Diarrhoeal Diseases in the Slums of Khulna City: Prevalence and Cost Analysis

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Abstract

This study estimates the prevalence and cost of diarrhoeal among the slum dwellers of Khulna city in Bangladesh. Estimation of health production function and Logit model gave useful insight about the factors influencing the health of slum people and the probability of the people being affected by diarrhoeal. It exposed that the children under five years old and the house wives are more vulnerable to this diarrheal diseases. However the people who have substantial year of schooling are less vulnerable to this disease. Each episode of diarrhoeal costs huge for those low income families. Average suffering days are 4 and it costs BDT 445 per day in each episode which is more than their per day income. Sharing of toilet and water sources implies significant positive relation with diarrhoeal prevalence. Consciousness and development in behavioral attitude can reduce the risk of diarrhoeal diseases.

Keywords: Diarrhoeal, Prevalence, Cost, Slum

Introduction

Diarrheal disease continues to be a major cause of childhood mortality and morbidity in developing countries. It is reported that in every year 1.8 million children less than 5 years of age die due to diarrhoeal. Most of these deaths are occurring in Africa and Southeast Asia (Ward, 2009). Southeast Asian countries, including Bangladesh, are experiencing the highest mortality rate among children with diarrhea. Global estimation shows that deaths due to diarrhoeal have declined from 4.6 million in the 1980s (Snyder & Merson, 1982) and 3.3 million in the 1990s (Bern et al., 1992) to 2.5 million by the year 2000 (Kosek, Bern, & Guerrant, 2003). Much of the decline is possibly due to improvements in the treatment and management of diarrhoeal disease and rapid increase in use of oral rehydration therapy (ORT) in the developing countries (WHO, 2004).

Diarrhoeal is usually attributed to ingestion of water or foods contaminated with faucal-coli forms or other pathogens, or faucal-oral contamination. Unsafe water supply, inadequate sanitation facilities and lack of awareness on personal hygiene cause 88% of diarrhoeal attacks (WHO, 2004). Diarrhoeal is almost preventable with hygiene interventions that reduce contamination of hands, food and water as well as the better management of water and sanitation facilities (Fewtrell et al., 2005). Alberini, Eskeland, Krupnick, & Mcgranahan (1996) uses the terms behavioral and engineering to categorize factors linked with the incidence and severity of diarrhoeal. The engineering factors refer mainly to clean water sources and sanitation services (Checkley et al., 2004). Behavioral factors focus on household behaviors and hygiene practices such as use of soap, hand washing practices by mother and children before meals and after defecation, the use of a lid while carrying and storing water and boiling/treating water (Alberini et al., 1996; Han & Hliang, 1989; Knight et

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al., 1992). All these factors lead to changes in the exposure to risks associated with diarrhoeal.

As Bangladesh is a river-reign country, flood is a common natural hazard. Although diarrhoeal diseases are prevalent throughout the year, epidemics of diarrhoeal diseases and cholera mainly occur twice a year – during the hot and humid summer months of April-May, and after the monsoon floods from July to September (Alam, 2009). From 30 July to 26 August of 2007 about 104,846 cases of diarrhoeal and 20 deaths were recorded in the flood affected areas of Bangladesh (WHO, 2007). During the same period, 19,190 diarrhoeal cases were admitted to the specialized hospital, International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) from flood affected areas across Dhaka (WHO, 2007). Flood-related diarrheal epidemics cause significant morbidity and mortality in Bangladesh and throughout the world.

