INTERNATIONAL NUTRITION PLANNERS FORUM

NUTRITION AND DIARRHEAL DISEASE CONTROL

REPORT OF AN INTERNATIONAL CONFERENCE HELD AT THE WEST DEAN CONFERENCE CENTER, UNITED KINGDOM

AUGUST 12-16, 1985
The International Nutrition Planners Forum is an informal organization of senior officials for developing countries with responsibility for nutrition-related policy or programs. Members do not represent governments. They participate in their individual capacities as professionals. The forum exists to provide greater opportunities for developing country nutrition and other professionals to exchange ideas and experiences, to learn from one another, and to speak out on important nutrition issues. Its program consists of activities such as conducting exchange study visits, writing and publishing case histories on nutrition planning, and holding forums on practical nutrition topics. Forum participants are predominantly from developing countries; therefore, the published conclusions and recommendations represent the view of the developing world.
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ACRONYMS USED

DDC  Diarrheal disease control
ORS  Oral rehydration solutions
ORT  Oral rehydration therapy
PHC  Primary health care
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INTRODUCTION AND SUMMARY

Concrete actions in nutrition along with other interventions, constitute integral parts of a comprehensive approach to the control of diarrheal diseases in children through primary health care (PHC). Nutrition interventions not only are effective means of disease prevention themselves but also are key elements in case management for the prevention and recuperation of the nutrient depletion accompanying diarrhea and in the improvement of the nutritional status of those surviving diarrheal disease. Unfortunately, the implementation of diarrheal disease control (DDC) often relies overly on selective, isolated distribution and use of oral rehydration solutions (ORS), to the neglect of the nutritional aspects of control.

It was in recognition of this problem that the International Nutrition Planners Forum convened its third International Conference on the topic of Nutrition and Diarrheal Disease Control. The Conference intended to focus the attention of selected developing country experts in nutrition and diarrheal disease control on the current status of program implementation, the identification of existing constraints to effective program integration, and the formulation of practical recommendations for a more comprehensive approach to DDC through PHC.

Twenty-seven experts from twenty developing countries and five representatives from three international organizations (WHO, UNICEF, and USAID) met at the West Dean Conference Center in West Sussex, United Kingdom, on August 12-16, 1985. The purposes of the Conference were:

- To identify the central issues associated with implementation of nutritional actions for DDC in children
- To exchange information on actions currently taken in developing countries to meet the nutritional needs of children during and after acute diarrhea and to prevent the nutritional deterioration of these children
- To identify constraints to the integration of nutrition actions and DDC and to examine critical factors related to success or failure of such integration
- To formulate practical recommendations for an effective integration of nutrition and DDC actions, with emphasis on PHC.
The Conference took the form of a workshop. First, three keynote working papers were presented: one on current scientific knowledge, another on the state of the art in dietary management of diarrheal disease, and a third on constraints and promising approaches to integration of nutrition and DDC actions. Then three working groups, following detailed sets of guidelines, discussed a series of issues related to policy and planning, implementation, and research. A summary of the salient conclusions and recommendations of the Conference follows.

Given the cumulative deterioration in nutritional status associated with repeated episodes of acute diarrheal disease, survivors tend to become progressively malnourished if their nutritional needs during and after bouts of the illness are not adequately met. Hence, preventing deaths from diarrheal dehydration by means of oral rehydration therapy (ORT) is not enough to ensure long-term health benefits and significant reduction of overall child mortality. Infants and children saved by rehydration alone will continue to be malnourished and exposed to high risk of morbidity and mortality from other infections and diarrhea itself. Therefore, integrating dietary actions with ORS and other DDC interventions is fundamental for an effective prevention and control of both diarrhea and protein-calorie malnutrition.

The principal interventions selected as part of a comprehensive approach to nutrition and diarrheal disease control are:

- ORS to prevent or correct dehydration
- Continued feeding, particularly uninterrupted breastfeeding, or early refeeding and compensatory extra feeding with high nutrient-density foods during convalescence
- Judicious specific therapy when indicated
- Promotion of breast-feeding and improved weaning practices
- Systematic use of "home technologies" for diarrhea prevention within the household through hygienic food preparation, preservation, and use.

Constraints to the implementation of such a comprehensive approach are:

- Little political commitment to PHC
- Deficient implementation of PHC
- A tendency toward selective care, with "verticalization" of programs
o Deficient coordination, information, and monitoring and evaluation

o Lack of concrete, culturally relevant guidelines and specific recommendations for feeding during and after diarrhea

o Poor attitudes and inappropriate behavior of some health personnel

o Cultural barriers, and resistance on the part of the community.

