's soy-cereal diet) one containing animal milk as well

as cereal. As the authors note, a whole series of studies have explored various approaches to milk feedings during diarrhea. This study uses a number of them:

1. Give more dilute feedings early in the diarrheal episode: Brown et al gave only a total of 55 kcal/kg diluted in 150 mg/kg/day for 2 initial days;
2. Break down the lactose (the nutrient most likely to cause absorption problems) by predigestion: Brown et al used a commercial enzyme (B-galactosidase from yeast), while others have used yoghurt;
3. Substitute another carbohydrate, usually cereal-derived: Brown et al used noodles to replace half the milk received by the control group;
4. Give small feedings, and feed more frequently (5 to 8 times per day): the report does not inform us how many feedings per day were taken by the children.

As noted in the summary, the noodle-milk diets worked better than the non-noodle diets, exhibiting an "antidiarrheal" effect much like that seen when cereal-based ORS is compared to standard glucose-based ORS. This illustrates, as did Abiodun's report, that the feeding approach must be considered as part of the rehydration therapy, not as a separate or isolated component aimed only at adequate nutrition.

Surprisingly, the pre-digested milk did not show an improved effect compared with milk. Perhaps this was due to the additional osmotic load from the lactose digestion. Use of the enzyme made the osmolality of the predigested milk-corn syrup diet 433 mOsmoles per liter, compared to 350 mOsm/L for the milk-corn syrup diet and 160-217 mOsm/L for the noodle-milk diets.

Perhaps the best way to include milk in the diarrheal diet is to give it from the breast. That kind of milk is likely to be given in small, frequent feedings, and has "built-in" components which help to ease digestion. None of the patients in this study were breastfeeding significantly at the onset of diarrhea (all less than 2 times/day), so this option was unfortunately not available to them.

Javaid, N.; Haschke, F.; Pietshnig, B.; et al. "INTERACTIONS BETWEEN INFECTIONS, MALNUTRITION AND IRONNUTRITIONAL STATUS IN PAKISTANI INFANTS." ***Acta Paediatrica Scandinavica Supplement*****, vol. 374, 1991, 141-50.** ***Order #5229***

Summary

"The interactions between infections, malnutrition and poor iron nutritional status in infants at weaning ages are poorly defined. Therefore, four groups of infants from an area with a high incidence of malnutrition (Lahore, Pakistan) were enrolled in a prospective, randomized nutritional intervention study. Between 122 and 365 days of age, the infants from one community received either a milk cereal without iron fortification (n = 29), a milk cereal fortified with ferrous fumarate (7.5 mg/100 g; n = 30), or a milk cereal fortified with ferric-pyrophosphate (7.5 mg/100 g; n = 27). Forty-four infants from a neighbouring community did not receive a nutritional supplement and served as the control group. Calculated mean daily energy- and protein intake with the cereals was between 259-287 kcal, and 9.6-10.6 g at 12 months of age, respectively. Mean daily iron intake with the fortified cereals was between 4.1-5.1 mg at corresponding age. Nutritional supplementation resulted in significantly lower incidence of malnutrition and [higher] weight gain. Incidence of acute diarrhoea was significantly ($p<0.05$) lower in the supplemented groups. The infants fed the iron-fortified milk cereals had significantly higher hemoglobin (mean 10.4 vs. 9.8 $g \cdot dl^{-1}$) and serum ferritin (mean 13.3 vs. 8.5 $ng \cdot ml^{-1}$) values than the infants fed the non-fortified milk cereals. However, no differences in the incidence of infections were found between the supplemented groups. It is concluded that poor nutritional intake between 122 and 365 days of age substantially contributed to the high incidence of diarrhoea and malnutrition in Pakistani infants." [Published Abstract]

Editorial Comment

The title of this paper attracted me initially, and the abstract suggests a fascinating effect of supplementation: lower **incidence** of diarrhea. I wondered, "Does increased iron help to increase resistance to diarrhea? More likely, there's a problem with the study." And that is clearly the situation. I include this paper as an excellent illustration of the difficulties of carrying out studies of the effect of nutritional interventions on diarrhea incidence.

The investigators provided a powdered, commercial infant cereal to the supplemented children. We are not told how it was prepared, but it seems likely that the field workers who visited each house **daily** in the supplemented group would have boiled the water used in making it. This would certainly help to reduce intake of contaminated foods.

The study started the supplement at 4 months of age (122 days). This is itself probably too early. The supplemented communities added other solids at 254-279 days of age, while the unsupplemented community started other(presumably contaminated) solids at 191 days (6.5 months). Probably the mothers in the supplemented groups felt that their infants were already getting "solids"—the supplement—so they did not need to add further foods. Perhaps the field workers encouraged this on their daily visits. This delay in adding potentially contaminated solid foods to the infants' diets is a likely explanation for the reduced incidence of diarrhea in the

supplemented infants, one which has nothing to do with the nutritional effect of the supplement.

Was there any difference in baseline incidence of diarrhea between the communities? Any difference in education, handwashing by mothers, routines of food preparation? We are not told. Certainly if the investigators wish to draw inferences about the effect of one input—the supplement—on diarrhea incidence, they must carefully assess those other behaviors that would influence that outcome, and ideally determine that the incidence of diarrhea prior to the study is the same in the two communities.

Lastly, there is the potentially very important influence of daily visits by field workers on a range of behaviors, which could influence diarrhea incidence. Thus I cannot accept the authors' conclusion that "poor nutritional intake...contributed to the high incidence of diarrhea...," implying that the nutritional effect of the supplement somehow enhanced the infants' resistance to diarrheal infection. Multiple previous studies elsewhere have made it clear that incidence of diarrhea is not affected by nutritional status, although the severity and duration of diarrhea may be.

Perhaps the investigators wanted to prove that putting more and better food into the mouths of undernourished children would improve their nutrition. The data indicated that this did happen, but we have known that for a long time. However, from the perspective of public health programs, the methods used here are just not practical. Daily visits by field workers (perhaps even preparation of the supplement by those field workers) are not feasible in every poor community, and it seems likely to me that the effects reported, both on nutrition and infection, would not have occurred if feeding of the supplement had not been enforced by the daily home visits. So while the study does document that the supplement had a useful nutritional effect, it would be wrong to conclude that we should use such a supplement in a public health program.

West Jr., K.P.; Pokhrel, R.P.; Katz, J.; et al. "EFFICACY OF VITAMIN A IN REDUCING PRESCHOOL CHILD MORTALITY IN NEPAL." *The Lancet*, vol. 338, no. 8759, July 13, 1991, 67-71.
Order #5010

Summary

"Community trials of the efficacy of vitamin A supplementation in reducing preschool childhood mortality have produced conflicting results. To resolve the question, a randomised, double-masked, placebo-controlled community trial of 28 630 children aged 6-72 months was carried out in rural Nepal, an area representative of the Gangetic flood plain of South Asia. Randomisation was carried out by administrative ward; the vitamin-A-supplemented children received 60 000 retinol equivalents every 4 months and placebo-treated children received identical capsules containing 300 retinol equivalents. After 12 months, the relative risk of death in the vitamin-A-supplemented compared with the control group was 0.70 (95% confidence interval 0.56-0.88), equivalent to a 30% reduction in mortality. The trial, which had been planned to last 2 years, was discontinued. The reduction in mortality was present in both sexes (relative risk for boys 0.77; for girls 0.65), at all ages (range of relative risks 0.83-0.50), and throughout the year (0.76-0.67). The reduction in mortality risk was not affected by acute nutritional status, as measured by arm circumference. Thus, periodic vitamin A delivery in the community can greatly reduce child mortality in developing countries." [Published Abstract]

Editorial Comment

This paper is the most recent evidence that vitamin A supplementation in a vitamin-A deficient population can reduce overall mortality in children. A previous issue of the *Technical Literature Update* (vol. 6, no. 4, 1991) presented a number of articles on this point.

The study achieved careful follow-up and field management. Home visitors personally administered the capsule contents to 88% of children and, by leaving capsules in the houses of children who were out at the time of the visit, the coverage was raised to 93%. At least 74% of the children in each group received all of the planned supplements, and only 2% received no supplements.

Because of this careful implementation of the study, one can believe the results. The conclusions confirm the previous studies showing that vitamin A does have a beneficial effect. The effect was so clear that the investigators had to stop this study in the middle; it would not have been ethical to continue withholding the vitamin A supplement from the control group. It was of interest that the vitamin had a demonstrable effect on reducing mortality in wasted children (small arm circumference) even though all such children in both groups were sent to health facilities consistently whenever they were encountered.

The authors note that periodic dosing with vitamin A supplements should not displace efforts to improve the intake of vitamin A from locally available foods. They note, however, and I agree, that children cannot be allowed to continue dying from lack of vitamin A while we seek ways of effectively changing dietary habits at reasonable cost.

Theme: Dysentery

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VII, Nº4 1992

DYSENTERY

As control of diarrheal diseases (CDD) programs have begun to examine the impact of their efforts, it has become apparent that dysentery and persistent diarrhea play an important role, in some cases a dominant role, in mortality from diarrhea. The next two issues of the *Technical Literature Update* focus on dysentery, responding to the recent outpouring of articles on that problem in the published literature. Dysentery or bloody diarrhea is more complex in its diagnostic and therapeutic pathways than dehydrating watery diarrhea. It cannot be dealt with by a universal solution like ORT, and it falls prey to a range of issues surrounding the use of antibiotics. The articles and commentaries in this issue touch on the epidemiology of dysentery, as well as community and environmental aspects of its control.

Dysentery is characterized by the frequent passage of loose stools with blood and mucus, and often is accompanied by other symptoms such as fever, severe abdominal cramps, and tenesmus (rectal pain following defecation). Unlike most watery diarrheal diseases, which result from infection in the small intestine, dysentery results from infection in the colon, resulting in inflammation and often in ulceration. Dysentery is often labeled either "bacillary" (caused by bacteria, most commonly *Shigella*) or "amebic." The proportion of dysentery which is bacillary or amebic is variable, but in general, bacillary dysentery is much more common. *Shigella* is not the only cause of bacillary dysentery, but it is the most common. Other bacterial agents that can cause dysentery include invasive *E. coli*, *Campylobacter*, and probably *Aeromonas* and *Plesiomonas*. *Shigella* organisms are divided into four species: *S. dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei*. *S. flexneri* is the most common cause of endemic dysentery in developing countries while *S. dysenteriae* is frequently associated with severe epidemic disease. *S. sonnei* seems to be unusual in developing countries but is the most frequently isolated species in industrialized countries.

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Islam, A.B.M.Q.; Siddique, A.K.; Mazumder, Y.; et al. "A STEEP DECLINE OF DEATH IN A SHIGELLOSIS EPIDEMIC IN BANGLADESH BY A COMMUNITY-PARTICIPATED INTERVENTION."
***Journal of Diarrhoeal Disease Research*, vol. 6, nos. 3 and 4, September and December 1988, 215-20.**
Order #3256

Summary

An epidemic of shigellosis began in Dimla, Bangladesh on March 2, 1985. People of the community raised funds and requested assistance from the local Health Administration and the Epidemic Control Preparedness Programme (ECPP) of the International Centre for Diarrhoeal Disease Research, Bangladesh to operate a local, makeshift hospital. This facility, which functioned in a school building from April 20 until the end of the epidemic on July 14, was able to treat 40 to 50 patients at a time.

A physician assessed each patient twice daily. Clinically diagnosed blood-dysentery patients were rehydrated as necessary. Ampicillin by oral route (100 mg/kg/day) was given to all patients initially. For those patients who did not show clinical improvement within 48 hours, nalidixic acid (55 mg/kg/day) was then given. Patients were fed protein-rich meals three times per day. Patients and attendants were given soap for washing their hands before meals and after defecation, to avoid spreading infection.

Data on patient numbers and deaths were collected from the routine subdistrict diarrhea surveillance records and from treatment charts. It was found that the intervention produced a 187-fold decrease in the case-fatality rate, which dropped from 11.2% (70 deaths among 626 cases) before the hospital was established to 0.06% (one death among 1,708 patients) during its existence.

A sub-group of 108 hospital patients was studied for clinical and epidemiological characteristics. Only 22% of stool cultures (taken from 65 of these patients) were positive for *Shigella*. Although the organisms from 86% of the cultured patients showed resistance to ampicillin, 70% of the 108 patients in the sub-group improved with ampicillin treatment. Common dysenteric symptoms included acute onset of diarrhea, fever, frequent bloody-mucoid stools, and abdominal cramps. Most of the patients had mild to no dehydration and had come to the hospital within 5 days of onset. Conversely, surveillance data showed that 80% of pre-intervention deaths occurred after 5 days of illness.

It can be extrapolated that another 191 patients would have died without the services of the community-operated hospital. Similar interventions may avert almost all deaths in rural epidemics of shigellosis.

Editorial Comment

This report describes a remarkable event, a community responding to a devastating dysentery epidemic by organizing a practical, close, and therefore easily accessible, makeshift treatment center *cum* hospital, and reducing subsequent mortality from the epidemic from 11% to almost zero. The report shows first of all the dramatic damage that dysentery can exert in a community epidemic, enough to energize the community and local doctors to stop everything else and take action. I wondered what role the information obtained by the routine diarrhea surveillance system had in bringing this about. Scattered over a rural area, would the community and responsible physicians have known that an epidemic was taking place, and how damaging it was, without that routine surveillance data? I suspect it was quite important in providing a solid factual basis for motivation toward action.

Second, the report dramatizes for me the fact that a comprehensive approach to dysentery treatment is needed to have such a positive impact. Good diarrhea management, in particular assessment and treatment of dehydration and aggressive feeding, was probably as important as the antibiotic therapy, especially in that two-thirds of the initial deaths were in children under 5, many of whom were undoubtedly undernourished. With fully 6% of the specially studied group severely dehydrated, and another 14% moderately dehydrated, keeping the patients alive with fluids was a necessary first step to allowing the antibiotics to eliminate the organism. The extra attention to feeding may have been particularly

Technical Literature Update

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important in supporting healing of the intestine in what was probably a generally malnourished group of children.

Third, locating the treatment center in the community and providing quick access allowed for early initiation of treatment. The authors comment that prior to opening the community center, the nearest source of care was a rather distant government health center, 10 km from the epidemic. In addition, the treatment there may have been minimal; many rural health centers have shortages of personnel and supplies, and monitoring of patients may be difficult or impossible. The close and well-run community treatment center allowed for earlier and better treatment and patient monitoring.

Was the epidemic in fact shigella, despite the low *Shigella* positivity in the specially studied patients—only 22%? I suspect it was because of the classic pattern of illness and mortality. In developing countries, some 60% of bloody diarrheas are caused by *Shigella*, and it is without question the most likely cause of epidemics of bloody diarrhea such as this one. The authors attribute the low positivity to the long period the specimens spent in transport media before inoculation of culture media.

Was ampicillin the reason for the patients' recovery, despite the fact that 86% of the *Shigella* samples were resistant to it? Here I wonder a bit more. The authors state that patients with mucoid stool only were also counted as "blood-dysentery" patients, despite the name. How many of the patients who recovered with ampicillin alone were in fact infected with *Shigella*? We know that *Shigella* infections do recover spontaneously in most patients. Would many of the patients have done as well without ampicillin?

These questions demonstrate the importance of careful documentation of both clinical and laboratory characteristics of patients and organisms. It is not possible to draw dependable conclusions from this study regarding the effectiveness of ampicillin in cases of *Shigella* dysentery which have been shown to be resistant to ampicillin *in vitro*.

Bennish, M.L.; Wojtyniak, B.J. "MORTALITY DUE TO SHIGELLOSIS: COMMUNITY AND HOSPITAL DATA."
***Reviews of Infectious Diseases*, vol. 13, suppl. 4, 1991, S245-51.**
Order #5040

Summary

Published data on the mortality associated with shigellosis in developing countries are available from three primary sources: investigation of epidemics of dysentery caused by *Shigella dysenteriae* type 1, surveillance of endemic diarrheal disease in communities, and hospital records. Investigations of eight dysentery epidemics in various countries worldwide between 1969 and 1984 showed overall incidence rates ranging from 1.2% to 32.9%; attack rates appeared to have been higher when active case finding was used to detect cases than when passive governmental reporting systems provided the information. Overall case-fatality rates ranged from 0.6% to 7.4%. In general, case-fatality rates during epidemics were highest among infants (17% in one epidemic on an island in Bangladesh) and were higher among both children 1 to 4 years of age and persons over 50 years of age than among other age groups.

Although epidemic *S. dysenteriae* type 1 is the most dramatic manifestation of shigellosis, the majority of *Shigella* infections are due to endemic shigellosis caused by other *Shigella* species. Information about endemic shigellosis is available through the Demographic Surveillance System maintained by the International Centre for Diarrhoeal Disease Research, Bangladesh in the rural district of Matlab. This system has monitored diarrheal deaths in a population of about 200,000 since 1965. From 1975 to 1985, deaths attributed to dysentery accounted for more than 20% of deaths from all causes in the 1- to 4-year age group for every year except 1981. Deaths due to dysentery outnumbered deaths due to watery diarrhea by a ratio ranging from 2.1 to 7.8. Using data from Matlab to estimate nationwide mortality for dysentery and shigellosis, one can calculate that in peak epidemic years such as 1984, dysentery accounts for approximately 150,000 deaths among children aged 1 to 4 years in Bangladesh, of which about 50%, or 75,000, are due to *Shigella* dysentery. In non-epidemic years, an estimated 35,000 such children die from dysentery.

Information from the Dhaka and Matlab diarrhea treatment centers, both of which provide in-patient care, has also been analyzed. Hospital fatality rates for patients admitted to the Dhaka unit with any species of *Shigella* ranged from 13.9% in infants to 3.7% in patients over 15, with an overall mortality of 9.1%. Data from the Matlab field hospital (1983-84) indicated that substantial mortality occurred following discharge. This hospital admits all patients who come for care at least overnight, thus admission does not imply severity or complications. Nevertheless, 4.9% of patients admitted with shigellosis died within 3 months following admission, four-fifths of them after discharge from the hospital. Because of its negative impact on nutritional

status, shigellosis may have a long-term effect on mortality. Three studies from Bangladesh have demonstrated that dysentery has a greater effect on growth than watery diarrhea, and that catch-up growth is less likely to occur after recovery from the infection.