In Bangladesh around 125,000 children less than five years old die each year from diarrhoeal, i.e. 342 children per day as per the PRSP report (Alam, 2007). During the year of 1984, the incidence rate of diarrhoeal was 3.8 episodes per child per year (Huttly et al., 1989). In the year 2010, about 269,687 children were attacked by diarrhoeal in 42 districts of Bangladesh who had the age range of 28 days to 5 years (MHFW, 2011). Khan (2010) refers that due to climate change the tendency and frequency of diarrhoeal in hot season is increased in Bangladesh. In August 2011, there were 3,396 patients admitted to ICDDR,B hospital within a week by attacking diarrhoeal due to poor access to safe drinking water, higher temperatures and power outage (Khan, 2009) where in the 3rd week of March, 2009 over 40 patients an hour were seeking admission at the same hospital in Dhaka city (BBC, 2009). Another study shows that the risk of child diarrhea increased by 25% after the flood than the normal wet season in Bangladesh (Konkel, 2011). In the year 1993-94, 814 children died due to diarrhoeal in Dhaka city (Albert et al, 1999).

In city areas a huge number of people live in the slums. Alam (2009) investigates that 50% of slum households reported diarrhoeal episodes during the recall period of 15 days, with an average duration of 3.76 days of diarrhoeal. Therefore, there is a high scope of prevalence of diarrhoeal in slums areas. In the slums of Dhaka, 27 % of all deaths are attributable to diarrhoeal (Hussain, 1999) and this dominance is also seen among the other cities such as Rajshahi, Chittagong and Khulna and so on. Hence it can be argue that the slum area of Khulna city is highly vulnerable to diarrhoeal and this study has been designed to detect the prevalence and cost extent of diarrhoeal diseases in the slums of Khulna city.

Considering the importance of health care for the slum dwelling people this study investigates the impact of different economic, social and behavioral factors on the health status of those slum dwelling people. Estimating the health production function at micro level, the study can offer significant background for determining the most efficient way of allocating available resources for improving the health status of the slum peoples. This study is also going to estimate the prevalence of diarrhoeal diseases among the slum people in Khulna city and the cost incurred by the household due to these diseases. Analyzing the degree to which every factor contributes to the improvement of the health status of the slum people the study could help the authorities in making decisions and designing more appropriate policies with greater impact.

Objective and Research Question

The main objective of this study is to estimate the prevalence and cost of diarrhoeal among the slum dwellers of Khulna city in Bangladesh. This study also aims to investigate the impact of different economic, social and behavioral factors on the health status of those slum dwelling people. To reach the ultimate objective this research seeks the answer of the following research questions.

Research question 1: How does the health status of the people being affected by the socio economic and behavioral factors from the context of diarrhoeal?
Research Question 2: How the risks of diarrhoeal diseases are associated with the socio economic and demographic factors?
Research Question 3: What amount has to bear (including opportunity cost) by a family for diarrhoeal diseases per episode?

Research Methodology

Study Area and Data Collection

This study considers different slums of Khulna city of Bangladesh as the study area. Khulna is the third largest city and 1.4 million people hurdle together in this vicinity. There are 132 slums in Khulna city. Among these 132 slums, 22 slums are large (no. of household > 60). This city stands on the bank of two big rivers *Rupsha* and *Voyrab* and most of the large slums are adjacent to these river banks. Hence the people of these slums are more vulnerable to water born diseases. This study conducts multi-stage random sampling technique to collect the necessary information. Firstly it has selected randomly 4 slums from 22 large slums and then from each slum 25 households have been selected randomly. For proper randomization every 10^{th} household has been considered as the 2^{nd} stage sampling unit for this study. Total 100 households have been taken as the 2^{nd} stage sampling unit. Finally all the house hold members of 100 households have been considered as the final sampling unit. Necessary information has been collected regarding 357 people of 100 households through structured questionnaire.
Secondary information has been collected from government and nongovernment organizations for example Bangladesh Bureau of Statistics, Ministry of Health and Family Welfare, International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B).

