**Trends in Improved Sanitation Facility Utilisation in Bangladesh: Evidence from Bangladesh Demographic and Health Surveys**

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**Abstract**

Improved sanitation is indispensable to human health. However, lack of access to improved sanitation remains one of the most daunting public health challenges of the twenty-first century in Bangladesh. The aim of the study was to describe the trends in access to improved sanitation facilities; to determine the associated factors and the inequities of improved sanitation utilisation in Bangladesh. Data from the Bangladesh Demographic and Health Survey (BDHS) 2007, 2011, 2014, and 2017-18 were extracted for this study. To execute the equity analysis, concentration index was calculated.In Bangladesh, the proportion of households with access to improved sanitation increased steadily from 25.35 % in 2007 to 44.99 % in 2014, but slightly decreased to 42.98 % in 2017-18. Age, sex, educational status, marital status of household head, wealth index, household size, division, year, place of residence were significantly associated with utilisation of improved sanitation. There is a pro-poor equity situation, which means that the utilisation of improved sanitation was more concentrated among poor in all study years except 2017-18.The government and other relevant stakeholders should take initiatives considering inequality among different socioeconomic groups to ensure the use of improve sanitation facility for all, hence achieving universal health coverage.

**Key Words:** Bangladesh, BDHS, Improved sanitation, Trends, Equity

**Introduction**

Access to improved sanitation is a basic human right for every person (1), however over 3.6 billion people around the globe still do not have access to this fundamental need (2). According to the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation, and Hygiene, improved sanitation facilities are those designed to hygienically separate excreta from human contact and that are not shared with other households (3). 32% of the global population don’t have the access to an improved sanitation facility (3). Unimproved sanitation increases the risk of cholera, typhoid, schistosomiasis, respiratory infections, skin infections, eye infections, and even certain cancers due to exposure to carcinogens(4). Moreover, it also increases the burden of malnutrition (5).

Improved sanitation is considered as one of the most significant public health needs which requires much attention in low-and middle-income countries (LMICs). Only 27% of the population has access to improved sanitation in LMICs (6). Rural communities within LMICs contribute 70% of the population who do not have access to basic sanitation and approximately 90% practice open defecation (6). Furthermore, poor sanitation is primarily liable for about 432,000 deaths and is also a prime reason for high transmission of neglected tropical diseases in LMICs (7). At least 50% of people do not have access to improved sanitation facilities in 46 countries in Asia and sub-Saharan Africa (8). In Bangladesh, only half of the population (47%) has access to basic sanitation (3). Between 2006 and 2009, there was an almost twofold increase in the availability of individual improved sanitation facilities, with both rural and urban regions exhibiting remarkable growth (9). Despite experimenting and building a variety of updated sanitation models, the coverage of improved sanitation could not reach the desired level in Bangladesh (10).

Studying determinants associated with the utilisation of improved sanitation is one of the ways of understanding inequalities in utilising improved sanitation among people with different socioeconomic status. Evidence suggests that wealth index, gender, age, and education of household head, household size are associated with the utilisation of improved sanitation in LMICs (11, 12). Although a limited number of studies have been conducted on improved sanitation facilities in Bangladesh (9, 10, 13, 14), no study has covered the comprehensive picture of improved sanitation utilisation over the recent time. Therefore, the objective of this study is to investigate the utilisation of improved sanitation, its associated factors and existing inequity of this service utilisation in Bangladesh.

**Main Text**

**Methods**

**Data Source**

Data were extracted from four rounds of Bangladesh Demographic and Health Surveys (BDHS): 2007, 2011, 2014 and 2017-18. These nationally representative surveys covered information on demographic characteristics, family planning, maternal and child health, access to water and sanitation. We conducted a pooled analysis using consecutive surveys from BDHS 2007, 2011, 2014, 2017-18 (15-18).

**Study population**

These cross-sectional surveys followed a two-stage stratified random sampling of households. The BDHSs of 2007, 2011, 2014, and 2017-18 collected information from 10,400 (response rate (RR)-99.4%), 17,141 (RR-98%), 17,300 (RR-99%), and 19457 (RR-99.4%) households, respectively. From all the residents of a selected household, information about household conditions, sources of drinking water, sanitation facilities, demographic characteristics, etc., was collected. No data was available for Rangpur in 2007 as well as for Mymensingh in 2007, 2011 and 2014.

**Variable description**

The dependent variable in this study was access to improved sanitation facilities, which were divided into two categories: improved and not improved. In this study, we have defined improved sanitation (basic) according to JMP by WHO and UNICEF as follows: an improved sanitation facility is one that hygienically separates human excreta from human contact and that is not shared with other households (3). Improved sanitation facilities include: flush or pour-flush to piped sewer system, septic tank or pit latrine; ventilated improved pit latrine; pit latrine with slab and composting toilet. However, sanitation facilities are not considered improved when shared with other households, or open to public use. While, unimproved sanitation facilities include: flush or pour-flush to elsewhere; pit latrine without slab or open pit; bucket, hanging toilet or hanging latrine as well as no facilities, bush or field (open defecation) (3). In our data, we had two variables which represents toilet facility and shared status of toilet respectively. Following the definition, we recoded these two variables as “1” for improved toilet facility and “0” for not improved toilet facility and shared status as “1” for not shared and “0” for shared toilet. Finally, we created a new variable with two categories, “1” indicating improved sanitation (both improved toilet facility and not shared toilet) and “0” indicating not improved sanitation (either not improved toilet facility or shared toilet). We have used this variable as our dependent variable.

