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AN ANALYSIS OF HOME-BASED ORAL REHYDRATION THERAPY IN THE KINGDOM OF LESOTHO

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Abstract—Mothers in developing countries are being successfully taught to give an oral rehydration solution (ORS) at home. The quantity of oral rehydration fluid that mothers administer to their child remains a critical question. Inadequate quantities render oral rehydration therapy (ORT) ineffective. The primary focus of our investigation was direct measurement of the quantity of fluid unsupervised mothers gave their children at home. This study validates a methodology that provides precise information on ORS administration in the home, information essential for evaluating the effectiveness of home-based therapy and for planning programmes to influence unsupervised mothers to correctly administer ORS to their sick children.

This study, conducted in the Kingdom of Lesotho, assessed the impact on home care of the national control of diarrhoeal disease (CDD) programme. Direct observations in the home established each child's status and the quantity of fluid used 24 hr after children left the ORT unit where mothers were instructed to give ORS at home. Data were gathered on natural consequences that might discourage use of ORS, such as vomiting, increased frequency of watery stools and distaste for the solution.

The health status of most of the 197 children followed improved. The average volume of ORS administered was 544 ml. A full liter was given by 21% of the mothers. Only 3% of the mothers gave no ORS. The average dose was 65 ml/kg. Younger children got about the same volume as older children; thus, they received a higher ml/kg dose. Mothers gave more ORS to children who had more symptoms of diarrhoeal disease at the time they were brought to the clinic. Mothers who said that their child liked the taste of ORS gave more than those who reported that their children did not like the taste. There was no relationship between loose stool frequency reported by mothers and quantity of ORS given.

Interviewers were able to obtain acceptable volume estimates from mothers by identifying the container used to administer ORS in the home and asking how often it was filled. Using this approach, 81% of the mothers accurately recalled how much ORS they had administered. This technique may make it possible to obtain accurate estimates of quantities of supplementary liquids such as juice, tea and soup given in the home.

Key words—oral rehydration, dehydration, diarrhoea, children, Healthcom

INTRODUCTION

Dehydration secondary to diarrhoea accounts for up to 50% of all infant deaths in some areas of the world [1]. In most developing countries, diarrhoeal disease and associated dehydration are recurrent throughout childhood. They are responsible for 3-6 million deaths among children each year [2, 3]. Worldwide, mothers in developing countries are being taught to carry out oral rehydration to prevent the potentially devastating consequences of diarrhoeal dehydration [4, 5].

Oral rehydration has been widely accepted and repeatedly proven effective in managing dehydration secondary to diarrhoeal disease in children [6]. Two uses are prevalent. First, significantly dehydrated children are rehydrated, usually in a clinic setting.

Second, children are given ORS at home to prevent dehydration and/or maintain hydration following a clinic visit [7]. It is the latter use that we investigated.

This study analyzed the behavior of mothers who brought their sick children to a health care facility where they were rehydrated. The mothers were instructed to give ORS at home as necessary to maintain the child's hydration. The model is broadly used in child survival programmes in developing countries and it represents the safest approach to treatment of children with significant dehydration. Treatment carried out entirely at home is far riskier and less likely to stabilize the child expeditiously.

Even with the burden of acute intervention shifted to the health care worker at a clinic site, mothers must provide adequate continuing care at home. There is little evidence to suggest whether mothers comply with the ORT regimens at home. If they do comply, there is even less evidence as to how much ORT they actually give during the crucial 24 hr period following the clinic visit and whether it is a useful quantity.

