Reducing deaths from diarrhoea through oral rehydration therapy

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In 1980, diarrhoea was the leading cause of child mortality, accounting for 4.6 million deaths annually. Efforts to control diarrhoea over the past decade have been based on multiple, potentially powerful interventions implemented more or less simultaneously. Oral rehydration therapy (ORT) was introduced in 1979 and rapidly became the cornerstone of programmes for the control of diarrhoeal diseases. We report on the strategy for controlling diarrhoea through case management, with special reference to ORT, and on the relationship between its implementation and reduced mortality.

Population-based data on the coverage and quality of facility-based use of ORT are scarce, despite its potential importance in reducing mortality, especially for severe cases. ORT use rates during the 1980s are available for only a few countries. An improvement in the availability of data occurred in the mid-1990s. The study of time trends is hampered by the use of several different definitions of ORT. Nevertheless, the data show positive trends in diarrhoea management in most parts of the world. ORT is now given to the majority of children with diarrhoea. The annual number of deaths attributable to diarrhoea among children aged under 5 years fell from the estimated 4.6 million in 1980 to about 1.5 million today.

Case studies in Brazil, Egypt, Mexico, and the Philippines confirm increases in the use of ORT which are concomitant with marked falls in mortality. In some countries, possible alternative explanations for the observed decline in mortality have been fairly confidently ruled out.

Experience with ORT can provide useful guidance for child survival programmes. With adequate political will and financial support, cost-effective interventions other than that of immunization can be successfully delivered by national programmes. Furthermore, there are important lessons for evaluators. The population-based data needed to establish trends in health service delivery, outcomes and impact are not available in respect of diarrhoea, as is true for malaria, pneumonia and other major childhood conditions. Standard indicators and measurement methods should be established. Efforts to change existing global indicators should be firmly resisted. Support should be given for the continuing evaluation and documentation activities needed to guide future public health policies and programmes.

Keywords: fluid therapy, utilization; rehydration solutions, administration and dosage; infant mortality, trends; diarrhea, infantile; Brazil; Egypt; Mexico; Philippines.

Introduction

In 1980, diarrhoea was the leading cause of child mortality, accounting for 4.6 million deaths annually (*1*). Efforts to control diarrhoea over the past decade have been based on multiple, potentially powerful interventions implemented more or less simultaneously. Oral rehydration therapy (ORT) was introduced in 1979 and rapidly became the cornerstone of programmes for the control of diarrhoeal diseases (CDD) (*2*, *3*). Consisting of the oral administration of sodium, a carbohydrate and water (*4*), ORT was potentially the most significant medical advance of the 20th century (*5*). Other important interventions likely to have had an impact on mortality caused by diarrhoea include the promotion of breastfeeding, improved supplemental feeding, female education, and immunization against measles. Improvements in socioeconomic status, safe water supply, safe faeces disposal and the provision of vitamin A may also have played a role. We place special emphasis on the role of ORT but it is important to recognize the combined influence of these developments in reducing deaths associated with diarrhoea.

At the World Summit for Children in 1990, over 150 countries undertook to attain 80% ORT

coverage by 1995 with a view to achieving a reduction of 50% in mortality attributable to diarrhoea by 2000.

We review the strategy for controlling diarrhoea through case management, with special reference to ORT, and the relationship between its implementation and reduced mortality. The focus on ORT does not preclude recognition that broader case management interventions, including ORT, are important for reducing the case-fatality rate associated with dysentery and persistent diarrhoea (6).

Evolution of ORT

Scientific progress in the management of diarrhoea, together with considerations of feasibility, have led to a series of changes in recommendations on the use of ORT for early home treatment of diarrhoea. Recommendations on the use of ORT in health facilities have, however, remained essentially unchanged. An understanding of the evolution in thinking about ORT in people's homes is important for interpreting changes in the control of diarrhoea. Table 1 (7–12) summarizes these changes and demonstrates their effect on estimated coverage rates in the light of 76 CDD surveys conducted between 1990 and 1993 (13). The following phases can be identified.

ORS only. In the early 1980s it was felt that all diarrhoea episodes should be treated with a solution of oral rehydration salts (ORS), prepared by dissolving ready-made packets of the salts in water. At this time the terms ORS and ORT were used interchangeably. This was reflected in the 1981 WHO Programme for Control of Diarrhoeal Diseases (Table 1), in which the indicator of choice was the proportion of children aged under 5 years who were treated with ORS. Another widely used indicator was the ORS access rate, i.e. the proportion of a population with a regular supply of ORS in its communities.[a] The 1994 report of WHO's Diarrhoeal and Acute Respiratory Diseases Division (CDR)[b] recognized the difficulty of measuring the latter indicator. Until 1993, estimates of the global ORS access rate were based on reports, many unvalidated, from national programmes or on extrapolation from ORS production figures (14).

