

Determinants of Use Rate of Oral Rehydration Therapy for Management of Childhood Diarrhoea in Rural Bangladesh

Mohammed Ali¹, David Atkinson², and Peter Underwood¹

¹Community Health Research and Training Unit, Department of General Practice, University of Western Australia, A Block, Fremantle Hospital, Fremantle; and ²Centre for Aboriginal Medical and Dental Health, University of Western Australia, Stirling Highway, Nedlands, WA6907, Australia

ABSTRACT

In rural Bangladesh, mothers were interviewed to identify factors that determine the use of oral rehydration therapy (ORT) for management of diarrhoea in children aged less than 5 years. The point prevalence of diarrhoea among 1,600 children was 11.6%, with 46% having acute watery diarrhoea. The overall ORT-use rate was 29%; only 17% of the cases used it adequately. Common reasons for not using ORS included misperception about diarrhoea and age of patients. Other reasons included incorrect assessments, severity, and difficulties with the administration of oral rehydration solutions. Promotion of ORT can be effected by improving the level of understanding of mothers with regard to assessment of severity, early initiation of treatment regardless of age, sex, type of diarrhoea, breast-feeding, and nutrition status.

Key words: Diarrhoea, Infantile; Oral rehydration solutions; Oral rehydration therapy; Dehydration

INTRODUCTION

Diarrhoea is a major cause of child mortality throughout the world, claiming about 3 million lives every year (1). Globally, the disease accounts for 15-30% of deaths in children aged less than 5 years (2). Appropriate case management, which could be life-saving in most cases includes: oral rehydration therapy (ORT), feeding during and after the diarrhoeal episode, and use of antibiotics in cases of *Shigella*-associated dysentery (3). Not only does ORT prevent deaths from dehydration, in field studies, children have been shown to grow faster and to be better nourished when glucose-based oral rehydration solutions (ORS) were used consistently with adequate feeding. In this regard, better results were obtained when cereal-based ORS, such as rice-ORS, was used (4,5). Since ORT is a simple and inexpensive life-saving

means, both government and international bodies have been promoting its household use.

In Bangladesh, a rural child, on average suffers from 4.6 episodes of diarrhoea every year (6), while 230,000 children die due to the disease (7). Field workers of the Bangladesh Rural Advancement Committee (BRAC) have visited 14 million households to train mothers in the use of ORT (8). Despite this, the actual ORT use during childhood diarrhoea has only recently risen to about 60% of all episodes (9). UNICEF estimates that about 1.5 million childhood deaths still occur in the world every year that could have been prevented by increased use of ORT (10).

To understand the factors that limit or enhance the use of ORT by many mothers of children with diarrhoea, it must be recognized that the use of ORT depends primarily on the home environment (11). It was with this awareness that the present study was designed and conducted in a rural area within traditional social system of Bangladesh in 1993 to obtain a picture of both clinical and sociocultural contexts in which parents manage childhood diarrhoea using ORT.

Correspondence and reprint requests should be addressed to: Dr. Mohammed Ali
1/3 Scenic Crescent
South Perth, WA 6151
AUSTRALIA
Fax: (61-8) 94005449
E-mail: mali@cygnus.uwa.edu.au

METHODS AND MATERIALS

During February-May 1993, 1,237 households in 10 villages in Brahmanbaria district in northeast Bangladesh were surveyed for identifying cases of diarrhoea in children aged 5 years or less. The population in the study area, as elsewhere in Bangladesh, has received health-education relating to diarrhoeal diseases conducted by BRAC and the government health agencies. Monitoring of diarrhoea was based on self-reporting by mothers during once-only household visits by the research team. Diarrhoea was defined in accordance with WHO as passage of three or more loose stools or one bloody stool in the preceding 24 hours (12). A questionnaire was used for interviewing mothers or caregivers of children with active diarrhoea on the same day on their beliefs and practices relating to the current episode of diarrhoea. Demographic and socioeconomic data and details of any healthcare sought for the episode were also elicited. Evidence of outside treatment, including medicine bottles, packaging and written prescriptions, was recorded.

At the end of the interview, the child was examined by one of the investigators (MA). Clinical signs of coexisting infections were also looked for. Treatment was given on a case-by-case basis depending on the clinical diagnosis. Generally, mothers of children with diarrhoea were given advice regarding the correction and prevention of dehydration with ORT, and were given ORT sachets free of charge. Any infections requiring antibiotics were also treated for. Antibiotics were given free of charge. Nutritional advice was also given. The nutritional status of children was recorded (13) by measuring the mid-upper arm circumference (MUAC). Local practitioners, who treated the children, were also interviewed at a later date to elicit their treatment practices for childhood diarrhoea.