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ORT, unlike other home remedies, requires that the child's caretaker engage in the unfamiliar behavior of giving a substantial quantity of fluid over an extended period of time. Getting the mother to follow through with ORT at home may be facilitated when the mother takes her sick child to a clinic and there delivers ORS herself under supervision. When mother and child are sent home to continue the therapy, she must prepare a solution that is properly mixed and then administer it in sufficient quantity. Both of these elements have been of concern when treatment is carried out at home. The question of what sort of training and procedures will best enable mothers to mix a viable solution has been researched in some detail [8-10]. Little is known, however, about the quantity of ORS mothers give their sick children at home or factors that influence the quantity of ORS they administer. The CDD oral rehydration programme in Lesotho gave us the opportunity to investigate the quantity question in a substantial number of cases.

The research reported here is part of a unique 14-year investment in health communication research by the U.S. Agency for International Development. Funded under three successive 5 year contracts, the Healthcom project has provided technical assistance to child survival programs in more than 20 developing countries since 1978, with the overall objective of refining the use of communication and social marketing methods for public health behavior change.

SETTING

Diarrhoea and dehydration in Lesotho

At the inauguration of the Lesotho CDD Programme in 1986 it was estimated that 600,000 cases of diarrhoea occurred annually in children under 5. In a 1990 national survey of 1016 mothers, 28% reported that one of her children had diarrhoea at the time of the interview or had an episode during the prior two weeks. Ministry of Health (MOH) statistics showed three main causes of death for children under five, diarrhoea (and the dehydration that results from it), pneumonia, and malnutrition. Diarrhoea and consequent dehydration are serious health problems among young children in Lesotho. The MOH has committed itself to intervention through the use of ORT in clinics and in the home.

In 1986 the MOH, in conjunction with the CDD programme, created a national policy for ORT which prescribed the use of oral rehydration salts manufactured in Lesotho to World Health Organization (WHO) specification as the treatment of choice for dehydration resulting from diarrhoea. Standardized messages were developed to guide all health education concerning the management of diarrhoea and the treatment of dehydration. The messages are used in education of the public, initial training and continuing education of nurses and health workers, orien-

tation of new doctors, and in elementary school curricular materials.

The CDD programme established ORT units in all but 1 of the 18 hospitals in the country and in several of the 165 clinics. Children presenting at a facility with diarrhoea or dehydration are referred to these units. If the child has diarrhoea complicated by other illness, the child is referred to a pediatrics ward for treatment. Children suffering from an uncomplicated case of diarrhoea are rehydrated in the unit. Each mother is taught about ORT by the unit's nurse and rehydrates her child under the nurse's supervision. Rehydration typically requires about four hours [11]. The mother is instructed to continue treatment at home and is given one or more ORS packets. A child is not released from an ORT unit until he or she is fully rehydrated. In severe or protracted cases the mother and child may stay overnight.

The genesis and objectives of the study

Home-based oral rehydration requires that the child's mother or caretaker engage in unfamiliar behavior. The mother must recognize the problem, obtain ORS materials, prepare a rehydration solution properly, and administer an adequate quantity of the liquid. Efforts to initiate these behaviors in the mothers of sick children have met with considerable success [12-15]. Still, many mothers in developing countries apply a common-sense remedy of restricting fluids to reduce diarrhoea [16]. This practice and its associated beliefs must be overcome to get mothers to administer sufficient quantities of ORS at home. There is a universal concern that unsupervised mothers may not give their sick children enough oral rehydration fluid. The limited evidence available supports this concern [17, 18].

The lack of information concerning the quantity of ORS given reflects the difficulty of obtaining accurate measures what mothers or caretakers actually do in their homes. The difference between a clinically useful quantity and an ineffective amount is not very large. Crude quantity estimates may provide no useful insight into the value of treatment. The issue is of great practical importance. Healthcom, the sponsor of this project, has been developing an objective behavioral measure of ORS administration in the home. Although not perfect, it represents a considerable improvement over self-report alone, and it may help diarrhoeal disease control managers to determine the reliability of self-report administration data in diverse cultural, socioeconomic and demographic populations.