ORS and/or recommended home fluids. Although WHO continued to recommend ORS packets for all cases of diarrhoea, it was recognized that access to ORS was limited. Furthermore, 60–70% of cases of diarrhoea were not accompanied by dehydration and therefore did not require ORS. The emphasis therefore shifted to preventing dehydration by means of recommended home fluids (RHFs), an approach that gained popularity in the 1980s. RHFs

were initially defined as home-made solutions containing sodium and glucose or sucrose or another carbohydrate. They included salted rice water, salt and sugar solution, cereal-based solutions, and traditional soups and paps. Each country was asked to define which RHFs were acceptable. The definition of the use rate of ORT was changed in 1988 to the proportion of children with diarrhoea who received ORS and/or RHFs (15), now widely known as the pre-1993 definition. This change led to increased coverage levels relative to the earlier definition embracing ORS only. Table 1 shows that, in 76 surveys where both indicators were measured, the inclusion of RHFs increased coverage by a factor of 2.5. According to WHO/CDD this increase reflected a broadening of the definition to include a wider range of RHFs (15). The requirement to include both salt and a carbohydrate was soon waived and some countries included water and herbal teas as RHFs.

Continued feeding. Research during the 1980s showed the importance of feeding children during diarrhoea episodes, not only to reduce the nutritional impact of diarrhoea but also to shorten its duration. This was a major change in the medical management of diarrhoea: the withholding of foods had previously been recommended by some as a standard procedure (16). In 1988, continued feeding was added as one of the indicators of appropriate management (Table 1),[c] although greater emphasis was still given to the use of ORS and/or RHFs.

Increased fluids. In 1990–91, emphasis shifted to the amount of fluid given rather than the type of fluid, and the indicators were modified accordingly.[d] The expression "ORT (increased fluids)" was introduced. A comparison of survey results (15) (Table 1) showed that the redefinition resulted in a marked fall in coverage rates. An opposite trend was reported for eight surveys carried out by WHO between 1992 and 1994; the median rate of 62% for increased fluids was higher than that of 55% for ORS and/or RHFs. This change in definition was apparently not well accepted, as many researchers continued to report their results using the ORS and/or RHFs indicator.

ORT (increased fluids) plus continued feeding. From 1993 onwards the indicator of choice was increased fluids plus continued feeding. The combination was expected to supply salt, carbohydrates and water, thus preventing the occurrence of dehydration (15). This became known as the post-1993 definition, and the goals that had been established at the World

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[a] Until 1991 the definition of ORS access rate also required that the ORS provider had been trained in case management. Few countries applied this definition, however, probably because of difficulties in measurement.

[b] The Diarrhoeal and Acute Respiratory Diseases Control Division replaced the CDD Programme in 1993.

[c] This indicator is difficult to measure, since some degree of anorexia is common in all children who are ill. To account for this, some questionnaires allow children who eat "a little less" during episodes of diarrhoea to be included in the continued feeding category. Some investigators have tried to measure how much food was offered to children, rather than how much was eaten. Uneducated mothers apparently have difficulty in understanding the difference.

[d] The authors' experience suggested that some mothers had difficulty in estimating whether the total intake of fluids during episodes differed from previous intake, since the types of fluids often changed.

Table 1. Changes in definitions of indicators of diarrhoea management

Years and references	Main indicator: proportion of diarrhoea cases in children aged under 5 years who were:	Global coverage rates according to indicator[a]	Comments
1981 (7)	Treated by oral rehydration	23%	Oral rehydration usually interpreted as being limited to oral rehydration salts.
1988 (8, 9)	Treated by oral rehydration therapy: oral rehydration salt solution and/or recommended home fluids	57%	Separate indicators were also proposed for: oral rehydration salt solution only; increased fluids (oral rehydration salt solution or recommended home fluids); continued feeding.
1991 (13)	Treated by oral rehydration therapy (increased fluid intake)	32%	Oral rehydration therapy redefined as increased fluid intake.
1993 (10, 11, 12)	Treated by oral rehydration therapy (increased fluid intake) and continued feeding	21%	Continued feeding included as part of the indicator.

[a] Median values from 76 CDD surveys carried out between 1990 and 1993, as reported by WHO.

Summit for Children in 1990 were rephrased accordingly. The change resulted in lower coverage rates relative to any of the previous indicators (Table 1). In the eight surveys conducted in 1992–94 the change was from 62% for increased fluids to 43% for increased fluids plus continued feeding.

When interpreting trends in ORT use over time the successive changes in its definition must be taken into consideration.

Data sources

Annual reports from WHO's Department of Child and Adolescent Health and Development and its predecessors[e] provided information on activities supported by WHO for the implementation of national CDD programmes, training activities and ORS production, and the main achievements in this area have been summarized (17).

Since 1987, UNICEF's annual publication *The state of the world's children* has presented a compilation of data on ORT indicators from several sources. These have included Macro International's demographic and health surveys (DHS), UNICEF's multiple indicator cluster surveys (MICS) and WHO's CDD surveys, as well as other coverage estimates provided by UNICEF country offices.

Global and regional estimates of mortality attributed to diarrhoea have been developed for 1980, 1990 (18) and 1999 (A. Lopez, personal communication, 2000) on the basis of reviews of published studies and the use of estimation techniques.