None of these types of data may represent the true picture, for various reasons. The mortality rates from epidemic disease are the most valid; the exact quantitative contribution of endemic shigellosis to mortality is less clear, although certainly substantial. It is evident that prevention of deaths due to shigellosis will require efforts directed at controlling both epidemic and endemic shigellosis.

Editorial Comment

The impressions of *Shigella* dysentery one obtains from these different types of data remind me of the story of the group of blind men trying to understand "elephant." One grabbed the tail and said, "Oh, elephant is like a rope." Another felt the elephant's side, and said, "No, elephant is like a wall"...you know the story. This report shows nicely the "blindness" we experience from different ways of looking at dysentery and *Shigella* infections. Some investigations actively seek cases in the community, and say, "Oh, shigella is widely prevalent, everybody gets it, but only a small proportion die." Others look only at cases which come to health facilities, or more narrowly yet, at cases admitted to hospitals, and say, "No, *Shigella* dysentery affects only a small proportion of the population, but case-fatality rates are high."

Further confounding these contradictory impressions is the influence of varying treatment availability and use. I cannot help but wonder, for example, about the extent to which the availability and use of oral rehydration in Matlab may reduce deaths from watery dehydrating diarrhea and thereby make dysentery a larger proportion of Matlab diarrheal deaths than it is elsewhere in Bangladesh. In the same way, ORT may reduce the proportion of diarrheal deaths overall among all childhood deaths in Matlab. If one chose by chance an elephant to investigate whose trunk had been cut off in a logging accident, would one want to conclude confidently that "elephant" was a short-nosed animal? Looking at relative proportions of dysentery and diarrheal deaths in Matlab may be like that.

The data from hospitalized cases are also exaggerated in certain ways. Hospital admissions are likely to be selected not only for severity of their dysentery, but also for severity of underlying or complicating factors (e.g., fever, pneumonia, malnutrition, shock). Is it appropriate to generalize that *Shigella* dysentery, like measles, has long-lasting effects on mortality (increased mortality during the 3 months after admission) from such a sample of cases? Although hospital policy admits all cases that reach the Matlab hospital, the patients who choose to seek care at hospitals are already a highly self-selected and biased group.

The authors of this review are not guilty of being blind: they carefully describe the limitations of each of the three types of data they present. Yet we the readers, as "blind men," must be even more on guard to avoid the unconscious tendency to conclude "Elephant is like a rope," or "Dysentery occurs mostly in malnourished children," after grabbing only one part of the animal. All of the impressions of "elephant" are true, but each is not the whole truth.

Henry, F.J. "THE EPIDEMIOLOGIC IMPORTANCE OF DYSENTERY IN COMMUNITIES." *Reviews of Infectious Diseases*, vol. 13, suppl. 4, 1991, S238-44. *Order #4845*

Summary

Various community studies in both urban and rural Bangladesh have provided information on the prevalence and incidence of dysentery as well as its association with pathogens, nutritional status, persistent diarrhea, and mortality. In one study, *Shigella* was isolated from 50% of stools with blood, but was also present in 19% of mucoid stools. In a comparative longitudinal study in urban Zinzira and rural Mirzapur, *Shigella* was recovered in 9.4% of urban dysenteric (bloody) stools, and 28.3% of rural dysenteric stools. The peak prevalence of watery diarrhea occurred at 6 to 11 months of age, while the peak prevalence of dysentery occurred at 18 to 23 months. In another study, children averaged one attack of bloody diarrhea per 2-year period; these episodes lasted an average of 14.2 days. Several studies have shown that *Shigella* is the dominant pathogen in cases of dysentery in Bangladesh.

Study results have also shown that cases of dysentery are more likely to persist than cases of watery or mucoid diarrhea, and that the prevalence of dysentery, as well as *Shigella* isolation, is higher in persistent diarrhea patients than in patients with acute watery diarrhea. A Teknaf study showed dysentery lasting a mean of 8.8 days, watery diarrhea 5.4 days. A Matlab study found that 21% of *Shigella* illnesses lasted 10 to 19 days, and 16% continued more than 20 days.

In Teknaf, dysentery lasted significantly longer in children with stunted growth. Similarly, height-for-age was the most significant determinant of the duration of dysentery. Several studies in Bangladesh have suggested that dysentery has a particularly strong negative effect on linear growth. The reasons for this may be the longer duration of dysenteric episodes than watery diarrheal episodes, the greater likelihood of enteropathy with protein loss in the stool (82% in dysentery versus only 38% in watery diarrhea), or the fact that already stunted children have longer dysenteric episodes.

An active surveillance study in Matlab found equal mortality in children under 5 from acute dysentery and acute watery diarrhea—5% of total mortality from each. In another area of Bangladesh, however, child deaths from dysentery were 1.8 times higher than deaths from watery diarrhea. Another report from Matlab showed dysentery accounting for 20 to 50% of all diarrhea-associated deaths; 56% of these dysentery-associated deaths were due to acute bloody diarrhea, and 44% to chronic dysentery. Comparing various causes of diarrheal deaths, the Matlab surveillance study found that acute watery diarrhea, acute dysentery, post-measles dysentery, and persistent diarrhea each accounted for 13% to 15% of diarrhea-related deaths in children under 5. In contrast, persistent diarrhea in association with malnutrition caused 42% of diarrheal deaths.

Dysentery and *Shigella* infection can be prevented by improved hygiene and water/sanitation. Installation of latrines and tube wells reduced the prevalence of bloody and mucoid diarrhea in one study area, but had little effect on watery diarrhea. Other results showed that handwashing with soap and water can also interrupt transmission of *Shigella* infections.

Since the largest single group of diarrheal deaths occurs in malnourished children with persistent diarrhea, most often associated with dysentery, CDD programs which focus only on ORT are unlikely to have a major impact on diarrheal mortality. Other important program components should include improvement of nutrition, weaning practices, personal and domestic hygiene, and sanitation.

Editorial Comment

It is becoming ever more apparent that dysentery, especially in combination with malnutrition, is at least an equal, and in some localities a greater, cause of diarrhea-related death than watery diarrhea. Many of the data in this review are from Matlab, the field research area of the International Centre for Diarrhoeal Disease Research in Bangladesh (ICDDR,B). Knowing the special nature of the facilities there, one may wonder to what extent quantitative results from Matlab are directly transferrable to other sites. I have no doubt, however, that the general conclusions are transferrable, and that dysentery is a major challenge to CDD programs today, even more so as dehydrating watery diarrhea is dealt with by better rehydration treatment.

The review raises an important question facing those who would investigate the epidemiology of diarrhea: What word or words should be used to elicit the presence of diarrhea? Few reports describe in adequate detail the word or words used in asking families if their children have diarrhea or watery diarrhea or just loose bowels or dysentery. Yet, in Bangladesh, the responses to the word "diarrhea" may differ substantially from the responses if the words *amasha* (mucoid diarrhea) and *rokto amasha* (bloody/mucoid diarrhea) are used. How many of the differences reported from study to study are related to the ignorance of the investigator regarding the different words families use to describe their diarrheal illnesses? Perhaps some of the early priority given to watery diarrhea as a cause of morbidity and death may have been due to insensitivity of interviewers to the fact that the word "diarrhea" does not include dysentery in the minds of a particular population. We seem to be seeing an increase in the quantitative importance of dysentery. Was it there all the time, but not detected, because the words used by field interviewers to ask families about diarrhea did not include bloody diarrhea?

The author's conclusion raises the question of the appropriate balance between preventive and curative services in CDD programs. Is the current emphasis on case management likely to result in mortality reduction? In countries such as Bangladesh, where the data suggest that ORT alone will have only a limited effect on mortality, would an educational stress on case management of dysentery have a greater effect? Or are the problems in the health system too great for the system to effectively support good dysentery case management? If families understand the principles of dehydration and oral rehydration, they can prevent death from dehydrating diarrhea at home. Practitioners can similarly use available solutions if ORS packets are not available. But for dysentery, antibiotics are needed to prevent mortality in the severe cases. Can CDD programs overcome the weaknesses in health system logistics and drug management which make antibiotics unavailable in many health facilities?

Cohen, D.; Green, M.; Block, C.; et al. "REDUCTION OF TRANSMISSION OF SHIGELLOSIS BY CONTROL OF HOUSEFLIES (*MUSCA DOMESTICA*)." *The Lancet*, vol. 337, no. 8748, April 27, 1991, 993-97.
Order #4760

Summary

The effect of control of houseflies on the incidence of diarrhea and shigellosis was evaluated in a prospective crossover intervention study at two Israeli military field camps several kilometers apart. On the intervention bases, about 60 baited fly traps were placed around the latrines, the field kitchen, and the mess tents, with bait changed twice weekly. Spraying with pyrethrum as a supplementary measure was also carried out. Counts of flies were made thrice daily by counting the number of flies on a 2.5 meter segment of electric wire in two mess tents on both control and intervention bases. Pooled samples of ten trapped flies were ground up, emulsified, and cultured for *Shigella*. Environmental samples from field latrines were also cultured for *Shigella*. The intervention was carried out for 11 weeks at one camp, with the other serving as a control. After 11 weeks, the intervention was stopped at the first camp, and started at the other, concomitantly with the arrival of new recruits. This was done for two consecutive summers (1988 and 1989).

Results showed that fly counts were 64% lower on the bases exposed to fly-control measures (p=0.024). Clinic visits dropped by 42% (p=0.146) for diarrheal diseases (from 25.2% of soldiers to 14.6%) and by 85% for shigellosis (p=0.015, from 4% of soldiers to 0.06%). Rates of seroconversion also fell by 76% (p=0.024) for antibodies to *Shigella* and by 57%(p=0.006) for antibodies to enterotoxigenic *Escherichia coli*. Cultures of 33 pooled fly samples revealed that 6% contained *Shigella* sp. Cultures from 9% of the samples from latrines at both intervention and non-intervention camps yielded *S. sonnei* or *S. flexneri*, indicating that flies in the area of the latrines had access to human feces containing *Shigella*.

This study supports the contention that houseflies act as mechanical vectors, transmitting *Shigella* and other diarrheal infections. Analogous intervention studies should be carried out in developing countries using a combination of fly-control measures and improved sanitation, particularly the VIP latrine, which is relatively flyproof.

Editorial Comment

I was delighted to see this article, as I had long been convinced of the importance of houseflies as vectors, although fly-control measures have not been demonstrably effective. This carefully done study shows that fly control can effectively reduce both diarrhea (although not statistically significantly) and *Shigella* infections. The authors point out that outbreaks of diarrhea, and even of *Shigella*, during the four periods of study, even when fly control was good, suggested that flies were not the only vectors or transmission mechanism. (The cases could still have been caused by contaminated flies, however, as fly control was never complete.) The clear-cut differences in the development of antibodies to *Shigella*, however, confirm the clinical epidemiological data indicating the substantial role of flies in transmission of diarrheal disease and of fly-control measures in reducing this transmission.

Whether fly control could have a similar impact on pediatric diarrhea and in villages of developing countries is more uncertain. The military camp setting described in this paper represented a situation in which most other modes of shigella transmission were not present. Food and water started out clean, and handwashing behavior was ingrained. Hence, fly transmission from latrine to food represented the major role of transmission. Transmission in developing country settings, or where children are involved, is likely to be much more complex. Under these settings, fly control, while useful, may influence a smaller proportion of all transmission. One unique aspect of the military camp setting, for example, was that food preparation was done in a single area, not scattered over the area as it would be in an ordinary village setting. This geographic concentration of food allowed control measures, also concentrated, to be more effective.

Should developing countries make fly control an important part of their efforts to prevent dysentery, or diarrhea? WHO/CDD recently reviewed this question (Esrey WHO/CDD/91.37) and found that almost all the published studies were inconclusive, that fly control was difficult or impossible in many settings, and that the evidence that changes in fly densities led to related changes in diarrhea was not clear. Esrey concluded that fly control was not a cost-effective measure for CDD programs in developing countries which aim to control diarrheal diseases in young children.

This study shows that fly control can be an effective preventive measure in certain circumstances. Certainly CDD programs should not discourage groups wishing to control flies, but should keep in mind that other efforts to prevent childhood diarrhea, such as handwashing and exclusive breastfeeding, are likely to be more effective for the same expenditure of effort, and certainly should not be displaced by fly-control interventions.

Theme: Dysentery

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VII, Nº5 1992

Ronsmans, C.; Bennish, M.L.; Chakraborty, J.; et al. "CURRENT PRACTICES FOR TREATMENT OF DYSENTERY IN RURAL BANGLADESH." ***Reviews of Infectious Diseases*****, vol. 13, suppl. 4, 1991, S351-56.** ***Order #4843***

DYSENTERY

This issue continues last issue's discussion of dysentery, particularly *Shigella* dysentery. The articles presented here deal with the reality of treatment in rural areas by often untrained practitioners, the changing nature of antibiotic therapy as resistance to cheaper antibiotics spreads, the belief structure surrounding bathing and washing as key elements in the hygienic control of *Shigella* transmission, and the microbiology and pathology of *Shigella*. Underlying many of these themes are the issues of practicality and of integration of the science of dysentery into the reality of community concerns.

Summary

Dysentery that is primarily caused by infection with *Shigella* is responsible for the majority of diarrheal deaths in Bangladeshi children. This study compared the type of care received by children under 5 with bloody diarrhea to that received by children under 5 with nonbloody diarrhea, all of whom had been ill less than 14 days. From May to November 1988, information on 960 patients (480 with dysentery and 480 with nonbloody diarrhea) was gathered by community health workers during bi-weekly home visits in the Matlab and Chandpur districts. This information included type and duration of the episode; name, type, and location of health care providers used for the episode; and type of treatment received.

The children with bloody diarrhea were more likely to have received care from a medical practitioner. This likelihood, however, was related to duration of illness rather than to type of episode, as 71% of children with either type of diarrhea who had been ill for more than 3 days received some type of medical care.

Allopathy was the most common type of outside care received for both types of diarrhea. Patients with bloody diarrhea were more likely to have been treated by an allopath than those with nonbloody diarrhea (62% vs. 43%). Most of these allopathic practitioners had little or no formal training; only 6% were medical school graduates. Patients also received care from homeopaths (48% of children with bloody diarrhea and 40% of children with nonbloody diarrhea), herbalists (30% and 19%), and spiritualists (4% and 5%). No outside care was obtained in 32% and 42% of cases respectively. In Matlab, community workers recommended that all children with bloody diarrhea (240) be taken to the official treatment centers for treatment, but only ten actually went.

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About a quarter (27%) of all patients with diarrhea in Matlab received oral rehydration therapy, in all cases ORS. In Chandpur only 15% received ORT, all but one as homemade oral rehydration solution. Overall, more children with nonbloody diarrhea received ORT than did those with bloody diarrhea. In most cases, the amount of solution was insufficient to prevent dehydration if the purging rates had been high. Although the low level of use is disappointing in view of the extensive CDD program operating in Matlab for over 10 years, it may indicate a perception that certain children are at lower risk. In fact, none of the children with nonbloody diarrhea became dehydrated.

Allopathic drugs were prescribed for 40% of the children with bloody diarrhea and 22% of the nonbloody diarrhea patients. Overall, 66% of children received a prescription for one allopathic drug while 23% received prescriptions for two, and 11% received prescriptions for three or more drugs. Furazolidone, trimethoprim-sulfamethoxazole, metronidazole, and ampicillin were most frequently prescribed. The latter two drugs were given more frequently to patients with bloody diarrhea than to those with nonbloody diarrhea. Most prescriptions were for an inappropriately small quantity of drug and most of the prescribed drugs were not indicated.

Editorial Comment

Rural Bangladesh appears to resemble India in its care-seeking response to diarrhea and in the actions taken by rural practitioners (see *TLU*, Volume V, Number 7). Rural families prefer to go to the non-physician practitioners who are located close to their homes. Despite the known high quality of care provided at the ICDDR,B centers in Matlab, only a few families used them for bloody diarrhea. As the duration of an episode lengthened, however, families began to seek allopathic care: the use of allopathic treatment went from only 45% of children after 3 days of bloody diarrhea, to 80% after 14 days. About a quarter of all patients sought help from more than one practitioner.

The report unfortunately does not indicate what percent of practitioners prescribed both a drug and ORS for bloody diarrhea or nonbloody diarrhea. We do know that less than 20% of bloody diarrhea patients received ORT, while 40% received drugs. In comparison, nonbloody diarrhea patients received more ORT and fewer drugs.

Given the fact that almost all rural practitioners make their money from selling drugs, not from charging for consultation, I actually was surprised that only 34% of the drug-receiving patients had received two or more drugs—two-thirds received only a single drug. Unfortunately, most of the drugs prescribed were not indicated, and were given in ineffectively small quantities.

The authors comment that given the inevitably high use of these local, easily accessible practitioners, CDD programs must either make an effort to assist these practitioners to give more effective treatment, or give up having an impact on the case management of diarrhea, either bloody or watery. Note how few families accepted the recommendations of the community workers to go to the official health facility for treatment. The authors suggest giving private practitioners a simple treatment algorithm. Such assistance must take into account, however, the economic realities these practitioners face; they must obtain their income from the sales of what they prescribe. Could a way be found, for example, to allow such rural practitioners to make a satisfactory profit from selling ORS packets, or a special diarrhea or dysentery food, or other truly appropriate therapy? Without an approach which responds to the practitioners' survival needs, it may be difficult to convince them to adopt a different treatment algorithm than the one they are now using.

I was also struck by the authors' comment that despite the low use of ORT in nonbloody diarrhea, and the inadequate quantity of fluid given when it was used, none of the patients became dehydrated. Most of our CDD programs recommend giving ORT to every child with diarrhea, from the first loose stool. Mothers appeared to decide that this advice was not sensible, or was more work than was indicated by the child's condition, and did not follow it. We know that a small percentage of children will become dehydrated, even though this report did not find them. What information could be given to these mothers that would allow them to more reliably identify those times, those episodes, when dehydration is more likely to occur, or has already occurred, so that they will be sure to use ORT then?

Technical Literature Update

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Putting more emphasis on dehydration in messages, stressing the observation and estimation of fluid losses, conveying the signs of dehydration so mothers won't miss it, or will pick it up early (e.g., irritability or restlessness as an early sign of "some" dehydration) all have been tried elsewhere. Which set of messages would this population be best able to receive? Studies trying such approaches certainly qualify as essential national (and international) health research.