The assessment procedure was first used in a study conducted in rural Mexico [19] in which 44 families of children with diarrhoeal disease were visited at home the day after they left a health care center with a liter of pre-mixed ORS. The fluid remaining at the time of the visit was measured to determine how much ORS had been administered in the previous 24 hr. The Mexico study showed that the logistics of

follow-up were practical. The results suggested that children were given little ORS at home. There was no clear evidence to suggest the cause of low fluid use. Conclusions were limited by the small sample, lack of child status measures, and the absence of rehydration services on site at the clinic. The present investigation sought to extend the Mexico study and to address these questions:

Can accurate quantity measures be obtained on a large sample in difficult to access areas?

Does mothers' behavior in administering ORS relate to the child's status after 24 hr?

Does vomiting, frequency of loose stools and severity of illness influence how much ORS is given?

The Lesotho CDD programme provided an opportunity to determine if children received enough fluid at home to produce a positive clinical response and whether the existing messages on ORS administration were appropriate to the needs of parent and child. Nevertheless, acquiring data in this area presented some challenges. The most common method of collecting information on ORS administration is to question mothers about their child's last illness. Unfortunately, these interviews are often unreliable even under the best circumstances. Stanton and colleagues [20] found that field information gathered by interview and questionnaire was not consistent with data obtained by direct observation. They concluded that quantitative data derived from interviews are at best suggestive and at worst misleading. The limited use of standard volume measures in developing countries makes verbal estimates of quantity especially clumsy. This study extended the use of direct observation in the home to get exact quantity measures combined with observations concerning the child's status at the clinic and at the home. Interview data collected at the clinic and at the home completed the picture of the treatment the child received.

RESEARCH PROCEDURE

The study evaluated the outcome of the current practices of the Lesotho CDD programme, which were not altered prior to or during the course of the study. Six field researchers were employed. All of the staff spoke Sesotho as their mother tongue and were competent in English as their second language. The interviewers were trained to recognize the symptoms of diarrhoeal disease. They were given a thorough background in diarrhoea case management and in the diagnostic and treatment protocols of the ORT units. Observers pretested procedures and materials as part of their training. They then carried out measurement and interview protocols under supervision before following up cases independently.

The research sites were: Scott Hospital in Morija, and in Maseru, Mafeteng Hospital and Queen Elizabeth II Hospital. At all three sites, people tended to

come from small towns and villages, often from considerable distances. The sample represents rural people and urban dwellers. Two researchers were assigned to each of the three hospital ORT units. At Scott and Mafeteng hospitals, the researchers were accommodated at the hospital for the duration of the study. After about 100 cases had been followed up, the number of cases at Scott Hospital dropped to an unproductively low level. The two observers assigned to Scott were reassigned, one to Maseru and one to Mafeteng, for the remainder of the study. Data were gathered during ten weeks between mid-January and the end of March 1990.

Examination of children with diarrhoea was conducted by the nurse at the ORT unit, following normal procedure. One of the researchers was present. In the course of examining the child and questioning the mother about the history of the case, the nurse asked the mother where she was staying. No indication was given that a follow-up visit would be made. Data gathered included: date; time; clinic case number; name, sex, and age of the child; name of the mother or caregiver; number and age of siblings; child's weight and length; severity of the child's illness; symptoms; and the estimated number of loose stools in the last 24 hr. The child's status and the volume of ORS given in the clinic were also recorded.

During clinic-based rehydration the nurse trained each mother in how to mix the fluid using the standard WHO packet, and how to administer the mixture. Mothers of children under 9 months were told to give one small mug of ORS after each loose stool. Mothers of children over 9 months were told to give their child two mugs of ORS after each loose stool. Each mother was asked to repeat these instructions to the nurse. Mothers were encouraged to continue breast feeding or to give the usual solid foods and liquids if the child would consume them.

