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THE HOUSEHOLD MANAGEMENT OF CHILDHOOD DIARRHEA IN RURAL NORTH INDIA

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Abstract—An in-depth anthropological study of child diarrhea in 3 villages in rural North India investigated the variation in the household management of child diarrhea. Qualitative and quantitative methodologies were used to collect data on a series of variables, including maternal knowledge, beliefs, and practices during diarrhea, feeding and fluid intake during diarrhea, treatment choices, and knowledge and use of oral rehydration therapy (ORT).

The results showed both positive and negative diarrhea management behaviors. Almost all mothers continued to breastfeed normally, and did not decrease fluids during diarrhea. A shift in the child's diet toward 'softer' and 'cooler' foods rather than the withholding of food was the norm. The use of anti-diarrheals was widespread.

Acceptance and sustained use of ORT was found to be inversely related to an understanding of the function of ORT. Eighty-one percent of mothers who had previously used ORT but who do not plan to use it again were dissatisfied because it 'did not stop the diarrhea'. These mothers thought that ORT was a medicine that would cure the diarrhea. Therefore, in ORT interventions there is a need to explain that the function of ORT is to replace lost fluids, and not to stop the diarrhea.

Anthropological research of household diarrhea management can provide important information that will result in improved intervention design. Messages that are meant to change behavior must be based upon the target group's perception.

Key words—child diarrhea, oral rehydration therapy, social marketing, North India

INTRODUCTION

This paper reports the preliminary results of an anthropological study of the household management of child diarrhea in Haryana State, North India. The study was part of a larger oral rehydration therapy (ORT) intervention study undertaken by the All-India Institute of Medical Sciences (AIIMS), Department of Pediatrics, and funded by UNICEF.

The objectives of the anthropological study were to document the variation in community knowledge, beliefs, and practices of child diarrhea, including feeding and fluid intake, health care and home treatment, and the use of ORT. The purpose of the study was to identify superior intervention methods and social marketing messages through a dialogue with mothers, other household members, and health care providers.

STUDY DESIGN AND METHODS

A brief description of the larger ORT intervention study is necessary before reporting on the methodology of the anthropological component. Phase I of the study began in October, 1981. An experimental design was chosen with 2 control villages and 1 experimental village making up the study population. The villages were located approx. 25 km from Delhi.

Oral rehydration salts (ORS) in the form of packets were provided in the experimental village, following home training visits to explain and demonstrate their proper use. Village health workers were trained and were the primary distributors of packets. Fortnightly surveillance by a team of data collectors established the pattern of morbidity and mortality for children under 5 years of age. An identical surveillance system was used in the control villages, but the ORS packets were not provided. The objective of phase I was to assess the utilization and acceptability of the packets in the experimental village. Phase II of the study began in March, 1983. The objective of this phase was to evaluate the impact of the oral rehydration packets on the prevalence of malnutrition and incidence of mortality. Phase III was begun in August, 1984, and introduced a cereal-based home ORT solution in the control villages and substituted a homemade sugar/salt ORT in place of ORS packets in the experimental village. Results of this larger ORT intervention study undertaken by AIIMS are not reported upon here.

The anthropological component of this study began in April, 1984, and continued for a full year. Three complementary methodologies were used. First, ethnographic techniques were used for two purposes: (1) to establish trust and rapport with the community, especially mothers, that would facilitate informal, in-depth, and repeated visits to households; and (2) to provide the qualitative data that were necessary to design the quantitative phases.

Second, a detailed, structured interview schedule was administered to 199 mothers across all the villages. The respondents were selected by a stratified random sample of households based upon *per capita* income. The proforma was both open-ended and closed, to allow for maximum spontaneity of responses. The interview schedule included questions about the beliefs and knowledge regarding the cause and prevention of diarrhea, subjective definition and

categorization of diarrhea, perceived appropriate treatment during diarrhea (including feeding and fluid intake), and the knowledge and use of ORT.

The third methodological approach followed actual diarrheal episodes through recovery. The methods included participant observation and the collection of quantitative behavioral data. Where possible, household visits were made either daily or every other day until the diarrhea had stopped for 2 days. Post-recovery visits were also done to compare feeding practices during and after diarrhea. During these visits it was possible to observe the child, mother and other child-care providers, and to focus on the behaviors of interest. Fifty diarrhea episodes, both acute and chronic, were followed.

The combination of these methodologies enables a comparison between reported and actual behavior. Often people do not do what they think or say they should do; this is a major limitation of the survey research method to describe behavior [1].

RESEARCH SETTING

The 3 villages are located in Haryana state, about 25 km south of Delhi. The AIIMS study village, Anangpur, has a population of about 6000, whose residents either farm or work in nearby quarries. The 2 AIIMS control villages, Tilpat and Palla, have a combined population that equals that of Anangpur. They are located within 10 km of Anangpur, but are close to a major highway and an industrial area. Residents in Tilpat and Palla work in agriculture or in the nearby factories, and have access to more pluralistic health care.

The climate is hot and dry from March to June, with temperatures regularly reaching more than 100°F. In July the monsoon rains begin and continue through September. During this time it is hot and humid, and there is a marked increase in diarrhea [2]. October to February is dry and cool.

All 3 villages have access to electricity, but many households do not have a connection. For those that do, one of the first purchases is an overhead fan. Radios, bicycles, and cows or water buffalos are commonly owned. Land is owned by about one-quarter of households, but the amounts are usually small. Agricultural crops include wheat, corn, barley, potatoes, beans and green vegetables. Wheat is the staple, consumed in the form of unleavened bread (*roti/chapati*).