The following approaches to integration of nutrition and DDC actions are recommended:

o Promotion of political commitment to PHC by all appropriate means

o Support for the planning and implementation of a comprehensive rather than a selective care approach to PHC, with adequate coordination, information, and monitoring and evaluation, as well as integrated implementation and supervision at the local level

o Improvement of the managerial capabilities of PHC implementors with emphasis on problem-oriented management

o Promotion of community participation through consciousness raising and active involvement in PHC

o Development of more concrete, locally relevant and specific guidelines for feeding during and after diarrhea (possibly requiring applied field research on weaning practices, local foods, and effective feeding schemes)

o Promotion and support of locally relevant, applied or operational field research on nutrition and DDC, as well as strengthening of the research capabilities and encouragement of technical cooperation among developing countries

o Training and retraining of health personnel in the comprehensive approach to PHC, nutrition, and DDC

o Improved educational approaches for behavior modification in the community, through mass media and face-to-face contact, to foster prevention of diarrhea and comprehensive case management.
Diarrhea is a major cause of childhood mortality in developing countries. Recurrent attacks and prolonged diarrhea also lead to protein-calorie malnutrition among the survivors. Diarrhea reduces food intake through anorexia and food withholding, impairs absorption and utilization of nutrients, and increases catabolic losses. The adverse effects of diarrheal disease are accentuated if the child is already malnourished and if there are secondary infections and other complications. Malnutrition impairs host defense and worsens clinical manifestations and can thus increase the risk of death from diarrhea or other infections. Malnourished children are more likely to have more severe and longer-lasting episodes of diarrhea. The problems of diarrheal disease and malnourishment are interrelated; their solution must also be integrated.

The ill effects of diarrhea and malnutrition on child growth and development can affect the community at large and interfere with national development. The need for an integrated approach to malnutrition and diarrheal disease in children of developing countries is increasingly recognized. The control of diarrhea and malnutrition simultaneously is a practical, economical, and expedient way to promote good nutrition and health in children, and the PHC strategy offers the best opportunity for implementation of these control measures.

Desirable interventions for prevention and control of diarrhea and malnutrition within the PHC approach are:

- ORS during diarrhea for prevention of fluid and electrolyte losses or rapid replacement of same (this can be done by making use of the standard ORS, cereal-based ORS, or appropriate homemade fluids)

- Continued feeding during and after diarrhea to prevent nutrient depletion (this includes uninterrupted breastfeeding and frequent feeding of other foods in children who are already on a mixed diet)

- Provision of extra food, high nutrient-density food preparations, or both during convalescence to promote catch-up growth

- Judicious specific therapy of diarrhea when indicated

- Promotion of breast-feeding and timely introduction of safe complementary foods to maintain good nutrition
Feeding under hygienic conditions to prevent contamination and diarrhea, as well as other simple home measures such as hand washing, proper handling of food and water, and adequate food preparation and preservation.

Both rehydration and proper dietary management are essential for reducing child morbidity and mortality from diarrhea and malnutrition. ORS alone is inadequate treatment without nutritional support.
CONSTRAINTS AND APPROACHES TO INTEGRATED POLICY, PLANNING, AND IMPLEMENTATION

The success of oral rehydration in reducing the lethality associated with acute infectious diarrhea in children has resulted in some neglect of the already well-recognized need to maintain nutritional support during the episodes. With the survival of more malnourished children, the need to reinforce the importance of the nutritional aspects of DDC is becoming more apparent. The integrated approach to DDC, which includes the nutrition component, requires time, planning, and investment to make sure that all levels of the health system are adequately linked, having efficient flow of information and feedback capacity, mutual support, and constant evaluation.

Linking DDC with control of malnutrition can be done more effectively within the context of the overall health plan but particularly with PHC. Pressures to develop specific DDC plans that are not within this context should be resisted. In some countries, "nutrition" and "diarrhea control" responsibilities are in different sections of the Health Ministry or even in different ministries (Social Security and Health, for example). Methods to ensure integrated (or interministerial) planning need to be developed appropriately for each case; the first step should be a joint recognition of the problem. Again, the PHC approach provides for this integration. The planning process itself needs to be based on true priorities rather than on sectoral or subsectoral interests. If this is done with a focus on community needs and measures, horizontal integration becomes possible.

Actions to control diarrhea and malnutrition must not wait on economic progress. It is neither scientifically nor economically sound to rely solely on economic development in the expectation that diarrhea and malnutrition will automatically decline with economic growth. Experience indicates that, in the absence of effective control programs, decline in morbidity and mortality will lag unacceptably far behind economic growth. Rising incomes or increased industrialization do not by themselves necessarily lead to rapid reduction of infant mortality or to healthier children.

Integration of malnutrition control and DDC does not involve a significant increment in health care costs. Extra materials required are limited (because foods available to the family will usually be used rather than donated foods). The main extra costs are in restructuring training (which is of relatively low cost) and in community education (which will need to cover topics in addition to diarrhea and malnutrition). The cost of extending PHC is not specifically related to the problem of diarrhea and malnutrition; it has wider benefits as an investment in improving general health.
Table 1 provides a schematic representation of constraints to the effective integration of measures to control the interrelated problem of diarrhea and malnutrition. It also provides broad approaches needed to overcome these constraints. The approaches are necessarily indicative rather than exhaustive and each country will wish to complete its own listing of constraints and solutions according to its specific conditions.

Many of the constraints to integration listed in the table are also related to other areas of PHC inadequately covered in many countries, but they were included to help in defining the specific constraints in any one country.

A series of promising approaches to overcome the constraints to integration are recommended in the subsections that follow. Constraints to research and approaches to overcome them (last column of Table 1) are considered in detail in the next section.

I. Targeted Approach through Primary Health Care

In many countries, the PHC system is not yet fully developed and functional. Measures to reduce the problem of diarrhea and malnutrition should be implemented without delay even in these cases. Moreover, the survival of children and development of the country demand that PHC be accelerated and that any program to deal with diarrhea and malnutrition be developed within the context of PHC and not be allowed to sidetrack its growth. Otherwise, development is sacrificed for short-term gain. The extension of health service infrastructure is a priority if long-term impact is to be achieved.

