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ABSTRACT

Objective: To examine the changes in hand-washing practices with soap among women as a result of water, sanitation and hygiene (WASH) intervention of BRAC.

Methods: A community-based study was conducted in 50 rural sub-districts of Bangladesh where BRAC (a non-governmental organization) has been offering WASH intervention since middle of 2006. Through a multi-stage thirty-cluster random sampling 27,662 adult women were selected for this study. The intervention includes promotional activities to install tubewells, sanitary latrines and improve hygienic practices including demonstration of hand-washing with soap. In villages with $\geq 80\%$ sanitation coverage, the ultra poor received grant for sanitary latrine. The intervention is provided through cluster meetings, mosque sermons during Friday prayer, preventive home visits, and popular theater. To facilitate intervention, village WASH committees were formed across the villages. Data were collected before the inception and following two-year of intervention from the same households. Primary outcomes include changes in self-reported hand-washing practices with soap after contact with faces and waste; and before eating, cooking and serving food.

Results: At follow-up, a significant improvement was pronounced for hand-washing with soap irrespective of socioeconomic status in various indicators such as after contact with faeces, and waste; and before eating, cooking and serving food (ranges: 3%-15%). Multivariate analyses show that probability of washing hands with soap was higher among the non-poor and literate and less likely who reported to use unsanitary latrine. Participants who attended village WASH committee meetings were more likely to use soap for hand-washing.

Conclusion to make universal use of soap for hand-washing persistent intervention is due to prevent its related diseases and to enhance some of the targets of Millennium Development Goals.

Key words: Hand-washing, Soap, Rural, Women, Community-based, Bangladesh

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INTRODUCTION

Washing hands with soap is recommended after contact with faeces and waste; before eating, cooking and serving food as a preventive health measure. Compliance is desired whenever hands are exposed directly to various critical activities, which may have negative impact on health. Unlike many countries, people in Bangladesh have meal without using spoon, fork or chopsticks. Use of toilet papers is rare after defecation instead use only water is common for cleaning purposes. Hence, contact of hand with faeces is common. Similarly waste is cleaned without wearing hand gloves. Recent research indicates that a considerable proportion of people washed hands without soap after contact with faeces and before eating in Bangladesh (RED 2008). People are at risks of various diseases due to unhygienic hand-washing practices. Cultural norms, lack of knowledge on contamination and affordability may be associated with these practices. The countries located in tropical weather are vulnerable to various harmful viruses and germs. Thus, contamination of hands is more likely if necessary precaution is avoided during critical activities. Due to significant public health importance of hygienic hand-washing, in 2008 the global communities have decided to observe Global Hand-washing Day worldwide. The Day will be observed every year to increase awareness and understanding about the importance of hand-washing with soap as an effective and affordable way to prevent diseases (World Health Organization 2008).

Many people lack knowledge that hands can be infected with invisible viruses or germs that are not easy to detect through normal eye vision. This also leads to abstaining from hygienic hand washing (HHW). Recent research indicates that HHW is associated with habit, the motivated need for cleanliness and lack of cognitive concern about the cost of soap use (Aunger *et al.* 2009).

Health benefit of HHW practices is viewed to be equivalent to benefits of having clean water (Ejemot *et al.* 2008). Washing hands with soap reduce risk of diarrhoea substantially (Curtis and Carincross 2003, Luby *et al.* 2004) and it is simple and cost effective (Smith 2009). Diarrhoea is one of the major causes of under-five children mortality and morbidity and known public health problem particularly in low-income countries. Research indicates that this disease is transmitted due to intake of contaminated food or drink, by person-to-person contact, or from contaminated hands. It implies that hygienic hand-washing can be a potential option that facilitate to prevent the transmission of diarrhoea-causing pathogens (Ejemot *et al.* 2008). Through improving HHW behaviour diarrhea-related incidence can be reduced to about one-thirds (Ejemot *et al.* 2008). Thus HHW practice may be a potential preventive measure to achieve some of the targets of Millennium Development Goals (MDGs).

BRAC the largest indigenous non-governmental organization (NGO) initiated water, sanitation and hygiene (WASH) intervention in 150 sub-districts for five years where sanitation coverage was reported to be low compared to the national level coverage. The project received financial support from the Kingdom of the Netherlands government (2006-2011). Intervention activities have been offering in the community, social, religious and educational institutions.

