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Women's Role in Managing Household Water in Rural Bangladesh

Nepal C Dey
ARM Mehrab Ali

BRAC Centre, 75 Mohakhali, Dhaka 1212, Bangladesh
Tel: 9881265, 8824180-7 (PABX), Fax: 88-02-8823542
Email: research@brac.net, Web: www.brac.net/research

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ARM Mehrab Ali**

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Research and Evaluation Division
BRAC Centre, 75 Mohakhali, Dhaka 1212, Bangladesh
E-mail: research@brac.net, www.brac.net/research
Telephone: 88-02-9881265, 88-02-8824180-87

For more details about the report please contact: nepal.cd@brac.net

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ABSTRACT

The BRAC WASH (Water, Sanitation and Hygiene) programme was initiated in 150 upazilas in three phases (50 in each phase) aiming to improve water, sanitation and hygiene conditions in rural Bangladesh. The study explores women's role in managing household water i.e. collecting and storing water and maintaining cleanliness of the tubewells. Participants were selected through a two-stage sampling procedure. Respondents were the women of the households who had knowledge of the household day-to-day activities related to water, sanitation and hygiene. Most of the women (97%) were responsible for collecting water from both single-used and shared tubewells in baseline, which decreased significantly to 95% in midline. Putting cover (lid) on the opening of water vessels during fetching and storing drinking water increased significantly from 18% and 31% in baseline to 51% and 39% in midline, respectively. Besides, putting cover on the opening of water vessels for storing water for cooking increased significantly from 14% in baseline to 20% in midline. Multivariate analyses show that due to WASH interventions, the proportion of tubewells increased in the female-headed households compared to the male-headed ones in midline. Significant improvement in cleanliness of tubewell platforms was observed in midline where higher proportion of cleaned tubewell platforms was observed among non-poor households compared to poor and ultra poor households. The study reveals that WASH intervention has succeeded in increasing women's role in household water management and cleanliness of tubewell platforms, which may reduce the prevalence of waterborne diseases. Other household members except women should come forward to collect water or maintain tubewells, which may allow increasing participation of women in other productive work after taking break from tedious work. The ongoing WASH interventions should be strengthened and more emphasis should be given on the routine monitoring at household level to establish proper hygienic management of water by the women and other family members.

Key words: BRAC, Tubewell, Upazila, WASH

EXECUTIVE SUMMARY

INTRODUCTION

Water has significant influence on the life of human being. Worldwide, the demand for safe water is growing rapidly. The increased water pollution is worsening the imbalance between supply and demand. Therefore, its hygienic management is crucial for prevention of waterborne diseases. Women's involvement in managing water-related chores such as collecting and storing water and cleaning is universally recognized. The primary goal of BRAC WASH (Water, Sanitation and Hygiene) programme was particularly to attain targets 10 and 11 of the seventh Millennium Development Goals (MDGs), especially for under-privileged groups in rural Bangladesh, and thereby improve the health situation of the poor. The overall strategy is to bring hygiene and behavioural change by motivating people through awareness raising for hygienic management of water. This include handwashing, safe carrying and storage of water, cleaning existing tubewell platform and construction of new platform, repairing and maintenance of existing water facilities, and installing new options for safe water supply. Before interventions, a baseline study was carried out in 50 upazilas of the first phase.

OBJECTIVE

The overall objective of this study was to examine women's role in managing household water i.e. collecting and storing water, and cleaning of tubewell platform in rural Bangladesh. The specific objectives were to assess:

1. women's responsibility in collecting water
2. the status of household water cleaning/purification
3. the responsibility of cleaning tubewell platform
4. the level of changes of hygienic management of drinking and cooking water after WASH intervention
5. the awareness regarding cleaning/purifying water and prevention of waterborne diseases
6. the status of women's safety issues regarding collecting water from shared or public tubewells
7. the status of women's opinion in decision-making for community-based NGO activities

METHODS

This study was conducted in 50 upazilas where baseline survey was conducted between November-March 2006/7 and the midline during April-June 2009. From each upazila, 30 villages were selected using the cluster sampling method, followed by 20 households from each of the 30 villages for the study. Thus, 30,000 households were selected where 29,819 respondents (99.4%) were interviewed in baseline followed by midline. Data were collected using structured and pre-tested questionnaires and physical verifications of the verifiable issues of safe water and related hygiene at the households of the participants. Data were analyzed using the SPSS software version 16.0. Chi-square test compared the differences between baseline and midline surveys, and between different economic groups. Binary logistic regression was used to examine the prevalence of programme interventions.