Salam, M.A.; Bennish, M.L. "ANTIMICROBIAL THERAPY FOR SHIGELLOSIS." *Reviews of Infectious Diseases*, vol. 13, suppl. 4, 1991, S332-41.
Order #5031

Summary

In addition to rehydration therapy and nutritional support, early initiation of effective antimicrobial therapy is an important part of the strategy for reducing mortality related to shigellosis. Clinical trials have shown that use of antimicrobials shortens the duration of symptoms and the excretion of pathogens. For a drug to be useful in treating shigellosis in children in developing countries, it should be inexpensive, safe for use in children, available in an oral formulation, effective *in vitro* against the majority of *Shigella* isolates in the area where the drug will be used, and proven efficacious in controlled clinical trials.

Tetracycline and the sulfonamides alone are no longer useful in treating shigellosis because the majority of *Shigella* isolates are now resistant to these agents. For the last 15 years, ampicillin and trimethoprim-sulfamethoxazole have been the drugs of choice to treat this disease. They are inexpensive and widely available in developing countries. However, in the last 5 years, strains of *S. flexneri*, *S. dysenteriae* type 1, and *S. sonnei* that are resistant to both drugs have been identified in Asia, Africa, and North America.

Nalidixic acid has been the most common alternative for treatment of resistant cases of shigellosis, but resistance to this drug is also increasing. Two other alternative treatment options are the newer quinolines and amdinocillin. Unfortunately, at this time, all three of these alternatives have drawbacks (cost or questions about safety in children). A possible future option that should be explored is the use of second- and third-generation cephalosporins.

Editorial Comment

Does treatment with an appropriate antibiotic lead to a reduction in mortality? The studies used in this excellent review do not answer this critical question directly, but reduction in morbidity with antibiotic use is so obvious that this alone justifies treatment. Indeed the use of a placebo cannot be justified currently in experimental studies. Therefore, it seems very likely that antibiotic use must lead to a reduction in mortality, even if the studies themselves do not prove it. Yet in the real world of community practitioners described in the previous article (Ronsmans et al), there are many factors which interfere with theoretical efficacy becoming real efficacy, including availability of the right antibiotic in the rural periphery, its cost as a barrier to use, the duration of the prescribed course of drugs, the duration of the course purchased by the parents and then actually given to and consumed by the child, etc, etc. So it is not clear at all whether making correct advice regarding sensitivity and the correct antibiotic available to a particular population will lead to a reduction in mortality from shigellosis.

It must be noted that the article reviews studies on shigellosis, not dysentery. We know that *Shigella* causes 60% or so of bloody diarrheas in developing countries, thus it makes sense to manage dysentery as if it were *Shigella* dysentery, since it is impossible in places like rural Bangladesh to identify the specific causative agent. This article speaks of "proven or suspected shigellosis." The results of a particular antibiotic in treating dysentery will vary, however, if the agents causing the other 40% of dysenteries vary in their sensitivity to that antibiotic.

An effective antibiotic for shigellosis is not always easy to predict. Clearly, it should be one to which the bacteria is sensitive *in vitro*. However, not all such "sensitive" antibiotics are clinically effective, and the clinical effectiveness can only be determined through clinical trials.

An important characteristic of real world efficacy may be the ability of an antibiotic to be effective in a short course of therapy, since the majority of practitioners prescribe such short courses. Cost is also critical, especially for newer agents that are very expensive. We face a big problem in the future with resistance now widespread to the current, inexpensive, oral agents such as ampicillin and trimethoprim-sulfamethoxazole, and with manufacturers maintaining high prices for the newer agents. Parenteral agents might be considered, but they have no advantage and are not desirable in developing countries because of the inconvenience, cost and, more recently, risk of AIDS through injections with contaminated needles.

A critical factor in achieving reduction of mortality through treatment is the integration of diarrhea

management with the identification and management of malnutrition. This is especially important in dysentery management, because of the profound impact of dysentery on growth. Building steps to detect the stunted or wasted child into the approach used will be critical in order to ensure closer attention, recommend a return visit, and spend enough time convincing the mother that she must feed the child aggressively and talking with her about how to overcome anorexia. In situations where it is procedurally feasible, doing cultures and sensitivities on severely malnourished children with dysentery would help to ensure that the antibiotic chosen was likely to be effective.

The authors note that antibiotic treatment of watery diarrhea caused by *Shigella* has not proven to be effective. Using standard treatment recommendations, patients with acute watery diarrhea would not be considered for antibiotics initially, so this exception to antibiotic efficacy in shigellosis would not become a problem under field conditions.

Zeitlyn, S.; Islam, F. "THE USE OF SOAP AND WATER IN TWO BANGLADESHI COMMUNITIES: IMPLICATIONS FOR THE TRANSMISSION OF DIARRHEA." *Review of Infectious Diseases*, vol. 13, suppl. 4, 1991, S259-64.
Order #4815

Summary

The pattern of fecal-oral transmission of microorganisms plays an important role in the transmission of *Shigella*. Regular handwashing with soap and water has been shown to reduce such transmission. However, before handwashing can be effectively promoted on a wide scale, it is necessary to understand the perceptions of cleanliness and the roles of soap and handwashing at the community level. This study examined these perceptions among 100 mothers of children under 5 in a rural village and an urban slum in Bangladesh.

Both Bangladeshi Hindus and Muslims view water as an important agent of purification. Although water's religious significance differs between these groups, both regard the simple act of pouring water over the body or immersing the body in water as one of purification. Water is also attributed with a capacity for cooling, important in the system of ideas which classifies many substances according to inherent "hot" or "cold" properties. According to this belief system, a healthy body must maintain a balance between heat and cold, and illnesses may be caused by an extreme.

In these two study communities, after defecation, water from a small pot is used to wash the anal region with the left hand. The hands are then cleaned using ash, mud, or water. The left hand does not touch the right one during this process. Cleaning a child after defecation is generally done by the mother. Although most people regard feces as pollutants, they do not associate fecal contamination with the transmission of agents that cause diarrhea. Muslims are also supposed to wash the right hand and rinse the plate before meals, keeping the left and right hands separated during meals to maintain purity. However, people tend to use both hands out of necessity when preparing food and collecting drinking water, and children often do not make the appropriate distinction between their left and right hands.

Muslims perform ritual bathing before prayer five times a day, as well as at other times. Both Muslims and Hindus also take a daily bath if possible. This is considered a cooling and cleansing act. Most people who use soap buy the type produced for washing clothes since it is cheaper and lasts longer. Body soap is associated with luxury and beauty, a concept reinforced by advertising. Because of this perception, soap is rarely used for handwashing. In addition, because of their cooling properties, both soap and water are perceived as having potentially deleterious effects, especially for children.

To change handwashing habits so that effective cleaning occurs after defecation and before meals, perceptions and practices must be altered. Possible approaches include changing soap advertising so that it stresses the use of soap in handwashing and its benefits for children, and educating people about the relationship between fecal contamination and diarrhea.

Editorial Comment

This article is one more in the battery of evidence showing how valuable, even essential, anthropology and the information gathered by anthropologists is in designing communication messages that will work. If a Western-thinking person develops an advertisement, poster, or community talk based on the idea that people see feces as a source or cause of diarrhea, and are washing to prevent diarrhea, they will probably develop materials which won't work well because of the very different assumptions and beliefs which surround washing, bathing, and soap in other cultures. Only by directly addressing such beliefs in the messages will one be able to convince the listener that the ad understands and proceeds from his or her world view, and therefore must be taken seriously.

Anthropologists can also help to gather the subtle details of current behaviors, needed in order to identify why global or general messages may not work. In this article, for example, we learn that people from this culture generally do not rub their hands together when they wash them, for fear that the left, or fecal, hand may contaminate the right one. It will take a special message to address this detail, and encourage people to rub hands together so as to actually get better cleansing of pollution from the feces.

Put more broadly yet, this article should reinforce our conviction that communications messages and campaigns cannot be designed by men from the Ministry sitting around a table in the capital of the country.

Echeverria, P.; Sethabutr, O.; Pitarangsi, C. "MICROBIOLOGY AND DIAGNOSIS OF INFECTIONS WITH *SHIGELLA* AND ENTEROINVASIVE *ESCHERICHIA COLI*." *Reviews of Infectious Diseases*, vol. 13, suppl. 4, 1991, S220-25. *Order #5042*

Summary

"The etiology of dysentery in Thailand and the existing methods of diagnosing infections with *Shigella* and enteroinvasive *Escherichia coli* (EIEC) are reviewed. The four *Shigella* species (*S. dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei*) are classically identified by culture of fecal specimens on selective media and testing of isolates for agglutination in species-specific antisera. DNA probes have been used to identify both lactose-fermenting and non-lactose-fermenting EIEC as well as *Shigella* isolates that do not agglutinate in antisera. These DNA probes are not necessary for the identification of *Shigella* if a competent bacteriology laboratory with shigella antisera is available. In Thailand *Shigella* and EIEC are isolated more often from children > 2 years of age than from younger children. The clinical illness associated with EIEC infections is similar to shigellosis. Fewer children with EIEC infections than with shigellosis, however, have occult blood in stool (36% vs. 82%) and more than 10 fecal leukocytes per high-power field (36% vs. 67%). Standard bacteriologic methods and testing of *E. coli* isolates for hybridization with the shigella/EIEC probe are currently the most sensitive means of diagnosing infections caused by these enteric pathogens. A more rapid method of identifying *Shigella* and EIEC infections in a situation where a bacteriology laboratory is not available will probably involve immunologic assays." [Published Abstract]

Editorial Comment

How important is it for the practitioner to know what organism is causing the diarrhea, or the dysentery? The protocols for treating diarrhea are based on a progressive increase in detailed knowledge of the nature of the illness. We start with the simple presence of diarrhea, note that diarrhea by definition means fluid loss, and recommend use of ORT in all cases of diarrhea. We increase in complexity from there: presence of blood with the diarrhea means dysentery. Dysentery has a different time course, it won't respond to ORT alone, the patient may have more severe nutritional problems, etc. Knowing that it is dysentery will change both our treatment and our expectations, or prognosis. The problem is that various organisms may cause dysentery, and there is no single medicine, like ORT, which will act against all of them. So we seek more information.

In developing country settings, knowing that the disease is dysentery, i.e., that there is blood in the stool, is a fairly good predictor that the cause is *Shigella* (50% to 60% of the time), and therefore treatment with drugs that usually work against *Shigella* is indicated. That doesn't work in a different epidemiologic and environmental setting, such as a developed country, because *Shigella* is not as prominent as **the cause** of dysentery. It also won't "work," that is, won't lead to effective treatment, if the *Shigella* strains prevalent in an area are not sensitive to the usual antibiotics.

The practitioner takes a practical way out: the therapeutic test. Treat the patient with an approach that can be expected to work, use a combination of treatments to cover various less likely possibilities, and see what happens. If the patient gets better, then the "diagnosis" (in fact, the treatment used, whatever the real diagnosis) was correct. If not, then try something else. This approach is practical, but patients and practitioners still want to know the cause. At the heart of the process is a fundamental human need—to name the devil. In general we humans feel much better if we can name the enemy we are struggling with, **even if so naming the devil does not affect our response.**

This article explores the complexities of naming the devils that cause diarrhea, particularly dysentery. Certainly there are other benefits from knowing the organism, the species, even the strain, of the organisms which are causing an individual case, or are the predominant endemic strain, or are causing an epidemic. For research purposes, it may be the central focus of attention. But for therapeutic purposes it is possible to initiate sensible treatment without knowing

the specific causative agent. It must be kept in mind also that identifying an etiologic organism by ELISA or DNA probe still will not definitively predict whether it will respond to a particular antibiotic. Because of this, the therapeutic trial remains an important part of the practical response to dysentery in the individual patient.

The article points out that use of a microscope to detect fecal leukocytes, combined with the knowledge that there is blood in the stool, can be used to predict *Shigella* as the cause of illness. Microscopes are important in developing country health facilities for a variety of purposes, and have a low recurrent cost. This gives microscopes advantages over facilities and supplies for bacteriologic culture, which require refrigeration, become dried out or contaminated after a period of time, and require much more training to use effectively. Only bacteriologic facilities can run the antibiotic sensitivity tests which will predict the effectiveness of various antibiotics against a particular patient's organism however. Work is going on to develop simplified methods of doing ELISA type tests and other rapid procedures in field settings. These development efforts are of equal or greater importance in comparison to the more basic work, such as that reviewed in this article, to develop new approaches to identification and characterization of etiologic organisms.

I point out these various considerations to emphasize that the purpose of identifying organisms must be clear. Is it to determine treatment of an individual patient? If so, simple clinical information plus, perhaps, the examination of a stool for leukocytes, combined with previous knowledge of antibiotic resistance patterns in the locality, may be sufficient to prescribe treatment which will be effective most of the time. Going beyond this in accuracy of identification may require much more cost than the benefit in treatment effectiveness would justify.

Mathan, M.M.; Mathan, V.I. "MORPHOLOGY OF RECTAL MUCOSA OF PATIENTS WITH SHIGELLOSIS."
***Reviews of Infectious Diseases*, vol. 13, suppl. 4, 1991, S314-18.**
Order #5034

Summary

Biopsy specimens of rectal mucosa from 46 consecutive patients with dysentery, from whom *Shigella* was isolated, were examined. Thirteen of the patients had *Shigella dysenteriae* type 1 (the Shiga bacillus). Microscopic examination of the 46 specimens showed inflammation of the epithelium, with infiltration by polymorphonuclear leukocytes; damage to and detachment of the epithelial cells leading to ulceration; and exudates of inflammatory cells into the lumen of the rectum. Electron microscopy showed actual invasion of the epithelium by *Shigella*, migration of bacteria through cell walls, and damage of organelles within cells, such as destruction of mitochondriae in crypt cells. In the crypts, there was depletion of mucus and increased mitotic activity, presumably to replace epithelial cells being lost at a more rapid rate.

In deeper layers (the lamina propria), examination revealed congestion, edema, and scattered hemorrhages, with an overall increase in cellularity consisting of both polymorphonuclear leukocytes and plasma cells. There also were changes to the blood vessels suggestive of damage by Gram-negative bacterial endotoxin.

In patients with symptoms for greater than 1 week, the investigators found more eosinophils, degranulation of eosinophils and mast cells, an increase in plasma cell activity, and activated lymphocytes, suggesting that cell-mediated cytolysis may contribute to persistence of symptoms of shigellosis. The only difference between patients from whom the Shiga bacillus was isolated and patients from whom other *Shigella* species were isolated was a higher prevalence of epithelial cell detachment and exudate into the lumen of the rectum.

Editorial Comment

These findings are certainly consistent with the large numbers of white blood cells, along with red blood cells, in the stools of patients with *Shigella* dysentery. For me the most interesting finding was the evidence by electron microscopy of activated lymphocytes causing destruction to neighboring cells, presumably activated by immune mechanisms and possibly related to prior sensitization from previous infections. Is it possible that the frequent colonization of the intestine in contaminated tropical environments may augment or extend the symptoms of dysentery when it occurs, through this immune mechanism? Are cells being destroyed as "innocent bystanders" in a process similar to that seen in some autoimmune diseases?

The evidence of active cell reproduction and replacement, with immature cells migrating up from the crypts, suggests how malnutrition may prolong the course of illness by slowing cell reproduction, thereby delaying healing and return to normal functioning of the epithelial cells (and therefore, digestion and absorption). The toxic effects of the bacteria on cells described in this report places a major challenge on the crypts as sources of new epithelial cells which, without an adequate supply of nutrients as building blocks, they will meet only poorly. In light of this, the prolonged impact of dysentery on mortality, even after recovery from acute symptoms, is understandable.

Theme: Health Communications

Technical Literature Update on DIARRHEA

Guest Editor: William A. Smith, Ed.D.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Eileen Hanlon

Vol. VII, Nº6 1992

Fox, K.F.A. "SOCIAL MARKETING OF ORAL REHYDRATION THERAPY AND CONTRACEPTIVES IN EGYPT." ***Studies in Family Planning*****, vol. 19, no. 2, March/April 1988, 95-108.**
Order #2541

Summary

In 1983, the National Control of Diarrheal Diseases (NCDD) project, part of the Egyptian Ministry of Health, began a social marketing campaign for ORS. First, the NCDD hired a local consulting firm to conduct marketing research. Data were collected on the public's exposure to the media and on mothers' attitudes and practices about diarrhea. The firm also pretested logos, ORS packaging, media messages, and promotional materials. After initial analysis, the NCDD decided not to segment the public into different audiences: all children could receive ORS, and all family members could be caregivers of sick children. Health workers, however, were targeted separately to receive diarrhea case-management training.

Social marketing is a set of strategies — product, price, availability, and promotion — to convince the public to adopt a product or behavior. In the case of the NCDD's campaign, the product was a locally produced brand of ORS, eventually made in only one size. The affordable price was set by the government, but free ORS was available through health facilities. ORS was made widely available commercially, through wholesalers and retailers, as well as through health services. Finally, a media campaign showing the symptoms of diarrheal dehydration and how to mix ORS was developed and disseminated through radio, television, and print materials.

Guest Editor: William A. Smith, Ed.D.

William A. Smith is Executive Vice President of the Academy for Educational Development, a nonprofit organization with extensive experience in development communication and social marketing. Dr. Smith received his Ed.D from the University of Massachusetts, where he focused on rural consciousness-raising. During his subsequent career, he moved from consciousness-raising into social advertising and finally into social marketing and development communications. He has recently written on behavior change and sexually transmitted diseases, and on social marketing and narcotics education, adding to his earlier work on oral rehydration therapy and immunization programs.

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Management Sciences for Health

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The campaign was enormously successful. During one year, the percentage of mothers who could recognize dehydration rose from 32% to 90%; and the percentage of mothers who had ever used ORS rose from 1% to 50%.

Meanwhile, the Family of the Future, a family-planning nonprofit organization, began their social marketing campaign for contraception. This campaign was not as successful as the ORS campaign. Contraception is more difficult to market, as it involves advertising several products at once, without being able to explain visually their use, as well as involving culturally sensitive issues. While ORS was quickly accepted and adopted, rates of contraceptive use have been slower to rise.

The need for ORS and family planning will not diminish in the near future. Two other factors point to the sustainability of social marketing in Egypt. First, Egyptian nationals are now well trained in social marketing, and their skills may now be used for other products. This progress does not mean that ORS marketing will decrease, as the use of social marketing for the promotion of other related issues can be used to improve diarrheal disease control. For example, campaigns aimed toward physicians about inappropriate drug use during diarrhea, and messages aimed at the public about infant feeding and hygiene practices can use social marketing strategies, while continuing to promote messages from the earlier ORS campaign. Second, while U.S. aid will not always be available, and Egyptian public funds are limited, social marketing can become self-funding. The commercial firm that produces ORS has already begun to funnel some of its profits back into the NCDD.

