Diarrhea Management Among Under Fives

B. Banerjee, S. Hazra and D. Bandyopadhyay

From All India Institute of Hygiene and Public Health, 110, Chittaranjan Avenue, Kolkata 700 073, India.

Correspondence to: Dr. Bratati Banerjee, 113 B, Lake Terrace, Kolkata 700 029, India. E-mail: bratatibanerjee1@hotmail.com

Manuscript received: October 1, 2002, Initial review completed: December 9, 2002; Revision accepted: July 21, 2003.

This study was conducted to assess the magnitude of the problem of diarrhea and time of initiation of its management in under five children of different socio economic status, in an urban area of West Bengal. Overall prevalence of diarrhea was 31.67%, highest in lower socio economic class (41%). Prevalence was higher in the girls, though not significant. Acute watery dirrhea was most common (58.9%), followed by dysentery (24.2%) and persistent diarrhea (16.9%). Persistent type was inversely proportional to socioeconomic status. Majority of mothers administered fluids or sought treatments within six hours in the middle socioeconomic class but beyond six hours in lower socioeconomic group (P < 0.001). Percentage of children where doctors' advice was implemented within 12 hours was inversely proportional to socio econmic status (P <0.001).

Keywords: *Diarrhea, Socioeconomic status, Therapy, Under five children.*

Diarrhea is a major killer disease in under five (U5) children in India and thus an important public health problem. The alarming situation is created by delay in initiation of treatment and inadequate hydration resulting in high morbidity. Diarrheal diseases cause a heavy economic burden on health service as well, because up to a third of total pediatric admissions are due to diarrheal diseases and up to 17% of all deaths in indoor pediatric patients are diarrhea related(l). Much attention has been given over the last decade to acute diarrhea and its management by home available fluids (HAF), oral rehydration salts (ORS) solution and intravenous fluids, but it has not made much impact on the scenario.

The objective of the present study was to assess the magnitude of the problem of diarrhea and the time of initiation of its management in under five children of different socio economic status.

Subjects and Methods

A combination of retrospective and prospective study was undertaken from October 2000-April 2001 in an urban area of West Bengal. Standard definitions were used for identifying diarhea(2). The diarrheal prevalence among the under five children in the study area was observed to be 40% (from the Municipal records of 1999) during two weeks time, which is almost equivalent with the fact that average number of three episodes occur per child per year(3), mean duration being 3.61 days(4). Keeping in view with the prevalence of 40%, a sample size of 300 was estimated, considering 95% confidence level and allowing 14% error, using the formula $3.96\ pq/I^2$, where p is the prevalence, $q = 1 - p$ and I is the allowable error.

A stratified random sampling technique was adopted to select the sampling units, the under five children. The stratification was done according to the socio economic status in the

study area. Thus three strata, upper middle class (A), lower middle class (B) and lower class (C), were formed according to per capita income in the modified Prasad's classification(5) and using Consumer Price Index for July 2000 as 442(6). Though socio economic classification is usually done according to Kuppuswamy's scale(7), which includes education and occupation also, in this study only per capita income was used because, in many cases, the caretaker of the child was person other than the mother. So, to avoid disparity, these two variables were omitted. A sub sample of size 100 was taken from each stratum, comprising a total sample of size 300.

Studying the official records regarding the residing pattern according to socioeconomic status it was noted that people belonging to a particular socioeconomic class tend to live in a particular locality. Three such areas from the three strata were thus identified and from each area, 100 U5 children were selected by systematic random sampling method from the households having children under five years, using the household list from the Municipal records. The selected households with U5 children were visited, all three areas being covered simultaneously. Those families not conforming to per capita income for their particular stratum were not included in the study and the families residing next to them and having U5 children were taken. Information regarding diarrheal attacks in the children was enquired from the mothers, with a recall period of two weeks. In the absence of the mother any other responsible adult member of the family, involved in taking care of the child, was interviewed. The time sequence of attacks and management were studied in detail. The active cases at the time of visit were identified and these children were revisited on the 2nd and 4th days to note the time of management.