On any given day, one of the two field research staff was at the clinic observing the diagnosis and treatment of cases, recording information, and learning where the mother was staying. The other researcher was in the field following up cases from the previous day. Daily intake of cases was as few as 2, as many as 10. Since follow-ups were not prearranged some mothers could not be located 24 hr after discharge. More than 90% of the cases logged at the clinics were traced successfully. In the remainder, the mother was not at home or the home could not be found.

At discharge from the ORT clinic, each mother was supervised while she mixed a batch of ORS. She placed the mixture in a clean 1 liter soft drink bottle and capped it to prevent spillage. A researcher visited the home of the sick child 24 hr later. The field worker first asked for the mother's permission to follow up the sick child, then examined the child and rated each of the seven symptomatic indicators as present or absent, replicating the procedure carried out in the clinic. No mother refused the visit. The researcher asked for the bottle from the clinic,

emptied the remaining fluid into the graduate on a level surface and recorded the amount. The amount given to the child was inferred from the measurement. The observer recorded the location, time of day, and quantity of ORS remaining. The mother was then interviewed about, whether the child rejected the solution or found it palatable, other liquids given, food consumed, whether the child vomited and how many loose stools there had been during the last 24 hr. The researcher asked the mother to repeat administration instructions she had been given in the clinic and noted the elements she recalled. Before leaving, the researcher disposed of the remaining ORS, gave the mother additional packets and supervised her as she mixed a fresh batch.

Initially, field research staff received supervisory visits two to three times a week. This included accompanying the researcher to one of the homes and observing her technique, followed by remedial training, if required. Supervisory visits also included conducting a detailed examination of questionnaires, checking for completeness and errors, and making corrections where necessary. These visits were also the means of paying per diem and salary money as well as re-supplying the field researchers with questionnaires, soft-drink bottles, and other materials. At no point in the study did the field researchers go longer than a week without at least one supervisory visit. Staff from the Statistics Unit of the MOH entered observation and interview information into an International Questionnaire Development System (IQ) data base. Data were entered twice with forced comparison for reliability.

RESULTS

A total of 207 cases were registered and successfully followed. Of these three had incomplete data. The original target had been to follow children up to the age of 5. Only 7 children of scattered ages above 36 months came to the study sites. This group was too small to allow systematic analysis. The cohort was therefore restricted to children three years and under. The data below were derived from a group of 197 children ranging in age from 2 to 36 months.

Age distribution of children

Children under 12 months contributed 45% of the sample. Children between 1 and 2 years old accounted for 41%. The remaining 14% of the children were between 2 and 3 years of age. The cohort was made up of 106 boys and 91 girls. Clinic utilization by Basotho mothers with the youngest (0-6 months) and the oldest children (36-60 months) was very low. In contrast, Riyad *et al.* [21] found that 72-80% of the children presenting with dehydration at outpatient 'toddler' clinics in Egypt were under 12 months old. In Lesotho few children below 6 months or above 24 months of age came to the clinics. It may be that the incidence dehydration in the youngest

group is low because of the widespread practice of exclusive breast feeding. Some factor or factors associated with age differentially influence which children come to ORT clinics in Egypt and Lesotho. Since the makeup of the clinic population is a critical variable in this health service delivery model, the question deserves further investigation.

Quantity of ORS delivered at home

The summarized results of the field workers' direct measurement of oral rehydration solution remaining at the time of the follow up visit are reported in Fig. 1. The average quantity of ORS administered was 544 ml. At the extremes, 21% of the mothers gave all of the available fluid. Only 3% of the mothers gave no ORS. The average daily dose was 65 ml/kg. The group that received the mean dose (40-80 ml/kg) was the largest at 38%. A total of 69% of the children received more than 40 ml/kg/day, the quantity generally thought to be the lower limit useful in maintaining hydration during diarrhoeal episodes [21]. It should be noted that the dose given larger children was limited by the 1000 ml available to the mother. A child weighing 10 kg could not exceed 100 ml/kg. A child weighing 12 kg could receive no more than 83 ml/kg. In this study, 33 children (17%) weighed more than 10 kg.