Editorial Comment

This is one of the landmark ORS studies of the world. The Egyptian experience is an almost textbook field application of social marketing to ORS. While many lessons emerged from this program, perhaps one of the most important is the interaction of various programming decisions, such as the type of ORS to promote, where to make it available, and what to say about it. Each question was answered through field research on mothers and answers were integrated into a single comprehensive program. This project deserves our continued attention and should be a focus of regular follow-up.

The comparison of ORS with family planning messages in this paper highlights an important but often overlooked aspect of successful behavior change — it matters what behavior you are trying to change. The health education field badly needs a classification system of behaviors and the corresponding optimal intervention strategies. Such a system would help program managers not only select better interventions, but establish more realistic goals for their programs, based on our best understanding of behavioral change.

Briger, W. "MASS MEDIA AND HEALTH COMMUNICATION IN RURAL NIGERIA." ***Health Policy and Planning*****, vol.5, no. 1, 1990, 77-81.**
Order #3695

Summary

This study examined the media habits of adult men and women living in two villages in Oyo state, Nigeria. Survey questions focused on the availability and use of four mass-media channels: radio, television, newspapers, and magazines. Open-ended questions sought information on the recall of health messages, the types of programs preferred, and sources of information on AIDs, yellow fever, ORT, and immunizations.

One town, Eruwa, had a population of 45,000 and had electricity, piped water, a hospital and health centers, a factory, and access to national newspapers and magazines. The second town, Idere, was an agricultural town of 10,000 residents and did not have access to electricity or piped water. Both towns were in range of the national and state radio and television stations.

Technical Literature Update

The *TLU* is produced by the PRITECH Project under Contract #DPE-5969-Z-00-7064-00, Project #936-5969 with the Office of Health, Bureau for Research and Development, of the United States Agency for International Development (A.I.D.). The summaries and editorial comments represent the opinions of the *TLU* editorial staff and are not meant to represent A.I.D. policies or opinions. Inclusion of an article in the *TLU* does not denote endorsement or validation of the article cited, but rather indicates that it is worthy of attention and further critical appraisal.

Copies of articles featured in the *TLU* are available through the PRITECH Information Center, 1925 N. Lynn St., Suite 400, Arlington, VA, 22209. Please use the order number listed at the end of each title when ordering articles. Your comments are welcome.

Radio was the most popular channel among the 427 people interviewed; 75% of respondents reported listening to it, although only 40% listened daily. Fewer respondents reported watching television (48%), reading newspapers (29%), or looking at magazines (19%). People in Eruwa were more likely than people in Idere to listen to radio (85% versus 61%) and to listen on a daily basis (48% versus 31%). Women listened less often than men (34% and 46% daily, respectively), and 37% of women did not listen at all. People with no education were much less likely to listen daily than those with some education (27% versus 55%). Of respondents who listened to the radio, the most commonly recalled health messages were about immunizations, sanitation, and yellow fever. But a third of all respondents did not recall seeing or hearing any health messages.

Editorial Comment

The authors point out that child survival interventions are aimed at the poor and the illiterate. They are therefore discouraged that the prime targets of radio messages — poor, rural women — are the least likely segment of the adult population to listen to radio on a regular basis. The conclusions of the article stress the need "to use mass media in conjunction with local and interpersonal forms of health communication." It is always best to use multiple channels in any communication effort.

Clearly, radio is not the ultimate answer to the problem of public health communication. It, like all channels, has its limitations. The reality of the situation, however, is that "high-risk" families are always extremely difficult to reach. Poor rural women tend to be in the fields during the hours when health facilities are open. They are often too busy to attend social clubs, village meetings, and other local forum for health communication.

No channel reaches everyone, but I would still maintain that radio has the potential of reaching a larger proportion of the target population than other media. The way radio is used in this kind of setting must be carefully planned. It is important to air child survival intervention programs during the times that women are most likely to listen. The number of programs and the duration of broadcasting must also be adjusted to match the media habits of the target population.

Bosompra, K. "DISSEMINATION OF HEALTH INFORMATION AMONG RURAL DWELLERS IN AFRICA: A GHANAIAN EXPERIENCE." ***Social Science and Medicine*****, vol. 29, no. 9, 1989, 1133-40.** ***Order #3267***

Summary

Where do people get health information? This study asked 125 residents of two eastern Ghanaian villages whom they relied on for health information and what they knew about cholera, AIDS, ORT, and the government's immunization campaign. At the time of the survey, in 1986, the Ministry of Health was actively collaborating with newspapers, radio stations, religious associations, and health workers to disseminate health messages.

Conversation with peers was named as the most common channel for health information. Radio was also cited often, as the national radio station had health programs in many languages. Yet most rural residents relied on conversation and announcements by the town crier as the main source of information. Other traditional channels of communication, such as market days or theater groups, were not mentioned.

Credibility is an important factor affecting how information is perceived. Although the residents surveyed cited traditional channels as their main sources of information, official channels — such as radio or health clinics — were seen as more credible.

Most respondents had heard about cholera, due to an outbreak in the mid-1970s, but knowledge about its prevention was low. In addition, although 70% of respondents had heard of ORT; only 35% of respondents had ever used it. The presence of a government health facility in one of the villages did not affect the residents' level of knowledge about the selected health topics.

Editorial Comment

This study demonstrates a number of important points related to health education. First, when choosing channels for messages, it is important to consider not only *reach* (the number of people in the target audience exposed to the channel) and *frequency* (the number of times the message is seen or heard), but also the *credibility* of the channel (and therefore the message). I would also add cost as an important consideration, although this is not discussed in this article.

Second, the study once again demonstrates the difference between "awareness of" and significant "knowledge about" a health issue. In order for people to learn about and understand the important details of a health issue, the messages must be repeated and reinforced. Study after study has demonstrated that multiple sources of information are more powerful than one source alone. People will only do behaviors that they hear about repeatedly.

Finally, mass media can add a special credibility to messages. Mass media messages give the impression that others in a community believe in and are taking the advice. It is a powerful way to influence perceived social norms.

Aubel, J.; Rabei, H.; and Mukhtar, M. "HEALTH WORKERS' ATTITUDES CAN CREATE COMMUNICATION BARRIERS." ***World Health Forum*****, vol. 12, no. 4, 1991, 466-71.**
Order #5680

Summary

The first step to an effective health education program is to determine the current knowledge, attitudes, and practices (KAP) of the intended audience. The Sudanese CDD program went one step further by surveying the KAP of health workers in the White Nile province at the same time as surveying the community. The results of the two studies were compared. This comparison highlighted potential problems in health communications.

Qualitative data were collected by Ministry of Health workers using a 12-question guide. Twenty physicians and medical assistants, and 15 community health workers were interviewed. The study had three main findings.

First, the health workers' knowledge of popular terms and types of diarrhea was limited. While mothers defined 12 to 13 different types of diarrhea, the doctors and medical assistants could name only four lay terms. In addition, they could not explain the relationship between these terms and the community's methods of treatment. Community health workers could name six to seven terms, but they were also uninformed about treatments.

Second, traditional healers were respected by the community, not only for treatments but also for their demonstrated concern for the community as a whole. But health workers strongly discouraged the use of traditional healers, claiming that their practices were ineffective. They believed that mothers turned to healers as a result of ignorance, tradition, and distrust of officials.

Last, although the community identified home treatments for diarrhea, many health workers disregarded mothers' treatments. Most workers were unaware of the different types of treatment, or they automatically considered them ineffective and to be discouraged. In fact, mother's treatments included breastfeeding, soft foods, and liquids — behaviors that could have been reinforced.

Editorial Comment

Health workers often claim to have a familiarity with and an understanding of local health beliefs and practices. This simple but elegant study demonstrates that their understanding is often incomplete and misinformed. It is particularly interesting that the community health workers, often assumed to reflect the same beliefs and attitudes as the community, were not aware of many local types of diarrhea, and of local home-care practices. The authors explain that this is probably because the community health workers in the Sudan are men, and Sudanese men have limited involvement in child health problems.

What is the relevance of these differences in attitudes toward and knowledge of local beliefs and practices? How can and should a CDD program use the findings of the study to improve diarrhea case management?

First, the study demonstrates the importance of going to the community to determine the local terminology of diarrhea. Programs are often tempted to eliminate the community studies of beliefs and practices, and to base educational strategies and materials on the recommendations of experiences of health workers. This article demonstrates the importance of going directly to the target audience for the information.

Second, it is important for health workers to understand that local beliefs and practices are not the result of "ignorance and superstition," but represent part of a rational belief system that makes good sense in the given cultural environment. Mothers in the Sudan do not "neglect" their children as many of the health workers reported, but they care for their children in the best way they know how.

Third, many of the traditional practices identified in the community study (continued breastfeeding and the feeding of yoghurt, custard and rice, herbal teas, rice water, and fruit juices) are appropriate and effective interventions. Health workers should be alerted to these positive practices during their training so that they can encourage them and provide positive feedback to mothers during the health-care encounter.

Finally, the data collected during the household survey suggest that the national CDD program might consider targeting some of their messages to traditional healers. The healers are highly respected by the population and are frequently the first provider seen during an episode of diarrhea. Seeing healers as potential allies, rather than competitors, could well advance the program's objectives.

Kenya, P.R.; Gatiti, S.; Mughami, L.N.; Agwanda, R.; et al. "Oral Rehydration Therapy and Social Marketing in Rural Kenya." ***Social Science and Medicine*****, vol. 31, no. 9, 1990, 979-87.**
Order #4325

Summary

Two administrative units in a district of western Kenya were selected to test whether offering flavored ORS in shops could increase the awareness and use of ORS. An educational campaign was launched, and flavored ORS packets were made available in shops in one unit. Another unit was used as a comparison. Both units were similar in population distribution, morbidity, and services available, including primary health-care clinics that distributed unflavored ORS packets for free.

Prior to the campaign, surveys were conducted to establish baseline data and to learn about current practices and attitudes of mothers. Focus groups with mothers were used to develop the ORS product and the campaign, and a trade survey gathered information on other over-the-counter drugs available in shops.

The campaign was launched in early 1986. Banana-flavored ORS was distributed to shops and priced similarly to other over-the-counter drugs, but included an acceptable profit-margin for the retailers. Shopkeepers were trained to instruct buyers about the mixing of the ORS, and the availability of the clinics. The educational campaign included posters, billboards, calendars, instructional package inserts, and a film — all in the local language.

During the campaign, the clinics in both areas distributed the same amount of ORS — 13,500 sachets each. But in the intervention area, an additional 21,600 sachets were sold through the shops. Sales through the shops and training of the shopkeepers created an *additional* demand for ORS. One of the objectives of the campaign was not to interfere with breastfeeding or the giving of local foods. Surveys conducted during the campaign indicated that 95% of lactating mothers continued to breastfeed, and that 60% of mothers fed their sick child *uji* (a local porridge).

Editorial Comment

Commercial companies are sometimes reluctant to invest in the production and marketing of ORS while governments continue to distribute it for free through public health facilities. This article provides some evidence that the potential market for ORS is large enough to support additional private sector suppliers. It shows that people are willing to buy ORS even when it is available free of charge from health centers.

This intervention demonstrates that increasing ORS use through commercialization is not merely a matter of producing glossy materials and making the products available. An effective intervention requires a step-by-step approach that involves understanding the consumer and the seller, and careful planning that incorporates feedback from the community.

The project started with market research regarding consumers' knowledge, behavior, and practices related to diarrheal management, their preferences toward the taste of ORS, and the size of containers in households. A trade survey was conducted among local shopkeepers to determine the range of over-the-counter medicine carried by them and to assess shopkeeper interest in selling ORS. The price of ORS was carefully selected so as to make it affordable to, yet valued by, the target audience. Shopkeepers were trained to teach consumers how to use ORS appropriately, and an incentive system was designed to promote the selling of the salts. While the intervention was promoted through a communication campaign, this was only one facet of the intervention.

Seidel, R. *RESULTS AND REALITIES: A DECADE OF EXPERIENCE IN COMMUNICATION FOR CHILD SURVIVAL.* Washington, DC: Academy for Educational Development HealthCom Project, January 1992, 29 pages.
($10 prepaid from Educational Unit, HealthCom Project, Academy for Educational Development, 1255 23rd Street NW, Washington, DC 20037. Free to readers in developing countries.)

Summary

The Communication for Child Survival (or HealthCom) Project conducted programs to improve health practices in developing countries and promote health communication as a state-of-the-art practice. HealthCom has been active in 15 countries, in different health areas (including CDD, immunization, nutrition, malaria, maternal health, and respiratory illness), and different environments, with varied resources and goals. The project has two overall goals: 1) to adapt, refine, and transfer a systematic health education methodology to local institutions; and 2) to evaluate the impact of communications on behavior.

HealthCom developed a five-step communication method:

- Assessment of the health problem, present situation, and available resources,
- Planning of the messages and identification of communication channels,
- Pretesting of tactics and materials,
- Communication delivery, and
- Monitoring, which feeds back into the planning of future messages.

Seven project sites were fully evaluated, of which two were CDD interventions. HealthCom undertook a three-year CDD intervention in Lesotho, to promote ORS packets and sugar-salt solution, and to ensure the understanding of the signs and dangers of dehydration. The intervention included 10 radio programs on the importance of ORT; brochures explaining the causes of diarrhea and instructions on the mixing of ORS and sugar-salt solution; and the training of health workers.

Between 1987 and 1990, the percentage of diarrheal cases treated at home rose from 48 to 72%. Seventy-five percent of mothers listened to the radio, and 27% had heard a health program in the previous month. Mothers who listened to the radio programs were more likely to treat their child at home and to administer ORT. In addition, care in health centers became more appropriate: by 1990, 64% of diarrheal cases were treated with ORS or sugar-salt solution, up from 32% before the intervention.

A CDD intervention in Honduras was also quite successful. HealthCom and its predecessor project have been in Honduras for nearly a decade. A pilot communication project in the early 1980s promoted ORS and feeding in the home. This pilot program included radio and print messages, community activities, and was supported by extensive health-worker training. More than 300,000 packets of ORS were distributed.

The pilot project expanded into a nationwide intervention. By 1987, 99% of mothers surveyed said they had heard of ORS, and 85% had used it at some time. Mothers who had been to health centers were more likely to use ORS, reflecting the positive effect of health worker trainings. However, half of the mothers who did not use ORS said it was because they did not have access to packets. Improving the distribution of ORS is the current effort.

HealthCom's program experience and the evaluation results have highlighted important lessons for health communications. First, understanding consumer *attitudes* is essential, and community attitudes and behavior affect individual behavior. Although consumer research can be expensive, planners can rely on rapid assessment techniques, or work with partners to share costs. Second, to ensure sustained behavior change, communication programs must present meaningful consequences or benefits of the behavior in a culturally sensitive way. In addition, supplies must be assured, so that the target audience is not frustrated as demand rises. Third, media channels should be selected carefully, based on availability, the audience they reach, and message to be communicated. Special efforts must be made to reach hard-to-reach populations. Fourth, the most successful communication interventions are structured, long-term interventions that combine mass media, routine services, and face-to-face training — all aligned toward the same goals. Sustained programs may require collaboration with the private sector and community groups, and increased institutional capacity in all areas. Fifth, while promoting established policy, communication programs also must stay abreast of new technologies, such as changing medical practices. And finally, as the immediate mortality goals are reached in health campaigns, communication programs must shift to promoting preventive behaviors.

Editorial Comment

It is impossible for this editor to be objective about this particular document, given my many years of involvement with the project. It does appear to be one of the few comprehensive attempts, over time and across many cultures, to assess the role of modern communication in the promotion of ORS. Given that fact alone, it represents an almost unique resource to program managers trying to understand how and when to use communication strategies for child survival. The program was also blessed with a unique partnership with the U.S. Agency for International Development (A.I.D.), which provided (competitively awarded) funding over a 14-year period. Several top university research contractors provided the objective evaluation data cited in this publication.

Yet even this comprehensive program leaves many important questions unanswered. Several of the studies were truncated due to political or natural disasters. Other studies suffered changes in design that interfered with the clarity of the research results. But this document presents in a readable and persuasive manner the major lessons emerging from an important, and probably landmark, program that continues today under A.I.D. guidance.

PRITECH announces the publication of two new reports:

- ***The Ciclope Innovations in Rural Communication: Reaching the Unreachable Villages in Mexico* — describes a health education intervention in Mexican rural markets. Order #6011.**

- ***Integrating Diarrhea Control Training into Nursing School Curricula in the Sahel* — outlines the steps taken to develop nursing-school modules. Order #6012.**

TLU Survey Results

In April 1992, we conducted a survey to determine how readers use the *TLU* and with whom they share it. Eight percent (or 822) of those contacted by mail returned the survey. Many readers asked for more information about health education. We hope that this issue is useful to you in your work. Here are other results from the survey:

- 46% of respondents reported that reading the *TLU* has changed the way they teach by keeping them updated with the latest scientific information. Many reported using the *TLU* as a reference for preparation of lectures and as reading material for students.

- 43% of respondents stated that the *TLU* has changed the way they manage diarrheal disease cases. Respondents reported that their use of drugs and IV therapy had decreased, while their commitment to ORS and promotion of feeding during diarrhea had increased. Some readers indicated that the *TLU* had helped them prepare for the cholera epidemic in South America.

- 43% of respondents stated that the *TLU* is their primary source of information about diarrheal diseases. In addition, 84% of respondents share their copy of the *TLU* with others, 32% with more than five people. Because of your interest, the *TLU* mailing list has grown to more than 12,500 readers around the world.

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Technical Literature Update on DIARRHEA

Guest Editor: Robert E. Black, M.D., M.P.H.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Lisa Dipko

Vol. VI, Nº7 1991

Schorling, J.B.; Wanke, C.A.; Schorling, S.K.; et al. "A PROSPECTIVE STUDY OF PERSISTENT DIARRHEA AMONG CHILDREN IN AN URBAN BRAZILIAN SLUM: PATTERNS OF OCCURRENCE AND ETIOLOGIC AGENTS." *American Journal of Epidemiology*, vol. 132, no. 1, 1990, 144-56.
Order #3848

Summary

To better understand the epidemiology and etiology of persistent diarrhea, a prospective study was carried out in an urban slum in northeastern Brazil. A total of 175 children under 5 years of age participated over a 28-month period. Health aides gathered information concerning diarrheal episodes from households 3 times per week. Diarrhea was defined as an increase in stool frequency or a decrease in consistency which lasted at least 1 day and which was separated from other episodes by at least 3 days. Nutritional data were collected monthly. Stool specimens were collected on a periodic basis from both children with diarrhea and asymptomatic children.