It is neither beneficial to mothers and children nor cost-effective to develop programs to counter diarrhea in isolation of nutrition programs, and vice versa. Both must be considered together and in the context of other measures aimed to improve health (maternal care, growth monitoring, immunizations, etc.). Within the context of its PHC policy, each country will need to take decisions regarding integration -- both among diarrhea control and nutrition activities and with other health activities and social sectors. Such decisions will include considerable responsibilities and coordination at various levels, keeping in mind that the ultimate responsibility and coordination takes place in each family where malnutrition and diarrhea are risks to life and health. Such an integrated approach should be seen as an investment, including local resources, rather than as an expenditure.
TABLE 1. CONSTRAINTS AND APPROACHES TO INTEGRATION OF NUTRITION AND DIARRHEAL DISEASE CONTROL

<table>
<thead>
<tr>
<th>ECONOMIC</th>
<th>SOCIAL AND FAMILIAL</th>
<th>MANAG-ITAL</th>
<th>POLITICAL</th>
<th>SCIENTIFIC AND TECHNOLOGICAL</th>
</tr>
</thead>
</table>
| 1. Unequal distribution of resources  
2. Inadequate resources  
3. Inefficient utilization of resources | 1. Inappropriate practices and attitudes  
2. Lack of awareness and passivity  
3. Poor hygiene and food safety  
4. Low use of health services  
5. Food withdrawal | 1. Inadequate delivery systems  
2. Lack of personnel  
3. Logistic problems  
4. Vertical, selective approaches | 1. Lack of awareness of the problem and its consequences  
2. Lack of awareness of the correct approach  
3. Preference for oversimplified solutions  
4. Lack of concern  
5. Lack of commitment and involvement | 1. Limited financial and human resources  
2. Poor access to information and technology  
3. Low local priority rating for research  
4. Poor communication and cooperation among developing countries  
5. Inappropriate policies and priorities of funding agencies |

Specific Constraints

<table>
<thead>
<tr>
<th>Required Approaches</th>
</tr>
</thead>
</table>
| 1. Shift-priorities (*)  
2. Additional funds  
3. More efficient use of funds | Change behavioral patterns deleterious to health through:  
1. Targeted education (*)  
2. Community motivation and involvement (*)  
3. PNC | 1. PNC  
2. Training and motivation (*)  
3. Information systems  
4. Problem-oriented management | 1. Create awareness in political leaders through information dissemination (*)  
2. Show models of success  
3. Create demand (bottom-up)  
4. International agency advocacy and advise through governing bodies | 1. Increase local funds  
2. Improve communication  
3. Increase personnel training in research  
4. Promote technical cooperation among developing countries  
5. Reorienting policies of donor agencies |

(*) An asterik indicates special importance of item in integrated control program
The relevance of integrating nutrition support actions and the control of diarrheal disease is greatest at the field level, and especially within the context of PHC. It does not imply that the program should be integrated vertically, from the central level, but that every level of health manpower and the community should participate in its formulation and implementation.

2. Political Commitment

To be taken and acted upon, such decisions require political commitment. This commitment implies using political authority to see that coordinated action is taken to reduce deaths and disability from diarrhea and malnutrition. It also implies that resources are redistributed to reflect this commitment through the planning process.

Political commitment can be an uncertain element, however, and by itself might be insufficient. Success also demands that communities be informed and consciously involved in the integrated and sustained programs against diarrhea and malnutrition. If political commitment and community demand and participation develop together to support a rational approach, success is more likely.

The change in the nutritional and economic status of the poorer strata of developing countries requires a political commitment on the part of the governments. Besides the political determination to encourage income-generating activities in such communities, investment in health is essential if DDC programs or nutrition programs are to achieve their objectives.

3. Community Participation

Community participation is one of the key elements of the PHC strategy. Consciousness-raising through community education is a first necessary step to ensure active participation; this will allow for the joint identification of community needs and priorities and for the implementation of realistic actions under existing conditions. Community education is also needed for the modification of behavioral patterns that are deleterious to health, as well as for encouraging community involvement in PHC planning and implementation.

The role of women in community action is particularly important. Experience shows that education of women is fundamental for adequate decisions leading to better health of their families. Functional as well as formal education of women should thus be a priority. The higher the level of mother's education, the lower the infant and early childhood mortality rates. Nevertheless, although education of mothers is particularly important, education
of the whole family should be the aim.

4. Combining Hydration and Nutrition

ORT is one of the great advances in medicine of this century. In the absence of a real commitment to development and of an understanding of the causes of diarrhea and malnutrition, however, ORT can become merely a means of preventing immediate death while evading the goal of promoting the optimal quality of life and the health status of the survivors. Prevention and long-term rehabilitation should be as important a part of policy and programs against diarrhea and malnutrition as immediate treatment. Thus nutritional care, changing the attitudes of health workers through pre- and in-service training in the correct approach, improving the environment, and community education should all be important aspects of every program against diarrhea. Because continued feeding during treatment is vital in every attack of diarrhea, food must be available. Such food will often come from the family’s own resources, or should otherwise be provided through the health system whenever possible.

One of the probable reasons for the observed disparity in the implementation of the two basic elements of ORT (rehydration and feeding) relates to their relative ease of achievement. Whereas the procedures for correcting fluid and electrolyte losses can be more easily standardized worldwide, nutritional support has to take into consideration local sociocultural and economic factors and cannot be automatically formulated.