RESULTS

- Involvement of women in collecting water decreased significantly ($p < 0.001$) among all the three types of tubewell owners. In the case of both single-used and shared tubewells, 97% women

were responsible for collecting water from both in baseline which significantly decreased to 95% in midline. In the case of public tubewells, 80% of the respondent women were responsible for collecting water in baseline, which decreased to 78% in midline. The contribution of other family members in collecting water increased in midline among all of tubewells use.

- Multivariate analyses show that the prevalence of having tubewells was higher in the case of male-headed female households, but due to WASH programme interventions, the prevalence of having tubewells became higher in midline in the female-headed households.
- The women's responsibility of cleaning tubewell platform decreased significantly in midline for households of all economic categories ($p < 0.01$). The decrease was highest (2%) in midline from 90% in baseline among non-poor households. Significant improvement of cleanliness of tubewell platforms was observed in midline compared to baseline across households. Relatively higher proportion of cleaned tubewell platforms were observed in midline among non-poor households compared to poor and ultra poor households.
- A significant increase by 50% was observed in midline regarding covering water vessels during carrying and 24% for storing water for drinking purpose across households ($p < 0.01$). In baseline, 32% covering status of water vessels were seen during storing water, which increased significantly in midline by 37%. In baseline, ultra poor were relatively more reluctant to keep water container covered during carrying water for drinking and cooking. However, they became more aware in midline. Non-poor were more aware of putting cover during storing water for drinking.
- Awareness of cleaning/purifying water increased significantly in the case of major options used at the household level ($p < 0.001$). More than 67% respondents in baseline opined that boiling was the best option to clean/purify water, which increased to 78% in midline. In baseline, 44% respondents opined that waterborne disease could be prevented by drinking pure water, which increased up to 51% in midline. The proportion of respondents who did not know how to prevent waterborne disease decreased in midline by 30%.
- It was found that 30% of the women reported that their opinions regarding water, sanitation and hygiene-related intervention were accepted by BRAC WASH programme, whereas, in the case of other NGOs, 28% women's opinions were accepted. This indicated that women were aware of NGO activities and their opinions were getting priority in decision-making process.

DISCUSSION

After two years of WASH intervention a significant improvement occurred in some of the indicators of household water management. Contribution of women in collecting water for drinking and cooking, hygienic management of water, and cleaning of tubewell platform is enormous. This might be because of providing health education by the WASH programme on safe and hygienic management of water at household level. Besides, safe water can reduce prevalence of waterborne diseases which can be comparable to recent study findings. A recent study indicates that the combined effect of safe water, sanitation and hygiene practices, the prevalence of waterborne diseases reduced nearly 30% after 2 years of intervention (Rana 2009). Data show that involvement of women in collecting water has decreased significantly. Involvement of other family members in collecting water increased in midline, which may allow women to involve in other productive work. Although women play major role in collecting and using domestic water, they have a small role to play in key decisions on community safe water schemes by other NGOs. This study reveals that women became more proactive and their opinions were accepted more in decision-making in WASH programme areas.

CONCLUSIONS

The WASH intervention model has made significant impact on women's role in household water management i.e. collecting and storing of water and cleanliness of tubewell, which may reduce the prevalence of waterborne diseases.

RECOMMENDATIONS

- Other family members except women in the household should come forward to collect water or maintain tubewells, which may allow increased participation of women in other productive work after taking break from any tedious work.
- The places where safe water, sanitation and hygiene practices are still a challenge, BRAC WASH intervention can be a successful model.
- The ongoing WASH interventions should be strengthened and more emphasis should be given on the routine monitoring at household level to establish proper hygienic management of water by all family members.

INTRODUCTION

Hygienic management of water is crucial for prevention of waterborne diseases and improving security of safe water at any adverse situation. Women's involvement in managing water-related chores such as collecting, storing and cleaning of water is universally recognized. They not only collect domestic water, manage community water, but also take care of family health (Panda 2005). In all developing countries, it is the females who walk miles to collect drinking water for family, wash clothes, and boil rice (ADB 2000). Women are often deprived of opportunities to engage in income-earning activities because of the need to spend hours in fetching water. An Asian Development Bank study reveals that each female water carrier must reserve 1.3 hours per day during the monsoon season, and an average of 2-3 hours per day in the dry season to fulfill their daily household need in the developing countries (ADB 2000), which hinders the involvement of women in productive and income-generating activities (WHEP 2007). A minimum of 30% of the total time could be saved and used for other economically productive activities if there water sources are easily available and at community premises (Panda 2005).