Overall attack rates were very high: 11 episodes of diarrhea per year per child, resulting in an average of 82 days with diarrhea per child-year. Children experienced an average of 9.9 acute episodes (<14 days) per year. Overall and acute episodes peaked at 13-18 months of age (15.3 and 13.2 episodes/child-year respectively), while persistent episodes peaked at 19-24 months (2.2 episodes/child-year), as did days spent with diarrhea (117). Although there were seasonal variations in overall and acute episodes, persistent diarrhea occurred throughout the year with little variation.

Persistent diarrhea accounted for only 11% of all episodes, but 50% of days with diarrhea. Five percent of persistent diarrheal episodes lasted 21 days or longer. A total of 65% of children experienced at least 1 persistent episode. Children who spent at least 15% of their days with diarrhea had all had at least 1 episode of persistent diarrhea. Highest diarrheal attack rates and greatest number of days spent with diarrhea were noted during the first 4 months of study when the prevalence of severe malnutrition was greatest. Much of the subsequent decrease was attributable to a 50% decrease in the attack rate and days spent with persistent diarrhea.

A variety of potential pathogens were isolated from stool specimens of children with persistent diarrhea (most frequently rotavirus, enterotoxigenic *Escherichia coli*, or *Giardia lamblia*). However, these were similar to the organisms isolated from children with acute diarrhea and therefore, the authors conclude that factors in addition to infection with an enteropathogen must be involved in persistent diarrhea and will need to be further explored.

Guest Editor: Robert E. Black, M.D., M.P.H.

Dr. Robert Black is Professor and Chairman in the Department of International Health at the Johns Hopkins University School of Public Health. He has conducted diarrheal disease research and assisted with the implementation of CDD programs for more than 15 years. Dr. Black has been coordinator of the Johns Hopkins participation in PRITECH since 1985 and currently serves on the Technical Advisory Group of WHO's Programme for the Control of Diarrhoeal Diseases.

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Editorial Comment

Children in this study had a very high rate of diarrhea, such as is commonly found in urban slum settings. As elsewhere, most of the diarrheal episodes lasted less than a week and resolved with fluid and dietary therapy. Of the 11% of episodes that persisted for at least 14 days, it should be noted that more than half resolved spontaneously between days 15 and 21. On the other hand, it should be recognized that those episodes that persisted may have had particularly serious consequences and deserve special attention to prevent growth faltering.

The proportion of all acute episodes that persist at least 14 days varies somewhat in different settings but is usually less than 10%. Nevertheless, approximately a third of children in developing country settings will have an episode of persistent diarrhea in each of their preschool years. Community-based studies are the ideal way to determine the rates of acute and persistent diarrhea. While it is not possible to conduct this type of study in each country, one can assess the importance of persistent diarrhea by other means. A household survey can determine the proportion of episodes that are persistent if a question on diarrheal duration is asked, while assessment of the clinical syndromes associated with diarrheal deaths may give an impression of the relative importance of acute watery diarrhea, dysentery, and persistent diarrhea as causes of death.

In this study, a variety of enteropathogens were associated equally with acute and persistent diarrhea and so it appears that there were other factors which determined whether an episode resolved or persisted. In studies in other countries, factors found to increase the risk that the episode will become persistent include young age, malnutrition, and a recent episode of diarrhea. Persistent diarrheal illnesses associated with malnutrition may be of greatest concern, and require careful attention to dietary management.

Cravioto, A.; Tello, A.; Navarro, A.; et al. "ASSOCIATION OF *ESCHERICHIA COLI* HEP-2 ADHERENCE PATTERNS WITH TYPE AND DURATION OF DIARRHOEA." *The Lancet*, vol. 337, no. 8736, February 2, 1991, 262-64.
Order #4571

Summary

Escherichia coli strains show 3 patterns of adherence in the HEp-2 cell assay: localized, diffuse, or aggregative. This prospective study examined the relation between *E. coli* adherence patterns and the type and duration of diarrhea in Mexican children under age 2.

Over a 2-year period, physicians visited 75 children every 48 hours to detect the presence of diarrhea, and visited daily during diarrheal episodes. Stool samples were collected every 2 weeks and during each episode. Cultures from cases of diarrhea were tested for adherence to HEp-2 cells. For comparison, *E. coli* cultures from matched controls who did not have diarrhea were also tested for adherence.

Among the 72 children for whom full data were available, each child had an average of 4 episodes of diarrhea and was ill an average of 33 days per year. Of the total 636 recorded diarrheal episodes, 9% (57) were persistent. *E. coli* with localized adherence were significantly associated with acute watery diarrhea while *E. coli* with aggregative adherence were significantly associated with persistent diarrhea. *E. coli* with diffuse adherence were found in similar frequency in acute and persistent diarrhea. Of the *E. coli* with localized adherence, 41% were of serotypes included among the "enteropathogenic *E. coli*."

Editorial Comment

E. coli are a complex bacterial species. While this organism is a usual component of the flora of the large bowel, specific types of *E. coli* may cause diarrhea if they possess one or more of various virulence properties. Certain serotypes of *E. coli* were implicated as the causative agents of outbreaks of diarrhea in hospital nurseries in the 1950s, especially in the U.S. and United Kingdom. The serotypes became known as enteropathogenic *E. coli*, or EPEC. Later it was found that another subset of *E. coli*, having only limited overlap with EPEC, produced enterotoxins. These enterotoxigenic *E. coli*, or ETEC, have subsequently been found to be a major cause of diarrhea in children and the predominant cause of diarrhea in travelers from industrialized to developing countries. Entero-invasive *E. coli* that cause a dysenteric illness and entero-hemorrhagic *E. coli* that cause severe intestinal bleeding have also been described, but appear to be infrequent in developing country children.

Technical Literature Update

PRITECH is an A.I.D.-funded project which assists countries in implementing national diarrheal disease control programs. PRITECH publishes the *TLU*, a bibliographical listing of selected annotated articles and other information which our Technical Editor, Dr. Robert Northrup, feels should be circulated to individuals concerned about diarrheal diseases and related health issues.

Inclusion in a listing does not mean that we endorse or validate the article cited; rather, that it is worthy of your attention and further critical appraisal, particularly when it has already been published in a well-known journal. The summaries and editorial comments represent the opinions of the *TLU* editorial staff, and are not meant to represent A.I.D. policies or opinions.

Copies of the articles featured in this issue are available by writing to the PRITECH Information Center. Please use the number listed at the end of each title when ordering. Your comments are welcome.

Exploration of adherence properties of *E. coli* has led to several other possible groupings. This study and others demonstrate that *E. coli* having a localized pattern of adherence on tissue culture cell lines are associated with acute watery diarrhea and have substantial overlap with what has been called EPEC. Two other adherence patterns, diffuse and aggregative, have had variable association with diarrhea in several studies. This report and a previous one from India (Bhan et al, 1989) suggest that the aggregative *E. coli* may be particularly associated with persistent diarrhea.

Reports that particular strains of *E. coli* may be associated with persistent diarrhea have given rise to the speculation that some episodes might be treatable with oral antibiotics. However, results from studies in India and Guatemala demonstrate no benefit from oral gentamicin therapy. These studies, therefore, emphasize that dietary management and fluid therapy remain the cornerstone to treatment of persistent diarrhea, and that routine use of antibiotics is not warranted.

Penny, M.E.; Paredes, P.; Brown, K.H. "CLINICAL AND NUTRITIONAL CONSEQUENCES OF LACTOSE FEEDING DURING PERSISTENT POSTENTERITIS DIARRHEA." *Pediatrics*, vol. 84, no. 5, November 1989, 835-44. *Order #3170*

Summary

In a double-blind, prospective trial in Lima, Peru, children 3-36 months of age with persistent diarrhea (≥ 14 days) were recruited through community surveillance and at a local outpatient clinic. Breastfeeding children were excluded from study. Initial dehydration was corrected with ORS and ongoing losses were replaced with an oral maintenance solution. As soon as initial dehydration was corrected, patients received a full diet of either lactose-containing or lactose-hydrolyzed milk. Children continued these diets for 5 days.

Patients in the 2 dietary groups were initially similar in terms of nutritional status, diarrheal illness, and age. In the lactose group, 4 of 33 children had treatment failure compared to only 1 of 31 children in the lactose-hydrolyzed group. Stool rates were initially similar in both groups, but during days 3-5, children consuming lactose had significantly more diarrhea (mean of 74.4 g/kg/day vs. 42 g/kg/day). Forty-one percent of the lactose group purged more than 100 g/kg/day while only 5.5% of the lactose-hydrolyzed group had diarrhea of this severity.

Diarrhea also lasted longer in the lactose group. In this group, only 1 child had stopped having diarrhea within 30 hours compared with 11 children in the lactose-hydrolyzed group. By the end of day 5, diarrhea had stopped in 83.8% of the latter group compared to 54.5% of the lactose group. Children in the lactose group also had malabsorption of carbohydrates, nitrogen, and energy.

This study demonstrates that although sufficient nutritional intakes can be achieved by oral feeding in persistent diarrhea, a diet containing 6 g/kg/day of lactose resulted in potentially dangerous purging rates and increased fecal losses of nitrogen, energy, and carbohydrates. In a home setting, the increased stool losses could lead to dangerous levels of dehydration. Future experiments should test locally available, inexpensive, lactose-reduced diets which can be used safely during persistent diarrhea.

Editorial Comment

In this study, feeding non-human milk as the sole nutrient source resulted in both greater diarrheal stool output and prolongation of illness in children who had already experienced diarrhea for at least 14 days. This indicates that lactose intolerance may be a feature in some cases of persistent diarrhea, at least in this study population. The study further documents that this intolerance interferes with recovery and leads to malabsorption of other nutrients as well.

Studies of milk feeding during acute diarrhea are more equivocal in regard to adverse outcomes, but the use of mixed cereal-milk diets in acute diarrhea may be preferable to the use of milk alone. This approach permits the use of the child's usual cereal—or other staple food-based diet—with milk to provide additional protein. In smaller quantities and mixed with other food, the milk lactose has been found to be well-tolerated during acute diarrhea. This may also be an appropriate dietary approach in management of persistent diarrhea. Since malnutrition is commonly associated with persistent diarrhea in some settings, nutritional rehabilitation is an important aspect of management. Diets with adequate caloric content and nutrient balance are essential, but a reduced content of lactose would be preferred to avoid exacerbation of the diarrhea.

Bhutta, Z.A.; Molla, A.M.; Issani, Z.; et al. "DIETARY MANAGEMENT OF PERSISTENT DIARRHEA: COMPARISON OF A TRADITIONAL RICE-LENTIL BASED DIET WITH SOY FORMULA." *Pediatrics*, vol. 88, no. 5, November 1991, 1010-18. *Order #5105*

Summary

Khitchri, a traditional, semi-solid food of rice, lentils, and cottonseed oil, is widely used in Pakistan and India. It is commonly given to children in combination with yogurt as a weaning food, and is also given to adults who have diarrhea. This study at the National Institute of Child Health in Karachi, Pakistan, compared the effectiveness of a diet of khitchri and yogurt with that of a soy-based formula in children with persistent diarrhea.

A total of 102 weaned, male children, 6-36 months of age, who had had diarrhea for at least 2 weeks, were randomly

assigned to 2 dietary study groups. Of the original 102 patients, 29 were later excluded from study because of severe infection or were withdrawn by their families. Dehydration was initially corrected and continuing stool losses were replaced using standard WHO ORS. Group A patients received soy milk alone for the first 7 days followed by a combination of soy milk, khitchri, and yogurt for the next 7 days. Group B patients received only khitchri and yogurt for all 14 days. Children in both groups were fed as much as they would take, for a minimum caloric intake of 100 kcal/kg/day by day 4.

Despite a comparable caloric intake during week 1, Group B experienced significantly lower stool volume and frequency and gained significantly greater weight. When khitchri and yogurt were given to Group A during week 2, they experienced a highly significant increase in weight gain compared to week 1. Overall, children in Group B recovered significantly faster than those in Group A. Of the 7 clinical failures, 5 were in Group A and 2 in Group B. All of the failures occurred in children $\leq$ 15 months of age and 6 of 7 occurred during the first 8 days of study. Nutritional improvements were striking in both groups. In Group A, these improvements were most noticeable during week 2.

These findings indicate that a traditional diet of rice, lentils, and yogurt can be used successfully for the dietary management of persistent diarrhea in children. In the Pakistani setting, this diet is also advantageous because it is readily available, culturally acceptable, and inexpensive.

Editorial Comment

Enteral nutritional therapy of persistent diarrhea is preferred over parenteral therapy in industrialized countries, and is especially advantageous in developing countries where availability of parenteral nutrition is limited and the risk of infection with IV therapy is high. Lactose-free, usually soy, formula has been regarded as appropriate therapy in these cases. However, use of such formulas is limited by availability and expense in developing countries. This study is important because it demonstrates that a diet composed of local weaning foods can be effectively substituted for soy formula.

The rice-based diet used in this study also contained lentil and yogurt, important sources of protein, to ensure the nutritional adequacy of the diet. This mixture is commonly used as a weaning food in Pakistan and is made from inexpensive local ingredients. It is impressive that this diet resulted in reduced stool output and greater weight gain in comparison with a soy formula diet. Other studies of acute and persistent diarrhea support the approach of using cereal-milk mixed diets. These diets may best allow nutritional recovery while reducing the duration of diarrhea.

Sachdev, H.P.S.; Mittal, N.K.; Yadav, H.S. "ORAL ZINC SUPPLEMENTATION IN PERSISTENT DIARRHOEA IN INFANTS." ***Annals of Tropical Paediatrics*****, vol. 10, 1990, 63-69.**
Order #3847

Summary

"A controlled randomized trial was conducted in 40 infants (6-18 months old) with persistent diarrhoea (>2 weeks' duration) to evaluate the effect of oral zinc supplementation. After completion of rehydration, 20 infants in group A received oral zinc sulphate (20 mg elemental zinc twice daily) and an equal number in group B were given a placebo (glucose). Each child was given oral nalidixic acid and a similar milk-free feeding schedule. Both the groups were comparable with respect to various initial characteristics including nutrition, diarrhoeal disease, serum alkaline phosphatase and serum and rectal mucosal zinc content. During therapy, all the assessed parameters of zinc status (serum alkaline phosphatase and serum and rectal zinc) recorded significant elevation and reduction in groups A and B respectively. At recovery, the zinc status of group A was significantly higher than that of group B."

"The diarrhoeal duration and frequency in the zinc-supplemented group were lower but the differences were not statistically significant (p=0.078 and p=0.076, respectively). Weight gain in both groups was comparable. It is concluded that in persistent diarrhoea there is depletion of zinc with the progression of disease and oral zinc administration can improve the zinc status. The possible anti-diarrhoeal effect of zinc, however, merits further study." [Published Abstract]

Editorial Comment

Previous observations that children with under-nutrition have diarrhea of longer duration and a higher incidence of persistent diarrhea lead to various hypotheses about mechanisms to explain this relationship. Recovery could be delayed because of diminished immune function or reduced tissue repair, both of which could be a consequence of zinc deficiency, as could be the poor growth itself. This study in India found approximately 20% reduction in diarrheal duration and average diarrheal frequency in a randomized placebo-controlled zinc supplementation trial during persistent diarrhea. However, with only 20 subjects per group it was unable to conclusively demonstrate the role of zinc.

Until there are additional controlled trials of zinc supplementation, this specific therapy cannot be recommended for routine use, although it seems appropriate to provide the usual daily requirements of vitamins and minerals as part of the dietary management of persistent diarrhea. These findings and others on the possible role of zinc deficiency in persistent diarrhea and the effects of zinc supplementation on diarrhea and growth indicate the need for additional research.

Theme: Rotavirus

Technical Literature Update on DIARRHEA

Guest Editor: David A. Sack, M.D.
Technical Editor: Robert Northrup, M.D.
Managing Editor: Eileen Hanlon

Vol. VIII, Nº1 1993

Rotavirus

Among the many infectious causes of diarrhea, the most common cause in children under three years of age is rotavirus. This virus, first discovered in 1973 by Ruth Bishop and her colleagues in Australia, has subsequently been identified throughout the world. Unlike bacterial causes of diarrhea, rotavirus is just as likely to cause diarrhea in industrialized countries as it is to infect children in developing countries. In temperate climates, rotavirus "seasons" occur during the cooler months of the year; and during these seasons, most susceptible children become infected. In the tropics the illness can occur throughout the year. In either case, by the time children reach age three, nearly every child in the world has been infected. A proportion of those infected develop diarrhea, but certainly not all. Apparently because of immunity, rotavirus diarrhea is unusual after age three.

Symptoms of rotavirus are similar to those of other watery diarrheal diseases in that the predominant symptom is the diarrhea, often preceded by vomiting. Fever is not usually found, and then only low grade when it does occur (less than 38°C). The illness lasts for several days, but children whose hydration is maintained recover completely. The virus infects the absorbing villus cells of the small intestine. Because of the virus' preference for the villus cells—as opposed to the secretory crypt cells—there is an imbalance between secretion and absorption of fluid, leading to excess secretion and diarrhea. The symptoms can persist for several days after the virus infection is gone because the gut mucosa must heal itself from the infection. Rarely (such as in immunocompromised children), the virus can cause persistent diarrhea caused by persistent infection.

As with other causes of watery diarrheal illnesses, morbidity and mortality are due to the dehydration and electrolyte imbalance that accompanies the fluid loss from diarrhea and vomiting. Fortunately, dehydration from rotavirus diarrhea can be readily corrected with ORT. Its treatment, therefore, is not different from other forms of watery diarrhea. Being a virus, rotavirus does not respond to antibiotics, nor do other drugs benefit the child.

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Ruuska, T.; Vesikari, T. "A PROSPECTIVE STUDY OF ACUTE DIARRHOEA IN FINNISH CHILDREN FROM BIRTH TO 21/2 YEARS OF AGE." ***Acta Paediatrica Scandinavica*****, vol. 80, 1991, 500-7.**
Order #4989

Summary

A cohort of 336 Finnish children was followed from birth to the age of 24-32 months to determine the incidence, clinical significance, and etiology of acute diarrhea. More than half of the children had no diarrhea, 26% had one episode, and 19% had two or more episodes of diarrhea; altogether 248 diarrheal episodes were followed.

