



# Effectiveness of WASH Education to Prevent Diarrhea among Children under five in a Community of Patuakhali, Bangladesh

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## Abstract

Diarrhea is a leading cause of death among under five children in developing countries. The burden of child diarrhea in Bangladesh is still significant. Safe water, sanitation, and hygiene (WASH) can limit the events. This study aimed to assess the effectiveness of WASH education of mothers or caregivers on child diarrhea. A community-based randomized control trial was conducted in the selected households of a rural community in Dumki Upazila, Patuakhali from March–June 2019. A total of 202 mothers/caregivers received intervention and 202 did not receive intervention. A pre-structured questionnaire was used to gather information on household WASH activities and diarrheal cases. Baseline data were collected first from the intervention group before providing education. WASH messages were given to the intervention group by face-to-face discussion. Both groups were followed up for diarrheal episodes for 3 months. Diarrheal prevalence of intervening group is compared with that of baseline and control. The results revealed that diarrheal prevalence was 11.4% (95% CI: 7.4–16.59%), 4.0% (95% CI: 1.7–7.65%), and 14.9% (95% CI: 10.25–20.52%) in baseline, intervention, and control group, respectively. Also, diarrhea was found lower in the intervention group than baseline ( $Z = -2.524$ ;  $P$  value = 0.012) and control ( $Z = -1.85$ ;  $P$  value = 0.04). WASH interventions were found effective to reduce the diarrheal episodes among under five children in rural community. Further investigation is necessary to assess the long-term effect of such intervention in other similar settings.

**Keywords** Bangladesh · Child diarrhea · Impact · WASH education

## Introduction

Diarrhea is the second deadliest illness among under five children worldwide [1, 2]. More than half of all diarrheal cases occur in sub-Saharan Africa and Southeast Asia [3]. In Bangladesh, 20,155 under five children died due to diarrheal disease in 2008 [4]. National prevalence of diarrhea among this age group in Bangladesh is 6.1% [5]. Diarrhea hampers physical and mental development of child through malnutrition and needs to be prevented [6].

Unsafe drinking water, poor sanitation, and hygiene practices are responsible for 85% of diarrheal mortality [7]. Approximately, 2.4 million yearly global deaths could be prevented through practicing proper hygiene and reliable drinking water [8]. Good domestic hygiene practice also proves to be effective against diarrhea [9]. Hence, its preventive measure needs to be evaluated rather than its treatment. In addition, a recent review showed WASH interventions are affordable and effective in minimizing diarrhea burden [10],

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so a number of good research on water, sanitation, and hygiene intervention have been successfully done in Pakistan [11], Ethiopia [12], and India [13].

In Bangladesh, previous study in a plain district revealed hygiene intervention increased mother's hygiene knowledge and practices but failed to make significant reduction of diarrheal morbidity due to seasonal factors [14]. The impact of WASH educational intervention on childhood diarrhea in the rural coastal setting in Bangladesh remains unexplored, although childhood diarrheal prevalence was 10.9% in southern coastal area of Bangladesh which is almost double to the national burden [15]. Flood, cyclone, river erosion, tidal surge etc. are increasing the water, sanitation, and health problem like child diarrhea in this site than other part of the country [16]. Immediate action needs to be taken to halt the diarrheal occurrence in this setting. Thus, intervention with WASH education may improve the practices and reduce the child diarrhea. The findings of this investigation could be helpful for the authorities to take the necessary program to prevent child diarrhea in larger coastal belt of Bangladesh. Therefore, the study aimed to assess the effectiveness of WASH educational intervention on childhood diarrhea.

## Methodology

### Study Setting

The study was conducted in different communities of Dumki sub-district of Patuakhali (district), Bangladesh. Dumki is situated beside a river, 56 km straight line away from the Bay of Bengal and divided into five unions (smallest administrative unit). Two unions (Muradia and Pangashia) were selected for this study. Total population of Dumki was 70,665 as per 2011 census. This area is a poor where 65% households depends on the agricultural activities [17].

### Study Design

We conducted a randomized control trial among mothers or caregivers in some selected communities from March to June 2019. Investigators assessed the eligibility of households in the study area and identified 404 households. Having at least one under five children and planned to continue to reside in the area during intervention period was eligible for the study. To allocate intervention, the participants were divided them into two groups using simple random sampling technique. One of the investigators who were not involved in enrollment process programmed a spreadsheet to generate randomly the integers 1 or 2 with the equal probability of generating a 2 vs. a 1. The random numbers were applied sequentially to the list of all participants. The

respondents with 1 were assigned to control and those with a 2 were assigned to WASH education. We calculated the sample size using single population proportion test considering 3% margin of error, 95% CI, and 5% overall diarrheal prevalence in the Barishal division [5]. Both mothers and caregivers with their child were followed up for 3 months to monitor diarrhea occurrence. Baseline data on history of child diarrhea in the previous 3 months were also collected for intervention group. Diarrhea was defined as the passage of three or more times loose or watery stools in a 24-h period [18].

