

Risk Correlates of Diarrhea in Children Under 5 Years of Age in Slums of Bankura, West Bengal

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ABSTRACT

Background: Diarrheal diseases are an important cause of mortality and morbidity globally in children under 5 years of age. **Objective:** To find the prevalence and risk factors of diarrhea among children under 5 years. **Materials and Methods:** A population-based analytical cross-sectional study was conducted in the urban slums of Bankura, West Bengal on the prevalence of diarrhea and feeding practices, nutrition, and immunization among 152 children under 5 years (69 males and 83 females). **Results:** Overall prevalence of diarrhea was 22.36%; 21.73% males and 22.89% females were affected with diarrhea. There were 57.69% diarrhea cases in children of 7-12 months age group, followed by 25.71% in those of 13-24 months age group; with increasing age, the prevalence of diarrhea gradually decreased. Diarrhea was noted to be 20.33% in exclusively breastfed children and 31.57% in children who were breastfed for less than 6 months. In bottle-fed children, the frequency of diarrhea was 26.08%. The prevalence of diarrhea was 21.83% in completely immunized children and 30% in partially immunized children. Risk of diarrhea was 19.80% in normal participants and 27.45% in undernourished children. **Conclusion:** The present study identified a high prevalence of diarrhea in children under the age of 5 years. Findings of the study also revealed the demographic features, feeding practices, immunization practices, and nutritional status as risk factors of diarrhea, which can be tackled by effective education of the community.

Key words: Diarrhea, Exclusive breastfeeding, Immunization, Nutrition, Children under 5 years

INTRODUCTION

Diarrhea is one of the most important causes of death in the world. Globally, more than 10 million children die each year, of which about 1.5 million die from diarrhea.^[1,2] Diarrheal diseases are the leading causes of mortality and morbidity in children under the age of 5 years in developing countries and definitely threaten the attainment of Millennium Development Goal 4.^[3] Worldwide, acute diarrhea causes 16% of deaths in children under 5 years. Most of these deaths occur in low- and middle-income countries; these deaths are avoidable by the existing interventions.^[4] Using data obtained from the third round of National Family Health Survey (NFHS) conducted in

2005-2006, we analyzed information on 2687 children under 5 years of age who were living in urban slums located in eight selected Indian cities. The results revealed that about 8.3% of slum children under 5 years of age suffered from diarrhea during 2 weeks preceding the survey. About 14.6% infants suffered from diarrhea, compared to 12% among those aged 12-23 months.^[5] The factors related to higher prevalence of diarrhea are lack of education of mother, lack of exclusive breastfeeding, breastfeeding for less than 1 year, roundworm infestation, nutritional status, immunization status, night blindness, female sex, literacy, personal hygiene, overcrowding, garbage disposal, source of water supply, and toilet facility.^[6-8]

Population in the urban slums is a heterogeneous conglomerate of all castes, creed, and religions with a diversified lifestyle. In addition, the risk factors for childhood diarrhea are also related to the feeding practices

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and nutritional and immunization status. With this background, the study was undertaken in the urban slums of Bankura in West Bengal to elicit the prevalence and risk factors of diarrhea among children under 5 years of age.

MATERIALS AND METHODS

A population-based analytical cross-sectional study was undertaken in the urban slums of Bankura for 1 month in children under 5 years of age. Ward no. 15 (of Lokepur) of Bankura Municipality was randomly selected for the study, with four slums in the mentioned ward from the list of slums under Bankura Municipality. Two slums (50%) were selected randomly, namely Bakultala and Kadampara slums. Total enumeration of children under 5 years of age was conducted, and thus, a sample size of 152 was obtained.

The data collection tool was an interview schedule that was developed at the institute with assistance from the faculty members and other experts of Department of Community Medicine, Bankura Sammilani Medical College. Detailed information regarding socio-demographic characteristics, socio-economic status (SES), and health parameters was collected from each participant using this structured schedule. Initial translation, back-translation, and re-translation followed by a pilot study were conducted on mothers of 20 children under 5 years of age born in slums other than the selected slums and living in the study area to check the comprehensibility and acceptability of the questionnaire.