Rotavirus was by far the most common (26%) identified pathogen; adenoviruses and bacterial pathogens were each detected in 4% of cases. The etiology could not be identified in two-thirds of the episodes. Rotavirus diarrhea was significantly more severe than diarrhea due to other causes: 75% of severe episodes of diarrhea were associated with rotavirus. Rotavirus diarrhea was detected only once per child, was more common in males (22%) than in females (16%), and was more common during the winter months.

About two-thirds of the infants were breastfed for over six months; breastfeeding for less than six months was associated with a higher incidence of diarrhea for infants age seven to 12 months, but not thereafter. About three-quarters of the children were cared for at home beyond age one, and those at home had a lower rate of rotavirus diarrhea than children in daycare centers.

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Editorial Comment

In Finland, noted for its high level of sanitation, there were almost no cases of diarrhea due to bacterial causes, but rotavirus was the most common identified cause of diarrhea and the predominant cause of more severe diarrhea. Twenty-six percent of this group experienced rotavirus diarrhea during the follow-up period, and we can only presume that the rest experienced asymptomatic rotavirus infection. This percentage is about the same as has been reported from the United States and from developing countries.

Over 70% of infants breastfed longer than six months and all the children lived in homes with excellent levels of water and sanitation. But neither of these factors prevented the occurrence of the illness. So at present we have no way to prevent the infection, but we do have good treatment—ORT, to which virtually all patients readily respond.

Huilan, S.; Zhen, L.G.; Mathan, M.M.; et al. "ETIOLOGY OF ACUTE DIARRHOEA AMONG CHILDREN IN DEVELOPING COUNTRIES: A MULTICENTRE STUDY IN FIVE COUNTRIES." ***Bulletin of the World Health Organization*****, vol. 69, no. 5, 1991, 549-55.**
Order #5381

Summary

A two-year study of acute diarrhea in children under age three, who were attending health facilities, was carried out in five hospitals in China, India, Mexico, Myanmar (formerly Burma), and Pakistan. A total of 3,640 diarrheal cases and 3,279 matched controls were studied. About 60% of the patients were under age one, and 60% were male.

An enteric pathogen was detected in 68% of the cases and in 30% of the controls. In all study centers, the only pathogens that were consistently and substantially more prevalent in cases than in controls were rotavirus(16% of cases, 2% of controls), *Shigella* spp.(11% of cases, 1% of controls), and enterotoxigenic *Escherichia coli* (16% of cases, 5% of controls).

Rotavirus was most common among children between six months and one year of age, accounting for 20% of all cases in this age group. More than 70% of all rotavirus infections occurred during the first year of life.

While clinical findings were not consistently collated in each study site, some observations were noted. First, while only 1.8% of cases presented with severe

dehydration, these cases were due to rotavirus, *V. cholerae* O1, or enterotoxigenic *E. coli*. Visible blood in the feces was reported in 20% of cases; it was associated with the presence of *Shigella* (in 45 to 67% of cases) and *Campylobacter* (in 35 to 37% of cases), but rarely with rotavirus. Non-cholera watery diarrhea was most frequently associated with rotavirus, enterotoxigenic *E. coli*, and *Campylobacter*. Finally, in Pakistan and Mexico, vomiting was reported in 61% and 69% of rotavirus associated cases, respectively.

Editorial Comment

Whatever developing country you examine, rotavirus is the leading cause of infantile diarrhea. Unlike studies from countries like Finland, children in these developing countries were often infected with a variety of agents like enterotoxigenic *E. coli*, *Shigellae*, and *V. cholerae*, and were sometimes infected with more than one enteric pathogen at a time. But among the infants and young children, rotavirus was the leader. The peak age for rotavirus infection was between six and 12 months, but many infections occurred in infants even less than six months of age.

One can speculate that a rotavirus vaccine—if it were highly protective and used widely at a very young age—could prevent about 20% of episodes of all infantile diarrhea episodes and perhaps 20% of the diarrhea deaths. This amounts to roughly 800,000 deaths potentially averted. Only measles vaccine is a vaccine with such a potential for public health benefit. Though not a cure-all for the diarrhea problem, a rotavirus vaccine would cut the diarrhea burden in the world tremendously. This is why research is proceeding rapidly on the development of such a vaccine.

Rather than waiting for a vaccine, however, excellent treatment is available. Administration of ORT to correct the dehydration and acidosis is excellent therapy, and fortunately, children rarely have rotavirus diarrhea more than once.

Cook, S.M.; Glass, R.I.; LeBaron, C.W.; et.al. "GLOBAL SEASONALITY OF ROTAVIRUS INFECTIONS." ***Bulletin of the World Health Organization*****, vol. 68, no. 2, 1990, 171-7.**
Order #3875

Summary

Data from 34 studies on the etiology of childhood diarrhea were compiled to analyze the seasonal patterns of rotavirus gastroenteritis and their implications for transmission of the virus. Rotavirus was detected in 11 to 71% of children with diarrhea. The median rate of detection—33%—was independent of the level of economic development or geographical region of the study area, as well as method of detection.

Rotavirus infections have been noted as winter diseases in temperate zones. In fact, their incidence peaked in winter primarily in the Americas, while peaks in autumn and spring are common in other areas. In the tropics, seasonality of rotavirus infection is less distinct: within 10° of latitude (north or south) of the equator, eight of the 10 locations exhibited no seasonal trend. Throughout most of the world, rotavirus is present all year-round, which suggests that low-level transmission could maintain the chain of infection.

While studies have established that rotavirus is spread by the fecal-oral route, airborne and droplet transmission must also be considered. This study suggests that the epidemiology of rotavirus (seasonality in cooler months in temperate areas, but universal spread in tropical areas) more closely resembles that of childhood viruses that are spread by the respiratory route (such as measles) than that of common enteric pathogens that are spread predominately by the fecal-oral route.

Editorial Comment

Three distinctive epidemiological features of rotavirus diarrhea include: 1) seasonal epidemics during the cold or cooler seasons, 2) age less than three years, and 3) similar rates of disease between industrialized and less developed countries. These suggest that rotavirus is not just another enteric pathogen spread by

Technical Literature Update

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the fecal-oral route. Even though the main symptoms are vomiting and diarrhea, these epidemiologic features suggest that respiratory spread may be one of the ways (if not the major way) the virus is transmitted.

From the standpoint of limiting the spread of disease, this news is discouraging because one would hope that simple interventions such as handwashing, breastfeeding, and latrines would greatly reduce rates of infection. For rotavirus diarrhea, however, this does not seem to be the case.

Ford-Jones, E.L.; Mindorff, C.M.; Gold, R.; et al. "THE INCIDENCE OF VIRAL-ASSOCIATED DIARRHEA AFTER ADMISSION TO A PEDIATRIC HOSPITAL." ***American Journal of Epidemiology*****, vol. 131, no. 4, 1990, 711-8.**
Order #3691

Summary

To determine the incidence of viral-associated diarrhea after admission to a Canadian pediatric hospital, all patients admitted without diarrhea during a six-month period were followed for five days per week for presence of diarrhea, etiologic agent, and possible risk factors. A total of 1,530 patients were followed for 3,642 days. Of these patients, 69 developed nosocomial diarrhea episodes after 72 hours in the hospital—a nosocomial diarrhea rate of 4.5 infected children per 100 admissions.

Of 358 patients with an infected roommate, 10% developed nosocomial diarrhea. Etiologic agents included rotavirus (43%), calcivirus (16%), astrovirus (14%), minireovirus (12%), adenovirus (8%), and *Salmonella* spp. (4%). Nosocomial viral associated diarrhea is almost exclusively a disease of diapered children under age three, and it occurs at any time during the hospital stay. It is more common in multibed rooms, but it does occur in single-bed rooms.

Editorial Comment

Although most cases of rotavirus diarrhea are acquired in the community, this study, carried out in Toronto during the months of January through July, makes the important point that children admitted to hospital are highly susceptible to infection with rotavirus and a number of other diarrhea-associated viruses. The incidence of rotavirus diarrhea in Toronto (about 5% overall) was lower than that in other previously reported studies. Clearly infants who happen to be hospitalized during the rotavirus season—when other rotavirus-infected infants are receiving treatment—are at very high risk. Significant risk factors for nosocomial rotavirus diarrhea were young age (less than 36 months), rooms with multiple beds, and duration of hospitalization. Unfortunately, handwashing by the staff did not entirely prevent the spread of the virus between patients.

Nosocomial diarrhea in pediatric wards of developing country hospitals is likely to be at least as common as it was in Toronto, and is likely higher. Most cases in Toronto were viral in origin, but if hospitals are crowded and sanitation is not as adequate, spread of diarrhea pathogens is likely to be facilitated among these ill children who were admitted for other causes. In this setting, however, the bacterial pathogens likely contribute to the problem as well. Unfortunately, few data are available about this potentially important problem in developing country hospitals. While vigilance regarding handwashing by staff must be maintained, it is not clear from this study what proportion of potential infection transmission can actually be prevented by such careful handwashing measures.

Bernstein, D.I.; Sander, D.S.; Smith, V.E.; et al. "PROTECTION FROM ROTAVIRUS INFECTION: 2-YEAR PROSPECTIVE STUDY." ***The Journal of Infectious Diseases*****, vol. 164, 1991, 277-83.**
Order #5690

Summary

More than 160 U.S. infants enrolled in a rotavirus vaccine trial were followed prospectively for two years to measure the protection induced by natural rotavirus infection. In this study, protection against homotypic serotype 1 (the prevalent serotype during the study) reinfection appeared to last more than two years.

During the two-year study, significantly fewer infants infected before enrollment developed a reinfection compared with the previously uninfected infants. Of the 60 infants who developed a primary rotavirus infection in the first year, only four were reinfected the second year, compared with 29 of 82 infants not previously infected.

Asymptomatic primary infection (as defined by a rise in rotavirus antibody levels) appeared to be as protective as symptomatic primary infection. The only symptomatic reinfections occurred in two subjects who did not develop rotavirus antibody after the initial detection of rotavirus. An age-related reduction in the ratio of symptomatic to asymptomatic primary rotavirus infection was also detected.

Editorial Comment

A question central to the issue of vaccines for rotavirus diarrhea is whether or not natural infection with rotavirus protects against a second episode. If it does, then there is expectation that a vaccine might stimulate a similar immune response and protect children. If natural infection does not protect, then the problem of developing a rotavirus vaccine will be much harder. This study from Cincinnati clearly found that infection with rotavirus, whether it be with diarrhea or as an asymptomatic infection, protected children for one to two years. These encouraging results suggest that if a safe rotavirus vaccine strain can be found that will stimulate a similar immune response, the vaccine should provide excellent protection.

Before too much optimism is assumed, some cautions about the study are needed. The study population from Cincinnati was distinct in some important respects from populations in developing countries. First, a single strain of rotavirus predominated during the two years of the study. Hence, the study clearly demonstrated protection against the Cincinnati strain but we cannot be certain that protection would be as solid in areas where a mixture of rotavirus strains and serotypes circulate. Second, the Cincinnati children were all well nourished and were probably only infected with a single pathogen at a time. This is clearly different from developing country children who may be poorly nourished or be infected with several pathogens at once.

Nevertheless, this study of the natural history of rotavirus infections is consistent with other such studies (note the Finland study reported in this issue) and suggests strongly that potent immune protection follows natural rotavirus infection. It seems likely therefore that a rotavirus vaccine could be developed that will also stimulate immune protection of a similar degree.

Perez-Schael, I.; Garcia, D.; Gonzalez, M.; et al. "PROSPECTIVE STUDY OF DIARRHEAL DISEASES IN VENEZUELAN CHILDREN TO EVALUATE THE EFFICACY OF RHESUS ROTAVIRUS VACCINE." ***Journal of Medical Virology*****, vol. 30, 1990, pp. 219-229.**
Order #3673

Summary

The efficacy of a rotavirus vaccine against infantile diarrhea was evaluated through home surveillance of 320 children, ages one to ten months, in Caracas. An oral rhesus rotavirus vaccine or placebo was administered to low-income, healthy children in a randomized, double blind trial. Children were visited twice a week for one year, and diarrheal episodes were recorded and diarrheal specimens collected.

Of 632 diarrheal episodes recorded, 478 specimens were collected. The most common cause of diarrhea was *Escherichia coli* (52% of cases), followed by rotavirus (7%). While the number of diarrheal cases was similar in the two groups, the vaccine group had fewer cases of rotavirus diarrhea (5% compared with 15% in the placebo group). This difference resulted in an efficacy level of 64% against rotavirus.

Because rotavirus causes more severe diarrhea (half of all severe diarrheal cases in the study were due to rotavirus), the vaccine group had less severe diarrheal episodes. When examining severe diarrhea only, the vaccine provided 90% effectiveness against severe diarrhea, and the vaccine was especially effective in infants under four months old.

Most of the rotavirus illnesses occurring at the time of the study were serotype 3 strains, and analysis of the protection induced by the vaccine suggest that the vaccine protected only against this strain.

Editorial Comment

While several rotavirus vaccine candidates are under development, the one that is the most developed is the rhesus rotavirus vaccine—a live, attenuated, serotype 3 rotavirus isolated from a monkey. As with the approach used to combat smallpox, this animal virus is immunologically similar to human rotavirus, but is sufficiently less virulent for humans that it can be used as a vaccine.

The vaccine was well tolerated, and children who received the vaccine had 64% fewer episodes of rotavirus diarrhea than did children receiving the placebo, and perhaps most important, those receiving the vaccine experienced a marked reduction in severe diarrhea of any etiology (most of which were apparently due to rotavirus). Because children with severe cases are the ones who are at risk of death, and are also the ones who use clinic and hospital resources, a vaccine that protects against severe diarrhea should save both lives and money. Interestingly, the total number of diarrhea cases (most of which were mild) did not drop appreciably, apparently because rotavirus did not cause a sufficient number of the milder cases.

One of the issues in rotavirus vaccine development has been the degree to which a vaccine with a certain serotype would protect against infections with other serotypes. This study found that protection was much higher against the same serotype than against other serotypes. The predominant serotype in Venezuela was serotype 3, but in other areas, other serotypes occur more commonly. In the United States, for example, serotype 1 is most common, and in Bangladesh, all serotypes are common. Hence, other vaccine strains need to be included to improve protection against serotypes 1, 2, and 4.

A tetravalent vaccine (that is, one that protects against four serotypes), has been developed that incorporates strains of rhesus rotavirus that have genes giving them characteristics of other serotypes. It is currently being tested in several countries. The tetravalent vaccine appears to give the same degree of protection as that reported in this study, but appears to protect against all four major serotypes of the virus. We still do not have a vaccine for routine use, but rapid progress is being made.

TO OUR READERS

The last issue of the *Technical Literature Update* will be Vol. VIII, Nº3. The PRITECH Project will be ending in August 1993. As of June, we will no longer be able to respond to your requests for journal articles or add new names to our mailing list. Please be assured, however, that your name will remain on the mailing list to receive future mailings from other child survival projects of the U.S. Agency for International Development.

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Technical Literature Update on DIARRHEA

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Vol. VIII, Nº2 1993

Oladepo, O.; Oyejide, C.O.; and Oke, E.A. "TRAINING FIELD WORKERS TO OBSERVE HYGIENE-RELATED BEHAVIOR." ***World Health Forum*****, vol. 12, 1991, 472-475.**
Order #5825

The process by which investigators selected and trained a group of field workers to observe accurately behaviors related to the prevention of diarrhea is described. The trainees selected were women, thereby meeting local cultural requirements, and all spoke the local language. Some were experienced in field studies and from Ibadan, others were from the villages. Training took place in three phases:

(1) Lectures and discussions on behavior, expected roles of observers working in a village setting, and diarrhea, particularly the different terms used for diarrhea and its symptoms. Graduated practice in observing was given, from general observing to eventually observing hygiene-related behavior in an outpatient department without asking structured questions.

(2) Role-playing with trainees acting as family and as the visitor observer, followed by field training in a poor urban community, with trainees working in pairs for two weeks observing the behavior of women and children in homes. Observations of each were compared until they achieved 90% agreement.

(3) Data collection using draft structured questionnaires involving both questions and observations related to food preparation, feeding episodes, defecation episodes, and child behavior. Discussions examined each variable until there was agreement on an operational definition. The questionnaires were tried in homes, with investigators and field supervisor being present, and comparing notes afterwards. Again, trainees worked in pairs with separate recording until they achieved 95% agreement. The supervisor spent two extra days with trainees whose performance was comparatively poorer.

The subsequent performance and data recording of the trainees in the actual study were regularly monitored and found to be consistent with their training. Mothers rated the trainees' communication as satisfactory.

Editorial Comment

It has become clear to all those working in CDD that detailed information on actual behaviors potentially related to diarrhea incidence is needed if effective messages regarding prevention of diarrhea are to be designed and delivered. The 1987 study of Clemens and Stanton[1] showed the necessity of targeting communication efforts to the specific behaviors responsible for diarrhea in a particular setting. This exquisite report provides an ideal description of the kind of detailed training needed by field workers who

[1] J. Clemens and B. Stanton, "An Educational Intervention for Altering Water-Sanitation Behaviors to Reduce Childhood Diarrhea in Urban Bangladesh: I. Applications of the Case-control Method for Development of an Intervention," *American Journal of Epidemiology*, vol. 125, no. 2, 1987, 284-291; B. Stanton and J. Clemens, "An Educational Intervention for Altering Water-Sanitation Behaviors to Reduce Childhood Diarrhea in Urban Bangladesh: II. A Randomized Trial to Assess the Impact of the Intervention on Hygienic Behaviors and Rates of Diarrhea," *American Journal of Epidemiology*, vol. 125, no. 2, 1987, pp. 292-300.

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are going to be collecting this kind of data. While it seems long and complex, program managers must keep in mind that the effectiveness of their communication campaigns depends on the quality and appropriateness of the messages which it delivers. These will be only as good as the data on which they are based, which in turn depends on the quality of the observers collecting it.

