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Effects of BRAC Water, Sanitation and Hygiene (WASH) Programme in Improved Sanitation: Changes from Baseline to Midline Survey

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ABSTRACT

To facilitate achieving national target of 100 percent sanitation in Bangladesh by the year 2013, BRAC Water, Sanitation and Hygiene (WASH) programme has been working in 150 *upazilas* for improving water supply, sanitation and hygiene practices. This study investigated the effect of BRAC WASH programme on sanitation in the intervention areas after two years of implementation, by comparing the data of baseline and midline surveys. Data of 30,000 households from 50 *upazilas* were used to measure the improvement in sanitation at household level. The sanitation situation in the same *upazilas* at institutional level was studied by surveying educational institutions (2,395 during baseline and 1,487 during midline), which were financed by the BRAC WASH programme for arranging improved sanitation facilities. Use of sanitary latrines increased significantly ($p<0.001$) both at household (7.1%) and institutional level (2.4%). Additionally, the quality of sanitary latrines improved significantly ($p<0.001$). During midline survey higher percentage of latrines were found clean (17.2% at the households, 23.7% at the educational institutes) and with available water nearby the latrines (5.5% at the households, 11.4% at the institutes). There were also reduced percentage of latrines with stink (14.8% at the households, 22.4% at the institutes) and residual fecal left (12.8% at the households, 21.6% at the institutes). The improvements of sanitation status could be attributed to the BRAC WASH activities implemented in the study areas for 2 years. However, there were some impediments revealed from the study, i.e., shifting of households using sanitary latrines to unsanitary practices, poverty, illiteracy etc., which were slowing down the sanitation improvements. Thus, the BRAC WASH programme needs strengthening of ongoing activities addressing the key impediments at household level together with extended support for educational institutions to achieve the set goals.

EXECUTIVE SUMMARY

BACKGROUND

Both the government organizations and several non-government organizations (NGOs) are working to ameliorate the overall sanitation situation in Bangladesh and reach the national target of 100% sanitation by the year 2013. BRAC Water, Sanitation and Hygiene (WASH) programme is being implemented in 150 *upazilas* since 2006 to ensure sanitation services, provide hygiene education and give services for safe water supply. For evaluation of the WASH programme both baseline and midline surveys were conducted by the BRAC Research and Evaluation Division (RED). A comparative assessment between baseline and midline survey data may help understanding the effect of the WASH programme in improving sanitation both at household and institution levels.

OBJECTIVES

The overall objective of the study was to reveal the effect of BRAC WASH programme on sanitation in the intervention areas compared to the baseline status. The specific objectives were to:

1. Measure the extent of improvement occurred in sanitation practices at household and institution levels compared to the baseline status.

2. Identify issues for further attention of BRAC WASH programme towards reaching the set goals.

METHODS

Fifty *upazilas* were selected from the first phase of BRAC WASH programme, where baseline and midline surveys were conducted among 30,000 households. These households were selected using the multi-stage sampling methods. The variables were sanitary latrine use, quality of latrines, defecation practice of children, ownership of latrines, sources of money for latrine installation, reasons for using and not using sanitary latrines, hygiene knowledge and practices. Furthermore, 2,395 educational institutions were covered in the baseline. Of them 1,487 were re-visited during midline survey to collect data on sanitary latrine use, availability of latrine facilities for students, menstrual sanitation facilities for girls, hygiene practices and relevant education facilities for both students and teachers. Data collected from baseline and midline surveys were compared to show the effect of BRAC WASH programme in improving sanitation situation at household and educational institution levels.

KEY FINDINGS

1. The overall use of sanitary latrine increased significantly ($p<0.001$) in midline (39.1%) compared to baseline (32.0%). The relative difference in the use of sanitary latrine was found higher among the hardcore poor and poor households than the non-poor, which might be attributed to the impact of WASH programme interventions.

2. Though the use of sanitary latrine increased due to programme interventions, there were also incidents of households shifting from the practice of using sanitary latrine to unhygienic practices e.g., using ring slab latrines without water seal and unhygienic latrines. The programme achievements were thereby slowing down and it required more effort for further improvement. Maintenance of water seal probably seemed cumbersome, requiring sufficient flushing of water at each use. The users were reluctant in this regard, and thus, water seals were broken at or after installation.

3. The observed indicators for assessing quality of latrines revealed the improvement of latrine quality in midline from that of baseline, since all the indicators significantly changed ($p<0.001$), i.e., more clean latrines (50.8% in midline, 33.6% in baseline), less incidents of stink coming from the latrine (48% in midline, 62.8% in baseline), reduced number of latrines with any residual fecal left (35.2% in midline, 48% in baseline), increased frequency of water availability inside or nearby the latrines (37.9% in midline, 32.4% in baseline), etc. Additionally, during midline the use of sanitary latrine among the children also increased (5.2%). This might be ascribed to the promotional activities of BRAC WASH programme through the village WASH committees and active involvement of women.

4. The ownership of sanitary latrines also increased among the households of all economic groups (51.5% in baseline, 57.1% in midline), though the increase among the hardcore poor (37.9% in baseline, 44.3% in midline) and poor (43.3% in baseline, 5.4% in midline) households was higher than the non-poor (58.5% in baseline, 63.4% in midline). The source of money for installing sanitary latrines came predominantly from own arrangements of the households (92.6% in baseline and 93.1% in midline), however, getting finance from NGOs as loan increased significantly ($p<0.001$) in midline (1.8% in baseline, 4% in midline). Health concern was found to be the major reason for using sanitary latrines in the households, while financial inability was the major reason for not installing and/or using sanitary latrines, found in both baseline and midline surveys.

5. Significantly ($p<0.001$) higher tendency of not using sanitary latrines was found both during baseline and midline surveys among the households which were hardcore poor (1.4 and 1.5 times than the non-poor, respectively in baseline and midline) or of deficit economic status (2.1 and 2.0 times than the surplus, respectively in baseline and midline) or did not have access to media (1.8 times than having media access both in baseline and midline) or had illiterate household head (1.8 and 1.1 times than the literates, respectively in baseline and midline). Nevertheless, during baseline survey the male household heads had significantly higher tendency (1.3 times than the females) of not using sanitary latrines, but such tendency disappeared during the midline survey.