Mothers' estimates of how much ORS was administered

During the course of each home follow-up interview, mothers were asked how much ORS they gave. In order to enhance the accuracy of the estimate and compensate for the mothers' lack of access to standard measures, the following method was used. The mother was asked what container she used to dispense the fluid, how it was filled, and how often it was given. The field worker then measured the container and thus derived an estimate. Of interest was the correspondence between what mothers reported and

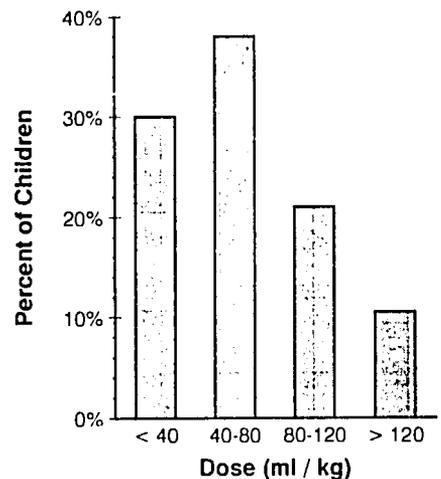


Fig. 1. Dose of oral rehydration fluid given at home.

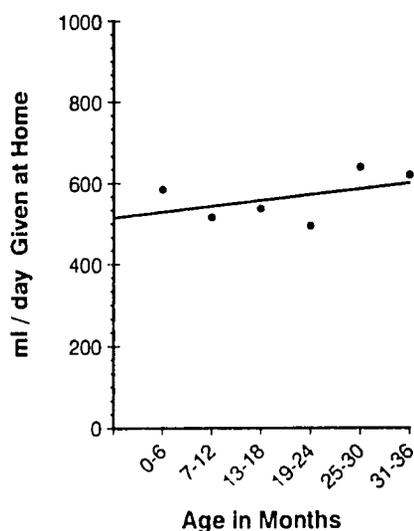


Fig. 2. Trend in volume of ORS by age group.

the actual quantity measured. Field reports and other investigators have suggested that mothers' reports are not very accurate for a variety of reasons. The correspondence between mothers' estimates and observed quantity in our sample was very good ($R = 0.849$, $P < 0.001$). Mothers' estimates were correct plus or minus 100 ml in 81% of the cases. The procedure produced overestimates of the amount given in 8% of the cases and underestimates in 11% of the cases.

ORS quantity (ml) and dose (ml/kg) by age group

The average quantity of ORS administered was 544 ml (Fig. 2). There was little difference across age groups. The range of mean quantities was 493 ml to 637 ml with no appreciable age-related trend. Because the amount given was nearly the same across age groups, the younger and thus smaller children received more ORS for body weight (Fig. 3). The 0-6 month group received almost 96 ml/kg. The 7-12 month group received 75 ml/kg on average. The three groups covering children from 13 to 36 months of age received a mean dose of approx. 55 ml/kg. The two youngest groups received a daily dose between the 100 ml/kg amount suggested by the WHO for maintaining hydration in children suffering from diarrhoeal disease [3, 5] and what appears to be the minimum effective dose of about 40 ml/kg.

The ceiling imposed by the one-liter total amount of fluid available probably did not play an important part in the decline in milliliter per kilogram doses given for larger children (Fig. 3). The average quantity administered to older children was about one half of the amount available. This finding replicates that of Touchette *et al.* [19] in Mexico. That study also revealed a decrease in dose as age increased, although average dose was lower than that observed in Lesotho at all ages.

Older and thus larger children received lower doses on average even though mothers were instructed to give children up to nine months of age one mug after each loose stool, whereas older children were to be given two mugs. The average quantity delivered to children 0-9 months of age was 543 ml, and the average for those 10 months and older was 545 ml. The two-tiered quantity instruction appears to have had no significant influence on the quantity delivered unless we assume that the younger children were more severely dehydrated. Neither clinic nor home observations support this supposition.

