

Observed Practices and Perceived Advantages of Different Hand Cleansing Agents in Rural Bangladesh: Ash, Soil, and Soap

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Abstract. Bangladeshi communities have historically used ash and soil as handwashing agents. A structured observation study and qualitative interviews on the use of ash/soil and soap as handwashing agents were conducted in rural Bangladesh to help develop a handwashing promotion intervention. The observations were conducted among 1,000 randomly selected households from 36 districts. Fieldworkers observed people using ash/soil to wash their hand(s) on 13% of occasions after defecation and on 10% after cleaning a child's anus. This compares with 19% of people who used soap after defecation and 27% after cleaning a child who defecated. Using ash/soil or soap was rarely (< 1%) observed at other times recommended for handwashing. The qualitative study enrolled 24 households from three observation villages, where high usage of ash/soil for handwashing was detected. Most informants reported that ash/soil was used only for handwashing after fecal contact, and that ash/soil could clean hands as effectively as soap.

INTRODUCTION

Diarrheal disease and acute respiratory infections (ARIs) are two major causes of childhood death worldwide including Bangladesh.^{1–3} In areas where ARI and diarrheal disease are major causes of childhood deaths, the rate of handwashing with soap was low.⁴ For example, one study conducted in rural Bangladesh using structured observation found that 21% of people washed their hands with soap after cleaning a child's anus, 14% after defecation, and less than 1% before eating or feeding a child.⁵

Although randomized trials demonstrate improved health in groups receiving encouragement to wash hands with soap,^{6,7} some residents of rural Bangladesh reported that the cost of soap was a barrier to handwashing.^{8–10} Structured observations of handwashing after defecation among women in rural Bangladesh also detected that 41% used water only, 38% used soil, 19% used soap, and 2% used ash.⁹ Moreover, low-income communities in different countries have used ash, soil, or mud to wash hands.¹¹

There are limited data on the effectiveness of low-cost/no-cost handwashing alternatives to soap such as ash or soil. Studies conducted in Bangladesh and India found that soil, ash, and soap were all effective in removing fecal coliforms from hands.^{12,13} One study found that observed caretaker handwashing with water alone was associated with less childhood diarrhea.¹⁴ Another study found that households that had ash as a handwashing agent experienced a similar burden of diarrhea compared with households that had soap as their handwashing agent.¹⁵ Limited studies in Bangladesh have focused on the perceptions and observed current practices of communities regarding advantages and disadvantages of different hand cleansing agents, specifically ash, soil, and soap. Behavioral interventions are unlikely to be effective without an understanding of the current community contexts, practices, and perceptions related to hand hygiene.

This paper presents findings using two different research methods. The first component was part of a large intervention

program (Sanitation, Hygiene Education, and Water supply-Bangladesh [SHEWA-B]) that included a pre-intervention baseline study of handwashing practices across rural Bangladesh. The first component assessed the frequency of using handwashing agents at different key times. The second component enrolled a subset of the SHEWA-B population among which high rates of ash and soil use had been observed; it explored current perceptions, reported practices and barriers with regard to handwashing with different cleansing agents (soap, ash, soil, and water only). The objective of this paper is to explicate which handwashing agents are actually used at specific times and why.

MATERIALS AND METHODS

Structured observation. The method for selecting the site and population has been described previously.^{5,16} In brief, SHEWA-B was a large intervention program targeting 20 million persons across 68 subdistricts in 19 districts in Bangladesh. To select a representative sample for baseline, each union (the lowest administrative rural unit within the Government of Bangladesh) in each of the 68 subdistricts of the SHEWA-B intervention was listed and 50 unions were randomly selected using the population proportion to size of unions. For each randomly selected intervention subdistrict, 50 matching unions within nonintervention areas were selected, resulting in 100 unions from 36 districts (out of 64) in rural Bangladesh. From each union, the study team randomly selected one village. From each village field workers systematically enrolled 10 households that had at least one child under 5 years old, resulting in 1,000 households total.