The government of Bangladesh recognizes the importance of safe water and sanitation for a healthy and productive population and is working with different development partners and stakeholders to achieve relevant targets (10 and 11) of the Millennium Development Goal (MDG) through innovative approaches (GOB and UNDP 2009). BRAC, the largest non-government organization (NGO), has been working since its inception for empowering poor women. To address the water, sanitation and hygiene issues, BRAC has been implementing a comprehensive programme on water, sanitation and hygiene (WASH) since 2006 in 150 upazilas across the country in collaboration with the government of Bangladesh and other stakeholders. The primary goal of the WASH programme is to attain the targets (10 and 11) of the MDG7, especially for underprivileged groups in rural Bangladesh, and thereby improve the health situation of the poor. The intervention package includes installation of sanitary latrines and tubewells. Health education is being provided intensively through cluster meetings and home visits to facilitate safe water, sanitation and hygiene practices. Other methods for educating people are popular theatre, film shows and folk songs. The formation of village WASH committee (WVC) is a vehicle to ensure community participation in consultation with water user committee (WUC) in repairing and maintenance of existing water facilities and installing new water supply options such as deep tubewell, small piped water schemes. To clean/purify water, arsenic removal filter, pond sand filter (PSF) and surface water treatment plant (at the community level) were installed. The committees consist of teachers, elite, religious leaders and generous people of the community. Although there are several reports published on the impact of WASH intervention, women's role in managing household water has not been assessed systematically.

OBJECTIVE

The overall objective of this study was to examine women's role in managing household water i.e. collecting and storing water, and cleaning of tubewell platform in rural Bangladesh. The specific objectives were to assess:

1. women's responsibility in collecting water
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6. the status of women's safety issues regarding collecting water from shared or public tubewells
7. the status of women's opinion in decision-making for community-based NGO activities

MATERIALS AND METHODS

STUDY DESIGN

This is a cross-sectional comparative study between baseline and the midline surveys.

Research area and sampling

BRAC WASH programme was initiated in 150 upazilas in three phases (50 in each phase) considering the geographical variations (Figure 1). A baseline (2006/7) and a midline (2009) surveys were conducted in all the 50 upazilas of the first phase of the programme. From each upazila, 30 villages were selected using the systematic sampling method, followed by 20 households from each of the 30 villages. Thus, a total of 30,000 households were selected where 29,819 respondents (99.4%) were interviewed in baseline, followed by midline. A few (0.6%) households were lost in midline survey, because of unavailability of the respondents during the interview time. Respondents were the women of the households who had knowledge of the households' day-to-day activities related to water, sanitation and hygiene.