6. Availability of sanitary latrines at the premises of educational institutes increased from 70% in baseline to 73% in midline ($p<0.001$). In addition, all the indicators for the quality of latrines also changed in midline from baseline status, indicating as improvement. Absenteeism of girl students during episodes of menstruation was reported to decrease significantly from 44% in baseline to 29% in midline ($p<0.001$). Though a small proportion of different institutes (2% primary, 4.7% secondary, 10.9% higher secondary, 5.5% *Madrasa*, 2.5% BRAC schools, 9.1% others) reported to have designated place for disposal of menstruation rags in baseline, it increased significantly in midline ($p<0.001$). The improvement was higher in the secondary schools and *Madrasas*. Observation of indicators for cleanliness of sanitary latrines showed marked improvement.

CONCLUSION AND RECOMMENDATIONS

The BRAC WASH programme was found to have positive effects on the use of sanitary latrines among both households and educational institutes. However, there were still several impediments, i.e., shifting of households using sanitary latrines to not using sanitary latrines, removal of water seal, poverty/financial crisis and illiteracy, predominantly slowing down the increase of sanitation coverage and challenging the success of programme interventions. Intensification of promotional activities as well as more support to those having financial crisis to install sanitary latrines is imperative. The interventions in the educational institutes warrant further expansion.

INTRODUCTION

Inadequate access to sanitation of a large population is one of the prime environmental health concerns in the low income countries. Almost half of the developing world's people still lack access to safe sanitation facilities (United Nations 2007; WSSCC 2003), which is usually attributed to institutional fragmentation, weak national planning, and low political commitment of a country (UNDP 2006). Additionally, poverty stands as a strong barrier in improving sanitation situation, since the poor people lack both the means to get access to improved sanitation facilities as well as they have limited knowledge on how to minimize the negative effects of unsanitary environment. Although the government of Bangladesh claimed 87% sanitation coverage (LGD 2008), the Joint Monitoring Programme for water supply and sanitation of WHO and UNICEF reported 53% people accessing improved sanitation, 25% sharing the facility of others, 15% using unimproved sanitation facilities and the rest 7% practice defecation in open places (WHO and UNICEF 2010). Bangladesh is improving sanitation coverage since 1990s (WHO and UNICEF 2010), but the progress is not satisfactory towards achieving the national target of 100 percent sanitation by the year 2013 (UNICEF 2010). Apart from the government interventions, a number of non-government organizations (NGOs) are working to increase access to sanitary latrine facilities (Ghosh *et al*. 2010; Hadi 2000; Hadi *et al*. 1996; Shailo 1995).

In the educational institutes of Bangladesh 150 or more students use one latrine, while in developed countries 20-30 students use one latrine (The New Nation 2009). Lack of sanitation facilities at the premises of educational institutes is a major cause of absenteeism and dropout among the students, which is especially true for the adolescent girls (IRC 2005). In many low income countries these aspects are rarely considered. Research indicates that availability of appropriate sanitation and hygiene management at the educational institutes reduce dropout and increase regular attendance of girls (Wateraid 2009). Besides, providing health education among the adolescent students on proper management of episodes of menstruation also reduces loss of their valuable study time (Lee *et al*. 2006). It is widely recognized that educational institutes play a crucial role in bringing about changes and promoting better health among the students (Burgers 2000). This improvement eventually may have an impact on the community level sanitation and hygiene practice as students might disseminate knowledge to other people where they reside (BRAC 2008a).

BRAC initiated the Water, Sanitation and Hygiene (WASH) programme in 150 *upazilas*, with financial support from the government of Netherlands aiming to ensure access to sanitation services for 17.6 million people along with providing education on hygiene practices to 37.5 million people, and safe water supply services to 8.5 million people through participation in and collaboration with the community people. Apart from the supports for improved sanitation and safe water supply, improvement of hygiene practices has been considered as the main focus of the programme (BRAC 2008a). To ensure participation of community people Village WASH Committees (VWCs) have been formed in the intervention villages. VWCs are the focal points for involving rural people at all levels, which function through problem identification, resource mobilization, adoption of strategic action within the existing synergy to provide sustainable services for access to safe water, sanitation and hygiene practices. Following a 6 months inception period (July – December 2006) the programme at its first phase started activities in 50 *upazilas*, while in two consecutive years, i.e., 2007 and 2008, respectively in second and third phases, each time 50 *upazilas* came under the programme coverage.

BRAC WASH programme started in 2007 in the educational institutes with two intervention protocols: (i) providing partial monetary support for construction of sanitary latrine in selected secondary level girls' or co-education institutes with higher proportion of girls students, and (ii) offering health education related to water, sanitation and hygiene to the students, teachers and staff of all the institutes selected under the intervention area. Three educational institutes from each union

are usually selected for support from the BRAC WASH programme where separate sanitary latrines for the girls are unavailable. It might be mentioned that union is the lowest administrative unit of the government of Bangladesh and each *upazila* usually consists of 7-8 unions. Presently Tk 45,000 is allocated for construction of a sanitary latrine at the premise of an educational institute, although initially Tk. 35,000 was granted (Arif *et al*. 2010). The financial support is managed by a tri-partite purchase committee formed locally by the respective BRAC *upazila* accountant, BRAC WASH programme organizer for the area, and one member (usually a school teacher) from the school. The grant is provided in several installments along with the share of respective school. The allocated money is spent for procuring hardware materials of sanitary latrine, water source and arranging waste management facility (dumping of the used sanitary pads). It may be mentioned here that this financial support meets half of the cost of a sanitary latrine. The community and school authority provide rest of the construction cost, which is a pre-requisite for getting finance from BRAC in this regard (Arif *et al*. 2010).

A baseline survey was conducted at the beginning of the programme. A report on the findings of baseline survey was published documenting the water, sanitation and hygiene condition in the intervention areas both at household and educational institution levels (BRAC 2008a). A follow-up, i.e., midline survey was done in 2009. However, since approximately 2 years was elapsed between the two surveys, a comparative study might give insight into the programme performance.

OBJECTIVES

The study aimed to reveal the effect of BRAC WASH programme on sanitation in the intervention areas compared to the baseline status. The specific objectives were to:

1. Measure the extent of improvement occurred in sanitation practices at household and institution levels compared to baseline status, and

2. Identify issues for further attention of BRAC WASH programme for reaching the goals.

METHODS

This study is a comparison of cross-sectional data on sanitation situation collected through baseline and midline surveys.