Households in Tilpat and Anangpur draw their water from open wells, which are shared by similar caste groups. The majority of households in Palla have their own hand pump or access to a communal hand pump. Water contamination, therefore, is much higher in Tilpat and Anangpur, which contributes to an increased diarrheal incidence in these 2 villages compared to Palla [2].

Palla and Anangpur have a government health dispensary, staffed by a full-time doctor, assistant, and nurse-midwife. For many reasons, including lack of medicines and poor rapport between the health care staff and patients, there is general dissatisfaction with this institutional health care. Private practitioners, located within each village or in the nearby town of Sarai, are widely used. Broad utilization of these practitioners, many of them uncredentialed and undertained, has an important effect on diarrheal treatment.

Over a period of 20 months, 1467 children under the age of 5 in all 3 villages suffered 1663 diarrhea episodes, and 23 children died a diarrhea-associated death [2]. These incidence rates are probably underestimated, as surveillance was done every 10 days to 2 weeks.

Over 45% of children under 5 in the villages fall into grade I or II nutrition grade, weight/age (mild to moderate malnutrition), and 7% are severely malnourished. Forty-three percent have normal weights/age. Malnourished children have a higher case fatality rate for diarrheal-related deaths [2]. This will be further discussed below.

RESULTS

Except where explicitly noted, the results of the cross-sectional survey data are combined for the 2 control villages (Tilpat and Palla) and the study village of Anangpur. This is because for many of the outcomes there were no statistical differences among the villages. Several important demographic, socioeconomic, and social structural inter-village differences, however, confound the AIIMS experimental research design and may also effect behavioral outcomes not attributable to the ORT intervention.

Other data undergoing analysis and not reported upon here include in-depth interviews with health care providers and with mothers whose children reportedly died of diarrhea in the preceding year. For a detailed presentation of the study, the reader is referred to Bentley [2].

Folk definitions and classification of diarrhea

In the world of cosmopolitan medicine, public health, and epidemiology, diarrhea is typically defined as the appearance of 2–4 liquid or watery stools per day and is classified into either acute/protracted and dysenteric/nondysenteric categories. An important question is how diarrhea is defined by *mothers*, and how their perceptions relate to household diarrhea management behavior.

A few studies have been done that show sophisticated indigenous classification systems for diarrhea, e.g. the work by Nations [3] in Northeast Brazil, Lazoff [4] in South India, Coreil in Haiti [5], Kendall *et al.* [6] in Honduras, Zoysa *et al.* [7] in Zimbabwe, Hurtado and Scrimshaw [8] in Guatemala, Nichter [9] in Sri Lanka, and Bentley *et al.* [10] in Peru and Nigeria.

The present study shows that mothers in the 3 study villages have a clearly defined classification system for diarrhea. Mothers were asked if their children ever experienced 'loose motions' or 'abnormal stools' and, if so, to provide the Hindi word for this phenomenon. Based on this question, diarrhea was generically defined as *dust*, and was classified into between 2 and 5 categories that are related to either a physical or spiritual characteristic. The names of the most commonly listed types of diarrhea were *khooni-dust* (bloody diarrhea), *pani dust* (watery diarrhea), *phate-phate* (bits and pieces), *hare dust* (green

diarrhea, often attributed to evil effect), and *pila dust* (yellow diarrhea).

When asked which 'type' of diarrhea, if any, 'worries' the most or is the most serious, 57% of mothers reported 'bloody' and 25% 'watery' diarrhea. These concerns were related to perceived consequences of weakness, water loss, and prolonged diarrhea.

Despite the popular belief held by the medical establishment and others that mothers do not consider diarrhea to be a serious illness because of its ubiquity [11], the results of this study show that, in fact, mothers were concerned about diarrhea and its consequences. Ninety-five percent of mothers interviewed believed that diarrhea could be harmful. When asked what could happen to a child with diarrhea, 66% in all villages reported that a child becomes 'weak'; 21% in Tilpat and Palla and 35% in Anangpur reported that 'water loss may occur'; and 14% in Tilpat and Palla and 20% in Anangpur reported that diarrhea may result in death. The higher number reporting water loss as a consequence of diarrhea in Anangpur can probably be explained by the health education messages learned about fluid replacement during diarrhea.

The high percentage of mothers who reported that diarrhea could be serious does not mean there is a high degree of concern for each and every episode. Most diarrhea, after all, is self-limiting and goes away after 2 or 3 days. Mothers have experienced this—over and over again—and on the whole they are not too concerned unless a symptom of severity occurs. In North India these 'signals' include the presence of blood, vomiting, fever, diarrhea of increased duration, a change in the color of stool (i.e. from yellow to green), or a sudden increase in the frequency of stools.

Causes of diarrhea are attributed to hot weather (66%), bad food (36%), overeating (30%), teething (24%), cold weather (23%), 'hot' food (16%), 'hot breastmilk' (after a mother works in the sun or consumes a 'hot' food; 15%), evil eye (12%), and dirty water or germs (4%). These are multiple responses so that more than one cause could be listed by an individual mother. The low percentage that identify germs as a causal mechanism reflects the extremely low educational level of these mothers. The mean number of years of maternal education is slightly over 2 for Tilpat and Palla, and less than 1 year for Anangpur. The causes attributed to the different diarrhea 'types' are shown in Table 1.