Global levels and trends

Data from WHO programmes

The ORS supply increased from 51 million packets in 1979–80 to 800 million in 1991–92 (Fig. 1) (3). The

[e] The Diarrhoeal Diseases Control Programme; the Division for the Control of Diarrhoea and of Acute Respiratory Infections; and the Division of Child Health and Development.

number of subregional and national ORS production centres increased from 15 in 1983 to 24 in 1990 (3). WHO and UNICEF were the main sources of ORS packets. Because of the shift in emphasis away from ORS, global ORS production figures were not compiled after 1992.

National CDD programmes (NCDDPs) were operational in 35 countries in 1983 and in 80 countries in 1990, by which date there had been marked increases in the numbers of health workers trained in this field (3). On the basis of data provided by countries with various levels of accuracy, WHO made global estimates of ORT use (ORS and/or RHFs) from 1984 to 1992 (Fig. 2). These compilations were discontinued in 1992 because of questions about the accuracy of the data. However, there can be little doubt that a substantial increase in global coverage was achieved during the 1980s.

Demographic and health surveys

DHS data are particularly important because the surveys had similar designs and validated instruments were used. However, relatively few countries conducted surveys both in the 1980s and the 1990s with detailed reporting on diarrhoea management (19, 20). Trend data are presented in Table 2. In these surveys, ORT use was defined as the use of either ORS solution or a recommended home fluid or the increased intake of liquids. This definition does not strictly comply with any of those described above. There were apparent increases for Bolivia and Colombia from 58.8% to 64.8% and from 63.7% to 67.9% respectively, but there was no testing for statistical significance. Ten other countries had at least one survey in both periods which included some relevant variables, but the data were not fully comparable, making it impossible to examine trends with precision (Table 2). In Kenya, Morocco, Peru, Senegal, and Uganda there was apparent progress, while in the Dominican Republic, Ghana and Togo, where changes of less than 5% occurred, the situation seemed to be stable. The data available in Egypt and Zimbabwe were inadequate for comparative pur-

poses. However, a case study reported below shows that high use rates were already being attained in Egypt by 1984. Despite their limitations, the DHS data show that ORT use increased between 1986–89 and 1990–95.

Fig. 3 shows the use rates for ORS and/or RHFs in 20 countries where two DHS surveys were conducted in the 1990s. In nine countries there were increases of at least 10 percentage points, but no tests of significance were presented; three countries reported increases in the range 5 percentage points to 10 percentage points; five reported little change, i.e. differences of less than 5 percentage points; and three reported declines exceeding 10 percentage points.

Table 2 shows the percentages of diarrhoea episodes in which health care was sought outside the home during the late 1980s and early 1990s. Care-seeking rates were very similar for most countries, some experiencing slight increases and some having slight declines. In Ghana, however, there was a marked reduction, and in Morocco, Senegal, and Uganda there were important increases. An un-published analysis made by UNICEF covering 17 countries with two national surveys in the 1990s showed a median increase of 13% relative to the baseline care-seeking rates, ranging from a 30% decrease in Malawi to a 191% increase in Morocco. Care-seeking patterns in relation to diarrhoea were therefore not as consistent as for ORT use.

Estimates compiled by UNICEF

In its annual publication *The state of the world's children*, UNICEF compiles data from several sources on ORT indicators. The first estimates, published in 1987, referred to the number of ORS packets produced per 100 children aged under 5 years. ORS production estimates were also presented for 1988 and 1989. In 1990 the indicator was changed to ORS use rate: this was estimated to be 11.4% for 30 countries with mortality rates of more than 170 per 1000 among children aged under 5 years, 11.8% for 29 countries with mortality rates between 95 and 170 per 1000, and 25.0% for countries with mortality rates between 31 and 94 per 1000.

From 1991 onwards, use rates referred to ORT (ORS solution and/or RHFs). As from 1993, regional estimates were also provided (Table 3). These covered periods of about two to five years before the year of publication, being based on DHS, MICS and other WHO and UNICEF sources. Few countries had annual data, and estimates based on national surveys were often reported for several subsequent years. All regions except Latin America and the Caribbean showed progress during the decade. Progress was particularly marked in Asia. The most recent estimated regional ORT use rates ranged from 58% in the Americas to 81% in the East Asia and Pacific Region.

Fewer data were available for the 1980s. Nevertheless, it is reasonable to assume that the