Empirical community-based studies for improving hand-washing practices with soap are not adequately done in low-income countries. Hence, this study may provide an insight about the effect of promotional intervention on hand-washing practices with soap. For measuring the effect of intervention at the inception phase a baseline study was conducted to document the benchmark status. This study aims to measure the effect of water, sanitation and hygiene intervention on hand-washing practice with soap for critical chores such as following contact with faeces and waste; and before handling food and eating. Association of socioeconomic and demographic indicators is also examined to elicit its association with the outcomes of interest.

METHODS AND MATERIALS

STUDY AREA AND DESIGN

This community-based empirical study was conducted in 50 sub-districts out of 480 sub-districts where BRAC has initiated its WASH intervention since middle of 2006. A quantitative method was followed in conducting this study.

Sampling

The participants were selected through a multi-stage thirty cluster sampling. In the first step, 30 villages were selected from each sub-district. In the second step, from each village, 20 households were selected proportionately as in all the villages the number of households were not equal. A total of 29,885 households were visited at baseline and follow-up. Of these, 27,662 adult women were interviewed at both periods. From each household an adult woman was interviewed. Lost to follow-up was found to be 7%. A reason of lost to follow-up was unavailability of the respondents during the time of data collection.

Data collection

Data were collected using structured questionnaire between November 2006-March 2007 at baseline and during April-July 2009 at follow-up. Informed consent was obtained from the participants before data collection. Interviewers were given adequate training on data collection. A training manual was developed to provide instructions about data collection. The field investigators used this manual as reference during data collection. A team of monitors was employed to oversee the data collection and to ensure reliability of data. Besides, respective researchers visited field regularly to check whether the data collection was done appropriately as instructed. Each team consisted of one field supervisor to check the accuracy of data. Cross checking of data was performed each day following the data collection for checking any missing information or any error. Whenever any such issues evident re-interview was conducted on the following day for the necessary amendment.

Intervention

The WASH intervention aims to offer its components to 37.5 million people in 150 sub-districts (RED 2008). The intervention has been offering in the community, religious, social and educational institutions. The intervention package includes promotional activities for installation of sanitary latrines, tubewells and health education. To facilitate sanitation and hygienic practices health education is provided intensively in various settings. The component of health education consists of awareness about i) washing hands with soap after defecation; and before eating and, serving food to the household members and children; ii) using safe for water drinking, cooking, washing and bathing; iii) keeping surroundings of the households, kitchen, tubewells and latrines tidy; and iv) to construct platform of the tubewells with solid materials; vi) disposal of domestic waste, excreta of poultry and livestock in fixed place, and children faeces in sanitary latrine.

To facilitate intervention activities village WASH committees (VHC) were formed in the intervention areas. The committees consist of teachers, elite, religious leaders, ultra poor, women and generous people of the community. These committees motivate people to use safe water, improve sanitation and hygienic practices. They also help generate funds from the community for helping ultra poor households for construction of sanitary latrines and tubewells. WASH programme provides financial support to the ultra poor for constructing sanitary latrine in the villages where $\geq 80\%$ households owned sanitary latrines. BRAC staff maintains liaison with government officials and union council representatives to make available water and sanitation-related hardware resources for the community people.

The intervention is provided through cluster meetings in the villages including men, women and adolescents. Sermons are imparted at the mosques during Friday's Juma prayer. Preventive home visits (PHV) are made to enhance the intervention activities. During PHVs demonstration on hand-washing with soap was shown among the community people. Other dissemination methods include popular theatre, film shows and folksongs. Educational campaigns also are performed through radio and TV. Sanitation month is celebrated through organizing workshops, rallies, sanitation fair and debate competition to make aware about WASH. In implementing intervention activities voluntary health workers (*Shaysthyo shebikas*), programme organisers, programme assistances and managers are assigned.

Outcome

The primary outcomes of this study include self-reported hand-washing practices with soap for various critical activities such as after contact with waste and faeces; and before eating, cooking and serving food.