Among the 1,000 households, a trained field team conducted 5-hour structured observations between July and August 2007 to record the frequency with which all household members used different handwashing agents at different key times: after defecation, after cleaning a child that defecated, before food preparation, before serving food, before eating, and before feeding a child. We calculated the proportion of different observed handwashing events when household members used different handwashing agents, that is, water alone, ash or soil, and soap. The details of data analysis and the ethical considerations have been described elsewhere.^{5,16,17}

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Qualitative investigation. *Study site and population.* This formative study was conducted in three rural villages of *Narshingdi* district, in central Bangladesh. The three villages were selected from the SHEWA-B structured observation study sites; two were from the control area and one received the SHEWA-B intervention. The SHEWA-B intervention commenced from January 2008. The villages were purposively selected for their high prevalence of handwashing with ash and soil found during structured observation in the SHEWA-B study. The study sites were typical rural areas of Bangladesh, possessing a shared tube well with hand pump and latrine facilities located outside of the household.¹⁸ In this context, people with conveniently located water points and latrine facilities are more likely to wash hands than people with less convenient of these facilities.¹⁶

The study participants were adults from households. The field team collected data from February to March 2009.

Sampling. For the in-depth interviews, we listed the 30 households (10 from each of the 3 villages) that were surveyed in the baseline structured observation study, for which we had data on hand hygiene practices using ash, soil, soap, and water only. From 30 households, we aimed to include 20 females and 10 males to conduct in-depth interviews. Females are the primary household caregivers in Bangladesh so we included twice numbers of female from male for interviews. The field team conveniently selected 15 female and 9 male adults from 24 different households. From each village, we selected approximately the same number of informants. When we completed 24 interviews, we reached data saturation and stopped enrolling informants, which is consistent with recommended strategies for enrollment in qualitative studies.¹⁹

Data collection and analysis. Social scientists, public health specialists, and epidemiologists who were working for an international non-government organization situated in Bangladesh and from two recognized university situated in United Nations of America developed an in-depth interview guide that listed themes according to our research objectives. Data were collected and analyzed by three Bangladeshi anthropologists with extensive experience in collecting and analyzing water sanitation and hygiene-related qualitative data.

In-depth interviews were conducted to explore informants' current perceptions, practices, and barriers regarding handwashing, with a focus on handwashing after defecation and the use of different cleansing agents. The interviews, which lasted for 60–90 minutes, were recorded using a digital recorder. The audio recordings from the in-depth interviews were transcribed in Bengali. Anthropologists then coded the data based on themes chosen prior to data collection according to study objectives. Anthropologists translated these Bengali codes into English, then analyzed the data manually and prepared a summary report on the findings.

Protection of participants. We explained the research study objectives clearly to the study participants. Before taking part in the study, participants provided informed written consent. This study protocol (no. 2008-061) was approved by the icddr, b Ethical Review Committee.

RESULTS

Sociodemographic characteristics. Characteristics of the structured observation participants have been reported previously.⁵ In brief, of 1,000 households enrolled, the mean num-

ber of household members was 5.6, approximately one-third of mothers (299, 30%) and fathers (337, 34%) lacked formal education. Half (492, 50%) of participants assessed themselves as belonging to the middle class, whereas 37% (367) assessed themselves as poor. Almost half (458, 46%) of the households had an electricity connection.

Of the 24 informants enrolled for in-depth interviews, 9 had used soap after defecation, 8 had used only water, and 7 had used ash or soil during the 2007 SHEWA-B structured observations (Table 1). Of the 24 informants enrolled, half (12) were between 20 and 30 years of age, and more than half (13) had no formal education. Half (12) assessed themselves as belonging to the middle class, whereas more than one-third (9) assessed themselves as poor. More than half (14) had an electricity connection in their households. All (15) female informants described themselves as homemakers and almost half of the male (4) informants described themselves as farmers (Table 1).

Observed handwashing practices from structured observation. During 5-hour structured observations of the members of 1,000 households, there were 349 opportunities to wash hands after defecation, on 25 (7%) occasions participants did not wash hands, on 45 (13%) occasions participants used ash or soil, on 67 (19%) occasions they used soap, and on 212 (61%) occasions they used water alone. Of 417 opportunities to wash hands after cleaning a child who had defecated, on 41 (10%) occasions participants did not wash hands, on 39 (10%) occasions participants washed their hand(s) with soil or ash, on 108 (27%) occasions they used soap and on 219 (54%) occasions they used water alone. Using ash, soil, or soap to wash hands at other key times (before food preparation, before serving food, before eating, and before