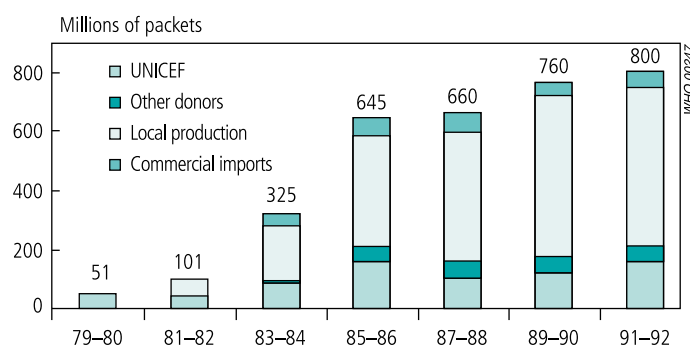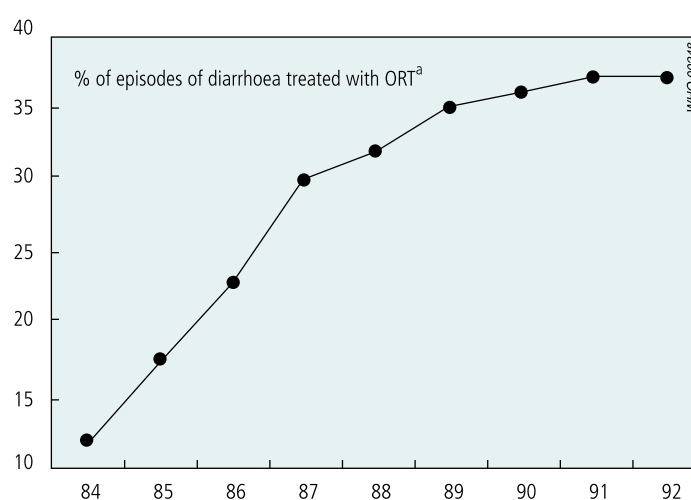Fig. 1. **ORS supply in developing countries, 1979–92**

Fig. 2. **Global estimates of ORT use 1984–92**

[a] Defined as oral rehydration salts and/or appropriate home fluids.

estimated 40% coverage achieved in developing countries during 1993 (Table 3), referring to surveys conducted in 1987–91, represented a substantial increase over the coverage rates close to zero in 1980.

Data from 99 national surveys carried out in the mid-1990s, 70% of them between 1995 and 1997, were compiled by UNICEF. Information on ORS solution and/or RHFs use rates was available for 99 countries. The median rate was 49.2% and the interquartile range was 33.5% to 74.0%. For 52 countries using the post-1993 ORT definition (increased fluids plus continued feeding) the median was 28.4% and the interquartile range was 18.9% to 40.7%. For 48 countries with both indicators, the median coverages were 57.3% and 27.4%. Differences between the pre-1993 period, relating to ORS and/or RHFs, and the post-1993 period, relating to the use of increased fluids and continued feeding, were calculated for these countries. For eight countries the post-1993 use rate was higher, for one country there was no difference, and for 39 countries the pre-1993 rate was higher. The median difference was 28.3%, similar to that reported in Table 1 for a different set of surveys.

Fig. 3. **Change in % of children with diarrhoea that received ORT[a] during 1990s for selected countries**
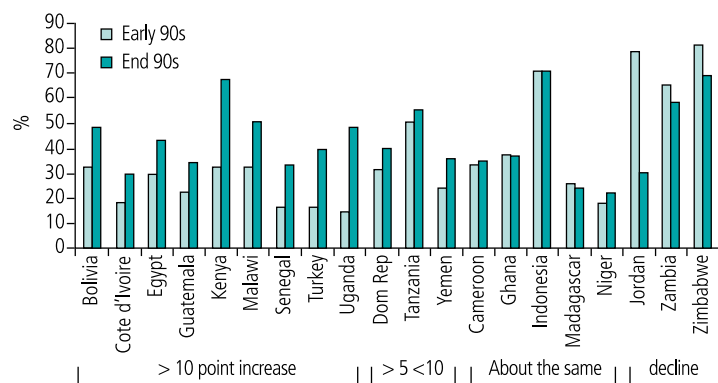
[a] either solution prepared from ORS packets or recommended home-fluids.

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Mortality trends

In 1980 it was estimated that 4.6 million children under 5 years of age died annually because of diarrhoea. Ten years later, the annual number of deaths attributable to diarrhoea was estimated to be 3.3 million. Major declines were reported for many countries in the 1980s, and further reductions were reported in the 1990s. In 1999 it was estimated that there were 1.5 million deaths globally (A. Lopez; personal communication, 2000). Notwithstanding some misgivings about data quality, coverage and estimation procedures, the magnitude of the decline is remarkable and cannot be explained by methodological differences.

Country case studies

Detailed case studies are available from four developing countries where efforts were made to assess the impact of NCDDPs.

Brazil

North-east Brazil has a population 40 million and is the area of the country which is poorest and has the highest mortality. Time trend and ecological analyses were used to investigate the possible reasons for the sharp decline in mortality attributable to diarrhoea during the 1980s (21). In 1980, infant mortality accounted for 32% of all registered deaths and diarrhoea accounted for 41% of infant deaths. By 1989 the corresponding proportions were 17% and 25%. Although the quality of the data did not permit calculation of population-based mortality rates, proportionate mortality statistics indicated a 57% drop in infant deaths attributable to diarrhoea in the 1980s. A similar reduction was observed for children aged 1–4 years. Admissions associated with diarrhoea to the major paediatric hospitals in the nine north-eastern states fell from 57% of all infant hospitalizations in 1980 to 30% in 1990. There were no comparably large declines in relation to any other major cause of death or admission. ORT was introduced in the early 1980s and was accompanied by extensive efforts to train health workers and strong campaigns in the mass media. ORS became widely available and millions of plastic measuring spoons were distributed for the preparation of salt

Table 2. **Oral rehydration therapy use rates for national samples of children aged under 5 years who presented with diarrhoea in the two weeks preceding the survey**