5. Coordination, Information, and Monitoring and Evaluation

There are two factors, common in many existing services, that need to be dealt with at the policy and programming level: one is a tendency toward a selective approach; the other is underinformation. They are related in that better information, available to all concerned, helps to break down artificial barriers imposed by specialization. A tendency toward a selective approach can be reduced through pre- and in-service training and through managerial arrangements that bring people together to solve problems.

Some information on the nature, causes, and extent of the diarrhea-malnutrition problem is necessary to obtain the political commitment and community concern without which little can be done. A start can be made, however, even if the information is poor. It is also vital to develop an effective and relatively simple information system to ensure an effective program with good coordination.
The monitoring and evaluation of both nutrition and DDC actions should be carefully planned from the beginning. Information to be collected should include service performance data such as the number of consultations for dehydrated children, the number of oral rehydration packets distributed, etc. Evaluation of the health and nutritional impact of DDC control programs needs more careful thought and operational research. Lay reporting should be attempted when possible so that the real occurrence of diarrhea in the community may be monitored.

Data from growth monitoring could also be useful for process and impact evaluation. Information from growth monitoring activities carried out in or by the community should be collected and processed so that the situation with respect to diarrhea and nutrition may also be monitored. Such information should be made rapidly available to the community and health workers for motivation and program reorientation when pertinent. The possibility of using simple, periodic surveys of knowledge, attitudes, and practices (KAP) to monitor changes in population behavior in relation to feeding during and after diarrhea is another possible avenue of evaluation and monitoring worth exploring.

Comprehensive evaluation should be carried out by national or district teams and should include the standard mortality, morbidity, and treatment surveys as suggested by WHO, with cluster sampling or other techniques used as appropriate. Such surveys might need modifications to strengthen those aspects related to nutritional evaluation. The development and implementation of integrated health and nutrition surveillance systems should also be encouraged. Baseline survey data can be collected by coupling the survey of nutritional and DDC information to the "supervisory skills course" advocated by WHO for DDC supervisors.

6. Behavior Modification

The overcoming of social and cultural barriers to better health practices is one of the most important steps to ensure that properly integrated nutrition and DDC actions will succeed. This statement refers not only to the general population but also to health personnel, some of whom have acquired inappropriate attitudes during training or may have them as a result of their sociocultural background. The most important message is the need to continue feeding during acute diarrhea independently of whether detailed knowledge on local infant feeding practices is already available. As more information becomes available, more specific and appropriate educational messages and actions can be developed. At this stage it will become imperative to develop more focused and elaborated techniques for the training of health manpower. At the same time, adequate technologies for food preparation and consumption will have to be developed that are acceptable to the population.
In an integrated effort of this magnitude, other barriers to success have to be considered, such as the influence of family and tradition-based beliefs, the influence of superstition and myths, etc. Traditional healers might be incorporated into the integrated process of prevention and treatment that emphasizes DDC and nutrition. The use of supposedly antidiarrheal drugs or of special food formulas not sufficiently proven should be discouraged, and the drug industry should be persuaded not to market dubious products.

6.1. Changing attitudes and behavior of health personnel

The lack of proper knowledge about basic nutritional concepts among health professionals and the concept that nutrition is equivalent to food distribution are major obstacles to the integration of nutrition and DDC actions. This lack of knowledge is one of the most important constraints, yet its solution is of relatively low cost. It involves curricula design and the introduction of the curricula into career training, in-service training, and retraining -- for both the modification of existing training and the reorientation of health personnel including physicians, nurses, PHC workers, and traditional health care providers.

For the health-related professions and auxiliary personnel, training in nutrition should be an integral part of the curriculum. It should focus not only on therapeutic nutrition but also (and mainly) on preventive aspects including breast-feeding, adequate weaning practices, feeding during and after diarrheal episodes, rehabilitation of malnourished children, adequate feeding during pregnancy and lactation, etc. The importance of infectious disease control as a nutrition-promoting activity, and vice versa, should be emphasized.

One of the most important steps in the success of these activities will be more appropriate support of the medical profession. A fruitful dialogue should be opened to explore ways of implementing positive actions, to modify existing erroneous ideas, and to train and retrain personnel. One of the most serious obstacles in convincing medical professionals about the need to continue feeding during acute diarrhea in children is the set of recommendations made by professional societies and contained in textbooks from developed countries. Such recommendations have little relevance to the needs of the majority of children in developing countries, who are much more likely to develop diarrheal infections while consuming diets that may be inadequate in quantity and or quality.

Besides the need to change the curricula of the health professionals in order to improve their preventive nutritional knowl-
ledge and skills in the long term, the support of the medical professionals for these programs must be assured. This may be achieved by involving faculty members in producing more relevant field research, state-of-the-art reviews, and training manuals for undergraduates and graduates. Similarly, professional societies should be involved in training and retraining. International organizations should provide support through structured programs that include visits by experts, courses, funding for research, etc.

For other members of the health team, the increased emphasis on the nutritional aspects of DDC can be achieved during in-service training and recycling courses and by adapting or modifying the existing training manuals.