Quantitative data were analyzed using Epi Info and SAS statistical packages (14,15). Descriptive statistics, measures of central tendency, and contingency tables were used for presenting the data. Where appropriate, relative risks and 95% confidence intervals were calculated. Qualitative analysis was used for describing beliefs and practices of the mothers and practitioners in relation to childhood diarrhoea.

RESULTS

Socioeconomic conditions

The general socioeconomic conditions of the study population were very poor. The economy was based mainly on subsistence agriculture. Almost a third of the families had no land of their own, and survived on agricultural labour and share-cropping. The median household size was 6 persons. Most houses were made with thatched walls and roofs, and more than three-

quarters of the houses had 2 rooms or less. Drinking water was obtained mainly from handpump-operated tubewells, while water for bathing and washing was usually obtained from ponds. More than two-thirds of the population used temporary, non-sanitary latrines, while none of the children aged less than 5 years used any type of latrines at all, but defecating in open areas or near the edges of fields, canals, or ditches.

Epidemiologic and clinical features

Of the 1,600 children aged less than 5 years, 186 had diarrhoea, giving a point prevalence rate of 11.6%. There were 7 families; each had two children with diarrhoea. Random selection of one child in families with two children with diarrhoea was done by drawing lots. The mother was interviewed in relation to that child. Thus, the results in the following sections will refer to the 179 children whose mothers were interviewed.

Clinical types of diarrhoea, based on the duration of illness, stool consistency, and the presence or absence of blood in stools, are shown in Table 1. The table shows that 82 cases (46%) had acute diarrhoea with duration less than 14 days. Persistent diarrhoea referred to diarrhoea of any type with duration of 14 days or more. Only one of the 179 cases had clinically-evident dehydration on examination.

Table 1. Distribution of various clinical types of diarrhoea

Clinical type of diarrhoea	No. of children (n=179)	%
Acute watery (0-13 day(s))	82	46
Acute bloody	21	12
Acute non-watery, non-bloody (gorhozmir haga)	36	20
Persistent (³ 14 days)	40	22

The prevalence of diarrhoea was related to age, being more common among the younger children (Table 2).

Table 2. Age-specific prevalence of diarrhoea

Age (years)	No. of children	No. of cases	Prevalence (%)
>1	316	52	16.5
1-1.9	304	51	16.8
2-2.9	348	42	12.1
3-3.9	272	25	9.2
4-4.9	360	16	4.4
Total	1600	186	11.6

Chi-square test for trend=32.4 df=1, p=<0.001

Many children with diarrhoea had other inter-related conditions. Of the 113 children aged 1-5 year(s) in whom MUAC was measured, 10% had a MUAC of 125 mm or less, indicating severe undernutrition, and another 27% had a MUAC between 125 and 135 mm, indicating moderate undernutrition (13). Table 3 shows that about a quarter of these children with diarrhoea also had one or more coexisting infections, such as lower respiratory infections (detected by clinical and auscultatory findings) and discharging ears.

Table 3. Co-existing infections/infestations among study cases

Condition	No. of children (n=186)	%
Lower respiratory tract infection	22	11.8
Suppurative otitis media	15	8.1
Impetigo/bacterial skin infection	18	9.7
Scabies	13	7.0
Overt helminthiasis	23	12.4

Some children had more than one of the above conditions

Understanding and use of ORS

Interviews with the mothers revealed that their basic knowledge of ORT was high, presumably as a result of the widespread comparison mentioned previously. Further, when asked to describe the preparation of ORS, using ingredients usually available at home, 87% of the mothers could do so accurately. Despite this, 29% of the children with diarrhoea received ORT at any time during their illness. Of the 52 mothers who administered ORT, 83% used *lobon-gur* solution made from common salt (*lobon*) and molasses (*gur*), while the rest used commercial packets of ORS available at local pharmacies.

Although it was difficult to assess precisely the amount of ORS given to each child, careful questioning established that only 30 of the 52 children given ORT received ORS in quantities adequate to prevent dehydration. These 30 children were reportedly given between 150 and 750 mL of ORS daily. The remaining 22 children were given quantities that were clearly inadequate with regard to severity and age; in some cases, this was as little as 10 mL per day.