Treatment during diarrhea

An overwhelming majority of mothers in the 3 villages believe that diarrhea can be treated: 92% answered in the affirmative when queried. The type of treatment preferred by 86% was 'doctor's treatment'; only 3% felt that 'home treatment' alone would suffice; less than 5% said both 'doctor and home treatment' should be done, and less than 1% listed 'exorcism' as a treatment. These response patterns were quite similar across all 3 villages, and did not vary by 'type' of diarrhea (with the exception of 'green' diarrhea, which was believed by about 20% of mothers to require a visit to the exorcist).

When asked what is the *first* thing that should be done when diarrhea occurs, 39% in the 2 control villages and 26% in the experimental village reported that a doctor should be seen; 24% and 18% reported that a home treatment should be given; 18% and 36% report that the diet should be shifted to more appropriate foods, e.g. 'lighter' and 'cooler' foods; 8% and 13% report that both a home treatment and a dietary shift should occur; 4% and 1% think nothing should be done immediately; and 0.8% and 1.8% think that ORT should be given immediately. This discouraging finding concerning prompt ORT use in Anangpur is discussed below.

In the 50 diarrhea episodes we followed, medical treatments were used in 62% of cases. A stepwise logistic regression was done to investigate the determinants of medical treatment for diarrhea (Table 2). The independent variables included socioeconomic and demographic household characteristics, age and sex of the index child, and episode characteristics (presence of blood, vomiting, fever, watery consistency, and total duration of episode). The only explanatory variable was the duration of episode; episodes of shorter duration were *less* likely to be those for which a medical treatment is taken. Older mothers were *more* likely to delay medical treatment (chi-square = 4.02, $P = 0.05$).

It is customary in North India for practitioners to charge for medicines but not for the patient visit. This virtually guarantees that a diarrhea episode will be treated with one or more drugs if medical aid is sought. Table 3 lists the medicines that were prescribed for each of the diarrhea episode case studies. The most striking finding is the broad use of antibiotics and, in many cases, the use of multiple antibiotics during a single episode. In the sample of episodes followed, there was no relationship between the presence of blood and whether or not an antibiotic was given (chi-square = 0.061, $P = 0.8$). In appropriate drug treatment, nondysenteric diarrheas do not require antibiotic therapy [12].

Nations [3] reports that in Northeast Brazil efficacious herbal treatments are losing ground to powerful, allopathic drugs in the home management of diarrhea. The present study finds a similar pattern: of the 199 mothers surveyed, and 50 diarrhea episodes followed, only 32% and 14% respectively reported using herbal remedies for diarrhea. Of the 18 herbal treatments used during diarrhea episodes, none was used by more than 2 mothers. The use of home herbal treatments is clearly on the wane. Mothers who do report using them are more likely to be older women (chi-square = 3.94, $P = 0.05$). The use of exorcism as a treatment for diarrhea was also rare (3 episodes out of 50).

Feeding and fluids

One of the key issues in household diarrhea management is feeding. It has been shown that children who continue to eat during diarrhea in fact absorb a significant amount of nutrients and experience less weight loss than children who have lower food intake [13–15]. For this reason, sound diarrhea management programs include both the concepts of fluid replacement and feeding.

Studies that have measured nutrient intake before and during diarrhea show a marked reduction in

Table 1. Perceived causes of diarrhea by type of diarrhea

Etiological categories	Percentage of mothers surveyed* ($n = 185$) 'Type' of diarrhea 'Watery' (*Pani*)	'Bloody' (*Khooni*)	'Green' (*Hara*)	'Yellow' (*Pila*)	'Mucous' (*Rhad*)	'Bits pieces' (*Phate-Phate*)	Total
'Hot/cold'							(Total) 32
Heat	25	28	5	13	19	14	17
Hot food	4	6	—	2	6	5	5
Hot–cold effect	2	3	2	4	1	—	2
Cold weather	2	2	9	4	2	5	3
Hot breast milk	2	2	3	4	—	2	2
Cold foods	<1	1	—	—	1	3	2
Rain	—	—	1	—	—	—	1
Food/digestion							(Total) 34
Bad food	14	7	1	13	7	15	10
Overeating	6	3	3	11	1	3	5
Sweets	1	3	—	4	5	2	3
Indigestion	6	1	3	11	4	7	5
Green vegetables	—	—	3	—	—	—	3
Mother's diet	—	—	—	2	—	—	2
Spices	—	—	—	2	—	—	2
Unboiled milk	—	—	—	—	—	2	2
Milk in diarrhea	—	—	—	—	—	2	2
Physiological							(Total) 17
Excess water	3	—	—	—	—	—	3
Joining fontanelle	<1	—	—	—	—	—	1
Blood deficiency	<1	—	—	—	—	—	1
Fever	1	—	1	—	—	—	1
Constipation	<1	—	1	—	1	—	1
Lack of food	<1	—	—	—	—	—	1
Weakness	<1	1	—	—	—	—	1
Stomach ache	<1	3	—	—	9	—	4
Mucosal injury	—	1	—	—	—	—	1
Worms	—	—	1	—	—	2	2
Bad liver	—	—	—	—	1	—	1
Developmental							
Teething	8	1	6	11	1	5	5
Spiritual							
Evil eye	<1	—	35	4	—	8	12
Other							
Continuous diarrhea	2	12	1	—	16	—	8
Infection	2	3	3	2	—	3	3
Don't know	22	24	24	31	23	22	24

*Multiple responses.