Inclusion criteria

Children under the age of 5 years residing in the selected study area (Bakultala and Kadampara slums)

Exclusion criteria

The cases with persistent diarrhea for more than 2 weeks duration and non-consenting caregivers were excluded from the study.

Data collection

Necessary approval was obtained from the institutional ethical committee. Cooperation from the Anganwadi workers was sought for recruiting the study participants. The respondents were the caregivers of the children. So, all the caregivers were explained the purpose of the study and were ensured strict confidentiality. Written informed consents were taken from the respective caregiver prior to the study. They were given the option of not to participate in the data collection of the study if they wanted.

The principal investigator collected the data using the interview technique by conducting house-to-house visits in the households of the selected slums. Children below 5 years of age were surveyed, with an average of 7-8 children per day, till 152 children were covered. Then the pre-designed, pre-tested, semi-structured questionnaire was used to collect the data regarding socio-demographic, economic, feeding practices, and morbidity of infant and children. Socio-economic status of the family of the family was determined by modified Kuppuswamy scale, according to price index 2012.^[9]

All efforts were made to collect the correct age of the child on the basis of information from the caregivers, age of other siblings, birth certificate, immunization cards/mother and child protection card, other available medical records, etc. The nutritional status was assessed and graded on the basis of expected weight for age by plotting in the growth chart as classified by the Indian Academy of Pediatrics. The weight of the children was measured with a standardized weighing scale (bathroom scale) with minimal clothes and barefoot. When the child was unable to stand, the weight of the child with the caregiver was taken and then the weight of the caregiver was deducted to get the weight to the nearest 500 g.

Operational definitions

Diarrhea

Any of the selected children having acute diarrhea at the time of interview or have had acute diarrhea in the preceding 2 weeks was taken as a case of acute diarrhea for this study.^[7]

Immunization status

Immunization status of the participants was obtained from their immunization cards and for the evaluation of immunization status, the criterion described by Narain was followed.^[10] Completely immunized children were those who received three doses of DPT, three doses of oral polio vaccine (OPV), and three doses of hepatitis vaccine administered between 6 weeks and 9 months at an interval of 4 weeks, plus one dose of BCG plus one dose of measles within 1 year of life. Partially immunized children were those who received one or more doses of the primary doses of the National Immunization Schedule.

Feeding practices

Exclusively breastfed children were those who received only breast milk from birth to 6 months of age, while bottle fed children received cow's milk or other animal's milk or reconstituted infant milk formula from birth onward.

Nutritional status

The nutritional status was assessed and the grade of malnutrition was calculated on the basis of expected weight for age by plotting in the growth chart as classified by the Indian Academy of Pediatrics,^[11] i.e. 80-100% normal, 71-80% Grade I, 61-70% Grade II, 51-60% Grade III, and less than 50% Grade IV.

The principal investigator personally contacted the health care providers, Anganwadi workers in the respective ward, and appraised the findings of the research with remedial measures. The study findings were also shared with the caregivers of the study participants by the principal investigator. As morbidity due to diarrhea in the study population was high, emphasis was given for utilization of locally available services like timely vaccination and regular growth monitoring in the Anganwadi centers, as well as early initiation of breastfeeding and exclusive breastfeeding for 6 months for prevention of diarrhea in children of under 5 years of age. The concept of Baby-friendly Hospital Initiative was discussed in connection with childhood diarrhea.

Statistical analysis

The collected data were entered into MS-Excel spreadsheets for analysis. The statistical analyses were done using GraphPad InStat3 software. Percentages and Chi-square tests were used in this study to analyze epidemiological variables.

RESULTS

The study population consisted of children in the age group of less than 5 years from a heterogeneous group in terms of caste, occupation, and income. Totally 45.39% male and 54.61% female children under 5 years participated in the present study. Majority (26.97%) of the study participants were in the age group of less than 1 year and the prevalence of diarrhea was highest in the age group of 7-12 months (57.69%) followed by 13-24 months (25.71%). The overall

prevalence of diarrhea was found to be 22.36%. Females were more affected with diarrhea (22.89%) than males (21.73%) in the study population. As the children grew older, the prevalence of diarrhea gradually decreased [Table 1].