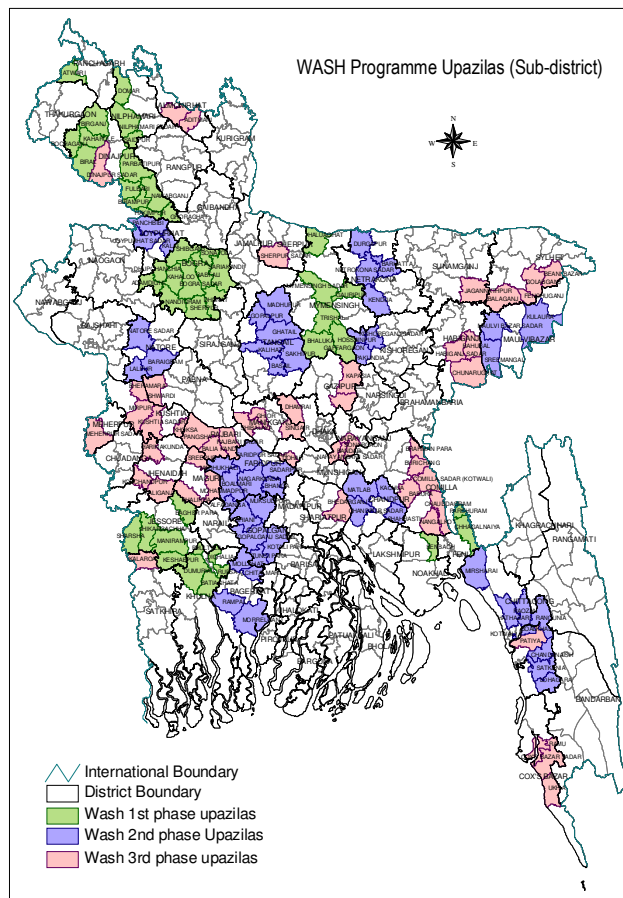


Figure 1. Study area

Variables

Education, economic status, occupation, and age were considered as independent variables. Economic status of households was classified as ultra poor, poor and non poor. Ultra poor are those people who are landless or homeless and who do not have fixed source of income. The households who have up to 50 decimal of land (agricultural and homestead) and any adult member of the household used to sell 100 days of manual labour per year for living, called poor. On the otherhand, the households that do not fall in any of the above categories are defined as non-poor (BRAC WASH baseline report 2008). The rural water is being supplied from single-used tubewell, shared tubewell, publicly used tubewell, whereas, urban water supply adopts piped/tape water with deep tubewell. A tubewell is called single-used when only a household used than to collect water for their daily uses. When a tubewell is used by a group of households, like neighbour and/or relatives, who may or may not follow any particular time to collect water is called shared, and which is publicly open for all and have no time restriction of collecting water is denoted as a public tubewell.

Data collection techniques and tools

Data were collected using structured and pre-tested questionnaires and physical verification of the issues of safe water and related hygiene at the households of the participants in both the surveys conducted in November-March 2006/7 (baseline) and in April-June 2009 (midline). Informed consent was obtained from the participants. Field enumerators were given adequate training followed by a field practice. Each interviewer was given a training manual containing instructions on data collection procedures (BRAC WASH baseline report 2008). The enumerators were divided into groups where each group had four members-two female and two male.

The supervisor went through all the questionnaires to identify inconsistencies and re-interviewed if necessary. 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. Whenever any such issues became evident a re-interview was conducted on the following day for the necessary amendment.

The responsibility of field coordinator was to supervise overall field activities. Field coordinator was the contact person for the WASH research team. Field coordinator is also responsible for document all the inquiries from the field for immediate dissemination to the concerned researchers. He also maintain a log book of field activities. Besides, a team of 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 problem arose in the field.

Data management and analysis

Filled-in questionnaires were edited and coded for computer entry under the close supervision. Twenty percent of questionnaires were rechecked for consistencies. The relative change (RC) between baseline (BL) and midline (ML) status was calculated using the formulae: $\{(ML-BL)/BL\} * 100$. The analysis was performed using SPSS 16.0. Chi-square test compared the level of significance of differences between baseline and midline surveys, and between different economic groups. Additionally, a binary logistic regression was used to estimate the odds ratio. The difference considered statistically significant at $p < 0.05$ (two-tailed test) level.

RESULTS

SOCIOECONOMIC AND DEMOGRAPHIC PROFILE OF THE RESPONDENTS

The literacy status of the respondents (15+ years old), the economical condition of the households, the main occupation of the household heads, marital condition and age of the respondents are presented in Table 1. Overall half (56%) of the respondents completed primary or higher level of education. More than half (53%) of the respondents were non-poor, 27% were poor and the remaining 20% were ultra poor households. The main occupation of the respondents was household work (92.5%) and day labourers (2.8%). More than 45% respondents were in age limit of 15-30 years, 46% in 31-50 years, and the remaining were in higher age groups.

Table 1. Socioeconomic and demographic profile of the respondents

| Indicators | | Percent |
|-------------------|--|---------|
| Literacy | Illiterate | 44.2 |
| | Literate (primary or higher levels) | 55.8 |
| Economic status | Ultra poor | 20.1 |
| | Poor | 26.8 |
| | Non-poor | 53.1 |
| Main occupation | Household work | 92.5 |
| | Day laborer | 2.8 |
| | Employee | 1.0 |
| | Student | 0.9 |
| | Others (rickshaw puller, carpenter, etc) | 2.8 |
| Marital condition | Married | 91.8 |
| | Unmarried | 1.5 |
| | Others (widow, separated & divorced) | 6.7 |
| Age (years) | 15-30 | 45.4 |
| | 31-50 | 46.4 |
| | 5 and above | 8.2 |
| n | | 29,819 |

Women's involvement in collecting water

The number of women involved in collecting water decreased significantly ($p < 0.001$) among all types of tubewell owners (Table 2). In the cases of both single-used and shared tubewells, overall 97% women were responsible for collecting water from both in baseline which decreased significantly to 95% in midline. In the case of public tubewells, 80% of the respondents were involved in collecting water in baseline, which decreased to 78% in midline. The contribution of other family members in collecting water increased in midline among all types of tubewells use.