Food and other fluids

Most children (83%) were fed during the first 24 hr. The most common food given was the local porridge (54%). Liquids other than ORS were given to 87% of the children. Many were breast feeding and 61% received breast milk. Soft drinks (47%) and a variety of juices and teas (34%) were also given.

Increase decrease in symptoms

Overall condition improved in 71% of the children followed from their clinic evaluation to the home visit. There was no change in 23% of the cases and 6% had worsened. None were returned to the clinic or hospitalized. These data were collected by direct observation of the child's status recorded during the home visit. Asked whether their children's diarrhoeal symptoms had improved, gotten worse, or stayed the same since the clinic visit, 76% of the mothers said the diarrhoea was less following treatment with ORS. 10% said that there was no change, and only 4% perceived a worsening. Asked if vomiting had increased or decreased in frequency, 33% of mothers indicated that the child had improved, less than 1% indicated no change, and 2% said the child had

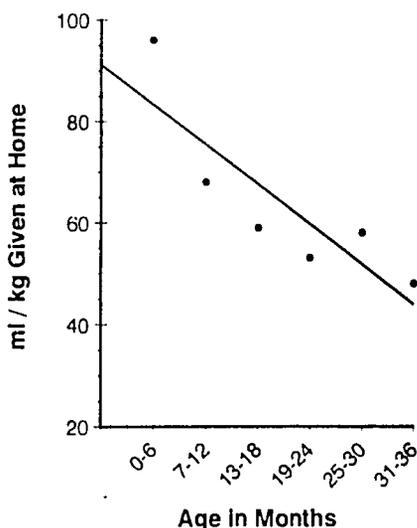


Fig. 3. Trend in dose (ml/kg) of ORS by age group.

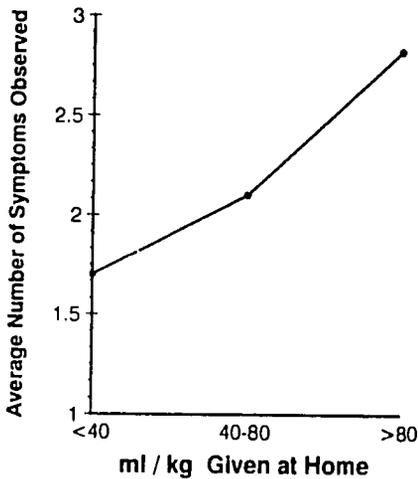


Fig. 4. Severity of illness at clinic by dose of ORS.

gotten worse. Most mothers reported that there had been no vomiting after leaving the clinic.

Severity of illness and quantity of ORS

As an estimate of the severity of illness, each child was evaluated on the presence or absence of seven symptoms: (1) loose stools, (2) vomiting, (3) fever, (4) sunken eyes, (5) torpor, (6) dark urine, and (7) shriveled skin. This evaluation was carried out at the clinic when the child was registered for the study and later at home when the field worker did the follow-up. On follow-up, only 18% of the children had more than one symptom, and 35% of the children had no symptoms at all. The improvement in the status from clinic to home was substantial across the symptoms monitored. Most children had improved dramatically so that there was only a small amount of variation left in the cohort after 24 hr at home. This virtually precluded the emergence of any relationship between the dose of ORS given at home and symptoms present at follow-up. Dose at home did relate to the number of symptoms present (severity of illness) when the child was evaluated at the clinic (Fig. 4). Children who were more ill at the time they were brought to the clinic were given more ORS per unit body weight while at home.

ORS taste

Mothers were asked if their children liked or disliked the taste of ORS. About 60% of the mothers interviewed reported that their children disliked the taste of ORS. The remaining 40% reported that their child found the taste of the fluid acceptable. Palatability has been raised as an issue by prior investigators. Figure 5 reveals that 50% of the children who were reported to dislike the taste were given less than 40 ml/kg. Only 18% of the children who 'liked the taste' received less than 40 ml/kg. This variable appears to have exerted a major influence on dose.