Model Specification

Estimation of Health Production Function

Grossman (1972) develops the theoretical model for the production function. He considers the social, economic, and environmental factors as inputs of the production system. Fayissa and Gutema (2005) estimate the health production function in macro level. They also consider the social, economic and environment are the basic inputs for health system. According to Nixon and Ulmann (2006), health represents an output that is determined by different inputs such as health care expenditure, or other medical resources. They also consider the health as a commodity and the people maximize its consumption with subject to budget constraint. Now based on the Grossman (1972) this study developed the following micro level health production function which has been modified from the context of diarrheal diseases.

$$h = \alpha_0 + \alpha_1 \ln F + \alpha_2 \ln M + \alpha_3 Hm + \alpha_4 Age + \alpha_5 Sex + \alpha_6 Edu + \alpha_7 Cd$$
$$+ \alpha_8 Ts + \alpha_9 Whde + \alpha_{10} Whm + \alpha_{11} Ust + e ----------(i)$$

Here *h* denotes how many days a household member suffered from diarrhoeal in the last three months (March'12 to May'12). Monthly food expenditure and medical expenditure have been represented by *F* and *M* respectively. *Hm* indicates household status where house rent is taken as proxy variable. Age, sex and education of the household members are also considered as the input variable for health production function. In equation (i) *Cd* represents the dummy variable for children under five years old. *Whde*, *Whm* and *Ust* are the dummy variables, which represent the behavior of washing hand with soap after defecation, before taking meal and using slipper in the toilet respectively.

Estimation of the Prevalence of Diarrhoeal

This study used the Logit Model (probability model) to detect the prevalence and affecting factors' status of diarrhoeal. Alam (2009) also considers this model to calculate the prevalence of childhood diarrhoeal in slums of Dhaka city. This model estimated the probability of household members to be affected by diarrhoeal diseases.

$$Y_i = \ln(\frac{p_i}{1-p_i}) = \beta_0 + \sum_{i=1}^{29} \beta_i X_i + u_i \text{ ----------(ii)}$$

Where, Y is the outcome variable which is attributed as dummy variable. It represents the incidence of diarrhoeal diseases to the household members. If the household member affected by this diseases within the reference period (3 months) then Y equals to 1 otherwise zero (0).

Here $(\frac{p_i}{1-p_i})$ is the odd ratio, P_i is occurrence of diarrhoeal in the last 4 months of any of the family members of the household, X_i stands for factors responsible for diarrhoeal diseases and β_i is the parameters to be estimated.

Variable Identification

To estimate the Logit model, Diarrhoeal occurrence within last three months (March'12 to May'12) was considered as dependent variable and others 29 variables were considered as independent/ explanatory variables. Table 1 reports the corresponding variables for estimating the prevalence of the diarrhoeal diseases in the slums of Khulna city.

Table 1: Description of Variables

Variables	Symbol	Measurement Unit
Diarrhoeal Occurrence	P_i	1= Yes, 0=No
Business	X_1	Yes =1, 0 = Otherwise
Industrial Worker	X_2	Yes =1, 0 = Otherwise
Maid	X_3	Yes=1, 0= Otherwise
Transport Worker	X_4	Yes=1, 0= Otherwise
Child (under 5 years)	X_5	Yes =1, 0 = Otherwise
Student	X_6	Yes =1, 0 = Otherwise
Housewife	X_7	Yes=1, 0= Otherwise
Day labor	X_8	Yes=1, 0=Otherwise
Sex	X_9	Male=1, 2= Female
Age	X_{10}	Year
Education	X_{11}	Primary=1, Above Primary=2
Having Dustbin	X_{12}	Yes=1, 0=Otherwise
Using Soap to Hand Wash	X_{13}	Yes=1, 0=Otherwise
Distance Water Source and Toilet	X_{14}	Meter
Toilet Sharing	X_{15}	Yes =1, 0 = Otherwise
Lid on Stored Water	X_{16}	Yes =1, 0 = Otherwise
Lid on Water Container	X_{17}	Yes =1, 0 = Otherwise
Age of Mother	X_{18}	Year
Mother's Education	X_{19}	Yes =1, 0 = Otherwise
Number of Children	X_{20}	Number
Participation in Awareness Program	X_{21}	Yes =1, 0 = Otherwise
Hours Spend to look after Children	X_{22}	Hour
Mother Engaged in Cooking	X_{23}	Yes =1, 0 = Otherwise
Distance of the Source of Drinking water	X_{24}	Meter
Sharing Household in Water	X_{25}	Number
Sufficiency of Drinking water	X_{26}	Yes =1, 0 = Otherwise
Water Storage Facility	X_{27}	Yes =1, 0 = Otherwise
Cost of Water	X_{28}	Yes =1, 0 = Otherwise
Using Rain Water	X_{29}	Yes =1, 0 = Otherwise