Table 2. Women's involvement in collecting water by types of water sources (%)

| Responsible persons | Types of water sources | | | | | | | | |
|---------------------|------------------------|-------|------|-----------------|-------|------|-----------------|------|------|
| | Single-used tubewell | | | Shared tubewell | | | Public tubewell | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC |
| Women members | 97 | 95.3 | -1.8 | 96 | 95.5 | -0.5 | 80.2 | 77.5 | -3.4 |
| Others | 3 | 4.7 | 56.7 | 4 | 4.5 | 12.5 | 19.8 | 22.5 | 13.6 |
| n | 14046 | 14421 | | 13992 | 13070 | | 7885 | 7167 | |
| p | <0.001 | | | <0.011 | | | <0.001 | | |

Association between selected background variables and tubewell ownership

The multivariate regression analysis showed that the prevalence of tubewell was correlated with economic status as well as self-rated economic status, land ownership, literacy, and sex of household head in both baseline and midline (Table 3). The extent of tubewell ownership increased with the increase of economic status of the households both in baseline and midline. Similarly, land owner households had more tendency of owning tubewell than landless households. Though the literacy of household heads showed a higher tendency of owing tubewells in baseline, but in midline, this was identical for both the literates and illiterates. In baseline, male-headed households had more tendency of having tubewell but in midline the situation reversed where more female-headed households had tendency of owing tubewells ($p < 0.001$).

Table 3. Odds ratio of selected variables predicting the issues of having tubewell

| Predicted variables | Baseline | | | Midline | | |
|----------------------------|----------|---------|---------|---------|---------|---------|
| | OR | 95% CI | p value | OR | 95% CI | p value |
| Economic status | | | | | | |
| Ultra poor | 1 | | | 1 | | |
| Poor | 1.1 | 1.0-1.2 | < 0.01 | 1.2 | 1.1-1.3 | < 0.001 |
| Non poor | 1.6 | 1.4-1.7 | < 0.001 | 1.7 | 1.5-1.8 | < 0.001 |
| Self rated economic status | | | | | | |
| Deficit | 1 | | | 1 | | |
| Equilibrium | 1.1 | 1.0-1.2 | < 0.001 | 1.3 | 1.2-1.3 | < 0.001 |
| Surplus | 1.8 | 1.6-1.9 | < 0.001 | 1.9 | 1.8-2.1 | < 0.001 |
| Land ownership | | | | | | |
| Landless | 1 | | | 1 | | |
| Landowner | 1.4 | 1.2-1.5 | < 0.001 | 2.1 | 1.9-2.4 | < 0.001 |
| Literacy of household head | | | | | | |
| Illiterate | 1 | | < 0.001 | 1 | | |
| Literate | 1.2 | 1.1-1.2 | < 0.001 | 1.0 | 1.0-1.1 | > 0.05 |
| Sex of household head | | | | | | |
| Male | 1 | | | 1 | | |
| Female | 0.9 | 0.8-1.0 | < 0.01 | 1.2 | 1.1-1.3 | < 0.01 |

Status of water cleaning/purification

Most of the respondents did not clean/purify water collected from tubewells and supply water for drinking or household uses (Table 4). However, a small proportion (4%) of the respondents cleaned/purified water collected from public tubewells and surface sources (river, pond, lake, etc) in baseline, which increased by 3% in midline ($p > 0.01$).

Table 4. Household level water cleaning/purification status for drinking or other use (%)

| Water sources | Economic status | | | | | | | | | n | p | |
|-----------------------------------|-----------------|-----|-----|------|-----|-----|----------|-----|-----|--------|--------|-------|
| | Ultra poor | | | Poor | | | Non-poor | | | | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC | | | |
| Single-used tubewell | 1 | 1.0 | 0.1 | 2 | 2.0 | 0.3 | 3 | 3.1 | 0.5 | 14,098 | 14,558 | <0.01 |
| Shared tubewell | 0.9 | 0.9 | 0.2 | 3 | 3.2 | 1.5 | 5 | 5.1 | 1.4 | 14,101 | 13,070 | <0.01 |
| Supply water | 0.9 | 0.9 | 3 | 1 | 1.1 | 1 | 1 | 1.2 | 1.5 | 224 | 61 | <0.01 |
| Public tubewell & surface sources | 4 | 4.4 | 3.8 | 3 | 3.3 | 3 | 5 | 5.3 | 2.6 | 12,543 | 10,307 | <0.01 |

*public tubewell also includes surface water like river, canal, pond, and dugwell.