Results

The estimated prevalence of diarrheal diseases of the entire area (combining A, B and C) was observed to be 31.67% (*Table 1*). This implies that the prevalence among under fives ranges from 26.4% to 37.0% (as the allowable error was 14%) with 95% confidence. Prevalence was highest in the area of lower class and lowest in the upper middle class area. The difference between these two classes at both extremes was strongly significant. Though the difference between areas A and B was not significant, prevalence in area C was significantly higher than in area B. Female children suffered more than males in all the three areas but none were found to be statistically significant.

Acute watery diarrhea was observed to be more common, followed by dysentry and persistent type. Persistent type was inversely proportional to socio-economic status, while acute watery diarrhea was significantly more in the upper socio-economic status (*Table II*).

Table III shows the time sequence of management of diarrhea. Maximum number of mothers of attacked children gave ORS/ HAF or sought treatment within six hours in areas A and B, whereas, in area C time of giving fluids or seeking treatment was beyond six hours but within twelve hours in most cases. The differences in delay in initiating remedial measures in area C were observed to be highly significant ($P < 0.001$), in comparison to other areas. In area A, doctors' advice was implemented in all the cases within 12 hours. Comparison between the other two areas showed doctors' advice had been implemented, in majority of the cases within 12 hours in area B and 24 hours in area C. This difference in delay in area C, also, was strongly significant ($P < 0.001$).

TABLE I–*Prevalence of Diarrhea According to Sex in the Three Different Socio Economic Strata*

Dearrheal	A area			B area			C area			Total		
Diseases	M	F	T	M	F	T	M	F	T	M	F	T
Total number of children	44	56	100	43	57	100	56	44	100	143	157	300
Total number of cases	9	16	25	10	19	29	18	23	41	37	58	95
Diarrheal incidence(%)	20.5	28.6	25.0	23.3	33.3	29.0	32.1	52.3	41.0	25.87	36.94	31.67
95%C.I.	(8.6, 32.4)	(16.8 40.4)	(16.6, 33.5)	(10.7, 35.9)	(21.1, 45.5)	(20.1, 37.9)	(19.9, 44.3)	(37.5, 67.1)	(31.4, 50.6)	(18.7, 33.1)	(29.4, 44.4)	(26.4, 37.0)

M = male, F = female, t = total; $Z_{AB} = 0.637$, $p > 0.05$; $Z_{AC} = 2.406$, $p < 0.005$; $Z_{BC} = 1.78$, $p < 0.05$.

TABLE II–*Distribution of Children According to Type of Diarrhea*

Type of Diarrhea	Number of cases				Prevalence(%)	
	A area (n = 100)	B area (n = 100)	C area (n = 100)	Total (n = 300)	Among total children (n = 300)	Among total cases (n = 95)
Watery	19 (76.0)[a]	16 (55.1)[a,b]	21 (51.2)[b]	56	18.67	58.9
Dysentry	5 (20.0)	9 (31.0)[c]	9 (21.9)[c]	23	7.67	24.2
Persistent	1 (4.0)	4 (13.8)	11 (26.8)	16	5.33	16.9
Total	25	29	41	95	31.67	100.00

Figures in parentheses indicate column wise percentage.
a: $z = 3.8$, $p<0.0001$; b: $z = 0.55$, $p > 0.05$; c: $z = 2.25$, $p<0.01$.

Discussion

In the present study, conducted in under five children of three different socio economic status, overall diarrhea prevalence was 3 (1.67%), within a recall period of two weeks. National Family Health Survey 2 (NFHS 2) has reported a prevalence of any diarrhea, with a recall period of two weeks, to be 19% in children under three years in India. In West Bengal, the prevalence was 8.3%(8). Longitudinal studies were done by several authors, to record the incidence of diarrhea, which range from 0.2 to 2.6 episodes per child per year(9-11).