Islam, D.; Tzipori, S.; Islam, M.; and Lindberg, A.A. "RAPID ISOLATION AND DETECTION OF SHIGELLA IN FAECES BY O-ANTIGEN SPECIFIC MONOCLONAL ANTIBODY COATED IMMUNOMAGNETIC BEADS." In: Adram, D.S.; Hasan, H.; Agboatwalla, M.; Jalaluddin; and Tahir, Ali S, eds. *Reflections on Diarrhoeal Diseases and Nutrition of Children: Proceedings of the Sixth Asian Conference on Diarrhoeal Diseases,* December 11-13, 1992, 46-53.

A method for detecting the presence of Shigella in diarrheal stool using immunomagnetic particles coated with monoclonal antibodies (IMS) was compared with latex agglutination (LA), indirect immunofluorescence (IFS), and routine microbiological culture. The IMSA assay detected 100% of the samples which were positive in culture. It showed positive results later in the clinical course of diarrhea in some samples which were negative on culture because of treatment. LA showed false negatives in 28% of culture-positive samples. IFS was 95% sensitive for detection of Shigella flexneri, and 100% sensitive for Shigella dysenteriae type 1.

Ramamurthy, T.; Bhattacharya, S.K.; Uesaka, Y.; et al. "EVALUATION OF THE BEAD ENZYME-LINKED IMMUNOSORBENT ASSAY FOR DETECTION OF CHOLERA TOXIN DIRECTLY FROM STOOL SPECIMENS." *Journal of Clinical Microbiology*, vol. 30, no. 7, 1992, 1783-1786.

A bead ELISA was evaluated for direct detection of cholera toxin (CT) from stool specimens of patients with acute secretory diarrhea. Culture detected Vibrio cholerae in 59 of 75 stool specimens. The bead ELISA was positive in 50 of the 59 (85%) culture-positive specimens, and an additional 3 specimens negative for culture.

Editorial Comment

These two papers describe promising techniques to detect important pathogens in diarrhea patients rapidly and with a high degree of sensitivity—100% in the Shigella test, 85% in the cholera procedure. Both these agents are of importance in epidemics of diarrhea, and the diseases they cause (dysentery and cholera) should be treated with antibiotics. It is these reasons that justify, at least partly, the use of a procedure to confirm the microbiologic etiology of a clinical diagnosis. Routine management of individual cases in poorly equipped facilities can proceed well on the basis of "diagnosis-by-epidemiology" alone: there is no need to confirm the microbiologic cause.

Public health workers seeking to manage an epidemic of diarrhea in a community, however, often need to identify its microbiologic cause, and could benefit from use of procedures of this type. In the past, cholera could be identified rapidly using a dark-field microscope on a stool specimen, often following brief incubation in enrichment broth to increase the numbers of bacteria. Today, procedures of the types reported here may be more feasible. Once the reagents are prepared, the ELISA procedure reported here is very easy to perform, and may be more feasible than obtaining an expensive microscope. We should reiterate, however, that the care of routine diarrhea patients does not require a microbiologic diagnosis, and therefore would not require the use of tests of the sort reported here.

Excler, J.L.; Standaert, B.; Ngendandumwe, E.; Piot, P. "MALNUTRITION ET INFECTION A HIV CHEZ L'ENFANT EN MILIEU HOSPITALIER AU BURUNDI." *Pédiatrie*, vol. 42, 1987, 715-8.
Order #1716

Summary

This study followed 40 children, aged 2 to 29 months, hospitalized for malnutrition in Burundi to determine the role of HIV in childhood malnutrition, and to describe the clinical differences between malnourished HIV positive

Technical Literature Update

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children and malnourished children who are HIV seronegative. Anthropometric measurements and HIV tests were taken, and treatment included a fortified, high protein-energy diet plus any medications needed.

Eighteen of the 40 children (45%) were HIV positive, but all five infants under six months of age in this study were HIV positive. Vertical transmission accounted for 15 (83%) of the 18 cases; blood transfusions accounted for three (17%).

The malnutrition cases seen in the HIV positive group were more often complicated by other problems. Protein-energy malnutrition started at an earlier age in this group. And other symptoms characteristic of HIV infection were also seen, such as thrush, labored breathing, skin lesions, and swelling of lymph nodes and the liver. But no difference was seen between seropositive and seronegative children concerning fever or diarrhea. Finally, HIV positive children did not respond as well to the improved diet given as therapy: seven HIV positive children did not gain weight.

Editorial Comment

This report gives a foretaste of what lies ahead in countries in which AIDS is added to an already difficult situation for children. While the sample selection of this study is biased (admissions to hospital for malnutrition, not a community population), the disproportionately large percentage of HIV+ children (45%, as compared to the proportion of HIV seropositive women in prenatal clinics of only 11%-28%) suggests that HIV infection is rapidly debilitating.

This is borne out by the earlier onset of malnutrition in these children, suggested by the large number of infants under 6 months who were HIV seropositive (5) compared to no seronegative malnourished infants under 6 months who required hospital admission. Given the likely high prevalence of breastfeeding in this population, it may be that breastfeeding during this first 6 months of life was not effective in protecting these infants from malnutrition, due to the detrimental effects of their HIV infections, although the authors unfortunately did not report information about breastfeeding.

We see also that many of these HIV-infected children responded poorly to the high protein-energy feedings provided by the hospital, in contrast to the seronegative children. Possible reasons would include inadequate intake of the feedings, inadequate absorption of nutrients due to morphologic abnormality or intestinal malfunction, or a higher rate of energy consumption or metabolism due to their ongoing opportunistic infections. Indeed the authors suggest that in this environment, failure of a malnourished child to respond to an appropriate therapeutic feeding regimen suggests the presence of HIV infection, especially when accompanied by other evidence suggesting HIV infection such as hepatomegaly, adenopathies, and skin and mouth lesions.

As with diarrhea, the poor response of these children to therapy will doubtless discourage both parents and practitioners from making an intensive effort to help them. This may lead to children not infected by HIV failing to get treatment for malnutrition due to the premature assumption of HIV infection.

Keusch, G.T.; Thea, D.M.; Kamenga, M. et al.
"PERSISTENT DIARRHEA ASSOCIATED WITH AIDS."
***Acta Paediatrica*, supplement, vol. 381, 1992, 45-8.**
Order #6271

Summary

Preliminary analysis was carried out of an ongoing prospective longitudinal study of 469 babies born to HIV seropositive and seronegative mothers in Kinshasa, Zaire. The objective of the analysis was to determine the incidence of diarrhea and the proportion of cases in which diarrhea persisted for more than 14 days. During the first 6 months of observation 269 episodes of acute diarrhea were observed. The mean duration of diarrhea was 5 days. Sixteen (5%) of the 269 acute episodes of diarrhea became persistent. The persistent diarrhea rate in HIV+ infants was over 6 times that of infants born to HIV seronegative mothers, and three of the four babies who died with persistent diarrhea were HIV+. The persistent diarrhea rate in HIV- infants born to HIV+ mothers was intermediate: 3.6 times the risk of HIV- babies.

Surprisingly, no association of persistent diarrhea was seen with breastfeeding before or during the diarrhea, water source, preparation of formula, use of boiled water, antecedent malaria or measles, or use of antibiotics. Fifty percent of the deaths in the babies were due to acute or persistent diarrhea, and were strongly associated with HIV infection. The article also reviewed other aspects of overall morbidity and mortality and of diarrhea disease relative to HIV status, based on reports from other centers.

Editorial Comment

This report, unlike most of the literature on diarrhea related to HIV/AIDS, focuses on children, the population with the highest non-AIDS diarrhea rates and the emphasis of control of diarrheal disease (CDD) programs. We note a relatively low incidence of diarrhea overall—0.6

episodes per infant in 6 months or 1.2 episodes per year, compared to general figures of 2.5 to 3.5 episodes per year in under-fives overall. This low incidence may be due to high rates of breastfeeding in this population, although this preliminary analysis does not report an analysis of overall diarrhea incidence relative to breastfeeding.

Yet the persistent diarrhea rate in the HIV+ infants was high: six times that in the HIV- infants from HIV- mothers. Seeing this, we might immediately jump to the conclusion that the persistent diarrhea results from immunosuppression, but it may well relate to other factors in some of the infant-mother pairs, as the persistent diarrhea rate is higher also in HIV- infants who have HIV+ mothers. Those infants may also be immunosuppressed, but perhaps from measles or malnutrition, not from AIDS. Also, as the authors note, HIV+ mothers, some of whom doubtless are suffering from AIDS infections, may be less able to care for their infants because of their illnesses, or because of living situations associated with HIV infection (for example, prostitution, poverty, or husband not at home).

The number of cases upon which these comparisons are based is quite small, only 16 cases of persistent diarrhea overall, due to the limited six-month period of data collection so far in this prospective study. We will look forward to a fuller analysis in the future, when more data become available. In the meantime, this important study draws our attention to the fact that AIDS will add to the diarrhea problem in children both directly, by means of infection and immunosuppression in HIV+ children, and indirectly, by its effect on parents, the home environment, and parental responsiveness to their children.

Dunn, D.T.; Newell, M.L.; Ades, A.E.; Peckham, C.S. "RISK OF HUMAN IMMUNODEFICIENCY VIRUS TYPE 1 TRANSMISSION THROUGH BREASTFEEDING." ***The Lancet*****, vol. 340, September 5, 1992, 585-8.**
Order #6034

Summary

This article estimates the rate of HIV infection of infants through breastfeeding based on four published studies that met the following criteria designed to ensure that transmission took place after delivery: (1) mothers were infected with HIV through a blood transfusion after delivery, or (2) repeated serological testing of mothers shown to be seronegative at the time of delivery and subsequently becoming seropositive. Children in one study (Kigali) born to mothers who seroconverted too rapidly after delivery (within 3 months) were excluded from the analysis.

Combining the data from these four reports shows that the risk of an infant contracting HIV infection from breastfeeding alone is 29% (95% confidence interval 16-42%).

The additional risk of transmission through breastfeeding, when breastfeeding follows exposure of the fetus to a seropositive mother in utero during pregnancy and subsequently during the delivery process, was estimated by comparing breastfed infants with exclusively bottlefed infants born to mothers known to be HIV positive. Six studies provided the data for this summary analysis. The additional risk of breastfeeding in such cases was 14% (95% confidence interval 7-22%), with extremes from the six studies being from a high of 33% (Australia) to a 5% lower risk of HIV in breastfed infants (Miami), compared to bottle-feeding infants.

Editorial Comment

Since we last discussed this issue in the TLU (vol. V, no. 4), a number of careful studies have been published, and much discussion of policy has taken place. This careful metaanalysis of two sets of studies summarizes what we know at present. It confirms that breastfeeding by a HIV+ mother puts the child at substantial risk of becoming infected with HIV: 29% in mothers seronegative at birth, 14% in mothers seropositive at birth.

Why should the second rate be lower? The authors point out the possibility that IgG antibody may be transmitted to the infant via the placenta during pregnancy and protect the child from infection by viruses transmitted during the traumatic birth process, also that mothers with antibody may be less likely to have viremia than mothers who are newly infected and have a period of intense viremia during breastfeeding prior to their own antibody response to the virus.

What should CDD programs recommend regarding breastfeeding? The most difficult aspect of this is the fact that most infected mothers in developing countries do not know that they are infected, and few developing countries would be able to do HIV serology on all pregnant women. In such circumstances recent computer modeling of risks indicate that, in most developing countries, breastfeeding is still the safer alternative, as alternatives to breastfeeding (milk, formula) are not safe in a contaminated non-hygienic environment. Discouraging breastfeeding in such circumstances would, according to these calculations, increase mortality, despite the risk of HIV infection and certain death from it. This would be true unless HIV prevalence in women is high, and infant mortality rates are low, a situation which does not currently exist in developing populations.

Theme: Integration

Technical Literature Update on DIARRHEA

Technical Editor: Robert Northrup, M.D.
Managing Editor: Karen White, M.L.S.

Vol. VIII, Nº3 1993

Integration

The movement in child survival efforts is toward integration. BASICS, the Agency for International Development's new child survival project, which will manage the activities of the current diarrhea, immunization, and health communications projects (PRITECH, REACH, and HealthCom), is integrated. In addition, the WHO/CDR program has been developing its "sick child initiative," which stresses the desirability of an integrated approach to sick children. The program will seek to integrate diarrhea and acute respiratory infection (ARI) case management with a broader assessment and management of the child, including nutrition. Many African health ministries have sought to add diarrheal disease control (CDD) programs organizationally to their primary care units, and have combined CDD operationally with other maternal and child health activities in the implementation of supervision, training, information systems, and other field and central functions. Diarrheal disease control efforts have long given priority to the close interaction between diarrhea and nutrition.

This issue of the *Technical Literature Update* is the last under PRITECH direction, and fittingly seeks to explore some of the issues facing the integration of diarrheal disease control and oral rehydration therapy with other elements of child survival and primary health care. The articles raise the question of a variable mix of interventions depending on local epidemiology, discuss the tension between selective primary health care and comprehensive primary health care and whether they are different in practice, and analyze the potential and actual impact of integrated programs.

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Management Sciences for Health

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Hirschhorn, N.; Grabowsky, M.; Houston, R.; and Steinglass, R. "ARE WE IGNORING DIFFERENT LEVELS OF MORTALITY IN THE PRIMARY HEALTH CARE DEBATE?" ***Health Policy and Planning*****, vol. 4, 1989, 343-53.**
Order #3298

Summary

Critics compare selective primary health care to comprehensive primary health care, and say that the former is top-down and fixed in nature, not responding flexibly to variations in local conditions. Selective primary health care is often militaristic, with minimum attention to community empowerment. It creates dependence and does little to build sustainable health care at the community level. Its narrow focus on infectious diseases ignores the social, economic, and nutritional antecedents of infections. Children saved from today's illness by selective primary health care may die tomorrow of something else (replacement mortality).

The authors describe a more flexible and responsive selective primary health care. They analyzed published infant mortality rates (IMRs) and specific mortality causes in a number of countries at various stages of development in health. The analysis showed that, as IMR falls, deaths from diarrhea first increase proportionally, then decrease, while neonatal tetanus deaths fall, then essentially disappear at low IMR levels. Measles is prominent at high IMRs, along with other parasitic and infectious illnesses including malaria, but decreases in proportional importance at lower IMRs. Nutrition-related deaths similarly decrease in importance. Perinatal and respiratory deaths remain proportionally constant. Thus, at low IMRs (59 to 24), the total number of defined causes contributing substantially to death declines, with perinatal deaths and diarrhea being the most prominent of the defined causes.

The authors draw the conclusion from these findings that selective primary health care programs should not consist of a fixed set of interventions, but should vary in programmatic content, according to the level of IMR and therefore the causes of mortality.

Thus, at high levels of IMR (240 to 120), the recommended components of selective primary health care should probably include vaccination against measles and neonatal tetanus; availability of antimicrobials for pneumonia, malaria, and dysentery; ORT for acute watery diarrhea; and vitamin A for measles treatment. All should be available at community and household level, because the health system is generally underdeveloped in situations having this level of IMR. This combination of interventions will both reduce IMR and initiate community-based primary health care with community health workers.

In areas with medium levels of IMR (119 to 60), ORT and nutrition programs, immunization, and programs to reduce low birth weight would be the priorities. In low IMR areas, antenatal care, health education and hygiene, water programs, and ORT would take priority as primary care interventions. As IMR decreases, integration of services within the primary level, and integration of the primary level with effective referral services at the secondary or tertiary level (e.g. support for underweight newborns) would also be needed to reduce infant mortality further, because of the more complex nature of its causes at this residual level of IMR. At the same time a lowered IMR from selective targeted programs may stimulate the increased political commitment to health needed to implement a true comprehensive primary health care system.

Editorial Comment

This article provides justification for the increasing importance of integration as health status improves. An unintegrated collection of interventions can make a substantial impact on mortality in high IMR areas, where there are many cases of a small group of simple problems manageable by comparatively simple interventions. As health levels improve, the simple responses to the simple problems will already be taking place. More complex service responses to both sick and well children, needing more complex support and management and integration in order to achieve greater biologic effectiveness and operational efficiency, will be needed if mortality is to be further lowered without overwhelming available resources.

Technical Literature Update

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Integration of interventions could enhance effectiveness and efficiency in high IMR areas as well. Integration of such services would be primarily horizontal, that is, across diseases and programs but essentially all at the primary care level. In a low IMR area, in contrast, further reductions in mortality would need planning for integration at different levels of health care services in addition to horizontal integration. For example, in perinatal care, establishing effective referral mechanisms such as screening for early identification of problems, communications, and transport would allow care at the primary level to be effectively integrated with services at secondary or tertiary levels for those mothers or infants requiring them. Decisions at all IMR levels of about whether to integrate certain interventions must primarily be determined on the basis of biologic and operational synergism: whether one intervention will biologically enhance the effectiveness of another (will hygiene enhance ORT, for instance, by reducing the number of diarrhea cases), and whether one intervention will fit operationally into or alongside another (such as vitamin A capsule distribution readily being joined with immunization).

The authors argue that, carried out in this flexible and responsive fashion, selective primary health care is not the monolithic, anti-community approach of which its critics complain. In fact, they say, even the more justifiably separate interventions appropriate to situations of high IMRs would be benefitted by greater emphasis on community involvement or training village health workers.

The study, based on data from many countries, draws attention to general patterns. These patterns should be valuable to international donor agencies developing approaches for many countries. Such patterns should not be overused in planning programs for an individual country, however. Special local social conditions, such as educational levels, climate or geography, economics, and existing health facilities, as well as local mortality and morbidity data, must be analyzed and incorporated in developing local plans.

Wisner, B. "GOBI VERSUS PHC: SOME DANGERS OF SELECTIVE PRIMARY HEALTH CARE." ***Social Science and Medicine*****, vol. 26, 1988, 963-69.**
Order #3287

Summary

This article targets for criticism the selective primary health care approach, for which UNICEF's GOBI strategy, as well as the PRITECH Project's even more focused emphasis on ORT, can be considered examples. Neither selective primary health care nor GOBI[1] has given priority to community participation and empowerment, even control, of health care. The interventions are chosen by external experts, not the people. They target individuals, in particular "ignorant" mothers. They lead to dependence on a health care system. In their effort to minimize costs and maximize impact they have utilized mass media social marketing and "massive ad hoc delivery systems." These approaches in particular undermine the formation of local grassroots organizations which join parents and primary health care workers in truly autonomous collaboration. The interventions also distract people from demanding that they be given what they themselves define as their needs. In addition, they distract people from efforts to overcome the obstacles imposed by factions of the privileged seeking to protect the status quo and keep the people in poverty.