Study area

During November 2006 to July 2007 BRAC RED conducted a baseline survey in 75 *upazilas*. Of them, 50 *upazilas* were from the first phase of BRAC WASH programme and 25 *upazilas* were from the second phase. Later during April-June 2009, a midline survey was carried out to assess the effect of programme interventions on the key variables e.g., use of sanitary latrine, quality of latrines, defecation practices of children, ownership of latrines, sources of money for sanitary latrine installation, reasons for using and not using sanitary latrine, and hygiene knowledge and practices influencing the sanitation behaviour. The same 50 *upazilas* of baseline survey were selected for the midline (Fig. 1).

Nevertheless, the 25 other *upazilas* from baseline were discarded in midline since the programme duration was less than two years. Apart from the household survey the existing educational institutions received sanitation support from the BRAC WASH programme were also surveyed both in baseline and midline.

Sample size and sampling

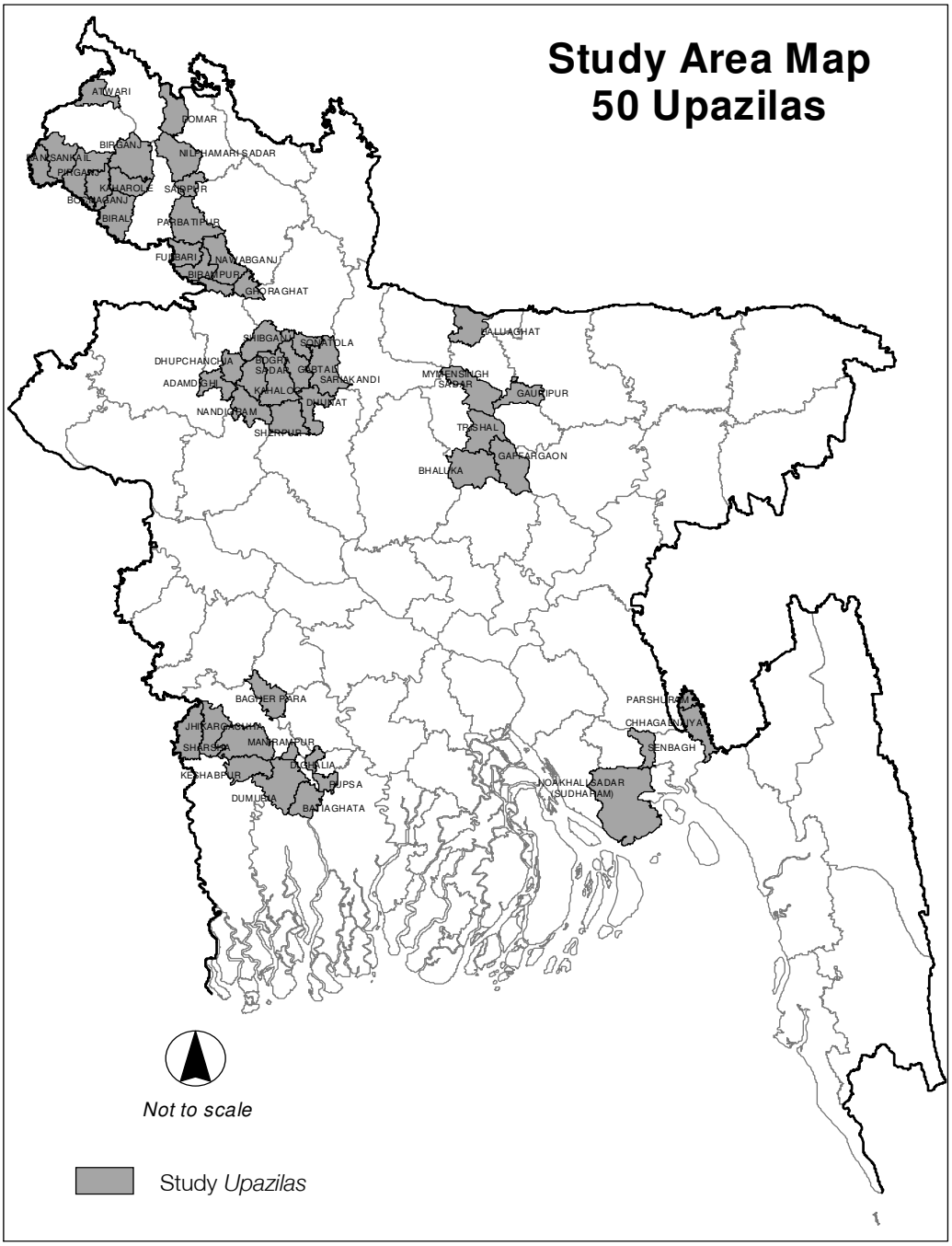
For conducting the household survey a multi-stage cluster sampling design was followed for selecting the households during the baseline survey (BRAC 2008a). The level of significance was set at 5% with admissible error of 5% and design effect of 1.5. Considering the maximum possible ratio of 50% the sample size estimated for the survey was 576 for each *upazila*, which was rounded to 600 for distribution convenience. In the first step, 30 villages from each *upazila* were selected. In the second step, 20 households were selected from each village. Thus, the total sample size for the household survey in baseline was 30,000 from 50 *upazilas*. The same households which were surveyed during the baseline were re-visited in the midline. Therefore, a total of 30,000 households from 50 *upazilas* were purposively selected and re-interviewed in midline. The households which could not be re-interviewed (due to death, displacement of the house, or absenteeism) were not considered, and thus the number of households in midline was not same as the baseline.

For the institutional survey 2,395 educational institutes for baseline and 1,487 educational institutes for midline were selected. The surveyed institutions of different types were divided into six broad categories, i.e., primary, BRAC school, secondary, *Madrasa*, higher secondary, and others. To reduce the number of institutions during midline, only one institution was included in the study from each category whenever several similar schools were found in operation in the same village. In such situation, the largest school in terms of number of students was chosen for the study.