6.2. Changing the behavior of the community

Positive behavior modifications within the community could be elicited by both mass media and face-to-face education. The development of a mass media educational approach is best achieved by using the techniques and expertise available through "social marketing". It involves field research as important for the understanding of existing practices in diarrhea treatment and for the design of educational programs aimed at behavioral changes. The content of the educational messages emphasizing both the oral rehydration and nutrition-promoting aspects of DDC can then be determined. Care should be taken not to confuse the community or in any way to suggest that feeding in diarrhea can, could, or should be replaced by oral rehydration solutions, or vice versa. No improvement in ORS, including natural food-based ORS, will replace feeding.

Face-to-face education requires the training of the health personnel in educational techniques. Practical exercises dealing with the situations that are most likely to be encountered in the population of a given geographical area are of considerable help. It is important to incorporate the community in the process of preventing and treating acute diarrhea and the prevention of malnutrition. In this context schoolteachers are important and should be involved in the popularization of health and nutrition concepts, including nutrition-promoting activities associated with DDC. The cooperation of civic and religious leaders and, particularly, that of nongovernmental voluntary organizations is also highly desirable. Such broad collaboration should create a situation in which the population is systematically exposed to structured information to attain saturation with the aim of introducing or modifying forms of conduct in the target groups.
Needless to say, it should be kept in mind that if, as a result of these campaigns, a demand for health activities, ORS, or some nutritional support is created, the health system should be able to fulfill it in the best conditions possible.

7. Coordinated Implementation

The implementation of integrated DDC and nutrition-promoting activities at the PHC level has already been recommended in relevant technical publications and manuals by WHO and UNICEF. In most developing countries, however, the imbalance in the implementation of those guidelines creates a need for the restatement and strengthening of their nutritional aspects by providing more concrete and specific recommendations on the use of locally available foods. At the field level, the schemes to be recommended for the treatment of diarrheal disease should embrace both ORS and feeding aspects. Standard procedures for both should be established, with the different situations and stages of the disease, the various levels of health service complexity and development in the area or country, and the nutritional status and feeding patterns of the population taken into account.

At the PHC level, educational activities should encourage early home preventive hydration (with home-based or prepacked ORS) and continued feeding. For dehydrated babies, immediate use of ORS is mandatory; breast-feeding should always be maintained, and if continued feeding is not possible because of anorexia or vomiting, refeeding should be initiated as soon as the child is able to eat. Experience shows that timely and adequate rehydration reduces or controls anorexia and vomiting; therefore feeding becomes easier. In the maintenance phase, both ORS and adequate feeding schedules should be instituted. In the convalescence phase, the need for more food than the usual intake should be emphasized. To be acceptable, dietary recommendations for nutritional support during diarrhoea should be compatible with local beliefs and customs. Such recommendations should be both practical and feasible within the day-to-day activities of the mothers and may require some previous field research on these aspects.

Practical demonstrations on the administration of ORS should also include information and actions related to the maintenance of feeding. Standardized, pictorial prescription forms could be developed to facilitate the integrated delivery of both ORS and dietary recommendations, including the need for breast-feeding. Such forms may also help the mother to remember how to carry out the treatment of her child during subsequent diarrheal episodes. The use of growth charts in growth monitoring should emphasize the concept that infections, and especially diarrheal disease, cause growth retardation that can be prevented or corrected by adequate feeding practices during and after illness.
8. Comprehensive Supervision

Articulation and coordination between DDC and nutrition programs are required at all levels of the health system. Duplication of information and supervisory systems should be avoided. Strengthening of the nutrition component of DDC will demand more intensive training in nutrition at all levels of the health system. Supervisory skills of DDC staff will have to include sound nutritional knowledge, and vice versa. Furthermore, the process of supervision should be developed as an extension and follow-up of the training activities.

9. Prevention of Diarrhea and Malnutrition in the Household

Educational efforts should not concentrate solely on what to do when a child gets diarrhea. Preventive education must also be provided systematically to reduce the occurrence of diarrheal attacks and to improve the nutritional status of children. Although basic preventive measures are described in many documents, in light of their importance they will be briefly restated here.

Breastfeeding and adequate weaning practices.

The protection that breast milk offers against diarrheal disease is well known. Exclusive breast-feeding should be encouraged for the first four to six months of life. Adequate, locally available, high-nutrient and energy-dense food mixtures should then be used to supplement breast milk. The introduction of supplementary foods should be done without interrupting breast-feeding. A warning on the potential of complementary feeding to carry pathogens is always desirable, together with concrete recommendations to avoid such a risk.

Water and food safety.

Potable water in adequate volume should be available to every household. Whenever its quality is uncertain, mothers should be encouraged to boil drinking water, especially that for small children, where feasible; otherwise, the cleanest available source of water should be used. Boiled water used for drinking and for preparing infant foods should be adequately stored. Infant weaning food mixtures are easily contaminated; thus they should be given freshly prepared to the child or should be adequately protected to prevent their contamination. Vegetables and fruits should be washed or peeled before feeding them to the child. Food and utensils should be protected from flies and cockroaches, and from contact with domestic animals.
Personal hygienic practices.

Hand washing (with soap when feasible) after defecation and before food preparation and consumption, as well as cleanliness of the home, should be systematically stressed in DDC programs, in such a way that it becomes a routine practice by all the population.

Environmental sanitation.

The implementation of effective control measures for the case management of diarrhea and its prevention through improved hygienic practices should not be an excuse to underestimate the need for specific sanitary measures, such as potable water supplies and sewage disposal systems, that may have more sustained impact for DDC.

