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Original Research Article

Risk Factors of Diarrhea in Children Under Five Years in Urban Slums: An Epidemiological Study

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ABSTRACT:

Introduction: Diarrhea is a leading cause of mortality in children in developing countries and the condition is worse in slums. In order to provide effective preventive and management strategies, it is important to identify factors associated with the disease. This study was carried out to investigate the risk factors of diarrhea in children under five years of age in urban slums. **Methods**: Parents of all children under five years from the urban slums of Tansen municipality, Palpa, Nepal were interviewed using a standardized pretested questionnaire and proforma. Parental variables, environmental factors, and presence of diarrhea in those children in past three months were collected by trained enumerators and the data were analyzed with statistical software SPSS-10. **Results**: A total of 450 under five years children were enrolled in the study. There were 216 (48%) male and 234 (52%) female children with F:M ratio of 1.08:1. Occurrence of diarrhea was lower if the children were breast-fed for more than six months, well-nourished, used fountain water for drinking, or used boiled or treated water. Similarly, diarrhea prevalence was lower if father had a regular job, daily income in the family was more than one US dollar, there was a toilet in the house, practice of hand washing was followed before feeding or preparing food, or there was no child suffering from diarrhea in the neighborhood. **Conclusion**: There are a few variables that are significantly related to diarrhea in children under five years of age. In order to decrease the diarrheal episodes in children in the slums of the developing countries, priority could be given in the improvement of those variables.

Keywords: child • diarrhea • risk factors • slums

INTRODUCTION:

Diarrhea is defined as more than three 'loose than usual' stools in 24 hrs.[1] Globally there have been 3-5 billion of cases and two million of deaths due to diarrheal diseases annually. Diarrhea is a leading cause of mortality in children under five in developing countries and the condition is worse in slums.[2] Multiple studies have identified various risk factors of diarrhea ie., younger age, male gender, early weaning, seasonal patterns, low maternal education, lack of piped water supply, poor water-storage practices, poor sanitation, younger maternal age, unsatisfactory garbage disposal, lack of hand washing with soap by caregiver, visible feces in the yard, indiscriminate disposal of child feces, inadequate boiling of water, using water from cistern trucks, and not treating water in the home.[3-9]

Diarrhea continues to be a major cause of childhood morbidity (13 per 1000 per year) and mortality (5 per 1000 per year) in children under five years and the burden is more in children aged 6-24 months in Nepal. There are 12-14% of children under five years suffering from diarrhea in a seasonal variation (April-August), 2% of them have blood in stool and 5/1000 dies due to diarrhea annually.[10]

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Literature shows that health status of urban slums of south East Asian region is worse than the national average. So, the mortality and morbidity caused by diarrhea is higher in slums.[11] It is important to gain overview of factors associated with the disease in order to prevent as well as manage it in effective manner. Thus, this research contributes in presenting the risk factors for diarrhea in children under five years of age.

METHODS:

This epidemiological study was conducted over a period of three months (1st April 2013 to 30th June 2013) in 24 urban slums of Tansen Multiplicity, Palpa, Nepal. The study was approved by the respective division of office of the Tansen municipality and institutional review committee of Lumbini medical college (IRC-LMC). All children, less than five years of age, living in the slums of Tansen Municipality were included in the study. Children with chronic illness like tuberculosis and HIV were excluded.

Diarrhea was the only dependent variable of the study. The independent variables include parental variables such as occupation, income, and education. Children variables incude age, sex, protein energy malnutrition, immunization status, breast feeding status, and period of exclusive breast feeding of the children. Environmental factors such as source of water, water treatment or boiling before drinking, practice of hand washing, presence of toilet at home, and history of diarrhea in the neighbor child were also studied. Nutritional status of the children were assessed according to WHO/NCHS recommendation by calculating the Z score, where a score of less than -2 SDs indicates malnutrition and between 2 to 3 indicates overweight.[12]

A standard pretested questionnaire and proforma was developed in local language (Nepali). Pretesting was done by a panel of expert in the field and modifications were done until the panel was satisfied. Enumerators visited every household of the slums with the questionnaire, collected data from the parents of the children, and entered those information in the proforma.

Data were entered into Microsoft Excel 2007 and statistical analysis was done with SPSS-10. Univariate analysis was done between the occurrence of diarrhea and other variables. Frequency and percentage were used for descriptive data whereas Chi-square and Fisher exact test were applied to see the relation between the categorical variables. *P* value < 0.05 was considered significant.

RESULTS:

A total of 450 children were enrolled in the study and among them 181 (40.2%) were found to have more than three episodes of diarrhea during the household visit or had history of diarrhea in last three months. Socio-demographic details of those children and family along with their frequency and percentages are given in Table 1.