Fluid and food intake

While the mothers in general did not restrict the normal fluid intake of their children with diarrhoea, only a few actively encouraged the consumption of more fluids. The exception to this was where green coconut water or buttermilk was given. About a third of the children drank the usual amount of water, while a little more than a third drank more than the usual amount. Again, although about 17% of the children reportedly drank less than the usual amount, in no cases was this due to a deliberate attempt by the mothers to restrict intake.

Of the 99 children aged less than 2 years, 91 were being breastfed at the time of the study. There were also 11 children aged 2-3 years who were still being breastfed. There was only one instance of a mother restricting breast-feeding.

Diets of about one-fifth of the children were modified, either by adding or restricting certain food items. These dietary changes were usually not of a dramatic nature, as more often than not their diets had been so meagre and restricted in the first place that there was little opportunity to delete potentially harmful items

or add beneficial foods. Addition of food items thought to be beneficial during diarrhoea was reported in 11% of the cases. These included rice flakes and molasses, infant milk formula, boiled vegetables, yogurt, bananas, mashed rice with salt, and barley. Restriction of items believed to be responsible for or aggravating diarrhoea was reported in 14% of the cases, and included one or more of the following: spices and chillies, fish, green vegetables, cow's milk, meat, and cold rice.

While modification of the children's diets was not dramatic, many lactating mothers modified their own diets in response to diarrhoea in their children. Forty-one (40%) of the 102 lactating mothers modified their diet, based on the belief that elements in breastmilk cause or exacerbate diarrhoea. The new diet usually consisted of rice and some vegetables with meat, fish, and eggs, and spices were usually avoided. In 10 cases, the mothers severely restricted their food and fluid intake to a little rice, salt, and water only, with the intention of reducing the production of breastmilk. This was probably the major potentially harmful change recorded; the change only occurred in a relatively small number of cases.

Factors related to ORS use

Type of diarrhoea: The mothers used an extensive taxonomic system for describing cases of different types of childhood diarrhoea; 12 different folk labels (popular names) for diarrhoea were identified. The perception about the type of diarrhoea by the mothers was important. About half of the mothers, not using ORS, believed that their children's diarrhoea was not *paatla paikhana* (watery stools) or *diaria depicted* in ORT promotional campaigns, it was rather *amasha*, *rokto amasha*, or *gorhoznir haga* (dysentery, bloody dysentery, and non-watery, non-bloody diarrhoea popularly related to indigestion respectively). This was borne out by the ORS-use rates in different clinical types of diarrhoea; the ORS-use rate was highest in acute watery diarrhoea and least in acute non-watery, non-bloody diarrhoea (Table 4).

Table 4. ORS-use rates by different clinical types of diarrhoea

Clinical type of diarrhoea	% of episodes treated by ORS
Acute watery	37
Acute non-watery, non-bloody	17
Acute bloody	23
Persistent	26

Severity of diarrhoea: Another reason cited by mothers for not using ORS was that the episode was not severe enough to warrant the use of ORS (Table 5). This was supported by the clinical observation that there was only one case of significant clinically-evident dehydration among the children examined by the investigator. Also, taking stool frequency as a proxy measure for the severity

Table 5. Reasons reported by mothers for not using ORS

Reason	No. of mothers	%
Diarrhoea not watery	62	49
Child does not want to drink ORS	30	24
Child too young to drink ORS	20	16
Illness too mild to use ORS	17	13
Difficulties in preparing ORS	11	9
Gur (molasses) not available	7	6

Some (n=20) of the 127 mothers not using ORS gave more than one reason

of the diarrhoeal episode, children having more frequent stools were also more likely to have received ORS than children with fewer stools (Wilcoxon 2-sample test, p value=0.04).

Perceived role of ORS: The mothers subscribed to one or both of two beliefs regarding the role of ORT in diarrhoea. One-third of the mothers held the biomedically-compatible belief that ORS replaced salts and water lost in the stools, or it kept up the child's strength during diarrhoea. The second type of belief, shared by the rest of the mothers, was that ORS helped reduce or stop purging, especially in watery diarrhoea. Some mothers expressed both the beliefs. Mothers subscribing to the belief that ORS replaced lost elements were about twice as likely to use ORS as mothers who only believed that it reduces purging (relative risk 2.2 with 95% confidence interval=1.0-5.1).