Children belonging to scheduled castes and scheduled tribes formed 97.37% in our study. Highest number of the families belonged to upper-lower socio-economic class according to modified Kuppaswamy scale. Diarrhea was seen in 20.33% of exclusively breastfed children and in 31.57% of children who were breastfed for less than 6 months. Again in bottle-fed children, prevalence of diarrhea was 26.08%, compared to 21.70% in non-bottle-fed children. Diarrhea prevalence was 21.83% among completely immunized children and 30.00% among partially immunized children. Children with completed primary immunization status were compared with partially immunized children in determining the risk for diarrhea in relation to immunization status. In the present study, the risk of diarrhea was 19.80% in normal children and 27.45% in undernourished children [Table 2].

DISCUSSION

The present study has identified a high prevalence of diarrhea among children under 5 years and pointed out various socio-demographic, immunization, and nutritional risk factors. The overall prevalence of diarrhea was found to be 22.36%. In our study, children of the age group 7-12 months were mostly affected with diarrhea. As the children grew older, the prevalence of diarrhea gradually decreased.

A study conducted in South India reported the prevalence of diarrhea to be 22.5% which once again reinforces the fact that acute diarrhea in children is an important health priority and that every effort has to be taken to control and prevent acute diarrhea and its sequelae. There are few studies done on the prevalence of acute diarrhea in children under 5 years in different parts of India and outside India.^[7] A study done in Bhopal by Tiwari *et al.* has reported the

Table 1: Distribution of diarrhea among the study participants

Age in months	Male			Female			Total n (%)	Overall diarrhea (%)
	Diarrhea present n (%)	Diarrhea absent n (%)	Total (%)	Diarrhea present n (%)	Diarrhea absent n (%)	Total n (%)		
0-6	1 (14.28)	6 (85.72)	7 (10.14)	2 (25.00)	6 (75.00)	8 (9.64)	15 (9.86)	3 (20.00)
7-12	6 (54.54)	5 (45.46)	11 (15.94)	9 (60.00)	6 (40.00)	15 (18.08)	26 (17.11)	15 (57.69)
13-24	4 (26.66)	11 (73.34)	15 (21.74)	5 (25.000)	15 (75.00)	20 (24.09)	35 (23.03)	9(25.71)
25-36	2 (28.57)	5 (71.43)	7 (10.15)	1 (11.11)	8 (88.89)	9 (10.85)	16 (10.52)	3 (18.75)
37-48	1 (5.55)	17 (94.45)	18 (26.08)	1 (4.76)	20 (95.24)	21 (25.30)	39 (25.66)	2 (5.12)
49-59	1 (9.09)	10 (90.91)	11 (15.95)	1 (10.00)	9 (90.000)	10 (12.04)	21 (13.82)	2 (9.52)
Total	15 (21.73)	54 (78.27)	69 (100)	19 (22.89)	64 (77.11)	83 (100)	152 (100)	34 (22.36)

Table 2: Correlates of diarrhea among the study participants

Correlates	Diarrhea present n (%)	Diarrhea absent n (%)	Total	Statistical analysis	
				Odds ratio	Chi-square test
Breastfeeding (n = 137)					
Less than 6 months	6 (31.57)	13 (68.43)	19	1.8	$\chi^2 = 0.64$, df = 1, P = 0.4237
For 6 months	24 (20.33)	94 (79.67)	118		
Bottle feeding (n = 152)					
Yes	6 (26.08)	17 (73.9)	23	1.27	$\chi^2 = 0.04$, df = 1, P = 0.8415
No	28 (21.70)	101 (78.30)	129		
Immunization status (n = 152)					
Partially immunized	3 (30.0)	7 (70.0)	10	1.53	$\chi^2 = 0.04$, df = 1, P = 0.8415
Completely immunized	31 (21.83)	111 (78.17)	142		
Nutritional status (weight for age) (n = 152)					
Underweight	14 (27.45)	37 (72.55)	51	1.53	$\chi^2 = 0.74$, df = 1, P = 0.3897
Normal	20 (19.80)	81 (80.20)	101		