Country	Survey years							
	1986–89				1990–99			
	ORS[a] (%)	RHFs[b] (%)	Increased fluids (%)	Medical care (%)	ORS[a] (%)	RHFs[b] (%)	Increased fluids (%)	Medical care (%)
Bolivia	25.6	10.8	44.7	30.1	33.2	27.0	63.2	42.8
Colombia	42.1	12.3[c]	—[d]	31.2	44.5	8.4	50.2	33.3
Dominican Republic	37.6	10.1[c]	14.6[c]	29.0	35.1	16.3	43.2	35.1
Egypt	—[d]	—[d]	—[d]	45.8	40.2	4.8	44.9	47.5
Ghana	33.5	6.1	—[d]	43.1	29.9	8.3	57.4	26.7
Kenya	21.2	48.9	—[d]	46.8	39.9	56.5	54.4	44.3
Morocco	14.7	1.3[c]	—[d]	15.1	28.2	4.2	36.1	30.6
Peru	3.6[c]	45.3[c]	—[d]	25.6	26.0	55.3	60.2	30.2
Senegal	2.0[c]	4.6[c]	—[d]	19.4	15.1	24.1	55.4	33.0
Togo	20.4	3.2	—[d]	25.4	17.1	10.0	61.3	18.5
Uganda	13.7	1.3	—[d]	14.8	48.2	4.9	48.6	55.1
Zimbabwe	—[d]	—[d]	—[d]	33.4	79.2	12.8	59.0[e]	29.7

Source: Demographic and Health Surveys

[a] Oral rehydration salts.

[b] Recommended home fluids.

[c] The subject of the question was part of an open question.

[d] No information available.

[e] Children aged under 3 years.

Table 3. Estimates for use rate of oral rehydration therapy (oral rehydration salt solution and/or recommended home fluids), 1993[a] and 2000[a]

Region	Estimates of oral rehydration therapy use rate (%) by year of publication	
	1993	2000
Sub-Saharan Africa	43	64
Middle East and North Africa	51	60
South Asia	19	69
East Asia and Pacific	49	81
Latin America and Caribbean	58	58
Developing countries	40	69

Source: UNICEF's *The state of the world's children*.

[a] Year of publication; average age of statistics usually 3–5 years.

and sugar solutions at home. In 1991 a representative survey showed that either ORS solution or home-made salt and sugar solutions were used in 35% of all episodes and in 62% of those regarded as severe by mothers. Socioeconomic conditions worsened during this decade but there were improvements in water supply, vaccine coverage, the duration of breast-feeding and nutritional status. A simulation model indicated that changes in factors other than ORT explained a 21% reduction in infant mortality attributable to diarrhoea, about a third of the actual decline. Finally, an ecological analysis correlated ORT use rates with proportionate infant mortality caused by diarrhoea, showing a negative association (with $r = -0.61$ and $P = 0.04$). Despite the short-comings of the data these findings suggested an impo-rtant impact of ORT on mortality attributable to diarrhoea.

Philippines

A national evaluation of the possible impact of the management of diarrhoea on mortality was recently performed in the Philippines (22), where diarrhoea is the second most important cause of death in children aged under 5 years. The NCDDP was launched in 1980 and important efforts were made to promote ORT through primary care facilities. ORT use rates obtained from national surveys in 1985, 1990 and 1993 showed that between a quarter and a third of diarrhoea cases were treated with either ORS solution or RHFs. Death rates associated with diarrhoea fell by about 5% annually from 1975 to 1993 for both infants and children aged 1–4 years, while those for acute respiratory infections fell by 2.9% and 4.0% respectively and mortality caused by perinatal factors declined by 2.6% a year. The proportions of hospital admissions attributable to diarrhoea showed annual declines of 2.5% for infants and 2.4% for children aged 1–4 years. The corresponding figures for admissions associated with acute respiratory infections were 1.8 % and 0.4%. Analyses were made in an attempt to detect significant correlations between proportionate diarrhoea mortality, maternal knowledge of ORS and use rates for ORT (ORS and/or

RHFs) in 1993 in the country's 14 health regions, but none were found. During the study period there were changes in other important variables, including income and the availability of safe water and sanitation, which might have affected mortality associated with diarrhoea. Variables related to health services also improved: these included vaccine coverage and the duration of exclusive breast-feeding; there was also a reduction in stunting, but this might have been influenced by the NCDDP. This evaluation showed positive achievements in programme implementation which could have led to the substantial observed reductions in morbidity and mortality associated with diarrhoea. However, changes in other relevant factors and the lack of correlations at the ecological level argued for caution in establishing a causal connection.