Independent variables

Chronological age, education, economic status, place of residence, use of latrine and, marital status of the study participants were considered as independent variables. Age was considered as continuous variable. Educational status was coded as literate and illiterate. Persons who attended schools were considered as literate otherwise illiterate. Marital status was dichotomized as currently married and single. Economic status was stratified as ultra poor, poor and non-poor. The details about the categorizations are available elsewhere (RED 2008). Place of residence of the study participants are divided into four administrative divisions according to the government guideline. These are north, south-west, central and the south-east regions.

RESULTS

PROFILE OF THE STUDY PARTICIPANTS

The mean age of study participants was 34.3 years. A higher proportion of study participants were literate and majority was currently married. The proportion of non-poor was higher than ultra poor and poor. Half of the participants reported that they heard about the WASH programme. Nearly 17% of the participants attended the village WASH committee meetings. A higher proportion of participants came from the north-west areas. About 42% of the participants reported that they used sanitary latrine with water seal. One-fourth of the participants reported that they used slab latrine without water seal, which is considered to be unhygienic. A considerable number of participants reported that they used other types of unhygienic toilets such as hanging latrine or defecate in open places (Table 1).

Table 1. Profile of the study participants

Indicators	% or mean (n=27,662)
Age of the study participants (mean & sd)	34.3 (11.2)
Literacy	
Literate	56.7
Illiterate	43.3
Marital status	
Married	92.6
Single	7.4
Economic status	
Ultra poor	20.1
Poor	26.8
Non-poor	53.0
Place of residence	
South-west	20.1
Central	11.6
North-west	58.2
South-east	10.0
Heard about the WASH programme	50.0
Participated in village WASH committee meetings	17.0
Use of latrine for defecation at follow-up	
Sanitary latrine ≥ 3 slabs with water seal	41.9
Slab latrine without water seal	26.0
Pit latrine (including ≤ 2 slabs)	12.1
Other options (open defecation, hanging latrine)	20.0

Overall, in all the indicators a significant improvement was noted regarding use of soap for hand-washing. A dismal status was noted at both study periods for use of soap for hand-washing before eating, after cleaning waste, before serving food and cooking where majority of the participants reported that they did not use soap for hand-washing. It also shows that after contact with faeces and waste considerable numbers of participants did not wash hands with soap (Table 2).

Table 2. Self-reported hand-washing practices with soap for various activities at baseline and follow-up (%)

Activities	At baseline (95% CI)	At follow-up (95% CI)	P value
Before eating	8.5 (8.1-8.7)	20.4 (19.9-20.8)	P<0.001
After defecation	62.4 (61.7-62.9)	73.7 (73.1-74.2)	P<0.001
After contact with child faeces	58.8 (57.0-60.4)	68.1 (66.3-69.8)	P<0.001
After cleaning courtyard	32.8 (32.1-33.6)	40.6 (39.8-41.4)	P<0.001
Before serving food to children	16.7 (14.9-18.4)	29.8 (27.2-31.9)	P<0.001
Before cooking	10.3 (9.6-10.9)	15.9 (15.2-16.6)	P <0.001
Before serving food	9.1 (8.1-10.0)	16.7 (15.4-18.0)	P<0.001

To explore whether hand-washing practice with soap varies between literate and illiterate following analyses were done. It indicates that in all the indicators significantly lower proportion of illiterate people reported that they used soap for washing hands. However, majority of the participants irrespective of literacy status wash hands without soap before eating, serving food and cooking (Table 3). However, in all the indicators hand-washing practice with soap was found to be significantly improved across literate and illiterate (data not shown).

Table 3. Hand-washing practices with soap for various activities at follow-up by educational status (%)

Activities	Illiterate	Literate	P value
Before eating	17.6	22.5	P<0.001
After defecation	67.6	78.2	P<0.001
After contact with child faeces	59.8	71.8	P<0.001
After cleaning courtyard	36.3	43.8	P<0.001
Before serving food to children	24.3	31.8	P<0.01
Before cooking	13.2	17.7	P <0.001
Before serving food	14.3	18.0	P<0.01

Changes in hand-washing practice with soap

Table 4 reveals that in all the indicators hand-washing practices with soap during various activities were found to be improved significantly across the ultra poor, poor and non-poor. The improvement was not encouraging for some of the indicators such as before eating, cooking, serving food and after cleaning waste of the household.