Responsibility of cleaning tubewell platform

The women's responsibility of cleaning tubewell platform decreased significantly in midline than baseline for households of all economic categories ($p < 0.01$). The decrease was highest (2%) in midline from 90% in baseline among non-poor households (Table 5). The involvement of other members increased significantly to 6.3%, 9% and 11% in midline from 5.7%, 8% and 10% in baseline for ultra poor, poor and non-poor households respectively.

Table 5. Women's responsibility regarding cleaning of tubewell platform (%)

| Status | Economic status | | | | | | | | | p |
|---|-----------------|-------|------|--------|-------|------|----------|--------|------|-------|
| | Ultra poor | | | Poor | | | Non-poor | | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC | |
| Women's responsibility regarding cleaning tube wells platform | 94.3 | 93.7 | -0.6 | 92.3 | 90.8 | -1.6 | 90.3 | 88.6 | -1.9 | <0.01 |
| Other members excluding females | 5.7 | 6.3 | 10.5 | 7.7 | 9.2 | 19.5 | 9.7 | 11.4 | 17.5 | |
| n | 4,014 | 3,322 | | 5,953 | 5,337 | | 12,543 | 11,918 | | |
| p | <0.005 | | | <0.001 | | | <0.001 | | | |

Cleanliness of tubewell platform

Significant improvement in cleanliness of tubewell platforms was observed in midline compared to baseline. Proportion of cleaned tubewells belonging to ultra poor, poor and non-poor households increased significantly in midline from baseline (31% vs. 23%), (35% vs. 24%) and (44% vs. 31%), respectively ($p < 0.01$). Relatively higher proportion of cleaned tubewell platforms were observed in midline among non-poor households compared to poor and ultra poor households (Figure 2).

Hygienic management of drinking and cooking water

A significant increase 50% was observed in midline in covering water vessels during carrying water and 24% for storing water for drinking purpose across households ($p < 0.01$) (Table 6). In baseline, 32% covering status of water vessels were seen during storing water, which increased significantly by 37% in midline. In baseline, ultra poor were relatively more reluctant to keep water container covered during carrying water for drinking and cooking, however, they became more aware of putting cover in midline. Non-poor were more aware of putting cover during storing water for drinking.

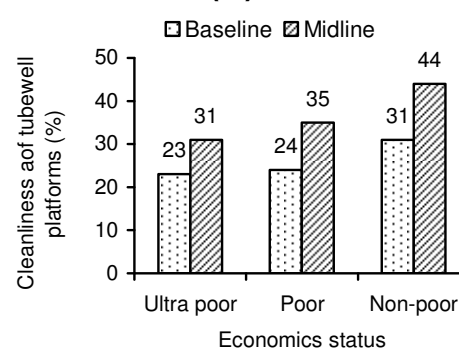
Figure 2. Cleaned tubewell platforms according to economic status (%)

Table 6. Status of covering water vessels during transporting and storing water for drinking and cooking (%)

| Status | Economic status | | | | | | | | | p |
|---|-----------------|------|------|-------------|------|------|---------------|------|------|-------|
| | Ultra poor | | | Poor | | | Non-poor | | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC | |
| Covered water vessels (for drinking) | | | | | | | | | | |
| During carrying | 16 | 25 | 56.3 | 18 | 27 | 50 | 19 | 28 | 47.4 | <0.01 |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |
| During storing | 32 | 38 | 18.8 | 32 | 38 | 18.8 | 31 | 40 | 29.0 | |
| p | >0.05 | | | <0.01 | | | <0.01 | | | |
| Covered to water vessels (for cooking) | | | | | | | | | | |
| During carrying | 13.1 | 18.3 | 39.7 | 16.2 | 21.8 | 34.6 | 14.3 | 19.9 | 39.2 | |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |
| n | 6,039 5,329 | | | 8,045 7,443 | | | 15,909 14,908 | | | |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |

Safe time of collecting water from shared or public tubewells by women

Women's safe time for water collection increased significantly in midline compared to baseline for households of all economic status and for shared and public tubewells. Most women respondents (81%) from each household status opined that water collection time from shared tubewells was safe in baseline. The increase was 2% (highest among all households) in midline from 82% in baseline among non-poor households (Table 7). In case of public tubewell users, 32% ultra poor, 34% poor and 29% non-poor households mentioned water collection time safe in baseline. The highest increase (14%) was found in midline among non-poor households for water collection time from public tubewells ($p < 0.01$).