Egypt

The Egyptian NCDDP was launched in 1981 and became fully operational in 1984. A comprehensive evaluation was carried out in the early 1990s (23). ORS was being used to treat between a third and half of all diarrhoea episodes by the late 1980s, thanks to increased availability of the salts, the training of health workers, the education of the general public and other intensive activities. Use rates were twice as high when diarrhoea was perceived to be severe as when mild episodes occurred. There were also positive changes in feeding during diarrhoea episodes, and most mothers were able to mix ORS solution correctly. Infant and child mortality declined more rapidly between 1983 and 1988 than in previous years. Deaths attributable to diarrhoea among infants fell more rapidly than those attributed to other causes, average annual declines of 4.2%, 7.8% and 15.9% occurring in the periods 1970–77, 1978–83 and 1984–90, respectively. Child mortality caused by diarrhoea showed a similar pattern. There was a marked reduction in the usual summer peak in mortality attributed to diarrhoea among children aged under 5 years. Hospital admissions for severely dehydrated children also fell. Alternative explana-tions for the improvement were sought. There was

some deterioration in socioeconomic status, and changes in water supply or sanitation could not explain the drop in mortality. There was a pronounced increase in the coverage of measles vaccination, but the vaccine was given when most infant deaths had already occurred, i.e. nine months after birth. Regarding nutritional status, there was no change in wasting prevalences but stunting was moderately reduced, perhaps because diarrhoea episodes were less severe. It was concluded that improvements in case management were sufficient to account for most of the reduction in mortality attributable to diarrhoea.

Mexico

Trends in mortality attributable to diarrhoea in Mexico were examined in 1978–83 (before the introduction of ORT), 1984–89 (strong implementation of ORT) and 1990–93 (ORT, intensive efforts in measles vaccination, improvement of water supply and sanitation) (24). Mortality data were based on registered deaths. Strong mass media campaigns promoted ORT, and ORS availability increased from 7.6 to 79.7 million packets a year. National estimates of the use of ORT (ORS solution and/or RHFs) increased from 47.5% of all diarrhoea episodes in 1986 to 80.7% in 1993, while ORS use increased from 24.3% to 41.9%. About half the children given ORT received home-made solutions. The proportion of deaths caused by diarrhoea among children aged under 5 years increased from 24.7% in 1978 to 26.4% in 1983, then declined to 17.2% in 1989 and to 11.0% in 1993. Mortality rates among children aged under 5 years declined more rapidly after 1990 but had to be interpreted with caution as they were more affected by underregistration of deaths than were proportionate mortality statistics. The marked summer peak in deaths attributable to diarrhoea in 1978–83 was replaced by a small winter peak in 1990–93, resembling that observed in developed countries. On the basis of correlation analyses of annual figures it was concluded that the strongest correlations were between death rates attributable to diarrhoea and the water and sanitation variables (Pearson's correlation coefficients ranging from 0.96 to 0.99) followed by ORT use rates (0.93 to 0.99). Female literacy and measles vaccine coverage were also highly correlated with mortality attributable to diarrhoea. These analyses have to be interpreted with great caution because of the absence of control for autocorrelation within the time series.

Discussion

This review has revealed important data limitations. Population-based data on the coverage and quality of oral rehydration use in health facilities are scarce, despite their potential importance in reducing mortality, especially in severe cases. ORS and ORT use rates during the 1980s are available for few countries. Data availability improved in the mid-1990s, particularly when MICS were carried out in more than 70 countries. Despite these limitations the management of diarrhoea is possibly second only to immunization coverage as the best documented indicator related to health services for children. Reliable data on the management of other conditions, such as acute respiratory infections or malnutrition, are even more scarce.

The conceptual model underlying the global strategy for the control of diarrhoeal diseases recognizes the need for a number of simultaneous interventions, leading to changes in family behaviours such as feeding, home-based treatment and care-seeking, in the quality of care at health facilities, and in the physical environment (2). The strategy also takes into account the need for differential treatment patterns based on the severity of illness. However, the indicators that have been widely used represent neither the full range of recommended interventions nor the importance of taking the severity of illness into consideration when assessing coverage. This makes it difficult to conduct a full evaluation of the strategy and can lead to undue emphasis on ORT and other elements for which adequate data are available.

The poor availability of data was compounded by the use of four successive definitions of ORT within a decade. These were justified in terms of expanding knowledge but it might have been wiser to make fewer changes.

Nevertheless, the data show positive trends in the management of diarrhoea in most parts of the world. Despite fluctuations based on indicator definitions, reported use rates show a systematic response to public health recommendations. ORT is now used for the majority of children with diarrhoea, in both developing and developed countries (25). The limited data on the percentage of children with diarrhoea episodes who were taken to health facilities suggest that, in contrast to the situation with ORT, there was no consistent global increase between the 1980s and early 1990s and that a slight improvement occurred between the early and late 1990s.

Mortality data are also affected by patchy coverage and problems associated with ascertaining the causes of death. Even so, deaths attributable to diarrhoea declined markedly in both the global estimates and the country case studies. The estimated annual number of such deaths among children under 5 years of age is now a third of the 1980 figure and less than half the 1990 value. Thus the goal established in 1990 at the World Summit for Children of reducing diarrhoea mortality by half has been achieved.

Evaluating national public health programmes is a difficult task because secondary data, with all their shortcomings, have to be used and there are usually concurrent changes in other factors that may not be accounted for. Nevertheless, in the country case studies reviewed here, mortality attributable to diarrhoea showed a dramatic reduction whereas that attributable to other causes did not fall as rapidly.