prevalence of acute diarrhea among children under 5 years as 27.4%, which is little higher than that found in the present study.^[12] Ansari *et al.* have reported the prevalence as 16% in their study done in Aligarh of Uttar Pradesh. The study by Ansari *et al.* relates to the patients attending the clinics under Rome scheme, which may not be representative of the population.^[13] A study done in East Africa by Mtiye has reported the prevalence of diarrhea to be 18% among children in both rural and urban populations.^[14] The study done in South India has shown a very high prevalence of acute diarrhea (40.7%) in the age group 7-12 months compared to other age groups and the difference is also statistically significant. This may be because at this age, weaning foods are introduced and the child is also exposed more to the environmental condition as it starts crawling and walking. The next vulnerable age group was found to be 13-24 months (32.1%). The prevalence of diarrhea was found to be only 17% in the age group 0-6 months, which probably reflects the protection offered by breastfeeding.^[7] A study conducted at Saudi Arabia revealed that the overall incidence of diarrhea was 9.9%. The highest incidence of reported episodes (23.3%) was seen in infants aged 7-12 months, followed by 8.4% in less than 7 months, while the lowest incidence (3.8%) was in the 1-5 years age group.^[15] This calls for intensive health education of parents and proper immunization of the child.^[16] A study conducted at Iraq showed that the prevalence of diarrhea was 21.3%. Compared to children aged 48-59 months, children in the age groups 6-11 months and 12-23 months were 2.22 and 1.84 times, respectively, more likely to have diarrhea.^[17] A study conducted in Pakistan revealed that the prevalence of diarrhea was 51%.^[6] A study conducted at Ethiopia revealed the prevalence of diarrhea to be 22.45%. The study showed that diarrhea was significantly associated with children in the age groups 6-11 months and 12-23 months, compared to children aged above 35 months.^[18] This finding is in agreement with other studies.^[19-20] The peak prevalence

of diarrhea at the age of 6-11 months can be attributed to the introduction of contaminated weaning foods.^[21] In addition, crawling starts at this age and the risk of ingesting contaminated materials may cause diarrhea. The risk of diarrhea decreases subsequently after 6-11 months; this is probably because the children begin to develop immunity to pathogens after repeated exposure.^[22]

In all the NFHS [NFH-1 (1992), NFHS-2 (1998-1999), and NFHS-3 (2005-2006)], the prevalence of diarrhea was calculated as the percentage of children who had diarrhea at the time of interview or during the preceding 2 weeks, as done in this study. NFHS-1 had reported the prevalence of diarrhea in children under 4 years of age, NFHS-2 had reported it in children under 3 years of age, and NFHS-3 had reported the prevalence in children under 5 years of age. Prevalence was 16.3% in the age group of 6-11 months and 12.8% in 12-23 months age group in NFHS-1; similar findings were observed in the other surveys (9.9 and 9.3%, respectively, in NFHS-2; 10.4 and 9.9%, respectively, in NFHS-3).^[23-25]

Gender

Among the participants in our study, females were more affected with diarrhea (22.89%) than males (21.73%). Similar pattern was reported in the South Indian study; though female children had slightly higher prevalence of acute diarrhea (23.8%) than males (21.4%), the difference was not statistically significant.^[7] In the study conducted at Saudi Arabia, the incidence in males was 6.8%, but in females, it was almost twice as much (13.3%). This might point to a possible cultural influence in this region by which the nutrition of female children is neglected, restricting their access to health.^[15] The prevalence of diarrhea was marginally higher among girls than boys (53% vs 49%, respectively).^[6] No gender difference in the prevalence of

diarrhea was observed in NFHS-1, NFHS-2, and NFHS-3.^[23-25]

Excusive breastfeeding and bottle feeding

In the present study, diarrhea was found in 20.33% of the exclusively breastfed children and 31.57% of children who were breastfed for less than 6 months. Again in bottle-fed children, the incidence of diarrhea was 26.08%, compared to 21.70% in breastfed children. About one-third of the cases (36.1%) were bottle fed, while 12.7% were breastfed.^[15] Terminating breastfeeding at 6 months increases the probability of occurrence of diarrhea and Acute respiratory infection by 19% and 25%, respectively, compared to counterparts who breastfeed longer than 6 months.^[3] It has long been established that bottle-fed children are at great risk of diarrhea than those who are breastfed, due to milk contamination. Even though it was not statistically significant in the multivariate analysis, the odds of bottle-fed children having diarrhea was approximately one and a half times greater than for children who were not bottle fed. Bottle feeding was significantly related with higher diarrheal morbidity in bivariate analysis.^[26] Similar findings were reported from India and Ethiopia.^[27]