Table 7. Safe time for women for water collection from shared or public tubewells by economic status of households.

| Types of tubewell | Economic status | | | | | | | | | p |
|-------------------|-----------------|----|-----|-------------|----|-----|---------------|------|------|-------|
| | Ultra poor | | | Poor | | | Non-poor | | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC | |
| Shared tubewells | 80.8 | 81 | 0.1 | 79.7 | 81 | 1.5 | 82.1 | 83.9 | 2.2 | <0.01 |
| Public tubewell | 32 | 34 | 6.3 | 34.3 | 36 | 6.1 | 29 | 33 | 13.8 | <0.01 |
| n | 4,014 3,322 | | | 5,337 5,953 | | | 13,126 11,918 | | | |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |

Awareness regarding cleaning/purifying water and prevention of waterborne diseases

The study revealed that awareness increased significantly in midline than in baseline for households of all economic status and regarding cleaning/purifying water and prevention of waterborne diseases (< 0.01) (Table 8). Majority of the respondents (61% ultra poor, 67% poor and 71% non-poor households) in baseline opined that water can be cleaned/purified by boiling water. The increase was highest (20%) in midline among ultra poor households. The number of respondents who did not know how water could be cleaned /purified decreased in midline than baseline. The decrease was highest (33%) in midline among ultra poor households. A few proportion, 5% of the respondents from ultra poor and poor household and 8% from non-poor households reported in baseline that water could be cleaned/purified by using medicine. The increase was found highest (111%) in midline among poor households. Similarly, about 2% of the respondents in baseline informed that drinking water could be cleaned by filtering, which increased significantly to 4% in midline ($p < 0.001$).

Significant difference was found across households regarding awareness on prevention of waterborne diseases. In baseline, 44% of the respondents said that waterborne disease could be prevented by drinking pure water, which increased to 51% in midline from 44% in baseline. The proportion of the respondents those who did not know how to prevent waterborne diseases decreased by 30% in midline than baseline.

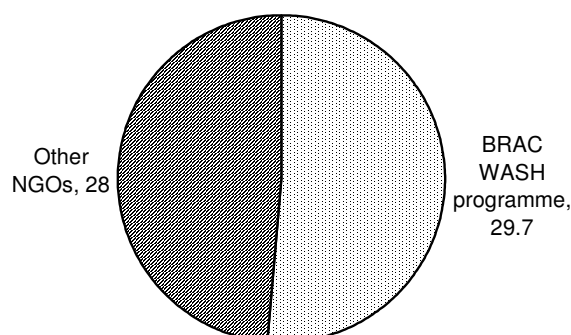
Table 8. Respondent's awareness regarding cleaning/purifying water and prevention of waterborne diseases (%)

| Awareness issues | Economic status | | | | | | | | | P |
|--|-----------------|-------|-------|-------|-------|-------|----------|--------|-------|-------|
| | Ultra poor | | | Poor | | | Non-poor | | | |
| | BL | ML | RC | BL | ML | RC | BL | ML | RC | |
| Opinions regarding cleaning/purifying drinking water | | | | | | | | | | |
| By boiling | 61.4 | 73.6 | 19.9 | 67.3 | 76.7 | 14.0 | 71.1 | 79.6 | 12.0 | <0.01 |
| With medicine | 4.9 | 10.3 | 110.2 | 5.4 | 11.4 | 111.1 | 7.9 | 14.7 | 86.1 | |
| By filtering | 1.5 | 3 | 100.0 | 1.7 | 3.7 | 117.6 | 2.6 | 4.2 | 61.5 | |
| Don't know | 28.2 | 17.6 | -37.6 | 21.2 | 14.8 | -30.2 | 17.6 | 11.8 | -33.0 | |
| Others | 11 | 8.4 | -23.6 | 13.3 | 9.5 | -28.6 | 12.2 | 9 | -26.2 | |
| n | 6,039 | 5,329 | | 8,045 | 7,443 | | 15,909 | 14,908 | | |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |
| Opinions regarding prevention of waterborne diseases | | | | | | | | | | |
| Drinking pure water | 38.1 | 47.1 | 23.6 | 43.9 | 50.7 | 15.5 | 48.7 | 54.2 | 11.3 | <0.01 |
| Drinking tubewell water | 36.1 | 36.6 | 1.4 | 36.7 | 37.1 | 1.1 | 37.1 | 38.4 | 3.5 | |
| Others | 2.4 | 1.3 | -45.8 | 2.8 | 1.4 | -50.0 | 2.7 | 1.2 | -55.6 | |
| Don't know | 28.5 | 19.5 | -31.6 | 22.9 | 16.7 | -27.1 | 19.5 | 13.4 | -31.3 | |
| n | 6,039 | 5,329 | | 8,045 | 7,443 | | 15,909 | 14,908 | | |
| p | <0.01 | | | <0.01 | | | <0.01 | | | |