The occurrences of diarrhea was lower among children who were breast-fed for more than six months (p=0.001), well-nourished (p=0.001), used fountain water compared to tap water for drinking (p=0.001), or used boiled or treated water (p=0.001). Similarly, the prevalence was lower if father had a regular job (p=0.04), income of the parents was more than one US dollar per day (p=0.01), there was a toilet in the house (p=0.001), practice of hand washing was followed before feeding or preparing food (p=0.001), or there was no child suffering from diarrhea in the neighborhood (p=0.001) (Table 1).

There was no significant association of diarrhea with gender of child, age-group, immunization status, bottle feeding, colostrum feeding, use of prelacteals, and education of parents (Table 1).

DISCUSSION:

The occurrences of diarrhea in the slums of Tansen was high at 40 percent. Different children, parental, and environmental factors were positively associated with the occurrence of diarrhea among the children under five years. Diarrhea prevalence was much higher among those children who were exclusively breast fed for less than six months and had malnutrition. Many environmental factors were also important. Having a toilet in house, using fountain water, treating water, practicing hand washing before feeding as well has not having diarrheal disease in the neighborhood had positive relation with less diarrhea. Father's having regular income and family having income of more than one US dollar per day were negatively associated with diarrhea. A study conducted by Bhatnagar et al. pointed out that untreated drinking water, unsafe feces disposal, malnutrition, lack of exclusive breast feeding, and low income of the family were risk factors for diarrhea.[13]

Overall 14% of the children under five had

Table: 1 *Demographic characteristics of the independent variables*

Variables		Diarrhoea (*N*=450)		
		Yes (n=181) n (%)	No (n=269) n (%)	*Statistics*
Gender of children	Male	86 (39.8)	130 (60.2)	X^2=0.3
	Female	95 (40.6)	139 (59.4)	*p*=0.87
Age of the children	< 2 years	68 (43.5)	88 (56.5)	X^2=1.1
	>2 years	113 (38.4)	181 (61.6)	*P*=0.29
Immunization status	Complete	170 (39.5)	260 (60.5)	X^2=1.9
	Partial	11 (55)	9 (45)	*P*=0.17
Ever breast fed	Yes	180 (40.5)	264 (59.5)	*P*=0.4
	No	1 (16.6)	5 (83.4)	*FET*
Ever bottle feed	Yes	71(40.8)	103 (59.2)	X^2=0.04
	No	110 (39.8)	166 (60.2)	*P*=0.8
Fed colostrums	Yes	173(40.4)	257 (59.6)	X^2=0
	No	8 (42.8)	12 (57.2)	*P*=0.98
Prelacteal feeding	Yes	19 (44.7)	25 (55.3)	X^2=0.18
	No	162 (40.1)	244 (59.9)	*P*=0.67
Exclusive breast feeding	<6months	174(55.4)	140 (44.6)	X^2=99.7
	>6months	7 (4.6)	129 (95.4)	*P*=0.001
Malnutrition	Yes	126 (78)	34 (22)	X^2=99.7
	No	55 (19)	235 (81)	*P*=0.001
Education of Father	≤ XII grade	167 (41)	239 (59)	X^2=1.4
	> XII grade	14 (31)	30 (69)	*P*=0.23
Education of Mother	≤ XII grade	170 (40)	252 (60)	X^2=0.01
	> XII grade	11 (39)	17 (61)	*P*=0.9
Father's job	Regular	46 (33)	92 (67)	X^2=3.9
	Irregular	135 (43)	177 (57)	*P*=0.047
Mother's job	Regular	36 (47)	42 (54)	X^2=1.38
	Irregular	145 (38)	227 (62)	*P*=0.24
Daily income	≤1 US $	137 (42.2)	173 (55.8)	X^2=6.5
	>1 US $	44 (31.4)	96 (68.6)	*P*=0.01
Source of water	Tap	110 (48)	119 (52)	X^2=11.6
	Fountain	71 (32.2)	149 (67.8)	*P*=0.001
Water treatment	Yes	20 (16.5)	108 (83.5)	X^2=45
	No	161 (50)	161 (50)	*P*=0.001
Toilet at home?	Yes	149 (37.6)	248 (62.4)	X^2=10.2
	No	32 (59.6)	21(40.4)	*P*=0.001
Hand washing before feeding and preparing food	Yes	103 (32.7)	212 (67.3)	X^2=24.7
	No	78 (57)	57 (43)	*P*=0.001
Diarrheal child in neighbourhood	Yes	22 (78)	6 (22)	X^2=18.3
	No	159 (37.6)	263 (62.4)	*P*=0.001

diarrhea in the two weeks preceding the survey in the national Demography and Health Survey 2011.[10] However, we assessed prevalence of diarrhea within past three months and the data was collected in rainy season, which explains this high difference with the national prevalence. Also, studies from other slums have reported that diarrhea is common especially among young children.[13-15]