Source: Authors' compilation based on field survey, 2012

Cost Estimation of Diarrhoeal Diseases

For sick days during diarrhoeal illness have no real implication in terms of loss of income but during the period of sick days the attending family members might lose income or leisure, which is included in the cost estimations. It is not possible however to directly estimate the value of the disutility due to sickness. Author classified the costs associated with diarrhoeal into treatment costs, averting costs in terms of actions taken to avoid sickness, and opportunity costs in terms of lost working days per episode.

Preventive Measure

To estimate the better preventive measure on the basis of respondents' opinion, this study used Likert scale. Here the six key issues have been considered as the preventive measures. For example i) improving sanitation system, ii) improving water facility, iii) improving hygiene in slum area iv) improving drainage system v) conducting awareness program vi) improving medication facility. These issues have been assigned rank ranging from 1 to 5 for instance, very urgent (5), urgent (4), moderate (3), necessary (2), and not necessary (1). The response of the respondent has been analyzed by using weighted average.

Result and Discussion

Demographic Feature of the Respondents

Most of the people in slums are living in *katcha* houses which are made from mud, bamboo and mangrove leaves. Sometimes a little number of *semi-pacca* houses is also seen in the slums. Among the sampled 100 household the author found only 5% households were living *semi-pacca* houses and rest of 95% households were living in *katcha* houses. The average size of the household is about 3.5 and 56% household have more than 3 household members which ranges from 4 to 6 members. The male female ratio in the study area is 5:6. Among the surveyed 357 people 17% is child (age less than 5 years). About 61% and 13% surveyed people have primary and secondary level of education respectively. So the socio economic status of the slum dwellers makes them more vulnerable to the risk of diarrhoeal and other diseases.

Sanitation Facilities

The sanitation system of the slum people is very poor. It is observed that 67% and 33% households were using sanitary latrine with ring-slab and open pit latrine respectively. Among the surveyed households 70% household share their latrine with other household. In different circumstances they need to share their latrine with 2 to 10 households. In some areas NGOs provided sanitary latrine but those are not adequate for the dwellers. Therefore, everyone has to share the latrine to others and none of them is interested to clean it. From the field survey it is found that 100% household gave the answer "no" in response to the question of keeping hygiene of the toilet. Though there is good water facility near the latrines, the condition of the sanitary latrine is too dirty to use.

Considering the hygiene issue it is discovered that, 38% households' family members do not wash at least one hand by soap after defecation whereas 62 % households do it. On the other side 64% households' members do not wash their hand perfectly before taking meal whereas 36% households do it. Another important issue is that 43% households' members use slipper in toilet and 57% households do not use it and this is a great threaten for diarrhoeal attack as well as other type of health hazards.

Income and Expenditure Pattern

Generally the people having relatively lower income lives in the slum area. The major occupations of these people are transport worker, day labor, small business holder, maid and

beggar. This study explores that the monthly household income of the household ranges from BDT 1000-15000 and the average monthly household income is about BDT 3114. From the field survey it is found that 28% and 64% household belongs to income range BDT 1000-3000, and BDT 3000-5000 respectively. Rest 8% household have the income above BDT 5000.

Conversely the major share of their monthly income goes to food consumption purpose and the second major head of expenditure is house rent. The other major heads of expenditures are medical, clothing, and education of the children. They have very little expenditure on entertainment and recreation.