Odds of reporting hand-washing practice with soap

To examine the associated factors of hand-washing practices with soap for various critical activities logistic regression analyses were performed. Five models were constructed for each of the outcome. Persons who reported that they used soap for hand-washing after or before these chores was coded as '1' otherwise coded as '0'. Table 5 shows that in all the indicators, probability of washing hands with soap was more likely among the non-poor and literate compared to their counterparts. With advancing age participants were more likely to use soap for hand-washing after defecation and before serving food, no significant association was noted for the other indicators with age. Interestingly the use of soap for hand-washing was less likely among the participants who reported to use unsanitary latrine such as slab latrine without water seal and other provisions. Participants who attended meeting of village WASH committees were likely to use soap for hand-washing. Finally, the probability of washing hands with soap was significantly higher among the participants from the north and south-east regions.

Table 4. Hand-washing practices with soap for various activities at baseline and follow-up by economic status of the participants (%)

Use soap for hand-washing	Ultra poor		Poor		Non-poor	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
Before eating	6.2	17.5	6.6	18.2	10.2	22.5
p value	<0.001		<0.001		<0.001	
After defecation	51.0	64.2	57.0	70.1	69.2	78.8
p value	<0.001		<0.001		<0.001	
After contact with child faeces	48.8	60.7	55.4	64.2	64.5	72.6
p value	<0.001		<0.001		<0.001	
Cleaning after courtyard	29.1	33.1	30.1	37.3	35.4	44.5
p value	<0.001		<0.001		<0.001	
Before serving food to children	16.0	27.8	13.5	27.1	18.6	31.5
p value	<0.001		<0.001		<0.001	
Before cooking	9.0	12.0	8.7	14.0	11.4	18.0
p value	<0.001		<0.001		<0.001	
Before serving food	8.1	12.4	7.0	15.5	10.2	18.4
p value	<0.001		<0.001		<0.001	

Table 5. Odds ratios of hand-washing practices with soap before and after various critical activities

Covariates	Wash hands with soap before eating OR (95% CI)	Wash hands with soap after defecation OR (95% CI)	Wash hands with soap before serving food OR (95% CI)	Wash hands with soap after contact with waste OR (95% CI)	Wash hands with soap after contact with faeces of babies OR (95% CI)
Education					
Illiterate	1	1	1	1	1
Literate	1.3 (1.2-1.3)*	1.6 (1.5-1.7)*	1.6 (1.2-1.8)*	1.2 (1.1-1.3)*	1.6 (0.99-1.0)
Age (in years)	0.99 (0.99-1.0)	1.0 (1.0-1.0)*	1.0 (1.0-1.0)*	1.0 (1.0-1.0)	1.0 (0.99-1.0)
Use of latrine					
Sanitary toilet with water seal	1	1	1	1	1
Slab latrine without water seal	0.8 (0.7-0.9)*	0.6 (0.55-0.64)*	0.7 (0.5-0.9)*	0.8 (0.7-0.9)*	0.7 (0.6-0.9)*
Others	0.7 (0.66-0.8)*	0.4 (0.39-0.5)*	0.7 (0.6-0.9)*	0.7 (0.6-0.8)*	0.6 (0.5-0.8)*
Participated in village WASH committee meetings					
No	1	1	1	1	1
Yes	1.4 (1.3-1.6)*	1.2 (1.1-1.3)*	1.2 (0.9-1.5)	1.5 (1.3-1.6)*	1.5 (1.1-1.9)*
Economic status					
Ultra poor	1	1	1	1	1
Poor	0.99 (0.9-1.1)	1.2 (1.1-1.3)*	1.4 (1.0-1.9)	1.2 (1.1-1.3)*	1.1 (0.87-1.4)
Non-poor	1.2 (1.1-1.3)*	1.6 (1.5-1.8)*	1.5 (1.1-2.0)*	1.5 (1.3-1.6)*	1.5 (1.2-1.8)*
Place of residence					
South-west	1	1	1	1	1
Central	0.9 (0.8-1.1)	1.0 (0.9-1.1)	1.8 (1.3-2.6)*	0.6 (0.5-0.7)*	1.2 (0.94-1.8)
North	2.0 (1.8-2.2)*	1.9 (1.8-2.1)*	2.2 (1.8-2.8)*	1.3 (1.2-1.5)*	2.0 (1.6-2.5)*
South-east	0.66 (0.6-0.8)*	4.2 (3.7-4.9)*	0.7 (0.4-1.0)	1.3 (1.1-1.5)*	2.6 (1.9-3.6)*