Table 2. Logistic regression: episodes of diarrhea in which a medical action was taken

Variable	Beta	SD	Chi square	*P*
Intercept	−1.33	0.961	1.92	0.1661
Duration of episode	0.350	0.167	4.37	0.0356

caloric intake [14–19]. The mechanisms for the nutrient deficits are hypothesized to be caused by a complex of factors, including nutrient malabsorption, increased nutrient utilization, anorexia, and maternal food withholding [20–22]. The work by Hoyle *et al.* [18] and Sarker *et al.* [16] in clinical settings suggest that anorexia is an important factor in reduced nutrient intakes during diarrhea [20]. The Dietary Management of Diarrhea (DMD) Programs in Peru is currently investigating the relationships between diarrhea, feeding behavior, appetite, and nutrient intake during and after diarrhea in a field setting [23].

Despite the present lack of solid data, the medical and public health community has developed a common mythology that postulates maternal food withholding during diarrhea as the norm. For example, in the Joint WHO/UNICEF Statement on the management of diarrhea and ORT [24], it is stated:

> In many societies the parent's remedial response to diarrhoea is to withhold food and fluid, including breastmilk, in the mistaken belief that this will stop the diarrhoea and ease the strain on the intestine. This "treatment" only adds to the dehydration and malnutrition caused by the illness.

Similarly, Khan and Ahmad [25] state, "Food withdrawal during diarrhoea is a tradition in Bangladesh, though how and when it started is unknown." Survey data from North India reports that "partial or total restriction of food was widely practiced" [26].

One of the key questions in this study was to probe the issue of food and fluid intake during diarrhea,

Table 3. List of medicines used in episodes*

No.	Village	Duration of of illness	ORS† use	No. of medical 'actions'	List of all medicines used
1	Anangpur	3	×	3	*Intestopan, *Sulphaguanadine, Kaopectate, unidentified tablets
2	Anangpur	4	×	2	*Mexaform, aspirin
3	Anangpur	4	×	1	*Furoxone, aspirin, cough syrup
4	Anangpur	5	×	1	*Intestopan, Kaolin-Pectin, unidentified tablets
5	Anangpur	5	×	2	*Dependol, Kaolin-Pectin, unidentified syrup
6	Anangpur	7	○	2	*Sulphaguanadine, unidentified tablets and syrup
7	Anangpur	7	×	1	*Chlorostrep, Kaolin-Pectin, aspirin, cough syrup
8	Anangpur	8	×	2	*Intestopan, *Amoxcillin
9	Anangpur	9	×	3	*Sulphaguanadine, *Intestopan, *Chlorostrep, *Metrodinazale, *Mexaform
10	Anangpur	11	×	3	*Intestopan, *Chlorostrep, *Metrodinazale, unidentified powder, injection
11	Anangpur	14	○	1	*Intestopan
12	Anangpur	13	×	1	Unidentified tablet
13	Anangpur	6	○	1	*Mexaform (self-administered)
14	Anangpur	18	×	2	*Chloramphenicol, Prolyte+, aspirin, unidentified powders and syrup
15	Anangpur	24	×	1	*Intestopan, *Amoxcillin (self-administered), unidentified tablet
16	Anangpur	40	×	5	*Thypostrep (self-administered), *Metrodinazale, *Amoxcillin, unidentified tablets, capsules, syrup
17	Anangpur	41	×	8	*Chlorostrep, *Intestopan, Kaopectate, Jectosec, unidentified syrups
18	Anangpur	1	○	1	Unidentified powder
19	Tilpat	3	○		Unidentified powder, syrup
20	Tilpat	5	○	1	Sulphaguanadine, unidentified tablet
21	Tilpat	6	○	1	*Centagyl, Kaolin-Pectin, unidentified powder, injection
22	Tilpat	9	○	1	Unidentified tablets, capsules
23	Tilpat	9	○	1	Unidentified powder
24	Palla	8	×	2	*Enterostrep, *Chloramphenical, Electral (electrolyte), unidentified tablet
25	Palla	8	○	1	*Septran, *Chloramphenicol, unidentified syrup
26	Palla	11	○	3	Kaolin-Pectin, Ayurvedic syrups and powder, injection

*Of 50 episodes monitored, 31 involved medical intervention and use of allopathic medicines (62%). Five of these episodes, which were 'chronic', are deleted in the above table, as they were picked up too late in the episode to reconstruct *all* previous medical actions and medicines. These 5 cases, however, were those with the highest total number of medical actions and medicines.

†Whether ORS was used at all during episode; does not imply efficacious or repeated use.

and to determine whether mothers were withholding foods or fluids, as is widely reported in the popular and professional literature. The use of the survey data, combined with dietary intake data and household observations during diarrhea episodes, provides some insights into feeding behavior during diarrhea.

When asked if a child is more or less hungry during diarrhea, 50% report that a child is more hungry, 35% less hungry, 9% report that appetite is unchanged, and 6% say it depends on the type of diarrhea. However, only 10% of these mothers feel that more food should be offered, while 65% think that less food should be given. Of these, 67% believe that more food will 'increase the diarrhea', 32% state the child is not hungry, and 11% list other reasons. Older mothers are more likely to believe food will increase or worsen diarrhea (chi-square = 3.94, $P = 0.05$). Therefore, this survey data does support the 'common wisdom' that mothers withhold foods during diarrhea. When investigated in more depth, however, it can be seen that the picture is far more complicated than a universal withholding of food.

What frequently occurs is a *shift* in diet, toward foods that mothers consider helpful—away from foods they consider harmful. In the present study this conclusion is supported by comparing the results from all three methodologies—ethnography, structured interviews, and following of episodes.