Result of Health Production Function

The health production function defines that the achievement of good health is the function of different socio economic factors. Schultz (2004) argues that, an individual's demand for health, and an individual's health outcomes determined by various exogenous inputs. Age, nutritional status, diet, drugs, immunologic status, use of rehydration fluids, methods of water storage and hand feeding practices are the major factors affecting the duration of diarrhoeal episodes (Mirza et al., 1997). This study considers how many days an individual suffers from diarrhoeal in the three month (March'12 to May'12) study period. Table 2 represents the result of OLS estimation of the health production function.

Table 2: Model Specification for Health Production Function

Duration of Diarrhoeal in Last Three Months (March'12 to May'12)	Coef.	Std. Err.	P-value
Ln (food expenditure)	0.420	0.541	0.438
Ln (Medical Expenditure)	-0.038	0.096	0.692
Accommodation Status	-0.004**	0.002	0.019
Age	-0.045***	0.009	0.000
Sex	-0.062	0.244	0.799
Education	-0.227*	0.220	0.103
Child	2.710***	0.588	0.000
Number of Household Share the Same Toilet	-0.007	0.012	0.552
Washing Hand with Soap After Using Toilet	-0.368*	0.289	0.104
Washing Hand with Soap Before Taking Meal	-0.659**	0.277	0.018
Using Slipper in the Toilet	0.399	0.284	0.160
Constant	1.915	4.196	0.648
Model Summary			
Number of Observation			297
F(11, 285)			9.55
R-squared			0.2693

Source: Authors' estimation based on field survey 2012

Table 2 shows accommodation status, age and education level of the household member are negative and significant at 5%, 1% and 10% respectively. These results indicates if the slum people have the chance to live in a better quality house which costs little more than the present one then they have the chance to reduce the suffering days from diarrhoeal. Similarly with the increase of age and education level they can reduce their suffering days. The table also articulates that the coefficient for children is positive and significant at 1 % level. Hence if the patient is child then it suffers relatively longer days from diarrhoeal than adult people. Side by side the people who wash their hand by soap after using toilet and before taking male

they suffers relatively less number of days from diarrhoeal than the others who do not do it. This result supports WHO (2004) which argues that lack of awareness on personal hygiene caused 88% of diarrhoeal attacks. Hence it can be said that the duration of suffering from diarrhoeal mostly depends on the social and behavioral factors associated with the slum people.

Prevalence of Diarrhoeal

Analyzing the data it is found that among 357 family members from 100 households, 58% members were attacked by diarrhoeal within the study period (March'12 to May'12). By considering the age group of the patients the result showed that 45% patients were in the age group of 0-10 years, 6% were in 11-20 years, 21% were in the group of 21-30 years and rest of 28% patients were in above 30 years old and the highest age limit of the respondents was 70 years. Hence it is clear that the tendency of diarrhoeal attack is high to the children. Therefore, children are in the most vulnerable position of diarrhoeal prevalence. The duration period of diarrhoeal attacked was found in between 0-11 days per episode where the average stuffing's time period was 4 days and it implies that the patients suffer from diarrhoeal averagely 4 days per episode.

Table 3 reports the result of Logit model and corresponding marginal effect model. From the model it is found that occupational status of the respondent significantly related with the prevalence of the diarrhoeal diseases. Here the business, industrial worker, maid and transport worker, day labor all had a negative relation with diarrhoeal and different from zero at 5%, 1%, 5%, 1% and 1%, level respectively. Furthermore the housewives are relatively more vulnerable in the prevalence of diarrhoeal diseases. It is positive and significant at 1% level. Hence the probability is 0.45 to be affected by diarrhea being a housewife. Therefore based on the empirical result it can be claimed that, housewives were in high risk of diarrhoeal where other professions had the less risk.