Data collection and analysis

For the household survey a structured questionnaire was developed, including the indicators such as use of sanitary latrine, quality of latrines, defecation practices of children, ownership of latrines, sources of money for sanitary latrine installation, reasons for using and not using sanitary latrine, hygiene knowledge and practices. The term “sanitary latrine” was defined as latrine with septic tank and water seal or concrete ring (usually 5 rings) and slab with water seal. If the water seal was found broken during physical observation that latrine was not considered sanitary (BRAC 2008a). However, during midline survey for considering “sanitary latrine” the number of rings was reduced to 3 from 5, while all other factors were same as baseline. Additionally, the “household poverty”, i.e., hardcore

Figure 1. The *upazilas* where baseline and midline surveys were conducted



poor, poor and non-poor, was defined according to the BRAC (BRAC 2008a). The questionnaire was pre-tested, modified and edited on the basis of feedback received before finalization. The respondents were the adult female members who had knowledge of their respective daily household activities related to water, sanitation and hygiene. The rationale of choosing female respondents was that the women, usually responsible for household activities, might better know the sanitation and hygiene practices. Furthermore, the BRAC WASH programme promotes household hygiene practice through involving the female members of the households. The administrative heads or the acting heads of educational institutes were interviewed for the institutional survey. A different set of

questionnaire was used to collect data on the use of sanitary latrine, availability of latrine facilities for students, menstrual sanitation facilities for girls, hygiene practices, and sanitation/hygiene education facilities for students and teachers.

The enumerators were divided into groups with four members in each group- two females and two males. In addition, five supervisors were selected and trained separately who supervised three to five groups each (based on the distance among the surveyed *upazilas*). Enumerators were instructed to complete all the questionnaires in the field and cross-check each other's questionnaires before finalizing the daily work. Two batches of enumerators were sent separately to the field at first. Later after completion of 50% of the field survey these two batches were mixed to replace the members (one male and one female) of one batch with those from the other batch to overcome any technical error or information gap.

The supervisor's duty was to spend a week in each of his assigned group. During their stay in the field they went through all the questionnaires to identify any inconsistency and the respondent was re-interviewed. In addition, they were also told to verify 5% of the previous weeks filled up questionnaires.

The field managers checked the quality of each interviewer by randomly picking 12 completed questionnaires of a particular day and visited the field to verify answers of some previously selected questions. They were provided with a structured checklist and reported back to the head office with their findings.

The responsibility of the field coordinator was to supervise overall field activities. Field coordinator was the contact person for the WASH research team and would document all the enquiries from the field for immediate dissemination to the concerned researchers. The field coordinator also kept a log book of field activities.

Besides, a team of the core researchers monitored the field activities closely by visiting some selected field locations to ensure the correct way of sampling and data collection and minimize the problems arose in the field.

Data of the same households from both baseline and midline survey were analyzed using SPSS version 11.5. The tested variables were latrine use by the households, quality of latrines, ownership of latrines, sources of money for latrine installation, reasons for using sanitary latrines. Additionally, a binary logistic regression was also accomplished to calculate the odds ratio (OR) at 95% confidence interval (CI) to predict the reasons for not using sanitary latrine in the households e.g., poverty, self-rated economic status, access to media, and literacy and sex of household head.

The relative difference in sanitation situation in midline from baseline was calculated using the following formula,

$$\text{Relative difference (RD \%)} = \frac{\text{Midline status} - \text{Baseline status}}{\text{Baseline status}} \times 100$$

RESULTS

SANITATION AT HOUSEHOLD LEVEL

The socioeconomic profile of the sampled households shows that the literacy rate of the household heads was 55.2%. Households below the poverty line were found to be 47% and 7.1% landless, while 37% had access to media e.g., radio and/or television (Table 1).

Table 1. Socio-economic profile of people living in the study area

Indicators	%	N
Literacy of household head		
Literate	55.2	16551
Illiterate	44.8	13441
Economic status of households		
Hardcore poor	20.1	6039
Poor	26.9	8045
Non-poor	53.0	15909
Media access of households		
Access	37.0	11100
No access	63.0	18893
Land ownership		
Landowner	92.9	27872
Landless	7.1	2121

Due to the implementation of BRAC WASH programme, the relative increase in the use of sanitary latrine among the hardcore poor (31.3%) and poor (30.4%) households during midline was higher than the non-poor households (17.6%). Thus, significant difference ($p<0.001$) was found in the use of sanitary latrine in midline survey compared to the baseline. The overall use of sanitary latrine showed 22.2% relative increase in midline. However, the overall practice of not using sanitary latrine also increased relatively in midline (23.8%) with 36.9% relative reduction of using ring slab latrines without water seal. Similar phenomenon was observed among all household groups (Table 2).

Table 2. Type of latrine used in the households (%)

Type of latrine used	Hardcore poor			Poor			Non-poor			Total		
	BL	ML	RD	BL	ML	RD	BL	ML	RD	BL	ML	RD
Hygienic	21.1	27.7	31.3	25.7	33.5	30.4	39.3	46.2	17.6	32	39.1	22.2
Ring slab without water seal	32.7	21.8	-33.3	42	26	-38.1	38.3	24	-37.3	38.2	24.1	-36.9
Unsanitary	46.2	50.5	9.3	32.3	40.5	25.4	22.3	29.9	34.1	29.8	36.9	23.8
n	6039	6001	-	8045	8005	-	15909	15813	-	29993	29854	-
χ^2	p<0.001		-	p<0.001		-	p<0.001		-	p<0.001		-

BL = Baseline, ML = Midline

Nevertheless, Table 3 indicates change in the use of latrine among the households in midline from that of baseline. The transition matrix shows that 32% of the total households used sanitary latrines during the baseline survey. However, 62.1% of those using sanitary latrines in baseline continued to do so in midline, while some of the households shifted to using unsanitary latrines (20.8%) and the rest (17.1%) used ring slab latrines without water seal. However, among the households using ring slab latrines without water seal during baseline (38.2%), 32.8% changed the behaviour of using sanitary latrines, 32.9% did not use sanitary latrines and the remaining (34.4%) were found to have the same status both in baseline and midline. Among the households which did not use sanitary latrines in baseline, 59.1% did not change their behaviour, while 18.5% were found to use ring slab latrine without water seal and 22.4% started to use sanitary latrines during midline (Table 3).