10. Role of Bilateral and Multilateral International Agencies

International agencies are now assisting the governments in the implementation of various intervention programs through PHC (DDC, nutrition, immunizations, etc.). However, these are often implemented as vertical programs, sponsored by different agencies or separate departments within the agencies. Some of the DDC programs rely mainly on the production and distribution of ORS packets. Agencies sponsoring DDC programs should make efforts to include nutrition components for optimal benefits, and the delivery of these joint services should be envisaged in the context of the PHC approach. Any attempts to promote a selective care approach would be counterproductive.

Cooperation among agencies and joint recommendations would be of great help to countries implementing integrated programs. Meetings to discuss such programs should be organized jointly by international agencies in order to develop a comprehensive strategy for the control of diarrhea and malnutrition. Agencies should also develop unified formats for country-level evaluation of programs.
RESEARCH NEEDS AND APPROACHES

At present, considerable knowledge exists about nutrition and diarrheal disease. Appropriate technologies to deal with some major aspects of disease prevention and treatment are also available. These have allowed successful interventions aimed to decrease diarrheal mortality in childhood.

The implementation of more effective actions to improve the nutritional management of diarrhea in children and to prevent subsequent malnutrition may require some additional knowledge and development of specific technologies for dietary management. Operational research is especially needed in some areas so that nutrition and DDC may be efficiently integrated.

In general, a sequence from basic knowledge to program implementation should be followed:

- Basic research
- Development and testing of technologies (clinical and field trials)
- Operational research (demonstration projects)
- Program implementation and evaluation.

Within this sequence, three main aspects are analyzed in relation to research to be carried out on nutrition and diarrhea in developing countries:

- Priority areas for further research;
- Present constraints of research in developing countries;
- Recommendations for research.
1. Priority Areas for Further Research

A considerable amount of knowledge is already available that has allowed the formulation of general and some specific recommendations for the dietary management of acute diarrhea in children (*). However, several research areas have been identified as relevant for the improvement or further implementation of prevention and control programs. The following list of highly relevant topics should not be taken as exhaustive, but as a useful basis for the definition of local research priorities.

o Biomedical research

(a) Pathophysiology of intestinal function in diarrheal disease in well and malnourished children

-- causes and mechanisms of anorexia and identification of means to prevent or minimize it

-- nutrient losses and nutritional implications according to the type of diarrhea

(b) Epidemiology of prolonged diarrhea

-- causes and identification of risk factors

-- contribution to mortality and malnutrition

-- prevention and treatment, with emphasis on nutritional management.

o Technology development and operational research

(a) Development of technology for feeding during and after diarrhea

-- food digestibility and nutrient absorption during and after diarrhea

-- composition of foods and use of local staples

-- significance of lactose intolerance in diarrhea

-- use and safety of milk and weaning foods

-- feedings schemes and techniques for feeding during and after diarrhea

(b) Sociocultural determinants of feeding practices in health and disease, as the basis for the development of educational programs

(c) Development of educational techniques for behavior modification within the community and training of health personnel

(d) ORT

-- improvement of current ORS to decrease stool output and duration of diarrheal episodes (cereal-based ORS, super-ORS)

-- appropriateness of homemade solutions already in use.

2. Present Constraints of Research in Developing Countries

Research in developing countries faces various constraints, which may differ from one country and region to another. The most salient ones are:

- Difficulties related to financial and human resources
  -- Local funds for research in developing countries are scarce. This makes researchers rely on international funds, which are also becoming restricted.
  -- There is a shortage of personnel trained in research. Health professionals are more motivated to provide curative care to patients than to carry out research.

- Difficult access to information and technology. This refers to scientific literature as well as to knowledge about resources available for investigation.

- The importance of research is underestimated in developing countries. Decisions on health matters are often made on political grounds rather than on scientific criteria. Research information and conclusions are not always made available to policymakers and planners, who often do not fully utilize the information that has been available to them.

- There is a noticeable lack of communication and cooperation, within and among developing countries, for the exchange and application of scientific information and technology.
The policies and priorities of international agencies funding investigations in developing countries are not always relevant to the local needs and often do not lead to the development of local research capabilities and active transfer of science and technology. This turns to be both a cause and a consequence of the difficulties previously mentioned.

3. Recommendations for Research

Locally available resources for research, including funds, should be increased to the extent possible. A proportion of the budget for diarrheal disease and nutrition programs should be allocated for research and development of technologies with the purpose of advancing scientific knowledge, strengthening research capabilities, and bridging the gap between research and implementation in nutrition and DDC.

Training of personnel in research should have a greater priority rating and should focus on areas relevant to country needs, and the trainee should receive continuous technical support. Short-term training in specific techniques and methodologies should be stressed.

Better communication and cooperation between researchers and government authorities should be promoted. This could be achieved by means of joint participation of investigators and implementors in operational research and in workshops for discussing and disseminating research findings and promoting their application.

Technical cooperation among developing countries should be encouraged for the exchange of scientific information and technologies leading to improvement in the quality and relevance of the research. This cooperation may be facilitated and sponsored by international organizations by means of meetings, exchange of scientists and experts, and publications.