These data may be misleading. Field workers reported a tendency for some mothers to substitute their own opinion for that of their child. The observed relationship between taste and quantity given could also be confounded by thirst. The child who was more ill might have more readily accepted any liquid, suggesting that they liked the taste. This thesis is not supported by the available data. The children who reportedly disliked the taste of ORS had the same severity of diarrhoeal disease at the ORT unit and at home as did those who reportedly liked the taste.

DISCUSSION

Each mother had her own reasons for doing what she did during the first 24 hr after she left the clinic with her rehydrated child. Some mothers noted that it was very difficult to get the child to take ORS in the clinic and deemed it impossible in their home. Others had no difficulty at the clinic and simply carried on the same regimen upon arriving at home. Work and obligations to other family members interfere with good intentions. Some mothers gave a liter of rehydration fluid to their children who had already recovered and had no loose stools. One mother obtained additional packets and gave almost three liters of ORS to her infant whom she said liked it so well he would drink nothing else. One mother stated that the ORS was only water and would do no good. 'I threw it away'. Although it is important to know what people think is right and what they plan or want to do, in the final analysis, what actually gets done is what affects the well being of the child.

Many factors including time constraints imposed by competing responsibilities in the home and mothers questioning the credibility of oral rehydration therapy mitigate against compliance [21, 22]. Cutts and associates [18] reported that most mothers

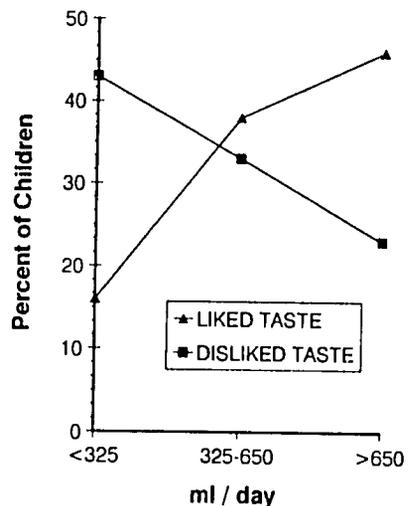


Fig. 5. Impact of taste on volume of ORS given.

in Mozambique were confused about the quantity of fluid to give and some administered it 'like a syrup, one teaspoon three times a day'. Stapelton [23] found that 75% of mothers surveyed in Nepal reported that fluids were withheld when a child had diarrhoea. Withholding liquid is a common practice; there is no traditional health belief or practice that supports giving more fluid. Oral rehydration is unlike other home-based medical interventions and is counterintuitive for most mothers.

Innovative research methods are necessary to elucidate the determinants of correct use of ORS in the home. The follow-up protocol reported here proved viable even in the inhospitable countryside of Lesotho where travel is often restricted to foot and horse. Over 90% of all cases registered at the clinics were successfully tracked down for the follow-up visit. The direct observation and interview procedures used enabled data collection on over 200 cases in a period of 10 weeks. This sample was satisfactory in terms of accuracy, quantity of data, resource allocation, and procedural demands. Measuring the container that a mother used to dispense fluid combined with the mother's estimate of how often it was filled provided a surprisingly high level of agreement. This approach offers a means of obtaining accurate quantity estimates for alternate fluids such as juice, soups, and tea given at home during diarrhoeal episodes. Giving increased fluids is a behavior in which mothers have been encouraged to engage but that planners have been unable to evaluate.