Editorial Comment

Wisner's unstated goal, upon which most of his arguments are based, is the primary health care process, a movement which in a larger political context would be seen as akin to communism. In this movement, the people or community should be helped to assume the power to solve their own problems. The hierarchy inherent in a system in which a few people "control" the knowledge and skills needed to bring about good health is inherently bad, according to this approach, and must be reduced or if possible eliminated. If it were not for the evil controlling doctors, who are keeping the inherently simple knowledge and skills needed for their own use and profit, the people could deal with their health problems themselves. People have a right to health, he implies (not to health care but to health), presumably measured by the usual indicators of mortality and morbidity. He seems to contend that improving health via the politically appropriate pathway is more important than the health itself.

The goals of selective primary health care and GOBI, are, in contrast, clearly stated—better health, specifically the reduction of mortality of children. These approaches seek to achieve that by the most direct and rapid methods available. As the author notes, the selective primary health care movement arose in response to disappointments with the primary health care movement and with earlier efforts to improve developing country health systems as a whole. Despite substantial investment, these efforts, *when carried out on a large scale*, had not resulted in much impact on mortality. Children were still dying at about the same rates.

[1]GOBI consists of growth monitoring, oral rehydration therapy for diarrhea, breastfeeding, and immunization.

In my own experience, communities may not put health first, or may drift away into other endeavors, despite sincere efforts to facilitate their development of primary health care. Much effort can be made by governments without a corresponding response by the people, and therefore with minimal impact on mortality. Philosophically the comprehensive primary health care approach is attractive, just as communism and a managed economy were attractive to the founders of the Soviet Union. But put into practice in a variety of situations, the comprehensive primary health care approach is inconsistent at best in bringing about the hoped-for improvements in health, as measured in children's deaths. Because of this, the selective primary health care/GOBI approach chose a few effective and efficient interventions that could be implemented in a way which would circumvent the immense investment that comprehensive primary health care seemed to require, and still achieve major reductions in mortality.

I continue to believe that this logic is valid. We cannot willingly allow children to die in the name of comprehensive primary health care or any other philosophy, no matter how internally moral that philosophy may be. In some settings, human beings are able to manage the complex relationships and divisions of labor and education that are needed for sustainable PHC to take place, and to bring about better health. But in many communities this does not seem to be possible. A more dependency-producing, more controlled and controlling, less consensus-dependent system seems to be necessary to keep children from dying within available budgets in such circumstances.

Wisner makes a number of stimulating suggestions, in particular where he cites mechanisms by which we could enhance community and group involvement and use selective primary health care as the "leading edge" of primary health care. The following paper by Kendall on Honduras shows how this can happen. In the last few years, we have seen in a number of countries how governments and politicians have been stimulated to invest more in health and primary health care by the success of immunization days and aggressive breastfeeding programs, for example. Our future efforts must continue to seek ways to engage the community in health-generating activities while not jeopardizing those activities that keep children from dying today.

Kendall, C. "THE IMPLEMENTATION OF A DIARRHEAL DISEASE CONTROL PROGRAM IN HONDURAS: IS IT 'SELECTIVE PRIMARY HEALTH CARE' OR 'INTEGRATED PRIMARY HEALTH CARE?'"
***Social Science and Medicine*, vol. 27, 1988, 17-23.**
Order #2175

This article addresses the debate between integrated or comprehensive primary health care and selective primary health care. Kendall notes many of the same differences between the two as Wisner (above): concerned or not with the structure and organization of services and of communities, functioning exclusively within the health sector or involving other sectors in broad development, driven by epidemiologic and cost considerations versus considerations of social equity, emphasizing community participation or not, and narrowly focused on single interventions or aimed at broader institutional and health system development.

He finds, however, that in the effective implementation of selective primary health care as in the Honduran natinoal CDD program, the distinctions between the two approaches become much less clear. The initially more focused selective primary health care implementors were forced to respond to issues related to community involvement, strengthening of basic health system functions such as health education, management, supervision, and supply logistics, and problems in the underlying basic primary health care system (such as village health worker and community fatigue). The CDD program went beyond case management of diarrhea patients with ORT to engage actively in water and sanitation and hygiene activities, which of necessity involve the community if they are to be successful. The program worked through multi-purpose workers at the community level and professionals at all levels of the health care system, not through a dedicated vertical system of specialized workers.

Honduras had an integrated primary health care system in place, which had as many problems as successes. The CDD program had to work with those problems, and the problems of the primary health care system became the program's problems. In some cases it could bypass such problems. For example, it used radio to reach community members directly, thereby creating demand which in turn provided incentive for both the nurses and auxiliary health workers of the primary health care system. It used municipal mayors to distribute ORS, which subsequently led to a rekindling of interest by volunteer health workers in their work.

Kendall concludes that issues of design and utilization of services at local levels, obstacles to service delivery, household level integration, political and economic implications of health services, and other questions and problems are issues that cut across primary health care and selective primary health care. When these issues are addressed from the more practical perspective of implementation than from a purely theoretical perspective, they are more fruitful in organizing what we already know about primary health care and what we should address in our research than the theoretical debate that inappropriately codifies and polarizes them.

Editorial Comment

This article speaks for many of us with experience in the field. We find the theoretical debate between integrated or comprehensive primary health care and selective primary health care as expressed particularly in CDD programs frequently irrelevant as we struggle via our "vertical" program efforts to deal with problems of village level participation and communication, parental education, home versus health facility treatment, home solutions versus ORS packets, and the like. Yes, the integrated primary health care approach seems to emphasize a participatory, community-driven *process* of health care rather than *impact* on mortality, certainly more than most CDD programs do. Yet CDD programs must ultimately face the problems of sustainability, of poor health services coverage at least by government health workers, and of the need to get ORS or drugs for dysentery out to the community and delivered appropriately. All of these concerns lead the programs to become involved with communities and village health workers, as happened in Honduras.

Perhaps the most important characteristic of the Honduran situation was that the CDD project was implemented with a project to strengthen basic and primary health care services. Both will apparently continue to be funded by USAID. By working together and being integrated, the projects could address fundamental and joint problems.

In contrast, CDD or other child survival programs working in situations where governments and donors are not addressing basic health service problems may be too minimally funded to address even the most critical basic primary health care system problems adequately. This is true particularly if they are tightly constrained by their funding sources to address only the problems and activities of the particular disease control program. To be successful, both donors and host governments must recognize and provide support for activities aimed at integrated problem solving in addition to the pure selective primary health care program activities which are their main focus. Collaboration with the basic primary health care systems of the health ministry and the private sector and its primary health care services, will both assist the targeted selected primary health care program in meeting its objectives, and help to solve the problems and achieve the philosophical goals of the underlying integrated primary health care system.

Black, R.E. "WOULD CONTROL OF CHILDHOOD INFECTIOUS DISEASE REDUCE MALNUTRITION?" *Acta Paediatrica Scandavica*, supplement, vol. 374, 1991, 133-40.
Order #5191

Pediatric infections have long been recognized as important influences on the physical growth of children and the nutritional status and rates of malnutrition in populations. Particular infectious diseases, such as diarrhea, measles, respiratory diseases, and malaria, have been identified as probable determinants of growth in seminal studies in various settings. The studies examined in this review article were mostly studies of the frequent childhood infectious diseases of developing countries, especially diarrhea and respiratory diseases. In some studies, measles, malaria, skin infections and other illness categories were also included.

Examples: (1) Seven hundred sixteen Guatemalan children under seven years of age were followed for 23 months. Illness histories were collected every two weeks and related to 6 monthly and yearly increments in weight and height. The percentage of days ill with diarrhea was found to be significantly associated with reduced gains in weight and height. Respiratory illnesses, which were present 30-35% of the time in the first four years of life, were not associated with reduced growth outcomes.

(2) In The Gambia, 152 children 3-36 months of age were studied for one year. Diarrhea was demonstrated to be significantly related to reduced increments in weight and height. Malaria prevalence adversely affected weight gain, but not linear growth. Other categories of infections, including upper and lower respiratory tract infections, were not found to affect growth significantly in this population of children.

(3) A longitudinal study in Uganda involving 45 children less than 3 years of age showed the

occurrence of diarrhea to be significantly associated with reduced weight gain. Diagnosed malaria and fever of unknown origin were also associated with reduced weight gain. Other disease categories, such as upper and lower respiratory illness and skin infections, were not associated with adverse growth outcomes.

When infectious diseases and routine dietary intake have been evaluated simultaneously, inadequate dietary intake rather than the infectious disease per se was found to have the predominant role in growth faltering. In many cases another bout of disease—frequently diarrheal disease—overtakes the child before the initial "catch-up" period has been completed, preventing by poor appetite the increased food intake needed. The magnitude of effect of diarrheal diseases on growth is difficult to estimate since effects ranging from 10-80% of the growth retardation in the first few years of life have been reported.

This variability in the observed effects may be explained in part by the presence of other factors that modify the potential effect of diarrhea, and possibly other infectious diseases. Control of infectious disease through prevention or proper case management can be justified for itself, but is not as cost effective in improving nutritional status and reducing malnutrition as more direct nutritional interventions such as breastfeeding support, dietary supplementation, or convalescent feeding approaches.

Lutter, C.K.; Mora, J.O.; Habicht, J-P. et al.
"NUTRITIONAL SUPPLEMENTATION: EFFECTS ON CHILD STUNTING BECAUSE OF DIARRHEA,"
***American Journal of Clinical Nutrition*, vol. 50, 1989, 1-8.**
Order #3296

Research has demonstrated that the positive effect of nutritional supplementation on child growth in malnourished children is small relative to the large negative effect of diarrheal disease. Length and diarrheal morbidity were compared at 36 months of age for two cohorts of Colombian children, testing the hypothesis that routine dietary supplementation can modify the negative effect of diarrhea on height. Among unsupplemented children, diarrhea was negatively associated with length, that is, children with more diarrhea were more frequently stunted. Among supplemented children, in contrast, diarrhea had no effect on length: the supplementation appeared to offset the stunting effect of diarrheal disease completely. The authors recommend targeting food supplementation programs to the critical period of high diarrheal prevalence among infants and young children in order to increase the effectiveness of such programs in preventing growth retardation.

Editorial Comment

The Lutter study is powerful evidence of the importance of integrated programs in controlling one of the most important negative effects of diarrhea, its effect on nutrition and growth, bearing out the conclusions of Black in the previous summary. A subsequent study from Peru, detailed in an abstract by Kenneth Brown and colleagues (FASEB Journal, vol. 5, A1079, 1991) examined a very similar question, whether having an adequate basic diet as compared to a deficient diet would influence the negative effects of diarrhea on growth. One would presume that diets of the children receiving supplements in the Lutter et al study would be considered "adequate" according to Brown's criteria. They used weight gain rather than length as their indicator.

Brown reported that those children whose regular dietary energy intake was greater than 75% of their recommended intake showed no relationship between diarrhea prevalence and weight gain, while children with energy intakes less than 75% of recommended levels did show poorer weight gain with greater diarrhea prevalence. This study confirms that having an adequate diet can offset the negative results of diarrheal disease on growth, both with regard to weight and length.

In both situations the critical action—adequate feeding or food supplementation—had to occur between diarrhea episodes, and would not ordinarily be part of the usual CDD program concentrating on case management. One presumes that in most circumstances children receiving a supplement would be chosen through a process of growth monitoring. In such a fashion, growth monitoring followed by supplementation or effective maternal education on diet to the most needy children would act synergistically with ORT and adequate diarrhea case management to prevent nutritional damage from diarrhea. Integration of interventions in this manner, that is, strategically planned integration, can take advantage of these biological synergisms and indeed improve both the effectiveness and the efficiency of the well-chosen interventions.

Such strategically planned, integrated interventions are very likely the appropriate response to the problems

described by Black in the preceding summary. A pure ORT program, even one that tried to improve feeding during and immediately after the diarrhea episode, would probably not have the same effect.

Mosley, W.H.; Becker, S. "DEMOGRAPHIC MODELS FOR CHILD SURVIVAL AND IMPLICATIONS FOR HEALTH INTERVENTION PROGRAMMES." ***Health Policy and Planning*****, vol. 6, 1991, 218-33.**
Order #5151

Summary

The authors review available data on child mortality from the Asia-Near East region. Major declines in child mortality have occurred over the last two decades. Some of this improvement occurred prior to the more intensive child survival and primary health care efforts of the last decade. Evidence from Demographic and Health Surveys and other sources, however, shows substantial correlation between mortality decline and increasing utilization (coverage) of primary health care services, particularly immunization. Further declines in mortality can be expected in the near future, also related to the effects of preventive interventions of the sort UNICEF and USAID have supported through their child survival strategies.

But much work remains to be done. A substantial decline in mortality has not occurred in all of the countries of the region; some will probably not achieve the WHO/UNICEF mortality target of 70 per thousand (expressed as probability of dying by age 5) by the year 2000, for example, Bangladesh. For the region overall, the total numbers of deaths of children under 5 will remain substantial—between 4 and 5 million per year, only 20 to 40 percent less than current numbers. And the relatively constant numbers of annual births projected along with declining deaths will lead to a gradually increasing number of children needing services. Thus maintaining current levels of support for child survival will be needed just to consolidate and maintain the health gains already achieved, while further reductions in child mortality will require increases in the current levels of service.

Critical to success, say the authors, will be strategies to improve program efficiency and effectiveness, most fundamentally those that combine interventions. For example, combining ORS/ORT with interventions to improve personal hygiene will have a multiplier effect. ORS will become more efficient because hygiene has reduced the number of cases, and hygiene will be more effective in mortality reduction because those cases of diarrhea that do occur despite better hygiene can be provided with a lifesaving intervention. Targeting interventions to high-risk groups will further increase the efficiency of the interventions. Operations research to improve existing interventions, developmental research to generate new appropriate technologies, and more consistent investment in evaluation research to document the demographic impact of interventions, are needed to further strengthen existing efforts.

Editorial Comment

This article stresses the continuing need for child survival services, even in the Asia-Near East region where so much progress has already taken place. Its data and projections show clearly that continuing support from governments and donors will be needed just to maintain existing health gains. It is not time to shift health dollars into care for adults. Further reductions in mortality will demand either an increased level of support, or an increase in the efficiency and effectiveness of the current level of interventions.

In this scenario, integration of interventions that takes advantage of the synergy between diseases (such as vitamin A deficiency and measles), or in some cases the operational synergy between interventions (such as vitamin A distribution carried out at the same time as immunization), is unavoidable if further progress is to be made within the limitations of available resources. Like Taylor and Parker (see below), these authors recommend starting with a small package of activities or even a single intervention, and later expanding and integrating others as the initial intervention solves its problems and becomes institutionalized. The challenge to those working with the child survival interventions is to differentiate between those situations where more problem solving within a single intervention is still the priority, and those situations where the priority should shift to adding and integrating new interventions which can be synergistic with the ongoing intervention.

Taylor, C.E.; Parker, R.L. "INTEGRATING PHC SERVICES: EVIDENCE FROM NARANGWAL, INDIA." ***Health Policy and Planning*****, vol. 2, 1987, 150-61.**
Order #3580

Summary

This paper reviews the findings from Narangwal in North India, where different combinations or packages of nutrition, infection control, family planning, women's

health, and children's health services were introduced into different sets of villages. The investigators collected data to measure inputs and costs, changes in health-related practices, and impact on morbidity, mortality, growth, psychomotor development, and fertility. Significant reductions occurred in morbidity and mortality in children and their growth improved in experimental villages receiving nutrition and/or infection control services compared to control villages. Family planning use increased in all villages receiving family planning inputs. The combined cost of services was about $US 2.00 per capita (1971 prices).

Integrated or combined services generally performed at least as well as more selective approaches, and because of their integrated nature were often more efficient. The major advantage of integrated services was that they provided multiple benefits, an important consideration in areas with many competing causes of morbidity and mortality. It was concluded that Narangwal demonstrated the potential of an incremental approach to integration, based on a process of learning by experience and supported by the continuous feedback of information from both formal and informal assessments.

Editorial Comment

This general review can only touch on the rich store of information that can be learned from the Narangwal experience, and reminds us again of how often we seem to have to keep re-learning what has been demonstrated clearly in the past but forgotten. The Narangwal project used a classic primary health care structure involving village volunteers and family health workers who lived in the village, supported by supervisory doctors and nurses who received referrals for problems unable to be handled by the village-level manpower.

While the services were integrated in terms of their delivery, they were not uniformly provided to the whole population. Instead, surveillance and screening identified children with high-risk, early problems which could become severe, or greater need, and intensive services were directed at these targeted cases. By integrating such surveillance and screening as well as the subsequent services, the program could identify and respond to multiple kinds of problems, not just one. The result was a significant impact on health problems at a feasible cost.

I was struck by the statement that family health workers spent only half the time on certain services in villages where the services were integrated (such as nutrition with health care) as they did in single-service villages. That may mean that all children got less of a particular service, or that the average was less, which could mean that some problem children got lots of service while others got almost none. In this overview article the data to clarify this point are not available. Given that the services had already been trimmed down to the most critical, it seems likely that the latter was true, and that the increase in efficiency was obtained by shifting time spent by health workers from one particular task to another.

The authors comment that they delegated the tasks that could be readily standardized to the periphery, and kept the total package of interventions to a feasible level—5 or 6 interventions seemed to be manageable. These were then supported by a surveillance system to monitor the population and a supervisory/management/evaluation system with readily available consultation to monitor and support the workers.

The report confirms the importance of a well functioning management system to success, a factor shown to be crucial in the narrowest of selective primary health care programs as well as the broadest of primary health care efforts. Add to this a judicious limitation of services and activities selected for feasibility, delegation of the most standardized services to the periphery and to lower level workers, targeting of intensive services to those with the greatest need for them, and inclusion of an information system that identifies problems and supports their correction, and you have a program that can respond to the most important health problems of the community in a cost-effective manner.

Is such a program feasible on a national level? The authors urge an incremental approach, starting with a smaller package of activities and subsequently expanding. This is just where many countries are today, having functioning CDD and immunization programs running, usually through but sometimes in parallel with a basic health care system. Using Narangwal's example, we could incrementally expand those programs, adding in turn acute respiratory infections, vitamin A distribution, prenatal care, or targeting via growth monitoring, while not forgetting to strengthen the necessary supportive referral services. This approach would be preferable, in my view, to implementing a whole package of services at once but of necessity at a superficial level, and would be much more feasible for most countries. The key is not to forget the need for solid management to identify and solve the problems which will inevitably arise.