Table 3. Transition matrix of latrine use in the households (%)

Use of latrine	Baseline (%)	Midline (%)		
		Sanitary latrine	Ring slab latrine without water seal	Unhygienic latrine
Sanitary	32.0	62.1	17.1	20.8
Ring slab latrine without water seal	38.2	32.8	34.4	32.9
Not sanitary	29.8	22.4	18.5	59.1
Total	100	39.1	24.1	36.9

The observed indicators for quality of sanitary latrines used in the households show that there was 51.2% relative increase of using clean latrines in midline compared to baseline. Consequently, the number of latrines with stink and residual fecal reduced relatively (23.6% and 26.7%, respectively). The availability of water inside or nearby the latrines also increased by 17% in midline. But for 8.3% of the cases sandals were available nearby the latrines during the midline survey; however, the relative increase was 84.4% from baseline. All the indicators were found to change significantly ($p<0.001$) among hardcore poor, poor and non-poor households (Table 4).

Table 4. Indicators of quality of sanitary latrines in the households (%)

	Is the latrine clean?							
	Hardcore poor		Poor		Non-poor		Total	
	Baseline	Midline	Baseline	Midline	Baseline	Midline	Baseline	Midline
Yes (%)	30.2	46.4	28.7	46.3	36.4	53.9	33.6	50.8
RD (%)	53.6		61.3		48.1		51.2	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	2646	2770	4804	4842	11470	11283	18920	18922
Is there any stink coming from the latrine?								
Yes (%)	65.9	53	69.2	52.9	59.4	44.6	62.8	48
RD (%)	-19.6		-23.6		-24.9		-23.6	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	2646	2770	4804	4842	11470	11283	18920	18922
Is there any residual fecal left in the latrine?								
Yes (%)	51.1	39.3	52.3	38.3	45.5	32.8	48	35.2
RD (%)	-23.1		-26.8		-27.9		-26.7	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	2646	2770	4804	4842	11470	11283	18920	18922

Table 4. (Contd…)

	Is the latrine clean?							
	Hardcore poor		Poor		Non-poor		Total	
	Baseline	Midline	Baseline	Midline	Baseline	Midline	Baseline	Midline
Is there water available in and/or near the latrine?								
Yes (%)	28.3	33.4	28.6	33.7	34.9	40.9	32.4	37.9
RD (%)	18.0		17.8		17.2		17.0	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	2646	2770	4804	4842	11470	11283	18920	18922
Is there any sandal near latrine?								
Yes (%)	2.8	5.9	2.2	5.5	5.9	10.1	4.5	8.3
RD (%)	110.7		150.0		71.2		84.4	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	2646	2770	4804	4842	11470	11283	18920	18922

The sanitation behaviour of children (<5 years) improved significantly (p<0.001) after the implementation of BRAC WASH programme, since there was 49.5% relative increase of using sanitary latrines for defecation. The increased use of latrine by the children led to the reduced unsanitary defecation practices, i.e., defecation in unhygienic latrines, household premises or no fixed place (Table 5).

Table 5. Defecation practice of children (%)

Defecation practice	Baseline	Midline	RD
Sanitary latrine	10.5	15.7	49.5
Unsanitary practices	89.5	84.3	-5.8
χ^2		p<0.001	-
n	13128	10924	-

The ownership status of sanitary latrines among the households of all economic groups, i.e., hardcore poor, poor and non-poor changed significantly (p<0.001) in midline compared to baseline. The number of households having own sanitary latrines increased by 10.9% relatively in midline than the baseline, while the number of shared latrines used by the households reduced relatively by 11.5 % (Table 6).

Table 6. Ownership of latrines used by the households (%)

Ownership of latrine and RD	Hardcore poor		Poor		Non-poor		Total	
	Baseline	Midline	Baseline	Midline	Baseline	Midline	Baseline	Midline
Own latrines	37.9	44.3	43.3	50.4	58.5	63.4	51.5	57.1
RD	16.9		16.4		8.4		10.9	
Shared latrines	62.1	55.7	56.7	49.6	41.5	36.6	48.5	42.9
RD	-10.3		-12.5		-11.8		-11.5	
χ^2	p<0.001		p<0.001		p<0.001		p<0.001	
n	3,265	3,315	5,681	5,648	12,794	12,666	21,740	21,658

Significant difference (p<0.001) was found between baseline and midline regarding the sources of money used for the sanitary latrine installation by the households. Though the arrangement of

money by the households themselves was predominant during both the surveys, however, getting money from the NGOs increased relatively (55%) in midline and the frequency of NGOs' finance was higher among the hardcore poor and poor than the non-poor households (Table 7).

Table 7. Sources of money for sanitary latrine installation (multiple responses)

Source of money	Hardcore poor		Poor		Non-poor		Total	
	Baseline	Midline	Baseline	Midline	Baseline	Midline	Baseline	Midline
Self	83.8	83.3	91.5	92.1	94.9	95.9	92.6	93.1
Government	12.9	10.0	9.6	6.9	4.2	3.0	6.7	5.0
NGOs	3.8	10.2	2.2	5.2	1.2	2.0	1.8	4.0
Relative/Neighbour	1.4	1.1	0.6	0.8	0.6	0.4	0.7	0.6
Others	2.5	1.6	0.9	0.4	1.1	0.7	1.6	1.0
χ^2	p<0.001		p<0.001		p<0. 001		p<0. 001	
n	2,179	2,561	4,051	4,533	10,064	10,621	16,294	17,742

Regardless of the poverty level of households, significant difference was found in the reasons of using own sanitary latrines in midline and baseline. During both the surveys the users mentioned health concern, convenience and cost effectiveness as the most frequent reasons for using own sanitary latrines (Table 8).

Table 8. Reasons for using own sanitary latrines (multiple responses)

Reported reasons	Hardcore poor		Poor		Non-poor		Total	
	BL	ML	BL	ML	BL	ML	BL	ML
Health concern	46.4	48.3	47.9	48.1	54.9	54.5	52.0	51.9
Convenient and reliable	34.2	31.1	36.5	32.6	32.5	31.1	33.7	31.5
Cost effective	15.0	17.5	11.3	15.6	8.2	10.8	9.9	13.0
Social status	2.5	2.4	2.5	2.8	2.7	2.4	2.6	2.5
Others	2.1	1.1	1.7	1.2	2.0	1.6	1.9	1.5
χ^2	p<0.05		p<0.001		p<0.001		p<0.001	
n	2,179	2,561	4,051	4,533	10,064	10,621	16,294	17,742

BL = Baseline, ML = Midline

There was significant difference (p<0.001) between the baseline and midline in the reasons mentioned by the respondents for not using sanitary latrines, irrespective of the household economic status. Financial inability to install sanitary latrine was the predominant reason for not using such facility mentioned both in the baseline (81.2%) and midline (86.9%, Table 9).