While recognizing the positive changes in policies for research in developing countries that some international organizations have implemented (such as WHO), it is recommended that other donor agencies consider establishing similar policy orientations promoting relevant local research and active science and technology transfer and strengthening the research capabilities of developing countries. This is recognized as the most promising approach to overcome many of the research constraints identified.
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APPENDIX 2 - SUMMARIES OF KEYNOTE PAPERS

I. "Scientific Basis for the Integration of Nutrition and Diarrheal Disease Control," by Dr. Leonardo Mata

Infectious diseases, particularly diarrhea, are a primary or secondary cause of malnutrition and growth retardation; malnutrition, in turn, enhances clinical response to infection. It has now been established that most childhood diarrheas are infectious and are acquired by ingestion of food or water contaminated with pathogenic enteric agents, or by direct and indirect contact with fingers or utensils contaminated with feces.

The metabolic consequences of infection, mediated by interleukin 1, include the appearance of fever and anorexia, as well as the breakdown of skeletal muscle leading to loss of weight, body cells, and stored body nutrients. Nitrogen losses are particularly important. In acute diarrhea, losses of water and electrolytes lead to dehydration and electrolyte imbalance, with severe clinical manifestations. The nutritional cost of infection is marked, particularly in diarrhea; it is also important in measles and pertussis.

Acute diarrhea is conducive to "sudden severe malnutrition" through metabolic losses, reduced absorption of nutrients, increased secretion, and diminished food consumption. The end result of such nutrient depletion is impaired growth and development. Diarrhea induces acute weight loss and arrests linear growth.

Studies have shown relative absence of diarrhea and adequate growth during exclusive breast-feeding up to about four to six months; but weaning is often a protracted process associated with infections, notably diarrhea (up to nine episodes per year between six and thirty-six months), and faltering growth (both in weight and height). The negative effect of diarrhea on growth has been described in many studies; wasted or stunted children are, in turn, more prone to suffer from more severe and longer-lasting diarrhea.

The impact of infection on growth can be minimized by prophylaxis (health education, immunizations), prompt adequate therapy (ORT, antimicrobials), and dietary actions (continued feeding or early refeeding, and increased feeding after diarrhea and other illnesses). Feeding during infectious disease and convalescence is particularly important, since it has been shown to be beneficial despite impaired absorption and utilization of macronutrients. Dietary intake of healthy children in disadvantaged communities
is often adequate, but food consumption abruptly diminishes during infectious diseases by at least 17 percent. Fasting should be avoided, and the sick child should be fed whenever appetite permits.

The main constraint for the control and prevention of malnutrition is the exceedingly high rates of infection throughout the developing countries. Another crucial constraint is inadequate maternal education. Failure to reach significant results from PHC seems to be due to insufficient education, community participation, and decision-making capacity of women. Successes may be attributed to considerable advancement in education, technology, and participation of women. Improved education of women is crucial to implement adequately interventions such as oral rehydration, health education, and feeding programs.

Linked to women's deficient education is their lack of sufficient knowledge of what, when, and how to feed children, both healthy and ill, particularly among poor women. There is limited data on weaning foods, local foods and their nutritive value, appropriate combinations and preparations, recipes and schedule of traditional foods for feeding during illness and convalescence, and techniques for educating poor rural and urban women in the technology of feeding children. "Maternal technology" for promotion of good nutrition and health seems to be the key to success and in such packages breast-feeding is a must.

Improved nutrition can be accomplished by better use of locally available weaning foods and their combinations in simple basic mixes or multimixes, and by ensuring food safety through hygienic handling, preparation, conservation, and use to avoid contamination. Interventions for the prevention of the infection-malnutrition cycle include family planning and prenatal care, breast-feeding, optimal weaning practices, appropriate treatment of infections, maternal education, and improved maternal technologies for child's feeding and prevention of infection.
Acute diarrhea in childhood is one of the most serious health problems in developing countries because of its high frequency (about 1.5 million episodes per year) and its contribution to mortality (diarrhea accounts for between 15 percent and 70 percent of all deaths in children under five years of age in some countries).

The net result of acute diarrhea is the loss of water and electrolytes (dehydration and electrolyte imbalance) induced by a series of mechanisms depending on the specific etiology. Therefore, early replacement of water and salts is crucial to prevent death. This replacement has been facilitated by the discovery that glucose at a certain concentration increases the absorption of salt and water from the intestinal lumen into the blood, which turned to be the basis for the development of ORS.

Further research for simplification and improvement of ORS has continued, and substantial progress has been made. One of the objectives is to make an ORS simple enough so that it can be prepared by the mother with ingredients readily available at home. In Bangladesh, a rice-based ORS has been developed and successfully used for treatment of acute diarrhea; stool volume and duration of diarrhea was reduced by 50 percent and vomiting by 60 percent to 70 percent compared with glucose ORS. Rice is cheap, available in every house of a rice-eating country, and -- being food -- is readily acceptable; thus it will increase the use rate of ORS.

Clinical trials have shown that rice-based ORS may be more effective than the standard glucose-based ORS in reducing stool output and duration of diarrhea and in promoting weight gain of children. Large field trials are now under way in Bangladesh on the efficacy, acceptability, feasibility, and nutritional impact of rice ORS compared with glucose ORS. Results available indicate that mothers prefer a homemade ORS over packaged ORS and that monthly weight gain of children is greater when using cereal-based ORS.