Unhealthy environment has been seen to be the main culprit for causation of diarrhoeal diseases in the community. For this reason, diarrhea and dysentry have shown a higher incidence in the lower classes, which can be ascribed to the poor state of physical

TABLE III–*Time of Management of Diarrhea According to Socio-Economic Status*

Average interval between onset of diarrhea and intervention measures	A area (n = 25)	B area (n = 29)	C area (n = 41)
Time of giving ORS/HAF			
Within 6 hours	23 (92.0)	23 (79.3)	3 (7.3)
6-12 hours	2 (8.0)	6 (20.7)	38 (92.7)
Within 6 hours: $Z_{AB} = 1.30$, $p > 0.05$; $Z_{BC} = 6.15$, $p < 0.001$; $Z_{AC} = 6.85$, $p < 0.001$.			
Time of seeking treatment			
Within 6 hours	22 (88.0)	23 (79.3)	7 (17.1)
6-12 hours	3 (12.0)	6 (20.7)	34 (82.9)
Within 6 hours: $Z_{AB} = 0.857$, $p > 0.05$; $Z_{BC} = 5.18$, $p < 0.001$; $Z_{AC} = 5.65$, $p < 0.001$			
Time taken for implementation of doctors' advice			
Within 12 hours	25 (100.0)	26 (89.7)	11 (26.8)
12-24 hours	0 –	3 (10.3)	30 (73.2)
Within 12 hours: $Z_{BC} = 5.19$, $p < 0.001$			

Figures in parentheses indicate percentages.

environment in which they live(1). A case control study done in Malawi, to assess the effect of environmental sanitation on diarrhea morbidity, showed that children living in families who use good quality water supplies and latrine, experience 20% less diarrhea, as reported to the health clinics during warm rainy season(12).

According to NFHS 2, children in high standard of living households are somewhat less likely to suffer from diarrhea, than other children(8). In the present study also, prevalence was observed to be inversely proportional to socio economic status. family income also reduces the risk of severe form of the disease as indicated by the presence of dehydration and thus favourably influence child survival(13). Female children were seen to suffer more from diarrhea than the males. On the contrary, NFHS 2 reported small sex difference, with male children under three years suffering more than their female counterparts, in both West Bengal and India(8).

Morbidity and mortality in diarrhea is mainly due to severe dehydration. Oral rehydration therapy (ORT) is the most simple, economical and effective therapeutic intervention, both for prevention and treatment of diarrhea. But the time of initiation of ORT is an essential element in its efficacy. Zodpey *et al.*(14) enumerated certain risk factors for

Key Message

- For control of diarrheal diseases, the main strategy should be awareness generation among the mothers, particularly those with low literacy levels, regarding the importance of early initiation of management.

development of moderate or severe dehydration, and not giving ORS,HAF or both during diarrhea was found to be one of the significant risk factors. They concluded that timely intervention may prevent the development of moderate or severe dehydration in children suffering from acute watery diarrhea. In the present study, however, a strongly significant delay in administering ORS/HAF, seeking medical help or implementing doctors' advice was observed in children suffering from diarrhea in the lower class. While in the upper and lower middle classes management was done within six hours, in the lower class it was delayed beyond six hours. This delay may be due to lack of awareness in the community, particularly among mothers.

It has thus been observed from the present study that among children from lower socio-economic class diarrhea occurs more frequently and management is delayed which results in increase of the risk of dehydration and death. To effect early initiation of management of diarrhea and to improve use of ORS, extensive IEC programs must be undertaken, particularly in the lower socio economic stratum.

Contributors: BB is responsible for conception and designing of the study, analysis, interpretation and drafting the article. SH did the statistical analysis. DB has been involved in conception and designing the study, and data collection. BB will act as guarantor of the paper.

Funding: None.