### Data Collection Procedure

A pre-structured questionnaire used to determine diarrheal occurrence at the last 3 months and other associated factors. Trained investigators carried out face-to-face interview to collect baseline information from intervention groups. At the same time, educational intervention on WASH messages was given to the participant. Interviewers delivered proper information on personal hygiene, food hygiene, kitchen, and household sanitation to every respondent. Late morning and afternoon were chosen for collecting data and providing education messages. After 3 months of intervention, the other investigators visited again to intervention and control group and recorded data by using same questionnaire. During this period, child mortality rate was zero and investigators revisited the households in the case of missing participants.

### Statistical Analysis

We performed descriptive analysis to summarize the demographic characteristics and prevalence of diarrhea. A normal population test was used to compare between the groups. Statistical package for social sciences (SPSS) 20 was used for analysis and 5% level of significance was considered.

## Results

### Socio-Demographic Characteristics of Respondents

There was a similarity in socio-demographic status within the cases and intervention sites. The gender of the child, mother, and father occupation and family size were nearly close between cases and control groups. The illiteracy rate of mother and father was almost double in cases (10.9% for mother and 18.0% father) than control (4.9% for mother and 9.4% for father) households. Less than 50 % family both for cases (47.3%) and control (26.6%) sites earned  $\leq 10,000$  BD TK monthly (Table 1).

**Table 1** Characteristics of participants and households in a community-based randomized control trial in Patuakhali, Bangladesh, 2019 (*N* = 202)

Parameters	Intervention <i>N</i> (%)	Control <i>N</i> (%)
Age of child		
0–2 years	25 (12.5)	71 (35)
> 2 years	177 (87.5)	131 (65)
Gender		
Male	110 (54.5)	97 (47.8)
Female	92 (45.5)	106 (52.2)
Mother education		
Primary education	50 (24.8)	43 (21.2)
Secondary education	102 (50.5)	110 (54.2)
Higher secondary	11 (5.4)	0
No education	22 (10.9)	10 (4.9)
Mother/caregiver occupation		
Housewife	191 (94.6)	196 (96.4)
Others (job and day laborer)	11 (5.4)	6 (3.6)
Father education		
Primary education	61 (30.2)	56 (27.6)
Secondary education	76 (37.6)	88 (43.3)
Higher secondary	14 (6.9)	0
No education	37 (18.3)	19 (9.4)
Father occupation		
Unemployed	162 (80.2)	151 (74.9)
Employed	40 (19.8)	51 (25.1)
Family size		
Nuclear	64 (31.7)	75 (36.9)
Extended	138 (68.3)	127 (63.1)
Family income (monthly, BDT)		
≤ 10,000	95 (47.3)	54 (26.6)
> 10,000	107 (52.7)	148 (73.4)

### Pattern of WASH Activities Among the Respondents and Households

Use of unhygienic kacha (mud) toilet reduced to 60% after intervention than cases (66%) and control (85%) groups. Closed waste disposal bin increased (14.4%) from 1% in baseline and zero in control. In the case of cooking water, 18.3% caregivers used tube well water which was only 5% in other groups. Use of dustbin for leftovers increased 26.7% from 12.4% in baseline. Observation of insect attack by caregivers reported 82.7% in intervention which was 95.5% and 84.7% in baseline and control, respectively (Table 2).

### Occurrence of Diarrhea Among Intervention and Control Households

In the baseline, 11.4% (95% CI: 7.4–16.59%) households reported history of child diarrhea event in the past 3 months. After intervention, diarrheal prevalence reduced at 4.0% (95% CI: 1.7–7.65%) in