Women's opinion in decision-making

Figure 3 shows that 30% of the women reported that their opinions regarding water, sanitation and hygiene related interventions in their households were accepted by BRAC WASH programme whereas, in the case of other NGOs, 28% women's opinions were accepted. This indicated that women were aware of NGO activities and their opinions were getting priority in decision-making process.

Figure 3. Women's opinion in decision-making for community-based NGO activities



DISCUSSION

The findings of this study show that after two years of WASH intervention, significant improvement occurred in some of the indicators of household water management. Contribution of women in collecting water, hygienic management of water, and cleaning of tubewell platform was enormous. This might be because of providing proper health education by the WASH programme at household level. Research indicates that proper hygiene education makes the community members aware about the correct use, storage and disposal of water and general hygiene (Duncker 2000). Another study reveals that women in rural households in Bangladesh are concerned with the privileged domain of water-drinking, cooking, and washing water for household use (WHO and UNICEF 2006). Furthermore, 94% of the diarrhoeal diseases are preventable through modifications to the environment, including access to safe water (WHO 2007). Besides, safe water can reduce prevalence of water borne diseases which can be comparable to recent study findings. A recent study indicates that the combined effect of safe water, sanitation and hygiene practices, the prevalence of waterborne diseases reduced nearly 30% after 2 years of WASH intervention (Rana 2009). Roberts et al. (2001) indicate that longer storage time implies more opportunity for contamination, because hands and the handle or outer surface of collecting devices frequently carry fecal pathogens.

The involvement of women in collecting water decreased while other family members' involvement in collecting water increased in midline. This may allow women to involve in other productive work and having break from tedious work. This can be comparable to the findings of a previous study (Jakariya 2003) where it was found that 95% of the women were responsible for collecting water. Another study reveals that women face difficulty in collecting water from shared and public tubewell. This was associated with distance, long queue that were very common in the study households (Akter et al. 2010). However, the study found that women's safe time for water collection increased significantly in midline from shared and public tubewells. Although women play major role in collecting and using of domestic water, they have a small role to play in key decisions on community safe water schemes implemented by other NGOs. However, we found that women became more proactive in decision-making for any community-based development work on water, sanitation and hygiene by BRAC than any other NGOs. This was because of services provided by BRAC WASH where both men's and women's participation were common in decision-making for any community-based development work. Besides, empowering poor women with right tools is the basic approach for poverty alleviation and economic emancipation that BRAC has been doing since its inception. Multivariate analyses also supported the aforementioned findings where it was found that due to programme interventions, the prevalence of tubewell became higher in female-headed than male-headed households in midline, which was reversed in baseline. Women were not only responsible for fetching water in most cases, but also played a vital role in cleaning tubewell platform on regular basis. Significant improvement of cleanliness of tubewell platform in midline may ensure safe water at household level.

CONCLUSION

The study reveals that WASH intervention model has succeeded in increasing women's role in household water management i.e. collecting and storing of water and cleanliness of tubewell and its platform, which may reduce the prevalence of water borne diseases.

Recommendations

- Other family members except women in the household should come forward to collect water or maintain tubewells, which may allow increasing participation of women in other productive work after taking break from tedious work.
- The ongoing WASH interventions should be strengthened and more emphasis should be given on the routine monitoring at household level to establish proper hygienic management of water by the women and other family members.

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