The analysis begins with Table 4, which is a list of foods that mothers surveyed reported to be 'useful' or 'harmful' during diarrhea. The 'useful' foods most commonly listed were: *kichuri* (a cooked rice and lentil dish), curd, banana, and rice. 'Harmful' foods were: *chapati* (unleavened bread), potato, *jaggery* (molasses), spices, and vegetables. A diarrhea survey in northern Harayana State by Kumar [26, 27] produced a similar list of 'safe' or 'harmful' foods. It is interesting that in that survey and the present study, *chapati* topped both lists, with 67% and 65% of mothers respectively reporting that *chapati* is not a good food for consumption during diarrhea. As *chapati* is the staple food of North India, there could be serious consequences if this important dietary item is regularly withdrawn when children have diarrhea.

Table 4. Foods considered 'helpful' and 'harmful' during diarrhea

	Percent of mothers surveyed (n = 192)*			
	Tilpat	Palla	Anangpur	Grouped
*Helpful**				
Kichuri	82	81	81	82
Dahi (yoghurt)	52	72	63	62
Rice	26	22	45	31
Banana	24	24	25	24
Lassi	26	24	21	24
Isagbol & Dahi‡	9	12	1	7
Bread	3	3	20	9
Dalia‡	9	4	5	6
Moongdal	—	10	6	5
Dal	9	—	1	3.5
Harmful†				
Chapati	57	59	50	55
Milk	43	43	44	43
Milk tea	34	48	29	37
Potato	15	17	28	20
Spices	17	17	13	16
Jaggery	22	9	24	15
Vegetables	10	14	11	12
Sweets/sugar	5	10	10	8
Dal	14	12	—	8
Masoor dal	—	2	11	4
Fried food	—	9	—	3
'Hot' breastmilk	3	—	—	1

*Of mothers surveyed who listed one or more 'helpful' food.
†Of mothers surveyed who listed one or more 'harmful' food.
‡*Isagbol* (fleased husk) is manioc, which is purchased in the market, and added to *dahi* (yoghurt) as an 'extender'; *dalia* is a wheat/milk porridge; and *moongdal* is a popular type of lentil.

When asked why foods were 'useful' or 'harmful' during diarrhea the answer varied, depending on the food and, in some cases, the village. *Kichuri* was considered useful because of its 'light' characteristics by 43% of mothers in Tilpat, 38% in Palla, and 15% in Anangpur. Forty-two percent of mothers in Anangpur believed that *kichuri* helps to 'stop the diarrhea', compared to only 10% and 21% of mothers in Tilpat and Palla, respectively. *Kichuri* was also considered to be 'cooling', in contrast to the 'hot' properties of diarrhea, by 29%, 23%, and 20% of mothers in Tilpat, Palla, and Anangpur. Yoghurt was considered useful because it is 'cool' by the majority of mothers, although nearly 30% of Anangpur mothers think it 'stops the diarrhea'. Bananas were considered to be a 'thickener' by 39%, 10%, and 15% of Tilpat, Palla, and Anangpur mothers. In Anangpur, 70% of mothers believed bananas 'stop or decrease diarrhea', while 33% and 60% reported this in Tilpat and Palla. Rice was considered 'cool' and 'light' by 40–45% of mothers across all 3 villages.

Chapati was considered 'harmful' during diarrhea because it is 'difficult to digest', and in Anangpur, because it 'increases the diarrhea' (70% of mothers). Cow or water buffalo milk, considered 'harmful' by more than 40% of mothers in all 3 villages, 'increases the diarrhea' for 60% of Anangpur mothers, while only 18% and 33% believed this in Tilpat and Palla, respectively. Twenty-seven percent of mothers in Tilpat reported that 'doctors advise' against milk during diarrhea, but only 17% and 9% report this in Palla and Anangpur. Milk was also considered to be 'hot' and 'difficult to digest'. Potatoes and vegetables were considered 'hot' and to 'increase diarrhea', as are spices. Sugar was thought to 'increase diarrhea' by the majority of mothers who list it as a harmful food, in all 3 villages.

Dietary items reported consumed from the household interviews and diarrhea case studies were coded as 'helpful' or 'harmful', based on their categorization by mothers. In the data shown in Table 5, the 192 single 24-hr recalls were defined as 'normal dietary days'. During the diarrhea episode monitoring, a total of 136 24-hr recalls were obtained for 41 partially or fully weaned children. These are defined as 'diarrhea dietary days'. The 'diarrhea dietary days' are disaggregated into 'acute' (episodes of <8 days' duration) and 'chronic' (episodes of >7 days' duration) categories. A frequency distribution of food items offered during each of the 3 intervals of 'dietary days' allows a rough comparison of food patterns during normal (nonillness days) and diarrhea illness days.

In interpreting the table, it is important to recognize that the data represent dietary intake days, not children, and that a smaller number of children contribute more days to diarrhea than is the case with 'normal' dietary days. In addition, the survey data were collected during June–August, 1984, while the monitoring of diarrhea episodes took place in September–November, 1984. It is possible, therefore, that there were some seasonal differences in diet [28].

Table 5. Comparison of 'helpful' and 'harmful' foods consumed during 50 diarrhea episodes and household interview data

	Percentage of days food was consumed		
	'Normal' diet n = 192 nonillness dietary days	'Acute' diarrhea n = 36 diarrhea days (episodes <8 days)	'Chronic' diarrhea n = 100 diarrhea days (episodes >7 days)
'Helpful' foods			
Banana	1	5	22
Kichuri	4	0	12
Yoghurt (*Dahi*)	18	5	5
Rice	11	16	13
Lassi	16	5	5
Misc. fruits	4	9	11
'Harmful' foods			
Chapati	94	89	70
Vegetables	77	67	57
Milk	65	44	32
Milk tea	49	67	52
Potatoes	1	23	28

By using the household survey data as a *rough* benchmark or 'normal' dietary patterns, however, a comparison can be made with diets of children experiencing diarrhea.