**Table 2** Comparative pattern of WASH activities of mothers/caregivers and households

Parameters	Cases <i>N</i> (%)	Intervention <i>N</i> (%)	Control <i>N</i> (%)
Personal toilet			
Yes	202 (100)	202 (100)	200 (99.0)
No	0	0	2 (1.0)
Types of toilet			
Kacha (mud)	132 (65.3)	124 (61.4)	172 (85.1)
Paka (brick)	70 (34.7)	77 (38.6)	28 (13.9)
Open defecation	0	0	2 (1.0)
Waste disposal			
Open	200 (99.0)	173 (85.6)	202 (100)
Closed	2 (1.0)	29 (14.4)	0
Location of toilet			
Outside from house	184 (91.1)	184 (91.1)	197 (97.5)
Attached	18 (8.9)	18 (8.9)	4 (2.0)
Hand washing materials			
Soap	201 (99.5)	201 (99.5)	201 (99.5)
Other	1 (0.5)	1 (0.5)	1 (0.5)
Hand washing with soap after cleaning child's feces			
Yes	186 (92.1)	202 (100)	167 (83.5)
No	16(7.9)		33 (16.5)
Drinking water source			
Tube well	202 (100)	202 (100)	202 (100)
Cooking water			
Tube well	10 (5.0)	37(18.3)	10 (5.0)
Pond/canal	192 (95)	165 (81.7)	192 (95)
Kitchen types			
Soil floor	192 (95)	186 (92.1)	196 (97)
Cement floor	10 (5.0)	16(7.9)	6(3.0)
Had refrigerator			
Yes	39 (19.3)	39 (19.3)	34 (16.8)
No	163 (80.7)	163 (80.7)	168 (83.2)
Used dustbin for cooking leftovers			
Yes	25 (12.4)	54 (26.7)	4 (2.0)
No	177 (87.6)	148 (73.3)	198 (98)
Insect attack in kitchen			
Yes	193 (95.5)	167 (82.7)	171 (84.7)
No	9 (4.5)	35 (17.3)	31,915.3)

intervention group. The prevalence of diarrhea was 14.9% (95% CI: 10.25–20.52%) in control group. The risk of diarrhea was found significantly lower in intervention than case ( $Z = -2.524$ ;  $P$  value = 0.012) and control ( $Z = -1.85$ ;  $P$  value = 0.04).

### Discussion

Diarrhea is considered a leading health problem among under five children in developing countries [19]. This interventional

study explored the effect of WASH education on the diarrheal incidence among under five children in this coastal area. The study shows that WASH educational intervention significantly reduced the incidence of childhood diarrhea.

We found WASH educational significantly reduced diarrheal prevalence in intervention group than baseline and control groups which support studies done in Pakistan [11] and India [13]. However, intervention approach might be failed due to social and cultural inadaptability or misunderstanding of target community problem [20, 21]. Previous studies in Myanmar [22] and Manikgonj district of Bangladesh [14] showed interventions failed to measure health outcome. Due to remote setting, they have poor knowledge about hygiene and sanitation. After intervention, cooking water used from tube well and waste disposal practices improved in the intervening households. Selecting suitable individual intervention approach may reduce diarrheal episodes in this area.

Various WASH interventions reveal diarrhea risk reductions between 27 and 53% in children aged under 5 years [23]. We found higher 73% and 64.9% reductions of diarrheal episodes at intervention group compared with control and baseline respectively. A study reported WASH educational intervention, consisting discussion and demonstration, reduced diarrheal risk of 35% in Jigjiga district, eastern Ethiopia [12]. This higher reduction may be due to lack of previous awareness regarding hygienic practices among the participants.

We found 8% more participants in intervention group who washed hand with soap after cleaning child's feces. A study done among different districts in Bangladesh estimated hand washing with soap after cleaning a child's feces increased from 22 to 36% [24]. Our study revealed households' waste management practices improved at intervene group. Use of closed waste disposal system and dustbin for cooking left-overs increased at intervention groups. This improper waste management of the households might lead to diarrhea in control groups [25]. WASH education may make quantitative and qualitative changes in multiple preventive practices which might dramatically reduce the clinical episodes.

In our study, cases were determined by mother or caregivers' report according to the definition of diseases, without biological or even practitioner's confirmation. All information was collected through interview. Hence, there is a possibility of information bias. Recall bias may also influence the precision of our estimates. However, trained investigators carefully interviewed the respondents which may reduce the bias in minimum level. The baseline and follow-up information were collected at different times of the year. We were unable to follow up study participants for longer periods because of limited resources. However, use of control adjusted the seasonal difference in disease burden. Despite of these limitations, we do believe, this educational message promotes awareness and improves hygienic practices to reduce diarrhea.

## Conclusion

This study explored the effectiveness of WASH educational intervention of mothers/caregivers on child diarrhea. Diarrhea has been considering the significant cause of morbidity and mortality among under five children. Respective authorities have been trying to cope up the vulnerable situation through different interventions. WASH education was found protective to reduce child diarrhea in this areas. Hence, quicker education program about WASH among mothers or caregivers may be used to minimize the episodes of diarrhea in other similar low resource settings.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** The study protocol reviewed and approved by Research Ethical Committee (REC) of Department of Food Microbiology, Patuakhali Science and Technology University (approval number: FMB:02/02/2019:06).

**Informed Consent** All procedures performed in studies were following the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written consent was obtained from mothers or caregivers after discussing the purpose of the study and confidentiality of their data, and after assuring them that this research would not be harmful to them or their child. The investigators specified that participation in the study was voluntary. They also explained that he or she could withdraw the consent at any time of study.

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