Table 9. Reasons for not using latrines (multiple responses)

Reported reasons	Hardcore poor		Poor		Non-poor		Total	
	BL	ML	BL	ML	BL	ML	BL	ML
Financial inability	85.8	88.3	83.7	89.0	75.3	83.4	81.2	86.8
Lack of enough space	11.2	1.4	6.9	7.5	7.3	7.2	8.5	8.5
Satisfied with current practices	2.6	0.8	3.3	1.4	7.1	2.5	4.5	1.6
Convenience	1.7	1.1	3.4	1.2	4.6	3.3	3.3	1.9
Others	2.5	1.9	4.0	1.8	7.0	4.1	4.6	2.6
χ^2	p<0.01		p<0.001		p<0.001		p<0.001	
n	2,323	1,446	1,902	1,222	2,574	1,437	6,799	4,105

BL = Baseline, ML = Midline

The log odds ratio of the selected variables showed that the poverty level, self-rated economic status, access to media of the households and literacy of household heads had significant (p< 0.001) influence on the behaviour of not using sanitary latrines both in baseline and midline (Table 10). The hardcore poor households had significantly higher tendency (1.4 and 1.5 times, respectively in baseline and midline) of not using sanitary latrines than the non-poor households. Similarly the poor households, both in baseline and midline, showed 1.4 times higher inclination to not using sanitary latrines. Considering the self-rated economic status of the households, both during baseline and midline, the deficit households showed highest (2.1 and 2.0 times, respectively in baseline and midline, higher than surplus households) tendency of not using sanitary latrines. Households not having access to media also had significantly higher tendency (1.8 times both in baseline and midline) of not using sanitary latrines than those accessing media. When all other variables are restricted, the illiterate household heads showed higher (1.8 and 1.1 times, respectively in baseline and midline) tendency of not using sanitary latrine than those who were literate. However, considering the sex of the household heads, the male had significantly (1.3 times) higher tendency of not using sanitary latrines during the baseline, while in midline there was no significant change observed in this regard (Table 10).

Table 10. Odds ratio of selected variables predicting the issues of not using sanitary latrine

Predicted variables	Baseline			Midline		
	OR	95% CI	p value	OR	95% CI	p value
Poverty						
Non-poor	1.0			1.0		
Poor	1.4	1.3 – 1.5	< 0.001	1.4	1.4 – 1.5	< 0.001
Hardcore poor	1.4	1.3 – 1.5	< 0.001	1.5	1.4 – 1.6	< 0.001
Self rated economic status						
Surplus	1.0			1.0		
Equilibrium	1.5	1.4 – 1.6	< 0.001	1.4	1.3 – 1.5	< 0.001
Deficit	2.1	1.9 – 2.2	< 0.001	2.0	1.8 – 2.1	< 0.001
Media						
Access	1.0			1.0		
Non-Access	1.8	1.7 – 1.9	< 0.001	1.8	1.7 – 1.9	< 0.001
Literacy of household head						
Literate	1.0		< 0.001	1.0		
Illiterate	1.8	1.7 – 1.9	< 0.001	1.1	1.0 – 1.1	< 0.001
Sex of household head						
Female	1.0			1.0		
Male	1.3	1.2 – 1.4	< 0.001	1.0	0.9 – 1.1	0.560

Sanitation at educational institutions

Among the type of educational institutes primary schools were found to be predominant both in baseline and midline. The reasons for inclusion of higher proportion of primary schools might be the more frequent presence of this school than the other educational institutes in every union. The second category represented BRAC schools, followed by secondary and *Madrasa* level educational institutes. A small proportion of higher secondary and other educational institutes were also included in both surveys (Table 11).

The availability of sanitary latrines in the educational institutions increased in midline compared to the baseline. However, about a quarter of the educational institutes were found to be without sanitary latrines. A small proportion of educational institutes used sanitary latrines with broken water seal, which also reduced relatively (35.8%) in midline (Table 12).

Table 11. Type of educational institutes participated in this study

Educational institutions	Number of institutions in baseline	Baseline (%)	Number of institutions in midline	Midline (%)
Primary	1080	45.1	763	51.3
BRAC school	449	18.7	292	19.8
Secondary	335	14.0	224	15.1
Madrasa	461	19.2	181	12.2
Higher secondary	48	2.0	18	1.2
Others	22	0.9	7	0.5
n	2395		1487	

Table 12. Available latrine facilities at the premises of educational institutes (%)

Provision of latrine	Baseline	Midline	RD	p value
Sanitary latrine (with water seal)	70.4	72.8	3.4	
Latrine (with broken water seal)	5.3	3.4	-35.8	
No sanitary latrine	24.3	23.8	-2.1	<0.001
n	2,395	1,487		

It was revealed that during baseline 25% of educational institutes reported to clean the latrines regularly. On the other hand, in midline 66.7% of educational institutes reported to clean the latrines regularly, which is significantly ($p<0.001$) higher than the baseline. Thus, there was 163.6% relative increase of reported regular latrine cleaning in the educational institutions and 25.4% relative increase of hand washing behaviour with soap. The other indicators relevant to sanitation facilities for girls' menstrual episodes showed that the availability of places for disposal of their menstrual rags increased relatively (190.5%) in midline, and there was 33.0% relatively less absenteeism among them in midline. The incidents of students and teachers receiving health education increased relatively (163.6% teachers and 43.6% students) in midline (Table 13).