Table 5 supports the hypothesis that dietary patterns continue as normal during diarrhea for many children, but that a dietary shift occurs for some. A chi-square for trend test was done for the rows of data, and there were no statistically significant differences between the 3 intervals. This suggests that although there are *apparent* shifts in feeding during diarrhea, they are not strong. The direction of the shift is both toward supplementation of the normal diet with 'helpful' foods, and a reduction of some foods that are considered 'harmful'. The shift—in both directions—is much more pronounced in episodes of increased duration.

The shift of most concern is the reduction of the staple food item, *chapati*. As the far left column shows, *chapati* is consumed by nearly all survey children. During diarrhea there is only a slight reduction in its consumption during diarrhea episodes of shorter duration, but for cases that last more than 7 days, consumption drops nearly 25%. This could have very deleterious nutritional effects, as the major nonbreastmilk source of calories is *chapati*. In point of fact, data by Bhan *et al.* [29] show that children in these villages who experience chronic diarrhea are substantially more malnourished and have higher diarrhea-associated mortality than those with no history of protracted diarrhea.

Milk, considered 'harmful' by more than half of all mothers, also appears to be consumed less during diarrhea, but the consumption of milk tea rises slightly, suggesting a shift away from milk to milk tea.

Of 'helpful' foods, there is an increase in 3 items—*kichuri*, bananas, and miscellaneous other fruits. The most dramatic increase is for bananas, offered in less than 1% of dietary recalls during 'normal' dietary days, but consumed in 27% of 'diarrhea' days. Their introduction is much more likely to occur in cases of longer duration. Fruit consumption also rises slightly during diarrhea.

The increase in *kichuri* consumption is not substantial, given the high percentage of mothers who considered it 'helpful' (82%). As with bananas, the addition of *kichuri* tends to occur with protracted diarrhea. The delay may be related to the amount of time required for its preparation.

In summary, there is some evidence of a dietary shift during diarrhea but, more importantly, an overall maintenance of normal dietary patterns is apparent. Of 'helpful' foods, only bananas are *frequently* added to the diet of a child suffering from diarrhea. Of 'harmful' foods, there is some reduction in the staple food items, which no doubt has a nutritional cost for affected children. The reduction in these foods is much more evident with protracted diarrhea episodes, suggesting the importance of anorexia during chronic diarrhea [30]. In this study, mothers reported the child's appetite to be reduced in more than 40% of diarrhea days, compared to <5% during healthy days.

It is not possible to know of possible quantitative reductions in the *amount* of food given. A more detailed analysis of this dietary data shows that, when scored for 'dietary diversity', there was no significant difference between diarrhea and nondiarrhea dietary days [2]. Nutrient intake data from Peru and Nigeria during diarrhea, convalescence, and health show little or no difference by stage of illness [31, 32]. There is a need, however, to quantify possible nutrient reductions during diarrhea in this setting.

Another important issue relating to maternal feeding behavior during diarrhea has to do with the maintenance of breastfeeding. In this sample, when asked whether breastfeeding should continue normally during diarrhea, 95% of mothers answered in the affirmative. These results tally with other studies that report unchanged breastfeeding patterns during diarrhea [5, 6, 10, 11, 14, 31–35]. When following diarrhea episodes, it was reported and observed that mothers in fact continued to breastfeed normally [2]. In a few cases, mothers reported that the child chose to suckle less.

Beliefs about appropriate fluid intake during diarrhea are similarly adaptive. When asked if a child is more (or less) thirsty during diarrhea, 94% of mothers reported a child is more thirsty. Of these, 83% believed that more fluids should be given, both because the child is 'asking for' or 'needs' the fluids (44%) and to 'replace lost water' (46%). More mothers in the Anangpur were concerned about water loss (54%) compared to the control villages of Tilpat and Palla (37%).

Another key question was the *type* of fluids that were given during diarrhea. A key programmatic strategy for diarrhea management is the use of 'home-available fluids' (HAF), both to prevent dehydration and to correct mild to moderate rehydration. The argument for their promotion is that they are drinks that are commonly consumed and that may be considered by the target group to be efficacious during diarrhea. Their acceptance as a therapy for fluid replacement may be culturally superior to 'home-made solutions' (HMS), such as the sugar/salt/water solution that is presently promoted in a door-to-door campaign in Bangladesh, by the Bangladesh Rural Advancement Committee (BRAC) [36]. However, the rehydration capacity of the many candidate home-available fluids is largely unknown, and is currently a research priority [37]. The sugar/salt solution, a drink that can be prepared in the home, has already been proven an efficacious rehydrant for mild to moderate dehydration [38].

In South India, coconut water and rice water are home-available fluids that are commonly used, although there are no reliable figures on actual use. In North India, 'sharbat' (lime water) and 'lassi' (yoghurt drink) are reported to be commonly used [27, 39].