REFERENCES

1. Park K. Park's Textbook of Preventive and Social Medicine. 16th edition, Jabalpur: M/s Banarsidas Bhanot Publishers; India. 2000.
2. National Child Survival and Safe Motherhood Programme. MCH Division, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 1994.
3. National Program for Control of Diarrheal Diseases. National Institute of Health and Family Welfare, New Delhi, 1988.
4. Pal SC. The Problems of Acute Diarrheal Diseases in Children in India. Indian J Public Health 1991; 35: 31-37.
5. Kumar P. Social Classification: Need for Constant Updating. Indian J Community Med 1993; 18: 60-61.
6. Consumer Price Index Numbers for Industrial Workers. Reserve Bank of India Bulletin, September 2002.
7. Kuppuswamy B. Manual of Socio Economic Status Scale (Urban). Manasayan, New Delhi.
8. National Family Health Survey 1998-1999, India 2001. International Institute for Population Sciences, Mumbai.
9. Sengupta PG, Sircar BK, Mondal S, Gupta DN, Ghosh S, De SP. Epidemiological Profile of acute diarrheal diseases of a Cohort of rural under five-children: A 3 years longitudinal observation. Indian J Public Health 1997; 41; 79-81.
10. Mandal AK, Tiwari IC, Sanyal SC. A profile of diarrhea in an urban slum area. Indian J Public Health 1990; 34: 66-67.
11. Reddiah VP, Kapoor SK. Epidemiology of diarrhea and its implications for providing services. Indian J Pediatr 1991; 58: 205-208.

12. Young B, Briscoe J. A case control study of the effect of environmental sanitation on diarrhea morbidity in Malawi. J Epidemiol Community Health 1987; 42: 83-88.

13. Mahalanabis D, Faruque AS, Islam A, Hoque SS. Maternal education and family income as determinants of severe disease following acute diarrhea in children: A Case Control Study. J Biosoc Sci 1996; 28: 129-139.

14. Zodpey SP, Deshpande SG, Ughade SN, Hinge AV, Shirikhande SN. Risk factors for development of dehydration in children aged under five who have acute watery diarrhea: A Case Control Study. Public Health 1998; 112: 233-236.

Lysosomal Storage Disorders

Jayesh Sheth, Pinaki Patel, Frenny Sheth and Raju Shah

From FRIGE (Foundation for Research in Genetics and Endocrinology), Genetic Center, 20/1, Bima Nagar, Satellite, Ahmedabad 380 015, India.

Correspondence to: FRIGE (Foundation for Research in Genetics and Endocrinology), Genetic Center, 20/1, Bima Nagar, Satellite, Ahmedabad 380 015, India..

Manuscript received: August 19, 2002, Initial review completed: November 29, 2002; Revision accepted: August 4, 2003.

This study was conducted to assess the variability of clinical expression of Lysosomal storage disorders (LSDs) and the selection of specific enzyme investigation to reach the differential diagnosis. Initially 150 children in the age range of 15 days to 13 years were screened for common metabolic disorder and based on screening results, clinical signs and symptoms, 30 children (4 mo-12 yr) of these were selected for the leukocyte enzyme study. Of these 21 were confirmed to have LSDs. The most common disorder was GM2-gangliosidosis (47.61%, 10/21) followed by mucopolysaccharidosis (33.33%; 7/21). All showed variable phenotypic expression. Metachromatic leukodystrophy (MLD) was observed in 9.5% (2/21) of children with arylsulphatase A enzyme deficiency, while two children had shown pseudodeficiency of arylsulphatase A. One case each of galactosialidosis and GM1-gangliosidosis were observed. We conclude that children with developmental delay, seizures, dysmorphic features and organomegaly, with or without positive urinary screening for common metabolic disorders, need to be investigated further for LSDs. Variability of clinical expression is commonly observed in LSDs which require further confirmation by specific leukocyte enzyme study.

Key words: *Lysosomal storage disorders (LSDs), Lysosomal enzyme, Metachromatic leukodystrophy (MLD), GM2-gangliosidosis.*

Lysosomal storage disorders (LSDs) are a group of genetic diseases characterized by an inherited defect in the functional expression of any of the lysosomal enzyme(1). The resultant accumulation of substrates of lysosomal enzymes inside the cell as well as in the blood stream causes a loss of function in one or several crucial areas of the body and the clinical features are very much dependent upon the rate and magnitude of accumulation of the undegraded substances. Therefore, a wide spectrum of phenotypic expression is observed in children with LSDs(2). These disorders are progressive and most affected