The dose of oral rehydration solution given by this sample of Basotho mothers varied across a wide range from case to case. Few associated variables imposed any order on the quantity data. The child's age and weight exerted no clear impact on the quantity that mothers gave. The finding that younger children receive proportionally more ORS was not explained by the data we had in hand. Whether the child reportedly liked or disliked the taste of the solution did influence both the amount given and the dose. The status data suggest that mothers were not influenced by severity of the child's dehydration in judging palatability. The relationship of palatability to quantity must be taken into account in describing the elements that influence how much ORS is given. The mechanism of this largely negative influence deserves further investigation with special attention to how it can be eliminated. Severity of illness at the time that the child was taken to the ORT clinic was the other factor which influenced the amount of ORS given at home. Those children most ill at the time of their clinic visit were likely to receive the most fluid at home. Mothers might have been influenced to withhold treatment or reduce quantity administered because their children vomited during or following ORS administration. There was, however, no correspondence between vomiting and dose given. Only 32% of the mothers reported any vomiting at all.

The number of loose stools reported by mothers

and quantity of ORS given did not correspond closely ($R = 0.21$). Neither was there any difference in the average amount of ORS given to children above and below the age of 9 months. The lack of relationship of volume given and number of loose stools observed raises the question of whether the cupful (or two) per loose stool instruction was effective. A common alternative is to tell the mother to give a fixed daily dose [21]. A recommendation such as $\frac{1}{2}$ l/day for infants and 1 l/day for older children is clear and simple. It is quite possible, however, that instructions concerning quantity have little impact regardless of content. At least one study [7] reported success using 'ad libitum' instructions in which mothers were given no specific instructions concerning quantity.

During the follow-up interview all of the mothers remembered that the nurse had told them to continue to give ORS at home and most recalled that they were to give 'a lot' or 'all' of the fluid. Few mothers could verbalize anything about the mug-full rule that was to guide fluid administration. No mother mentioned that she was supposed to give two cups per loose stool. Most mothers indicated that they were told to give the fluid frequently. How much mothers were influenced by the mugful (or two) per loose stool instruction is moot. No objective measures of the frequency of loose stools were collected.

Because diarrhoea is not a single disease, the subsequent dehydration is inherently variable from child to child and incident to incident in the same child. Mothers in Lesotho are being alerted to the signs of dehydration, are being encouraged to begin rehydration after two loose stools, and are being encouraged to treat simple diarrhoea at home. However, if the diarrhoea persists, if a fever develops, or if blood or mucus appears in the stools, mothers are directed to take their child to one of the growing number of ORT units. The exact criteria that form the basis for making the decision to come to the clinic are unknown. Presumably they have to do with severity of illness and factors relating to access. The families whom we studied were a select sample of families whose children had diarrhoeal episodes. It is likely that these children had more severe symptoms or more concerned parents. The act of coming to a clinic is probably associated with a more severely ill child and possibly enhanced likelihood of compliance with suggested home-based treatment.

There is no consensus on what constitutes an adequate dose of ORS for a child with diarrhoeal disease. The judgment is complex and involves estimates of current fluid deficit and likely future loss. If a child is dehydrated, the only safe procedure is to get the child to trained medical personnel who can make the proper diagnosis and prescribe the steps necessary to deal with the fluid deficit.

A critical issue in child survival is whether unsupervised mothers will administer ORS in sufficient quantity to prevent dehydration. In a study conducted in Egypt, Riyad *et al.* [21] found that home

administration of fixed quantities between 300 and 520 ml a day was sufficient to prevent dehydration in 99% the children under two years old that they followed throughout the duration of their illness. The minimum effective dose appears to be about 40–50 ml/kg/day. Roughly seventy percent of the Basotho mothers gave this much or more during the 24 hr observed. Recall that these mothers were not warned that there would be a follow-up visit.

Some caution should be used in attempting to generalize these results to other developing countries. Basotho women whose children we observed had just over two years of schooling on average. Only 3% had no schooling at all. Exclusive breast feeding is almost universal in Lesotho. Clinic staff are well trained. A sophisticated health message communication programme is in place. With all of these positive features that are not universal in developing countries, the Lesotho CDD programme has achieved substantial effectiveness.

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