Three studies provided evidence that hospital admissions associated with diarrhoea episodes also fell markedly. ORT use rates increased from around zero in the early 1980s to 35% in Brazil, 33–50% in Egypt, 81% in Mexico and 25–33% in the Philippines by about 1990. Data from Brazil and Egypt suggest that relatively low ORT use rates may be compatible with an impact on mortality. This is because ORT use tends to be much higher as a percentage of all episodes as well as in terms of volume ingested (26) for children who are perceived as being severely ill, many of whom need to overcome dehydration. Although these case studies are not appropriate for establishing causality beyond doubt, they are all compatible with a plausible impact of ORT on diarrhoea mortality (15).

With regard to ORT and diarrhoea, trends have certainly been moving in the expected direction over the last 20 years. Use rates have increased and mortality has fallen sharply. Alternative explanations were not found in the few countries where they were sought. There are strong grounds for considering that CDD programmes, in particular the promotion of ORT in conjunction with other key interventions, have had a large role in the marked reduction in deaths caused by diarrhoea among children.

Further challenges in estimating the impact of CDD and other large-scale public health and nutrition programmes include the need for regular, reliable, consistent and representative data on programme coverage and quality and on disease burden.

Greater attention should be directed to equity issues. As deaths caused by diarrhoea are being reduced, differences within countries may become more pronounced because of unequal development. For example, in 1985–87 an infant from north-eastern Brazil had a risk of dying from diarrhoea that was 5.2 times higher than that of an infant from southern Brazil (24.4 versus 4.7 deaths per 1000 live births); in 1995–97 this ratio had increased to 8.5 times (9.3 versus 1.1 per 1000) (27).

Conclusions

Experience with ORT can provide useful guidance for child survival programmes. With adequate political will and financial support, cost-effective interventions other than that of immunization can be delivered by national programmes at coverage levels adequate to reduce mortality. The question arises as to whether adequate coverage can be achieved and sustained for interventions designed to combat the other major causes of child mortality and for underserved populations. Despite high levels of commitment and interest, the population-based data needed to establish trends in health service delivery, outcomes and impact are not available for diarrhoea, malaria, pneumonia and other major childhood conditions. Standard indicators and measurement methods should be established. Efforts to change existing global indicators should be firmly resisted, although the introduction of additional indicators may prove unavoidable. Support should be provided for the continuing evaluation and documentation activities needed to guide public health policies and programmes. ■

Résumé

Réduire la mortalité diarrhéique grâce à la thérapie par réhydratation orale

En 1980, la diarrhée était la principale cause de mortalité chez l'enfant. Les efforts de lutte contre les maladies diarrhéiques déployés ces dernières années reposaient sur plusieurs interventions potentiellement utiles, mises en œuvre plus ou moins simultanément. La thérapie par réhydratation orale a été introduite en 1979 et est rapidement devenue l'élément central des programmes de lutte contre les maladies diarrhéiques. L'article examine la stratégie de prise en charge des cas de diarrhée en se référant notamment à la thérapie par réhydratation orale, ainsi que la relation entre son application et la baisse de la mortalité.

Des lacunes importantes ont été mises en évidence en ce qui concerne les données. Les données obtenues en population sur l'étendue et la qualité de l'utilisation de la thérapie par réhydratation orale dans les services de santé sont rares, alors qu'il s'agit là d'une intervention qui peut être importante pour réduire la mortalité, notamment dans les cas graves. On ne dispose de données relatives à l'utilisation de la thérapie par réhydratation orale pendant les années 80 que pour quelques pays. La quantité de données ne s'est améliorée qu'au milieu des années 90. L'étude des tendances temporelles est également rendue difficile par l'utilisation de quatre définitions successives de la thérapie par réhydratation orale depuis 20 ans.

Les données font néanmoins apparaître des tendances positives dans le traitement de la diarrhée dans la plupart des régions du monde. Malgré des fluctuations imputables à la définition des indicateurs, les taux d'utilisation notifiés montrent une réaction systématique aux recommandations de santé publique. La thérapie par réhydratation orale est maintenant utilisée pour la majorité des enfants atteints de diarrhée, aussi bien dans les pays en développement que dans les pays développés.

Le nombre de décès par diarrhée a sensiblement diminué. Le nombre annuel de décès par diarrhée chez les enfants de moins de cinq ans est désormais estimé ne plus représenter que le tiers du chiffre de 1980 et moins de la moitié du chiffre de 1990.

La mortalité par diarrhée a sensiblement baissé dans les études de cas analysées, réalisées dans quatre pays, alors même que d'autres causes de décès n'accusaient pas de diminution aussi rapide. Trois études ont montré que les hospitalisations pour épisodes

diarrhéiques avaient sensiblement baissé. Dans les quatre pays, les taux d'utilisation de la thérapie par réhydratation orale sont passés d'environ 0 au début des années 80 à 35 % au Brésil, 33 à 50 % en Egypte, 81 % au Mexique et 25 à 33 % aux Philippines aux alentours de 1990. Bien que ces études de cas ne suffisent pas à établir formellement la relation de cause à effet, elles sont toutes compatibles avec une estimation de l'impact plausible de la thérapie par réhydratation orale sur la mortalité diarrhéique.