Table 13. Reported regular cleaning of latrines (%) and the RD (%)

Responses regarding sanitation indicators	Baseline	Midline	RD	p value
Latrine was cleaned regularly	25.3	66.7	163.6	<0.001
n	2395	1487	-	
Soap was used for hand washing in the institutes	70.5	88.4	25.4	<0.001
n	2395	1497	-	
Had specific place for disposal of menstruation rags	4.2	12.2	190.5	<0.001
n	1015	1048	-	
Girls stayed at home during menstruation	43.7	29.3	-33.0	<0.001
n	918	1122	-	
Teachers received health education	25.3	66.7	163.6	<0.001
n	2395	1497	-	
Students received health education	50.0	71.8	43.6	<0.001
n	2395	1497	-	

Additional to the reported sanitation status in the educational institutes, the relevant observed data indicate that significantly higher proportion of latrine was found to be cleaned during midline compared to baseline (79.8% relative increase), together with the reduced incidents of stink (34% relative decrease) and residual fecal in the latrines (40.4% relative decrease). Additionally, in midline

there was increased number of latrines with enough water (24.9% relative increase) and ash/soap (151.3% relative increase) kept nearby. Significantly higher number of schools (41.9% relative increase) was observed to have clean surroundings during midline (Table 14).

Table 14. Observed indicators for the quality of latrines in educational institutes (%)

Indicators	Baseline	Midline	RD	p value
Latrine was cleaned	29.7	53.4	79.8	<0.001
Stink coming out of the latrine	65.8	43.4	-34.0	<0.001
Residual fecal left in the latrine	53.4	31.8	-40.4	<0.001
Kept enough water nearby or inside the latrine	45.7	57.1	24.9	<0.001
Kept ash or soaps nearby or inside the latrine	11.7	29.4	151.3	<0.001
Surrounding of the school premises was cleaned	24.6	34.9	41.9	<0.001
n	2,395	1,487	-	-

Significant improvement was observed among all categories of educational institutions in cleaning the premises. More BRAC schools were found to have clean premises both in midline compared to most of the educational institutes in baseline (Table 15).

Table 15. Whether surroundings of the premises of educational institutes were found clean (%)

Year and number of institutions	Primary	Secondary	Higher secondary	*Madrasa*	BRAC	Others
Baseline	18.6	15.8	33.3	24.9	43.4	45.5
n	1080	335	48	461	449	22
Midline	26.9	29.0	33.3	33.1	60.9	57.1
n	763	224	18	181	292	7
p value	<0.001	<0.001	ns	<0.001	<0.001	ns

A significantly higher proportion of educational institutes were found to be clean during midline compared to baseline (p<0.001). However, no significant improvement was noted in the higher secondary and others categories of educational institutes (Table 16).

Table 16. Whether latrine of the educational institutes were found clean (%)

Year and number of institutions	Primary	Secondary	Higher secondary	*Madrasa*	BRAC	Others
Baseline	29.1	27.5	51.1	28.9	31.2	42.1
n	995	316	47	377	202	19
Midline	50.4	65.3	38.9	57.9	46.0	66.7
n	698	216	18	145	124	6
p value	<0.001	<0.001	ns	<0.001	<0.001	ns

Significantly higher proportion of teachers and students used soap for washing hands after defecation in all the educational institutes except in the other categories of educational institutes (p<0.001, Table 17).

Table 17. Whether students and teachers used soap for washing hands after defecation (%)

Year and number of institutions	Primary	Secondary	Higher secondary	*Madrasa*	BRAC	Others
Baseline	78.0	81.2	89.5	50.8	62.2	72.7
n	1063	335	48	455	436	22
Midline	93.1	92.0	94.4	76.2	81.3	71.4
n	763	224	18	181	294	7
p value	<0.001	<0.001	ns	<0.001	<0.001	ns

Table 18 indicates that specific place for disposal of menstruation rags significantly increased from 5% in baseline to 34% in midline at secondary level educational institutes (p<0.001). A similar trend was noted for *Madrasa* as well. No significant improvement was noted in all other educational institutes (Table 18).

Table 18. Specific place for disposal of menstruation rags (%)

Year and number of institutions	Primary	Secondary	Higher secondary	*Madrasa*	BRAC	Others
Baseline	2.0	4.7	10.9	5.5	2.5	9.1
n	305	318	46	254	81	11
Midline	4.5	34.4	23.5	15.3	2.1	66.7
n	537	221	17	124	146	3
p value	ns	<0.001	ns	<0.001	ns	ns

DISCUSSION

SANITATION IN HOUSEHOLDS

It was revealed from the midline survey that the implementation of BRAC WASH programme during 2007-2009 led to increased use of sanitary latrine by the households. Though the use of ring slab latrines without water seal reduced; there was increase of households not using sanitary latrines. The transition of households using sanitary latrine to ring slab latrine without water seal and unhygienic latrines was responsible for the low growth of sanitation coverage (7.1%) from baseline to midline. It was found that all the households using sanitary latrines during baseline did not continue to do so during midline, though more than one-fifth of the households not using sanitary latrine during baseline, shifted to using sanitary latrines. Presence of water seal in the ring slab latrine was a major issue for the reduced sanitation coverage, since 24.1% ring slab latrines were not considered as sanitary latrines due to absence of water seal. Breaking of water seals in the sanitary latrines was found frequent among the households and is probably a major challenge for the success of WASH programme. Installation, use and maintenance of water seals in the latrines have been reported to be inconvenient for the users (Quazi 2002). Improved sanitation (latrines) and hygiene (hand-washing) is considered to have more impact on health outcomes (e.g., diarrhea, parasitic infection) than quality of drinking water (Hutley *et al*. 1997; Esrey *et al*. 1991). Overall child mortality can be reduced by about a third through transition from unimproved to improved sanitation only (UNDP 2006; World Bank 2003). Thus, 100% sanitation coverage needs to be achieved in Bangladesh through both government and NGO supports.

The observed indicators for assessing the quality of sanitary latrines showed that there was significant improvements in midline from baseline, since the cleanliness of the latrines increased, incidents of stink and residual fecal in the latrines decreased. Additionally, the preservation of water inside or nearby the latrines also increased in the midline. In few latrines there were sandals available during the midline survey, while the relative increase of the practice was high. The overall improvement of these indicators was also observed among the hardcore poor and poor households. Furthermore, the defecation practice of the children also improved due to increased use of sanitary latrines and reduced indiscriminate defecation. All these improvements might be attributed to the effect of BRAC WASH programme intervention involving strong software (motivation, training, and door to door visit) support by the BRAC village WASH committee members and monitoring the sanitary latrines at household level regularly by the BRAC employees and motivating mothers to educate their children for using sanitary latrines.