TABLE 1
Demographic characteristic of qualitative study participants

	Male	Female	Total
Age	<i>N</i>	<i>N</i>	<i>N</i>
20–30	2	10	12
31–40	4	2	6
41–50	1	2	3
> 50	2	1	3
Education			
No formal education	6	7	13
Class 1–5	1	5	6
Class 6–10	0	3	3
> Class 10	2	–	2
Occupation			
Farmer	4	–	4
Vendor	1	–	1
Rickshaw puller/van driver	2	–	2
Housewife	–	15	15
Service (garment operator, office assistant)	2	–	2
Social status of households (respondents' self-assessment)			
Rich	0	0	0
Upper middle	0	0	0
Middle	4	8	12
Poor	4	5	9
Hardcore poor	1	2	3
Households won electricity	4	10	14
Post-defecation cleansing agent used: observed in baseline study survey conducted in 2007			
Soap	4	5	9
Water only	3	5	8
Ash/soil	2	5	7

TABLE 2
Five-hour structured observations: handwashing behaviors at different key handwashing times, rural Bangladesh, 2007

Critical hand washing times	N	No hand washing	Hand washing with water alone	Hand washing with ash/soil	Hand washing with soap
		% (n)	% (n)	% (n)	% (n)
Before food preparation	1,834	50 (914)	50 (910)	0.05 (1)	0.49 (9)
Before serving food	1,717	25 (423)	74 (1,274)	0.17 (3)	0.99 (17)
Before eating	7,035	51 (3,619)	48 (3,385)	0.03 (2)	0.41 (29)
Before feeding	1,684	71 (1,203)	28 (465)	0	0.95 (16)
After cleaning a child that defecated	407	10 (41)	54 (219)	10 (39)	27 (108)
After defecation	349	7 (25)	61 (212)	13 (45)	19 (67)
Total	13,026	48 (6,225)	50 (6,465)	1 (90)	2 (246)

feeding) was rarely (< 1%) observed. Washing hands with water only was notably more frequent than using any cleansing agent; before food preparation among 50% of observed handwashing events, before serving food among 74%, before eating among 48%, and before feeding a child among 28% (Table 2).

Perceptions and practices of handwashing, and use of handwashing agents: findings from qualitative investigation. Although we enrolled three different groups of informants who used different handwashing agents during structured observation, as well as informants from both SHEWA-B intervention and control groups, we found similar responses across all groups on perceptions, practices, and barriers with regard to handwashing with different cleansing agents. Therefore, we have provided a summary of the findings instead of segregating to groups.

When to and why wash hands. Informants explained that they generally wash hands after waking up in the morning, after defecation, after cleaning utensils, before eating meals, after cleaning a child who defecated, after disposing of children's feces, after touching cow dung, after spraying pesticides in the field, and whenever they saw dirt on their hands. All informants said that they washed their hands to remove dirt as dirty hands made them feel bad. Almost a third of informants said that bad odors on hands after defecation made them feel disgusted, and washing hands gave them a fresh feeling.

One-fifth of the informants mentioned that they washed hands to remove germs to protect themselves from illnesses like diarrhea, dysentery, and worm infestation. One 55-year-old male said

If my hands are dirty, germs can enter the stomach and I will fall ill.

Almost one-fifth of the informants mentioned that they washed hands to stay clean as part of performing ablutions in the practice of Islam. One 37-year-old male mentioned

We follow handwashing practices to clean our hands prior to prayers to observe religious order.

Agents used to wash hands. Most (19) informants reported that community members habitually rinse hands only with water to remove any kind of visible dirt, especially during food-related key times, which they felt was sufficient to clean their hands.

Half the informants reported that after returning from the latrine they rubbed their left hand, used for anal cleansing, with soil or ash and then rinsed with water. Informants reported that they used ash and soil for handwashing only after defecation and after cleaning a child's anus/feces. Before eating a meal, they washed hands with water only and sometimes with soap if there was visible dirt on their hands. One 24-year-old female said

I use ash after defecation because it cleans hands like soap, but it cannot be used for other purposes; can you wash your face with ash? I even do not wash hands with ash before eating.