Moreover Table 3 exposed that the extent of prevalence of diarrhoeal among the children under 5 years old are very high. There was a positive relationship between the child age under 5 years and diarrhoeal occurrence with 1% significant level. That means there was a very high affinity tendency in the age group less than 5 years. The probability of a child to be affected by diarrhoeal is 0.31. Another important finding was that diarrhoeal tendency was becoming higher with respect to increasing age of the children among this age group. Diarrhoeal occurrence had a negative relation with student (though statistically not significant) similarly the level of education of the respondent is negatively associated with the prevalence of diarrhoeal and it is different from zero at 5% level, which endorse that educated person are more cautious about their health and hygiene. Having one more years of schooling reduces the probability of being affected by diarrhoeal by 0.13. Toilet sharing and water sources sharing had the positive relation with 5% and 10% level of significant respectively that refers, the sharing of toilet and water source increases the risk of diarrhoeal. Having dust bean, use of soap in hand washing, distance of water source from toilet, number of children, participation of awareness program, engaged of mother in cooking had the negative insignificant relationship to diarrhoeal. Distance of source of drinking water had no relationship to diarrhoeal prevalence in the study area.

Table 3: Prevalence of Diarrhoeal in the Slums

Variables	Logit Model			Marginal effect model		
	Odds Ratio	Std. Err.	P>z	dy/dx	Std. Err.	P>z
Business	0.023***	0.028	0.002	-0.652**	0.074	0.000
Industrial Worker	0.047***	0.041	0.001	-0.611***	0.092	0.000
Maid	0.189**	0.143	0.028	-0.393**	0.164	0.016
Transport Worker	0.147***	0.110	0.010	-0.445***	0.152	0.003
Child (under 5 years)	7.219*	8.645	0.099	0.314***	0.107	0.003
Student	0.544	0.347	0.340	-0.140	0.152	0.358
Housewife	0.138**	0.113	0.016	0.457***	0.158	0.004
Day labor	0.101***	0.071	0.001	-0.517***	0.124	0.000
Sex	1.253	0.507	0.578	0.049	0.088	0.578
Age	0.979	0.019	0.275	-0.005	0.004	0.275
Education	0.541**	0.157	0.034	-0.134**	0.064	0.036
Having Dustbin	0.992	0.334	0.980	-0.002	0.073	0.980
Using Soap to Hand Wash	0.157	0.324	0.370	-0.431	0.393	0.272
Distance Water Collection Centre and Toilet	0.994	0.008	0.394	-0.001	0.002	0.395
Toilet Sharing	0.996	0.019	0.823	0.001**	0.004	0.023
Lid on Stored Water	0.140*	0.157	0.079	-0.452**	0.204	0.026
Lid on Water Container	2.630	1.554	0.102	0.178**	0.090	0.047
Age of Mother	1.099**	0.042	0.013	0.021**	0.008	0.015
Mother's Education	1.224	0.514	0.630	0.044	0.091	0.630
Number of Children	0.676	0.172	0.124	-0.085	0.056	0.126
Participation in awareness Programme	0.570	0.374	0.392	-0.131	0.160	0.415
Hours Spend to look after Children	1.078	0.064	0.210	0.016	0.013	0.210
Mother Engaged in Cooking	0.665	0.409	0.507	-0.083	0.116	0.475
Distance of the Source of Drinking water	1.001	0.002	0.488	0.000	0.000	0.489
Sharing Household	1.028*	0.017	0.088	0.006*	0.004	0.090
Sufficiency of Drinking water	13.601	50.769	0.484	0.548	0.451	0.224
Water Storage Facility	1.223**	0.698	0.724	0.044	0.124	0.724
Cost of Water	1.290**	0.527	0.533	0.055	0.089	0.534
Using Rain Water	1.057	0.365	0.872	0.012	0.075	0.872