Not surprisingly, our study showed the higher prevalence of diarrhea among those who had exclusive breast feeding for less than six months. Similar finding was demonstrated in a study from urban slums of Dhaka. Compared with exclusive breastfeeding in the first few months of life, partial or no breastfeeding was associated with a 4-fold increase in diarrheal death.[16] Another study from India reported the protective effect of exclusive breast feeding for six months too.[17] Our study showed a very high prevalence of diarrhea among malnourished children compared to well-nourished ones. Diarrhea has been an established cause as well as effect of malnutrition. Diarrheal illnesses impair weight as well as height gains, with the greatest effects being seen with recurrent illnesses, which reduce the critical catch-up growth that otherwise occurs after diarrheal illnesses or severe malnutrition. Malnutrition leads to increased frequencies and durations of diarrheal illnesses, with a 37% increase in frequency and a 73% increase in duration accounting for a doubling of the diarrhea burden in malnourished children.[18]

Our study also corroborated the association of environmental factors with occurrence of diarrheal diseases. In this study, natural fountain water seemed safer than the municipal supplied water for drinking. Additionally, we found that treating or boiling water before drinking was associated with lower diarrheal prevalence. A Nigerian study by Yilgwan CS. et al. suggests that risk factors for diarrhea could be domestic source of water and domestic water treatment.[19] Contrast to our finding, piped water was found to be protective for diarrhea in a study from India.[20] However, it is possible that the quality of piped water in these two cities might be very different leading to these contrary findings. Another important finding from our study was association of diarrhea with not washing hands before feeding the child or preparing the food. In a study, Sabchareon et al. mentioned that the risk factors of diarrhea could be the socioeconomic status and poor hygienic status of mother.[21] Many other studies have successfully demonstrated the protective effect of hand washing on diarrhea.[22-24] In an another study by Gupta P. et al., malnutrition and poor hygienic practices were the common risk factor for diarrhea.[25] Having a toilet in the house was also negatively associated with diarrhea among children in our study. Similar to our findings, a study from a poor community of

Chile reported that providing private excreta disposal would be expected to reduce diarrhea by 42 percent, while eliminating excreta around the house would lead to a 30 percent reduction in diarrhea.[26] Similar to our findings, untreated water and improper or no hand washing practices could be a risk factor for diarrhea and is supported by another study conducted by Maponga BA. et al.[27] Improvement in sanitary condition is important to prevent diarrhea and thereby infant deaths in developing countries.

Our study revealed a significant association of the socio-economics status of household in terms of the father's regular income and family income of more than a dollar per day with lower diarrhea prevalence, which is supported by a study conducted by Masangwi SJ. et al. where he mentioned, the fathers job or poor income of a head of the household is also a risk factor for diarrhea.[28] In an another study, Mansur AM. et al. found that another member with diarrhea at home and no or faulty practices of hand washing also increases the diarrheal diseases.[29] In our study, instead of another diarrheal child in the same family, we had taken diarrheal child in the neighboring home.

In a study, Fuch S. et al. identified the environmental, maternal reproductive age, demographic, and health services factors as contributory factors for diarrhea.[30] These parameters were not included in our study but the other parameters like socioeconomic status and short duration of exclusive breast feeding were identified as risk factors for diarrhea in both the studies. Directly, this findings may not be similar to ours but it indicates that poor income of family have increased chance of diarrhea similar to our study.

Our study has several strengths. First, it addresses the issue of diarrhea in an urban slum area, which has been a neglected area of research as well as health services. This may be one of the first studies to explore childhood health problem in urban slums of western Nepal. Second, we were able to vigorously collect data on a range of parental, childhood, and environmental factors using trained data collectors. Furthermore, we explored the factors associated with diarrhea in an urban Nepali slum in addition to estimating a three month diarrheal prevalence in this area. However, our study also has some limitations. This is a cross-sectional study, hence we are limited in establishing a causal relationship because of our inability to establish temporality. Despite having multiple risk factors of diarrheal diseases, few of the factors could not be measured eg., food from the vendors and household hygienic status. We also did not conduct multivariate analysis so were not able to adjust for any confounding factors.

CONCLUSION:

We conclude from this study that occurrence of diarrhea was lower if the children were breast-fed for more than six months, well-nourished, used fountain water for drinking, or used boiled or treated water. Similarly, diarrhea prevalence was lower if father had a regular job, daily income in the family was more than one US dollar, there was a toilet in the house, practice of hand washing was followed before feeding or preparing food, or there was no child suffering from diarrhea in the neighborhood.

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