It was found that mixed-fed infants aged between 0 and 11 months tend to have a higher risk of diarrhea than fully breastfed children, while the risk of diarrhea among weaned infants is twice that of mixed-fed infants. In essence, the health risks of mixed feeding are real, particularly for infants aged less than 7 months, and are even worse for those weaned before 6 months of age.^[28] To address this question, a historical cohort study of the associations between feeding modes and diarrhea incidence and severity in children aged 0-14 months at baseline was done in Al Ain city, United Arab Emirates. In this city located in a newly developed country, modern water supply and sanitation facilities have become available to everyone during the last two decades. During 3 months of follow-up of 249 children, the non-breastfed children had more diarrhea than the partly breastfed children.^[29]

A case-control study in Brazil has shown that young infants who are not breastfed have 25 times greater risk of dying of diarrhea than those who are exclusively breastfed. A longitudinal study in the urban slums of Lima, Peru found that exclusively breastfed infants have a reduced risk of diarrheal morbidity when compared with infants receiving only water in addition to breast milk.^[30]

Complete immunization status (in participants above 12 months)

Partially immunized children were found to be at an increased risk for diarrhea in our study. The prevalence of diarrhea was 21.83% among completely immunized children and 30.00% in the partially immunized group, which was statistically not significant. Partially immunized children had higher risk for diarrhea [odds ratio (OR) 4.6] compared to fully immunized children.^[7] This is obviously due to the protective effect of immunization, especially with reference to measles immunization.^[31] The percentage of fully immunized children in the study population was 88.9%. Improving immunization coverage will help to reduce the burden of illnesses due to diarrhea in children.

Nutritional status (weight for age)

Our study reflected that undernourished children had 27.45% risk of diarrhea, as compared to 19.80% in normal participants. The undernourished children had 14.4 times higher risk for acute diarrhea than normal children. This is in conformity with the statement made by the International Center for Diarrheal Disease Research in Bangladesh that diarrhea is common among malnourished children. The prevalence of undernutrition in the above study population was 23.1%. It is very important to prevent undernutrition by proper implementation of the various nutritional supplementation programs for reducing the problem of diarrhea in children.^[7] The poor nutritional status of a child is a major risk factor of mortality. A study in Dhaka, Bangladesh identified the risk factors of mortality among children with diarrhea who were severely malnourished and hospitalized. In this study, hypothermia, clinical septicemia, and bronchopneumonia were identified as the major risk factors of mortality among the severely malnourished children with diarrhea.^[32]

Strengths of the study

Diarrhea is still a public health problem killing millions of our future citizens. The study would be an eye-opener for further research in this part of country with resource-poor health care settings. The risk factors identified for diarrhea would help the planners and program managers of our state of West Bengal and neighboring states to select and plan approaches in curbing the menace in Northeastern states.

Limitations of the study

The study was undertaken in the urban slums of Bankura city. Due to diversity of slum population in different parts

of India and also the living conditions, the findings cannot be generalized. Further, it could have been better if other related risk variables like type of family, housing conditions such as ventilation, overcrowding, parental current smoking habit, location of kitchen, fuel used for cooking, as well as literacy status of parents could be included in the study. Apart from that, manpower, money, and time also an important consideration.

Future directions of the study

There is a need to carry out extensive multicentric studies involving both rural and urban areas to identify all the risk factors precipitating diarrhea, so that preventive program becomes more successful in India. Not only the array of socio-demographic, socio-economic, and environmental factors along with the health-seeking behavior, but also other physiological and behavioral risk factors need to be explored for effective control of diarrhea in under-five segment of the population.

CONCLUSION

The present study identified a high prevalence of diarrhea among children under 5 years. It also pointed out various socio-demographic, nutritional, and environmental modifiable risk factors which can be tackled by effective education of the community.

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