Few (3) informants mentioned that ash or soil is used for handwashing when soap is not present near the water source or if soap is unavailable at home. Most (21) study participants bought bar soap for bathing and laundry for all family members. Some (5) informants reported that when there was just a sliver of soap remaining, they pasted it on the wall of the latrine or on a tree near the water source and used it for washing hands after defecation (Figure 1).



FIGURE 1. Sliver of soap remaining on hand and pasted on a latrine wall.

Perceptions regarding using different agents. About half (11) the informants stated that soil or ash can clean hands as effectively as soap. A 60-year-old female stated that

What can be better than soil? God has created us from soil and one day we will go back into it.

Two informants stated that after defecation it was necessary to clean the anal area with three pieces of hard soil and then water to obey religious rules for attaining purity. This prevents direct hand contact with stool.

Almost one-third (7) of informants perceived soap as a modern product that cleaned visible dirt and removed germs and bad odor from hands more effectively compared with other agents (soil, ash, water only). One 25-year-old male said

Soap itself is a clean product, factory produced matter. So, I like it for my handwashing.

Another 35-year-old female informant said

I use ash or soil for rubbing hands to clean them, but it cannot remove bad odor. Washing hands with soap leaves a fresh feeling and good smell.

Almost one-third (7) of informants also believed that soap is a health-care product and is necessary for staying clean and free from diseases.

Facilitators and barriers: findings from qualitative investigation. Almost all (22) informants said that ash is freely available from traditional cooking stoves (fuels include fire wood, cow dung, leaves, straw) commonly used in rural areas and soil is also available in rural courtyards. The majority (15) of informants said that because soap is expensive, they like to minimize the use of soap and use ash and soil to wash hands. One 26-year-old female said

We are poor, we could not use soap for all purposes. The bathing bar is used once a day for bathing, we cannot use soap more than that.

Most (21) of the informants reported that the soap was not usually kept in a handwashing place where it could be conveniently accessed, as latrines and handwashing places are generally situated separately outside the household in an open place. They usually kept the soap inside the living room in a safe place to reduce misuse and to avoid theft and misplacement. One 26-year-old female informant said

I feel inconvenienced to bring soap from my room; we do not keep soap inside the toilet, like in urban settings. Urban toilet has place to keep soap and water inside latrine, they can use soap for handwashing after defecation.

Informants also reported barriers such as being overburdened with household chores, being rushed because of other work such as attending to children who were crying, and not feeling sufficiently motivated to wash their hands.

DISCUSSION

The structured observation data from across rural Bangladesh in 2007 demonstrate that soil or ash is preferred by a minority of

residents. Field workers very rarely observed people using soil or ash for handwashing associated with food preparation and eating, but a minority of people did wash hands with soil or ash after defecation or after cleaning a child who had defecated. Fieldworkers observed that 13% of people washed their hands with ash or soil after defecation and 10% after cleaning a child who had defecated. This compares with 19% of people who washed their hands with soap after defecation and 27% after cleaning a child who defecated. Although our sample selection in the 2009 qualitative study was based on the type of cleansing agent used during observations in 2007, informants from each village reported practicing handwashing with all three types of cleansing agents, depending on availability, convenience, and key times. Thus, after decades of promoting handwashing with soap after fecal contact, the proportion of rural Bangladeshis using ash or soil was similar to the proportion who used soap.

Responses from the qualitative investigation highlighted that visible dirt triggered handwashing with soap. Although some informants described the removal of germs to prevent diseases as a motivator to wash hands, they believed that germs were present only on visibly dirty hands only. Findings from 23 years ago as well as more recently also suggest that these perceptions among Bangladeshis have not changed,^{8,15} highlighting a failure or omission of handwashing with soap promotion during this long period. Perception on the importance of handwashing with soap when hands are visibly dirty is also similar to other research findings from low-income settings.⁴

Informants reported that they wash hands to maintain religious purity, similar to findings from the mid-1990s.⁸ Soap is now considered a household essential that can improve health by preventing the spread of germs. This is a remarkable difference from the findings of a study conducted in 1991 in Bangladesh when soap was described as a beauty product.⁸ This indicates a shift in people's attitudes and perceptions regarding the importance of soap, possibly due to increased educational and household income status of Bangladeshi people,²⁰ commercial marketing of regular and antibacterial soap, and public health handwashing promotion campaigns in Bangladesh.