Similar types of research have been initiated with other cereals like maize, millet, sorghum, wheat, and other foods such as plantain, cassava, and potato, which are staples in many developing countries. Cereal-based ORS is certainly promising. Children fed on cereal-based diets during healthy conditions may take cereal-based ORS during diarrhea while continuing a normal feeding pattern.
The major mechanisms responsible for the nutritional cost of diarrhea are: reduced food intake due to anorexia and withholding of food; direct losses or malabsorption of nutrients; and increased catabolism due to infection. The reduction of food intake has been consistently documented and quantitated; it may range between 20 percent and 40 percent of total caloric intake, and it affects weaning foods rather than breast milk. Malabsorption of macro/and micronutrients has also been demonstrated, including that of carbohydrates, fats, and even protein.

Reluctance to feed during diarrhea is usually due to fear of malabsorption and increased diarrheic stool volume and duration. Indeed, carbohydrate absorption remains quite efficient (80-85 percent), whereas protein and fat absorption is more reduced, and protein malabsorption may last for several weeks. However, it is clear that, despite some malabsorption, feeding during diarrhea is beneficial for nutritional purposes and may even decrease diarrheic stool output and duration. Appropriate feeding should not affect the stool output in an adverse way. Extra feeding is facilitated by the increased appetite in the recovery state of diarrhea.
3. "Integrating Nutrition and Diarrheal Disease Control: Major Constraints and Promising Approaches," by Dr. Jose O. Mora

The increasing implementation of ORT is expected to lower diarrheal case fatality in children from its current rate of about 5 per 1,000. The number of survivors is likely to increase accordingly and, if not adequately protected from the malnourishing effects of diarrhea, most of them will be progressively malnourished and more prone to severe diseases and death from other infections or diarrhea itself.

Most diarrheal episodes do not lead to death but to progressive malnutrition. Therefore, nutritional care is as important as rehydration, and appropriate dietary management during and after diarrhea should become a key element in DDC. Nutrition interventions (promotion of breast-feeding, improved weaning practices, etc.) may also play an important role in the prevention of infection and diarrhea.

Integration should be possible at both the preventive and the case management levels. Dietary actions are not always implemented as part of ORT, however, and the integration of nutrition and DDC is far from being a reality. Some major constraints to such integration may be identified from either the community (families, mothers) or the health sector perspective.

Traditional knowledge and beliefs about the causes and implications of diarrhea determine particular attitudes and practices leading to food withholding (aggravated by child's anorexia) and the use of antidiarrheal mixtures and antibiotics in an attempt to reduce stool output, perceived as the most important concern. Medical professionals advocating fasting and antidiarrheal substances during diarrhea have reinforced such practices.

Health sector constraints relate to policy and planning, to implementation, or to current knowledge and technology development. Some policy and planning constraints are:

- Insufficient political commitment to primary health care
- Poor motivation of leaders toward health and nutrition, as a result of deficient information and awareness
Conventional public health planning based on the traditional medical approach of classical epidemiology focused on disease categories and specific health service programs to resolve them (this has led to verticalization of isolated health programs and is reflected in the structure of the health sector as a series of disease-specific compartments).

Tendency of international donors to support independent health and nutrition initiatives for the application of selective technologies (selective care approach).

Constraints at the implementation level reflect the above-mentioned problems. The most salient are:

- Little awareness and motivation of the health personnel about the importance of nutrition in health and of dietary actions in DDC

- Technocratic bias in medical education toward clinical curative practice, emphasizing technological solutions to socially induced health problems and underestimating primary health care, the social context of ill health, preventive community health care, and traditional practices

- Deficient implementation of health programs, including planning, management, execution, supervision, monitoring and evaluation, and poor administrative and logistic support services

- Availability of few sufficiently proved options and simple, specific guidelines for the dietary management of diarrhea, for disease prevention, and for behavior modification.

Some constraints refer to the availability of scientific and technical knowledge derived from sound research. Major gaps in knowledge pertain to the understanding of health behavior and traditional practices and to the development of appropriate dietary schemes and efficient strategies for dissemination and application. This lack is mostly due to the scarcity of technical and economic resources for local applied or operational research and technology development.

Promising approaches to overcome the above-mentioned constraints are:

- Promotion of political commitment and full implementation of the PHC strategy, emphasizing integrated health sector planning and socioeconomic development, promotion of self-reliance in health to the extent possible, active community participation, and restructuring of the health sector
to support priority activities at the primary level (both preventive and curative) according to the principle of social equity rather than disease category

- Increasing the awareness and motivation of politicians, decision-makers, and planners to assign higher priorities and resources to health and nutrition

- Promotion of PHC-related legislation, in particular establishment of national health systems, institutionalization of effective community participation, democratization of decision making in health, and policies to improve women's education and participation in development

- Coordinated programming at the national, regional, and local levels, as well as coordinated or integrated supervision, information systems, and monitoring and evaluation

- Training and retraining of health personnel, as well as of traditional health care providers, in health and nutrition (including reforms in the educational curriculum of medical and other health professionals)

- More intensive mass media and face-to-face education, making full use of social marketing techniques to address health and nutrition problems jointly

- Further basic research in areas relevant to technology development, and applied or operational field research for the design and application of simple, low-cost technologies to meet the nutritional needs of children, during and after diarrhea, by making use of local foods. Effective means to reduce stool output, development of cereal-based ORS, and methodologies for training health workers are also important areas for field research. All this will be facilitated by strengthening the research capabilities of developing countries and by providing greater support to local operational research.