Source: Authors' estimation based on field survey, 2012

Cost Analysis

By analyzing the cost of both direct and indirect aspects it is seen that the total cost of treatment of all the respondent families was BDT 120,030 in last diarrhoeal episode. And the total opportunity cost was BDT 56,140, which was calculated by total loss from monthly income and the total preventive cost was BDT 12,390 per month for the 100 sampled households. Therefore, if the average suffering day was 4 per episode then the total cost can be BDT 471 per day per household in the time of diarrhoeal attack and the per day average income of the household is BDT 103. Hence, per day cost of diarrhoeal is 4.5 times more than the per day income of the household. The cost of diarrhoeal is become higher due to insincerity of the people. At first when they are attacked by diarrhoeal they do not go to expert physician. Firstly they try to reduce the sufferings by controlling food or taking saline

which is completely fruitless. When the condition of the patient is becoming worse then they go to the local quack. The quack usually pushes a saline and gives some medicine. Sometimes this treatment also becomes ineffective then the patients go to the hospital. Since most of the people in slum area are physically weak due to mal nutrition and they do not take proper treatment from the beginning of diarrhoeal so they are gone under long term treatment. Most of the cases vitamins are suggested by the doctors for a long time after diarrhoeal. Therefore the cost of diarrhoeal is much higher in the slum areas.

Preventive Steps Ranking by the Respondents

Diarrhoeal is almost preventable with hygiene interventions that reduce contamination of hands, food and water as well as the better management of water and sanitation facilities (Fewtrell et al., 2005). There is a strong relationship exists between poverty and unhygienic environment, and the number and severity of diarrheal episodes especially for children under 5 years (Jamiso et al., 2006). This study considers several steps given in Table 4 which are necessary to prevent diarrhoeal. In response to the ranking of six major preventive steps the respondents ranked on the basis of very urgent (5), urgent (4), moderate (3), necessary (2), and not necessary (1). By assessing the weighted average of those issues we find the following values reported in the Table 4. The table depicts that to improve the situation improving sanitation system is badly in need in the slums in Khulna region. That is followed by drainage system. Likewise improving hygiene status, proper medication, adequate water supply and awareness programs also necessary for reducing the prevalence of diarrhoeal in the slums of Khulna city.

Table 4: Rank Analysis of Preventive Steps

Steps	Mean value
Improving sanitation	4.62
Improving drainage system	4.32
Improving hygiene	3.52
Improving medication	3.13
Improving water supply	2.87
Improving awareness	2.69

Source: Authors' compilation based on field survey, 2012

Conclusion

Slums of Khulna city are vulnerable to the occurrence of diarrhoeal diseases. Geographical location, natural calamity, demographic feature and socio economic status mostly shoulder this vulnerability. This study finds that the diarrhoeal disaster mostly affects the under year 5 children and they suffer from these diseases average 4 days in each episode. Housewives those who stay always in the slums area also affected by these diseases. Students, persons with more years of schooling are less vulnerable from this disease, since they have knowledge about the cleanliness. In the slum areas most of the household shares the same toilet which also invites diarrhoeal to occur in the slums. By adopting hand washing behavior after defection and before taking meal can reduce the duration of suffering days and prevalence of diarrhoeal. Improvement in accommodation status also helps to achieving good health.

The cost of diarrhoeal is huge for these low income people. It costs BDT 445 per day in each episode, which is higher than their per day income. Thus this types of diseases confines them under the poverty line. Low income, low literacy rate, unhealthy accommodation,

unawareness of the mother, unhealthy sanitation system and lack of proper awareness programs and medication facilities are the major influential factors for the prevalence of diarrhoeal in the slums in Khulna city.

To prevent this disaster at first it is needed to establish sufficient number of sanitary latrine for the slum dwellers and the number of sharing household should be reduced. This type of projects can be implemented by initiative of government and NGOs. Side by side proper sources of safe water should be ensured. It may be mentioned that at present the average sharing household number of tube well is above 30 in the slum areas.

The daily behavior should be changed such as use of soap to wash hand after defecation and before meal, using washed clothes, avoid unhygienic foods, use safe pots to store water and food, keep the toilet hygiene, use slipper in toilet, use dust bean to throw the household garbage, keeping personal freshness and build up awareness among the children to maintain the good and healthy habits and so on.

Finally it can be said that proper organizational support should be ensured in terms of infrastructural development, awareness building, changing behaviors in daily life and general health care services.

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