* indicates statistically significant: p<0.05

DISCUSSION

This community-based empirical study reveals that hand-washing practice with soap before and after various critical activities increased over time. Improvement of hygienic behaviour among the ultra poor is commendable. This was possible as this segment of people received special attention such as in villages with $\geq 80\%$ sanitation coverage ultra poor households received sanitary latrine at free of cost. Research indicates that accessibility and free of cost services may eliminate gaps between poor and non-poor (Karim *et al.* 2006). However, a striking feature is that considerable number of people avoided hand-washing with soap for some of the activities. It implies that use of soap for hand-washing is not universal among the study participants. Hence, there is a substantial room for improvement due to low level of compliance. Patarkul (2005) argues that knowledge, behavior, attitudes, and beliefs toward hand hygiene need to be improved through multimodal and multidisciplinary approach.

Evidence suggests that both sanitation and hygienic behaviour play an important role to prevent the incidence of waterborne diseases. Hence where hygienic practices at the individual level are poor effect of sanitation may be less in reducing the incidence of waterborne diseases. The sub-optimal condition of both sanitation and hygiene practices aggravate prevention of various diseases. Due to unhygienic practices in low-income countries, spread of waterborne diseases is common and attributable to huge burden of morbidity and mortality. Preventive value of HHW and sanitation in controlling many diseases is well established (Ray *et al.* 2009). Furthermore, beneficial effects of HHW for preventing the spread of swine flu and other respiratory infections are documented in other studies (Brooks *et al.* 2009; Jefferson *et al.* 2009). As a result, during recent outbreak of swine flu, frequent hand-washing with soap was the most common medical advice suggested to the people.

It was observed that majority of the participants do not use soap for washing hands before eating. Similar trend was pronounced before serving food to the children, after contact with faeces of the children and following contact with waste. Lower use of sanitary latrine is another risk factor prevailed among the participants. All these are risk factors of waterborne diseases. It is known that in low-income countries women play major roles in child caring, cooking, serving food and cleaning waste of the household. Thus, unhygienic practices among women may increase the risks of many diseases among them as well as other family members particularly among the children. As found children are more vulnerable to waterborne diseases any unhygienic behaviour of other household members may increases the incidence of such medical conditions among children. Exposure to unhygienic activities is certainly a risk factor of waterborne and other diseases (Aunger *et al.* 2010).

The multivariate analyses indicate that use of sanitary latrine and hand-washing practice with soap is strongly associated. This may be due to fact that persons who use hygienic sanitation likely to pursue other hygienic practices. Some inequalities were observed in this study. Inequality between places of residence may be attributable to local norms and values where they had been brought up. Other research conducted elsewhere also found an association of cultural factors with HHW (Burnett 2009). Observed unequal hygienic behaviour between literate and illiterate, poor and non-poor is likely as better hygienic practices might be common among the non-poor as they afford to buy necessary commodities such as soap and capable to install sanitary latrine. Similarly persons who attended schools are aware of susceptibility of diseases and risk factors of unhygienic behaviors thereby more likely to pursue preventive measures. Of concern is that all the literate and non-poor did not pursue hygienic practices. Reversely, some illiterate and poor participants also followed hygiene practices. These variations might be associated with psychological and motivational factors. Earlier research indicates that psychological factors are associated with hygienic hand-washing practices (Aunger *et al.* 2010). Furthermore, lack of understanding about susceptibility and threat of the risks are other reasons. Health belief model suggests that these are strong predictors of positive behavioural change. However, to have more insight further qualitative study might be pursued.

Before conclusion some methodological aspects are discussed. A weakness of this study is exclusion of control group, which is known as adequacy design. Often this design is also used in assessing the impact of intervention (Hybicht, Victoria and Vaughn 1998). Nevertheless, availability of baseline information and random selection of the study participants allow attributing that the changes are due to the intervention. Strength of the study includes researchers were independent from the intervention activities as other groups of people were involved in implementing the intervention activities, which may allow avoiding potential information bias.

This study concludes that persistent intervention is necessary to increase compliance of hand-washing practice with soap. The universal use of this known modifiable risk factor may provide best possible benefits for preventing its associated diseases, thereby some of the targets of MDGs can be enhanced.

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