Mothers in this study were asked to list drinks that they thought were 'helpful' or 'harmful' during diarrhea. 'Helpful' drinks most commonly listed were: glucose water (32%), *lassi*, a yoghurt drink (24%), lime water (20%), and unboiled milk and lemon (10%), and in Anangpur, ORS (34%). 'Harmful' drinks were milk (45%) and milk tea (37%). Fluids, like foods, were considered 'helpful' or 'harmful' because of their cooling or heating properties. The high reporting of glucose water reflects the utilization

of private practitioners and pharmacists, where such a fluid would be recommended and available for purchase. When following diarrhea episodes, *lassi* was the only 'helpful' home-available fluid offered, and that too in only 12% of the episodes. The question of whether *lassi* could be a viable home-available fluid in North India requires further research about its current use. If it is available only for those who own milking animals or for those who can afford to purchase it, it should not be promoted.

Oral rehydration therapy

In a study of this kind with on-going surveillance and encouragement by data collectors to use ORT, any findings about ORT usage patterns must be qualified. However, some useful information can be generated and hypotheses about use or nonuse formulated. The results presented below derive from an analysis of the survey and diarrhea episode following data.

ORS packet exposure in the experimental village was quite high: 96% knew about it and, of these, 95% knew where to obtain the packets. Eighty-six percent of these mothers had a child who had experienced diarrhea in the previous year and, of these, 65% had used ORT. This is a rather high usage rate, and no doubt is influenced by the ongoing presence of the data collectors.

Of the mothers whose children experienced diarrhea in the last year, but who did not use ORS, 30% said that the preparation was too time consuming, and some of these felt that the diarrhea was not 'serious enough'. Twenty-four percent said the child did not like the taste of ORS, and 23% said the ORS 'didn't help'.

Fifty-seven percent of previous ORS users reported it to be 'helpful', 41% 'not helpful', and 2% were 'not sure'. Of those who considered ORT 'helpful', reasons listed for its efficacy were 'replacement of water loss', 'stops or helps diarrhea', 'prevents thirst', and 'prevents weakness' were the main reasons given, often as multiple responses. Of mothers who believed ORT is *not* useful, 80% said it 'doesn't stop or help the diarrhea'.

This quantitative result corroborated our fieldwork experience. Mothers were frequently heard to complain of the failure of ORT to 'stop' or 'decrease' diarrhea. We realized rather early that a significant portion of mothers were attributing antidiarrheal qualities to ORT, and did not understand what it was meant to do—replace body fluids lost from stool output. Apparently, many mothers did not plan to use ORT again because it had failed to cure or ameliorate a diarrhea episode.

To test this hypotheses—that one determinant of ORS use is whether its rehydration function is understood—mothers who had used ORS within the previous year were classified into 2 groups based on their knowledge of the rehydration 'function of ORS'. The score was based on their answers to several ORS-related questions. Forty-one percent were classified positively and 59% negatively with respect on understanding ORS function.

Table 6 shows a bivariate analysis of mothers' understanding of ORS by their perception of its usefulness. The results show that 88% of mothers who understand the rehydration function of ORS alao think it is helpful during diarrhea. Of mothers who do *not* understand ORS function, 38% think it is useful while 62% do not. These data support the hypothesis that user satisfaction is clearly related to knowledge of ORS function.

Table 6. Understanding of ORT function and perception of usefulness

		Perception of usefulness of ORT		
		Useful	*Not useful*	*Totals*
Understanding of ORT function	Yes	22	3	25
	No	14	23	37
		36	26	62

$\chi^2 = 15.4$; $P = <0.005$.

In Haiti, Coreil [5] found that mothers who held a 'hydration theory model' of ORS were more likely to choose the officially recommended method of ORS preparation using packaged salts, over the home recipe, compared to mothers who held a 'curative theory model'. However, those mothers who understood dehydration and fluid replacement tended to be 'late users', waiting for a few days after the episode started to introduce it. In the present study, the opposite association was found (Table 7). Mothers who did *not* understand ORS function were more likely to delay its use, compared to 'hydration model' holders.

To examine the factors that influence the timing of ORS administration, a stepwise logistic regression was calculated. Understanding of 'ORS function' and the 'mortality consequences of diarrhea' were included as independent variables, along with socio-economic and demographic variables (Table 8). The results of the regression show that in the context of other variables the 'understanding of ORT function' variable does not enter the model, as it is colinear with and less powerfully associated with the 2 variables that do enter. The results show that maternal education is strongly associated with mother's decision to give ORT immediately. Mothers with some education are much more likely to give ORS immediately, compared to mothers with no education. In addition, mothers who are aware that a child may die from diarrhea are about 5 times more likely to administer ORT early.

In interpreting the model in Table 8, it is important to remember that only a minority of Anangpur

Table 7. Timing of administration of ORT by understanding of ORT function

		Understanding of ORT function		
		Understand	Do not understand	Total
Timing of ORT	Given immediately	14	5	19
	Wait a few days	10	20	30
		24	25	49

$\chi^2 = 7.5$; $P = <0.005$.

Table 8. Logistic regression: mothers who give ORT immediately

Variable	Beta	SD	Chi square	*P*
Intercept	−1.679	0.487	11.87	0.0006
Maternal education	3.236	1.170	7.65	0.0057
Fatal	1.544	0.756	4.17	0.0411

mothers were educated and were scored positively in understanding the mortality consequences of diarrhea. Thus, although the 2 variables are important predictors of the probability of prompt ORS administration, they explain only a relatively small portion of the variation.

Study limitations

The results reported in this paper have limitations that should be discussed. First, there is the issue of generalizability. The villages are neither totally rural nor urban, but have rural characteristics and urban influences. The villages, therefore, are transitional. This is particularly evident in the high use of allopathic health care and the decreasing importance of traditional Indian medicine and home treatments.