Age of children: A striking finding of the study was the extremely low use of ORS in infants aged less than 7 months. Only 2 of the 24 children in this group were given ORS. In response to closer questioning, the mothers reported two important reasons. First, they attributed many episodes of watery diarrhoea in infants in this age group to quality or quantity of breastmilk. Thus, their intervention efforts were mainly aimed at improving the quality or reducing the quantity of production of breastmilk. ORS did not fit into this scheme of management. An even more important reason is related to the weaning age. In rural Bangladesh, weaning starts relatively late at about 6 or 7 months of age, and in many cases, even later (16). The mothers in this study generally had the perception that infants should not drink any fluids other than breastmilk before this age, and the infants were introduced to water and other clear fluids after this age. Hence, the concept of giving ORS to drink went against one of their basic feeding tenets. This concept was further reinforced by their fear, mentioned by several mothers, that offering clear fluids to young infants could cause a cold, 'chest congestion,' or even a pneumonia-like illness.

Maternal education: More than three-quarters (77.3%) of the mothers had had no schooling, 13% had attended a primary school, 8.9% had a secondary school education, and only 0.4% had education at the higher secondary level or beyond. The mothers with more years

of schooling were more likely to use ORS for their children than the mothers with less or no schooling (Wilcoxon 2-sample test, p value=0.03).

Role of local practitioners: About a third (32%) of the children with diarrhoea were taken for treatment to local practitioners. These practitioners included both licensed and unlicensed practitioners of western medicine (allopaths), homeopaths, and herbalists. Although almost all of these practitioners claimed that they advised ORT for diarrhoea, in practice, evidence from the mothers indicated that considerably less did so. Of the 20 cases with watery diarrhoea who sought treatment from a local practitioner, only 8 mothers reported having been advised to use ORT.

DISCUSSION

When an apparently simple technology, like ORT, is transferred to the reality of a Bangladeshi village, several factors can significantly affect its resultant use. A near-universal knowledge among mothers about ORT was, thus, not necessarily associated with high use-rates during episodes of diarrhoea. In terms of adequate ORT intake, the effective ORT-use rate was only 17%. However, a closer look into the situation suggests that these mothers may not be acting 'irrationally,' rather the clinical and practical issues often dictated when and how they used ORT.

An important clinical issue in relation to the use of ORT was the severity of episodes observed in the study. At first glance, it may appear surprising that, in spite of the low use-rate of ORS, there was only one case of clinically-evident dehydration in the study. However, as documented in a number of studies, endemic community diarrhoea is rarely severe or associated with dehydration, with dehydration in only 4-9% of cases, and the dehydration encountered being rarely life-threatening (17). In the present study, a number of maternal practices were used for preventing the development of dehydration, with almost all continuing to breastfeed, most not restricting, and some increasing fluid consumption and, in a number of cases, using ORT appropriately for the more severe cases of watery diarrhoea. Thus, a low ORT-use rate may not necessarily imply high non-compliance of mothers with ORT.

Vertical ORT programmes often tend to overlook the reality of children's health in poor countries of the developing world. Diarrhoea, in this study, was found to coexist with other infections and widespread malnutrition among the young children. The considerable difficulties many mothers faced in getting their children to drink ORS could, in part, be explained by the compounding of anorexia usually associated with diarrhoea by infections. The widespread prevalence of malnutrition could have further aggravated the situation. In the present study, 37% of the cases aged 1-5 year(s) had moderate to severe undernutrition. Due to

methodological reasons (only MUAC was used for measuring nutrition status), this is probably an underestimate, since recent statistics show that only 46% of Bangladeshi children have acceptable weight for age (18), and the villages studied were relatively typical rural villages.

There are other practical considerations with regard to ORT. One of the reasons some mothers reported for not using ORT was the difficulty in preparing ORS, particularly in the measurement of correct amounts of water, *gur* (molasses), and salt. There were also difficulties in obtaining *gur*, which is only readily and cheaply available after the sugarcane harvest during January-March. Thus, while refined sugar appears to be replacing, or will replace, in the near future, *gur* in many rural households, present ORT-promotion efforts still concentrate on *lobon-gur* solution. Thus, many mothers may need to be reminded that ORS can also be prepared using sugar.