Les tendances concernant la thérapie par réhydratation orale et la diarrhée ont certainement évolué dans la direction escomptée au cours des vingt dernières années. Les taux d'utilisation ont augmenté et la mortalité a nettement diminué. On a recherché d'autres explications au phénomène dans quelques pays sans en trouver. Il y a donc de bonnes raisons de penser que les programmes de lutte contre les maladies diarrhéiques, et

en particulier la promotion de la thérapie par réhydratation orale, alliés à d'autres interventions essentielles, ont eu un rôle important dans la nette baisse de la mortalité diarrhéique chez les enfants.

Il est difficile d'estimer l'impact des programmes de lutte contre les maladies diarrhéiques comme d'ailleurs celui d'autres grands programmes de santé publique et de nutrition pour d'autres raisons, dont la nécessité de pouvoir disposer de données régulières, fiables, cohérentes et représentatives sur la couverture, la qualité des programmes et la charge de morbidité.

L'expérience de la thérapie par réhydratation orale peut donner des indications utiles pour les programmes en faveur de la survie de l'enfant. Moyennant une volonté politique et un soutien financier suffisants, des interventions rentables autres que la vaccination peuvent donc être mises en œuvre avec succès par les programmes nationaux.

Resumen

Reducción de la mortalidad por diarrea mediante la terapia de rehidratación oral

La diarrea fue la principal causa de defunción entre los niños en 1980. Las actividades de lucha contra la diarrea se han basado durante el último decenio en la aplicación, de forma más o menos simultánea, de intervenciones múltiples de gran eficacia potencial. La terapia de rehidratación oral se introdujo en 1979 y se convirtió rápidamente en la piedra angular de los programas de control de las enfermedades diarreicas. En la presente revisión se examina la estrategia de lucha contra la diarrea mediante el manejo de casos, analizando en particular la terapia de rehidratación oral y la relación entre su aplicación y la reducción de la mortalidad.

El estudio ha revelado que los datos adolecen de importantes limitaciones. Así, son escasos los datos basados en la población sobre la cobertura con terapia de rehidratación oral y la calidad de la misma en los centros de salud, pese a su potencial utilidad para reducir la mortalidad, especialmente en los casos graves. Son también pocos los países para los que se dispone de datos sobre las tasas de uso de la terapia de rehidratación oral durante los años ochenta. La disponibilidad de datos mejora sólo a partir de mediados de los años noventa. El estudio de las tendencias temporales se ve aún más dificultado por las cuatro definiciones sucesivas que de esa terapia se han dado durante los últimos 20 años.

Los datos muestran no obstante tendencias positivas en el manejo de la diarrea en la mayor parte del mundo. A pesar de las fluctuaciones relacionadas con la definición de los indicadores, las tasas de uso notificadas revelan una respuesta sistemática a las recomendaciones de salud pública. La terapia de rehidratación oral se aplica hoy día a la mayoría de los niños aquejados de diarrea tanto en los países en desarrollo como en los países desarrollados.

Las defunciones por diarrea han descendido notablemente. Se estima que la cifra anual de tales defunciones entre los menores de 5 años equivale

actualmente a un tercio de la cifra de 1980, y a menos de la mitad del valor de 1990.

La mortalidad por diarrea disminuyó marcadamente en los cuatro estudios de casos de países examinados, mientras que las defunciones por otras causas no descendieron tan rápidamente. En tres estudios se han hallado datos que demuestran que los ingresos hospitalarios por episodios de diarrea disminuyeron notablemente. En los cuatro países, las tasas de uso de la terapia de rehidratación oral aumentaron de aproximadamente cero a comienzos de los años ochenta a un 35% en el Brasil, 33%–50% en Egipto, 81% en México y 25%–33% en Filipinas en torno a 1990. Aunque estos estudios de casos no son los más idóneos para establecer con seguridad una relación de causalidad, todos ellos son compatibles con una estimación del impacto plausible de la terapia de rehidratación oral en la mortalidad por diarrea.

Con respecto a la terapia de rehidratación oral y la diarrea, la situación ha evolucionado sin duda en la dirección esperada durante los últimos 20 años. Han aumentado las tasas de uso, y la mortalidad ha caído pronunciadamente. Algunos países han buscado explicaciones alternativas pero no las han hallado. Hay razones sólidas para considerar que los programas de lucha contra las enfermedades diarreicas, y en particular la promoción de la terapia de rehidratación oral, unidos a otras intervenciones clave, han influido poderosamente en la marcada reducción de las defunciones por diarrea observada entre los niños.

Otro reto que debe afrontarse para estimar las repercusiones de los programas de control de las enfermedades diarreicas y de otros programas en gran escala de salud pública y nutrición es la necesidad de disponer de datos regulares, fiables, coherentes y representativos sobre la cobertura y la calidad de los programas y sobre la carga de morbilidad.

La experiencia adquirida con la terapia de rehidratación oral puede servir de valiosa orientación para los programas de supervivencia infantil. Con la voluntad política y el apoyo financiero necesarios, se podrán poner en práctica exitosamente intervenciones eficaces en función de los costos distintas de la inmunización.

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