Significant increase was also observed in the ownership of latrine by households in midline compared to baseline. Both the hardcore poor and poor households showed relatively higher increase in using own latrines during midline survey. Nevertheless, the study revealed higher incidents of financial support from NGO for installing sanitary latrines by households during midline survey. This might be attributed to the BRAC WASH programme promoting sanitary latrines among all households, giving training and/or technical assistance, giving loan for sanitary latrine installation to those who do not have their own latrines. NGO-led participatory development approach through collateral-free credit support to the poor, skill training, adult literacy, health education and legal awareness has remarkably changed the social dimension and has played significant role in expanding sanitation coverage (Hadi and Nath 1996).

The concern about health was found to be the prime reason for using sanitary latrines, while the financial inability of the households was the major cause of not using sanitary latrines as mentioned by the respondents both in baseline and midline. Thus, it can be mentioned that though the BRAC WASH programme is providing software support for increasing awareness and health concern among the community, the lack of sufficient money to install sanitary latrines was a major challenge for increasing sanitation coverage. Financial inability, unawareness and not having access to quality

latrines, etc. have been reported to be the main factors for poor sanitation in Bangladesh (Quazi 2003).

Nevertheless, illiteracy of household heads together with poverty and not having access to media were found to be the other reasons for not using sanitary latrines both in baseline and midline surveys. Hadi (2000) also reported the rates of literacy, poverty and media exposure, participation in NGO-led credit programmes to have influence on the use of sanitary latrine by the community. In addition to these factors, during baseline male household heads were found to show significantly higher tendency of not using sanitary latrines, but in midline this difference disappeared. Hence, it can be mentioned that the BRAC WASH programme was successful to eliminate gender difference and increase awareness among the male household members to use sanitary latrines. Additionally, BRAC WASH programme led awareness activities and the mass media also played major role in developing awareness for using sanitary latrines.

SANITATION IN EDUCATIONAL INSTITUTIONS

Findings reveal that the BRAC WASH intervention had positive impact on the overall sanitation situation in the educational institutes of the study area, since the availability of sanitary latrines increased, as well as the reported and observed indicators for assessing the quality of latrines also showed improvement in midline compared to the baseline. The programme activities played important role in addressing the felt needs of adolescent girl students, since the teachers perceived that absenteeism of girls during menstruation reduced significantly due to availability of improved facilities for disposal of sanitary rags. However, concern remains as majority of the educational institutes found to be without adequate specific place for disposal of menstruation rags. Nevertheless, research indicates that having better facilities in the school premises for managing episode of menstruation increases attendance of girls (Wateraid 2009). Hence, focuses should be directed to improve these facilities as well as the provision of separate sanitation for girls and boys also might provide congenial environment for the girls against sexual harassment where eve teasing or other abuses are reported (IRC 2005). A positive impact of intervention on absenteeism is encouraging in a society where enrolments of girls in educational institutes impede notably for various underlying factors such as social, cultural and poverty. Other studies show that in Bangladesh the enrolment of girls has increased markedly and gender gaps has been eliminated (Schurmann 2009), and sex parity has achieved in literacy rate (BBS 2008). These achievements might be due to several interventions undertaken aiming the girls such as stipend programme in secondary education (Schurmann 2009) or enrolments of higher proportion of girl students in the NGO-led education programme (BRAC 2008b). The improved sanitation facilities in the educational institutes supported by the BRAC WASH programme might promote an ambient environment for education.

It has also been revealed from the results that the opportunity and incident of health education among the students and teachers increased in midline. Another important feature of the intervention is that as students have an opportunity to learn and practice sanitation and hygiene-related skills at the institutes, which is likely to continue throughout the life. The hand-washing behaviour of students and children with soap also increased after 2 years of implementing BRAC WASH programme in the educational institutes. Evidence shows that skill-based health education related to healthy lifestyles, which is offered at the school might sustain during schooling and throughout the life (Burgers 2000). Changes in sanitation and hygiene practices might have impact in reducing burden of waterborne illness among the students and other beneficiaries. Research indicates that unsafe sanitation and hygiene practices increase burden of various diseases (Prüss-Üstün *et al*. 2004). Rosen *et al*. (2009) showed that hand-washing intervention in pre-school changed educator beliefs, attitudes, knowledge and self-efficacy, which has positive effects on students. BRAC WASH programme might also enhance water, sanitation and hygiene practices in the community since students and other beneficiaries are likely to disseminate their knowledge and behaviour in the community. Burgers (2000) also argued similar opinions regarding potential spillover effects of the intervention from educational institutes to the community through beneficiaries of these institutes.

Partial financial incentive offered by BRAC for procuring hardware devices encouraged school authorities to improve their sanitation facilities. In future mobilization of resources for hardware devices will be necessary as findings suggest that a considerable number of educational institutes in

the WASH intervention areas had no improved sanitation facilities. The lack of adequate infrastructural facilities for sanitation is primarily attributable to financial constraint. However, both infrastructural development and health education should be continued as quarter of the students and teachers did not receive health education advices.

Nevertheless, this study suffers from a methodological weakness since control group was not considered in the study, which might pose a question whether the changes found are due to intervention or other associated factors. However, consideration of baseline survey allows attributing that the changes are due to the intervention. To overcome the limitation of changed definition of "sanitary latrine" in terms of number of rings from baseline to midline (3 instead of 5), during data analysis the number of rings were ignored, while all other factors were kept same both in baseline and midline. Additionally, for analysis of sanitation status in the educational institutions it was not possible to compare the panel data from both baseline and midline.

CONCLUSION

The implementation of BRAC WASH programme increased the use of sanitary latrine among both households and educational institutions. However, there were still several impediments, i.e., shifting of households using sanitary latrines to using unhygienic latrines, removal of water seal, poverty/financial crisis, and illiteracy predominantly slowing down the increase of sanitation coverage and challenging the success of programme interventions. Thus, it can be mentioned that the programme needs to concentrate more on sustaining the use of sanitary latrine as well as increase efforts to bring hardcore poor, poor and illiterate household heads under sanitation coverage with probably more financial or hardware support. With regard to the sanitation situation in the educational institutions it might be mentioned here that in a short span of time both hardware/financial support and health education contributed significantly in improving the sanitation and hygiene practices at the educational institutes. This study implies that such intervention might create a healthy teaching-learning environment in the educational institutions. Hence, continuation of this intervention is central to reap sustained benefits.

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