Poverty can also undermine ORT initiatives that are based on factory-produced ORS. Despite the widespread promotion and availability of factory-produced packets of ORS, only 17% of ORS used in the study was of this type, a pattern observed elsewhere in Bangladesh (19). Many rural families find it hard to afford ORS packets, which can be 7 times as expensive as home-made ORS (20). Where the daily per-capita income is US\$ 0.60 (18) and even lower for poor villagers, an investment of US\$ 0.10-0.20 daily on commercial ORS for a child with diarrhoea can be considerable, especially if that meant cutting back on an already insufficient diet for a malnourished child. Considering that children aged less than 2 years in rural Bangladesh may have diarrhoea for as many as 60 days a year (21), a family with 3 young children would be expected to use ORS for as many as 180 days of the year. Therefore, it is not surprising that mothers would tend to be quite judicious and conservative in using ORS, if the episode was not felt to be watery or severe enough.

Promotional campaigns for ORT may also be sending the wrong message to mothers and, in the process, contributing to a less-than-expected use of ORT. In the present study, the most frequent reason mothers gave for not using ORS was their perception that their children's episodes were not of watery type, portrayed in the ORT-promotional messages. Further, over-enthusiastic promotion of the benefits of ORT may have unwittingly resulted in the perception, held by about two-thirds of the mothers in the study, that ORS was supposed to stop diarrhoea. These mothers were half as likely to use ORT than those who perceived the role of ORT as helping replace lost salts and water. A similar finding was observed in Matlab, a rural area of Bangladesh (22). The discrepancy between this perceived effect of ORS in stopping diarrhoea and mothers' past experiences where ORS did not immediately stop purging may have discouraged their future use (22).

A number of important implications for diarrhoea control that emerged from this study need careful examination. First, given that dehydration is not a significant problem in the majority of cases of endemic diarrhoea, ORT promotion should focus primarily on episodes of watery diarrhoea, whether they are acute or persistent. Already a number of health planners have started to question the rationale for promoting ORT in all cases of diarrhoea, arguing that its inappropriate use could be linked to the irrational use of drugs for treatment of diarrhoea (23). Such behaviour was associated with "diversion of attention from appropriate treatment, unnecessarily high treatment costs and adverse reactions" (23). Concerns have been raised that the aggressive marketing of commercial ORS to poor families in developing countries may result in the diversion of scarce family finances to the detriment of nutrition status of children (24). Rather, the promotion of cereal-based ORT would be more judicious, especially in the light of their nutritional benefits with consistent use during episodes of childhood diarrhoea (5).

Advocating the use of ORT only for watery diarrhoea does not necessarily put at risk the small proportion of cases of dysentery due to *Shigella* which is associated with significant dehydration. These cases are usually marked by an acute watery phase resembling watery diarrhoea (25,26), which should alert mothers to the need for ORT.

It is also proposed that applying the calculation of ORT-use rates to only watery diarrhoea episodes would give planners a more accurate indicator of programme impact on mortality due to dehydration.

Second, the content of ORT messages should reflect the local terminologies and beliefs regarding childhood diarrhoea. If ORT is to be used for all types of diarrhoea, folk names corresponding to the major types of diarrhoea should be included in the promotional messages. Weaning practices that may have an influence on ORT intake should also be taken into consideration. For instance, in this study, most infants aged less than 7 months, a group specially vulnerable to the effects of dehydration, were not given ORS, because they were usually introduced to clear fluids only after this age. ORT campaigns could try to promote ORT-use among this group of children with the help of culturally-acceptable messages and strategies. Folk nomenclature, beliefs, and practices can be unearthed through rapid or focused ethnographic surveys prior to designing and commencing promotional campaigns (27).

Third, as pointed out by Fauveau *et al.*, while ORT is crucial to preventing deaths due to dehydrating watery diarrhoeas, exclusive emphasis on vertical ORT programmes will have a relatively little impact on mortality in children due to diarrhoea in rural Bangladesh (28). Their study on mortality due to diarrhoea in rural Bangladesh found that non-dehydrating diarrhoeas,

namely bloody diarrhoea and persistent diarrhoea, accounted for 50% of all deaths in children aged 1-4 year(s). Mortality due to these diarrhoeas can only be prevented through a broader strategy that encompasses measles immunization, nutrition education, dietary management of diarrhoea, and (antibiotic) treatment of dysentery in the community (28). In the final analysis, only a comprehensive primary healthcare programme that also complements poverty alleviation can provide a lasting solution to the problem of child mortality in developing countries.

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