Although located in close proximity, the villages have differences between them that confound the interpretation of results. Palla is clearly the most urban and modern, with a population that is in part transient. Anangpur and Tilpat are more traditional and agricultural. Health care options differ between all 3 villages.

The study is limited by the small number of diarrhea episodes (50) that were followed. The intensive methodology required that a mimimum number of households be followed at one time. It is not known whether the variations in household diarrhea management practices were captured in full.

DISCUSSION

The understanding of the household management of diarrhea has one applied purpose—the information can be used to design more effective interventions. Despite its biomedical context, improved diarrhea management is primarily a problem of behavioral change. Only by understanding why people act the way they do can we attempt to influence their behavior. Operational research must precede intervention design if behavioral change is to occur [40–42].

An encouraging commitment to this view is the national survey of household diarrhea management practices that is currently underway in India. The survey is a first, critical step in the National Diarrhea Management Plan, which is part of the Control of Diarrheal Diseases (CDD) Program within the Ministry of Health. In recognition of the broad ecological and cultural differences of the country, the survey was commissioned by the Government of India, with the assistance of UNICEF/India, and is being conducted by a private market research agency [43]. As a consultant to UNICEF, the author was privileged to be involved in the design of the study.

We know that use of ORT and feeding during (and after) diarrhea will decrease child mortality and the negative growth consequences of repeated diarrheal episodes. To be sure, there *are* skeptics [44], and it is increasingly understood that high-technology solutions (like ORS) are not 'simple solutions' [45]. However, given that ORT in whatever form has the potential to increase child survival, we still have much to learn about how to successfully implement ORT interventions [46]. I believe that we must address the question of behavioral change in diarrhea management as systematically and scientifically as we do the development of such technological innovations as 'Super ORS' [47].

What are some of the findings from this study that should be considered in future diarrheal interventions? One example is to incorporate how mothers perceive the consequences of diarrhea in our messages to them: as stated above, 66% of the mothers show concern when diarrhea occurs because their children 'become weak'. Only a small percentage believe that the consequences could be fatal. Obviously this is related to the case fatality rate for any 1 village, which will always be comparatively small. With this knowledge, we might conclude that messages of the kind that are meant to frighten the mother that her child might die from diarrhea will be ill-received. A recent global poster produced by UNICEF/WHO contains the message, "DIARRHEA CAN KILL YOUR CHILDREN! SAVE THEM! GIVE THEM MORE TO DRINK WHENEVER THEY HAVE DIARRHEA." One could assume that the developers of this poster used their knowledge and perceptions, not that of the mothers.

Social marketing messages must first and foremost be based upon an understanding of the target group's perception [48]. The work by Coreil [49] provides a good example of the use of anthropological data to design ORS social marketing messages. Her research in Haiti uncovered a traditional practice of offering 'refreshing teas' (rafreshi) during diarrhea. This word and concept was recommended by Coreil as a social marketing strategy for ORS.

Another finding of this study that requires further investigation is my hypothesis about sustained ORT use: that is, that mothers who understand its function in fluid replacement *and* who understand it is not a medicine that will stop the diarrhea, are more likely to be long-term users. This issue is of critical importance, as ORS has previously been marketed as a medicine [6]. In a discussion of the social marketing of ORS, Green suggests that it be marketed as a medicine to improve strength, but not as an antidiarrheal [50]. One thing is clear—mothers everywhere want the diarrhea to stop. Exploiting this 'felt need' with a product that will not deliver may be a serious error.

If, as I hypothesize, it is found that mothers who do understand relationships between dehydration, fluid replacement, and ORS are more likely to use it, we will need the help of communication people to devise simple ways of explaining the concepts of dehydration, which should be based upon culturally appropriate definitions and analogies.

Results of this study appear to show that *chronic* diarrhea (diarrhea episodes of 15 days or more duration) represents the greatest frustration, and the largest challenge, in household diarrhea management [2]. Results recently published by Bhan *et al.* [29] describing diarrhea-related mortality in the 3 villages support my anthropological findings. They report, "the mortality was higher in protracted diarrhoea than when the duration was less than two weeks". Although only 5% of all diarrhea episodes were protracted, 14% of children who had protracted diarrhea died, compared to a case fatality rate of 0.7

for acute (nonprotracted) diarrhea episodes. Malnutrition was a significant contributing factor in these deaths. There is a great need to disaggregate diarrhea mortality by dehydration and nondehydration causality.

In the anthropological research, I found that mothers whose children were experiencing chronic diarrhea frequently become 'frantic', and switched from one doctor to another, often stacking up bottles of expensive anti-diarrheals. Upon occasion, children were being administered several medicines at the same time, obtained from different practitioners. Also, a very few of these mothers did withhold foods during diarrhea. This appears to be in part because of the persistent anorexia that is associated with protracted diarrhea [30], and because they 'want the diarrhea to stop'. I believe that if mothers do indeed 'starve' their children during diarrhea, it is more likely to be those who are at the end of their rope because of a chronic diarrhea episode. Research priority should be given to this much neglected category of diarrhea.

The results of this and other anthropological studies have shown that mothers practice a variety of adaptive and maladaptive behaviors in the management of diarrhea. Adaptive behaviors can be further promoted with social marketing techniques. Maladaptive behaviors must be understood before strategies for change can be developed.

Anthropological methodologies can be used in the operational and evaluative research that is required for public health interventions. Standard survey research may result in superficial or even misleading data, and should be complemented with observational methods. To realize the promise of ORT [51] and other interventions for child survival, programmatic research into household and community behavior must be of high priority.

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