Informants of the qualitative study considered soap to be expensive, similar to recent study in rural Bangladesh.¹⁵ The majority of informants reported that soap was kept inside their homes, similar to the 2011 national survey findings, where few (17%) rural Bangladeshi households were observed to have soap and water at their handwashing place.²¹ Informants prioritized and limited soap use; bathing was accorded a high priority. To prevent misuse or loss, participants did not keep soap at a convenient handwashing place, which was typically located outside the home. Keeping soap inside the homes, rather than at a handwashing place was not surprising as there were few occasions when they considered the use of soap to wash hands to be important. Lack of availability of soap at handwashing places could contribute to its low use rate and co-location of soap and water improved the likelihood of handwashing with soap.^{15,22,23} This is consistent with behavior change theory that recommends addressing physical barriers to increase the targeted desired behavior.^{24–27}

A limitation of the qualitative study was that we included only one geographical site to collect data, and this site was purposively chosen because ash and soil use was frequently detected during structured observation. Thus, these practices and attitudes may not be representative across rural Bangladesh. However, the broader quantitative study found that handwashing

with ash or soil occurred with similar frequency to handwashing with soap, and so the perspective from these three villages is likely to be informative of local understanding of these differing options. Another study conducted with caretakers of children < 5 years of age in a rural site of central Bangladesh also found that 48% of household kept ash for handwashing.¹⁵ Moreover, in a national survey, 7% of rural Bangladeshi household members reported using ash or soil as a handwashing agent,²¹ indicating that our selected site was similar to other rural areas in terms of ash/soil use.

The SHEWA-B baseline observation study's limitations have been described elsewhere; most notably, the presence of an observer increases handwashing behaviors.^{28–31} However, the structured observation still identified frequent handwashing with water alone and no handwashing in contradiction to handwashing promotion messages disseminated in Bangladesh. Another limitation of the observation study was that we did not collect separate data for ash and for soil as hand cleansing agents. Since a previous study found an antibacterial effect from the high pH of ash,¹⁵ separate data for ash use might have been beneficial.

These findings show that handwashing behavior is directly linked with components described by the Integrated Behavioral Model for Water, Sanitation, and Hygiene (IBM-WASH).²⁷ These include contextual factors (e.g., habitually rinsing hands only with water to remove visible dirt), psychosocial factors (e.g., disgust and religious practices as a cue for handwashing), and technological factors (e.g., location, access, and availability of handwashing facilities/agents). These findings have implications for designing intervention approaches to encourage handwashing with soap.

Although communities currently consider soap as a health product, handwashing with soap still remains low despite decades of handwashing promotion, similar to other low-income countries.⁴ We suggest a thorough review of current messages and approaches on handwashing with soap to develop more effective communication messages and approaches that can be tested for efficacy in trials.

Messages could stress the importance of handwashing with soap even when hands look clean, as participants recognized the need to wash hands that were visibly dirty and these messages have been effective elsewhere.³² To encourage people to wash hands, focusing on achieving religious purity and eliciting disgust feelings could be a potential strategy, as our study informants mentioned that these factors act as a cue to wash hands, and studies using disgust messages have been effective.^{4,32–34} Though, a study conducted in rural Bangladesh found that soap, ash, and soil were similarly effective in removing fecal coliforms from hands,⁹ no studies have evaluated the ability of post-defecation handwashing with ash or soil to reduce disease burden. We suggest that interventions should continue to encourage soap use, as soap remains the handwashing agent for which we have the best evidence of health impact.^{6,7} Future assessment on the health impact of using ash or on the impact of rubbing hands is required before changes in the current approach are incorporated.

Soap remains the handwashing agent for which we have the best evidence of health impact.^{6,7} To address the barrier of soap cost, handwashing with soapy water (detergent powder plus water) could be promoted. Soapy water is just as microbiologically effective as bar soap at reducing fecal indicator organisms from hands,³⁵ and it is acceptable elsewhere in

Bangladesh.³⁶ A trial of individual and combined water, sanitation, hygiene, and nutrition interventions (WASH Benefits; www.washbenefits.org) will likely provide insights on the health benefit of washing hands with soapy water. To address the physical barriers of convenient handwashing agent location, encouraging placement of low-cost options such as soapy water at handwashing locations may be more successful compared with bar soap.

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