**Statistical analysis**

*Descriptive analysis and logistic regression*

The entire statistical analysis was performed using STATA (version 16.0). Initially, descriptive analyses were undertaken to describe the status and trends of access to improved and not improved sanitation facilities. Proportion test of having improved sanitation facilities was performed according to the year. Sample weight was considered while performing the analysis. We used binomial logistic regression model for pooled data of four consecutive surveys to evaluate the association between improved sanitation and different socioeconomic factors. Adjusted odds ratio (AOR) with 95% confidence intervals (CIs) was presented as the result of the logistic regression analysis. A P-value of less than 0.05 was considered statistically significant during the regression analysis.

*Concentration Index*

The concentration index is a useful tool proposed by the World Health Organization for assessing the degree of equity of health related indicators in different economic and social contexts (19). The concentration index is defined as the extent to which utilisation of services are distributed among lower-income groups as compared with those in higher-income groups with values ranging from −1 to +1. For the corrected concentration index for this study, the STATA conindex command was used (20).

**Results**

**Table 1** showed that the improved sanitation utilisation increased from 25.35% to 42.98% over the period from 2007 to 2017-18. Table1 also demonstrates the distribution of using improved sanitation facilities among households with different socioeconomic backgrounds across different time periods (2007, 2011, 2014 and 2017-18).

**Table2** shows the results of logistic regression analysis. Age, sex, educational status, marital status of household head, wealth index, household size, division, year and place of residence were significantly associated with utilisation of improved sanitation. Rural households were more likely (AOR = 1.77, 95% CI =1.69–1.85) to use improved sanitation compared to urban households. Female-headed households had 1.28 (95% CI=1.21-1.35) times higher chances of using improved sanitation relative to male-headed households. The odds of using improved sanitation increased with increased educational level and wealth status. Compared to no education, household head with primary education were1.26 (95% CI=1.20-1.32) times more likely to have access to improved sanitation, whereas higher educated household had 3.12 (95% CI=2.91-3.35) times higher chance to use improved sanitation. Likewise, poorer households were 2.20 times (95% CI= 2.06-2.35) more likely to have improved sanitation whereas richest households had 16.57 (95% CI=15.32-17.93) times higher chance compared to the poorest. Relative to Dhaka division, households situated in Barishal division were2.64 (95% CI=2.46-2.82) times more likely to have access to improved sanitation. Unmarried household heads (AOR: 1.26, 95% CI:1.11-1.44) were more likely to use improved sanitation compared to married counterpart.

**Figure 1** show the equity distribution of utilisation of improved sanitation over the time from 2007 to 2017-18. The situation was pro-poor, which indicated the use of improved sanitation was more concentrated among poor in the year 2007, 2011, 2014 except 2017-18.

**Discussion**

The present study revealed that the utilization of improved sanitation is considerably increasing and identified several socioeconomic factors associated with this, including age, sex, educational status, marital status of household head, wealth index, household size, division, year and place of residence. In addition, it also found that utilisation of improved sanitation was highest among wealthier households.

This study showed that Bangladesh made good progress in improving sanitation facilities from 2007 (25.35%) to 2017-18 (42.98%) which is consistent with the estimates reported by the BDHS (15-18) and similar studies conducted in other developing countries (11, 12, 21, 22). However, this study also found that improved sanitation facility utilisation decreased in 2017-18 compared to 2014. In this sudden downturn situation of improved sanitation utilisation, the risk of waterborne diseases such as cholera, diarrhea, and dysentery can be increased (23).

Our findings suggest that wealthy households were more likely to use improved sanitation facilities compared to poorer households, and these results are consistent with previous studies from around the world (11, 23, 24). In others words, household poverty makes it less likely for people to use improved sanitation (11). The plausible explanation is that wealthier people have more ability to pay for improved sanitation (25-27). This study also found inequalities among the different socioeconomic groups. Although the rich-poor gap declined from 2007 to 2014, it started to increase again by 2017-18. The government of Bangladesh has undertaken multiple programmes to promote improved sanitation at all socioeconomic levels of households. To achieve universal health coverage by 2032, it is imperative to ensure equitable sanitation facilities for all. A range of studies highlighted that unless governments and relevant stakeholders adopt strategies deliberately targeting all socioeconomic population groups, it would be challenging to achieve universal coverage (28-30).

Households with household heads who had achieved higher education were more likely to have access to improved sanitation than their counterparts. This finding is consistent with other similar studies (31-34). The finding can be attributed to the household heads having more knowledge of the health risks associated with poor sanitation systems (35). Our findings also indicated that female-headed households are most likely to have access to improved sanitation facilities. This finding was similar with some previous studies and may be linked to the country’s culture (11, 24, 36). In Bangladesh, women play a significant role in domestic chores, often promoting sanitation and hygiene. As a result, if a family has a female household head, she may place a greater emphasis on improved sanitation(11).

Residential differences (living in rural or urban) in access to improved sanitation were observed in this study. Results showed that people from rural areas had higher odds of using improved sanitation. This was surprising as prior studies had found the opposite result (4, 23, 24). One possible reason for this might be the number of households in urban areas that are situated in slums. In cities throughout Bangladesh, 47.2% of the urban population lives in the urban slums (37) and sanitation facilities in Bangladeshi slums are scarce or poor quality (38).

Age of the household head was positively correlated with improved sanitation. The possible explanation could be the higher age of the household head, the higher knowledge regarding the importance of improved sanitation(12). The findings also showed significant regional variation in this study. All other divisions have a higher probability of using improved sanitation compared to the Dhaka division. This can be attributed to the high number of people living in slum areas of Dhaka division with inadequate sanitation (37, 38).

This study has several strengths. Firstly, the data for this study were taken from large nationally representative surveys conducted at various periods of time. Secondly, the response rate of the participants was excellent.

We set out to analyse and present the trends of improved sanitation utilisation in Bangladesh across four nationally representative surveys from the BDHS, 2007 to 2018. Our analysis has enabled us to reach conclusions regarding the trends of improved sanitation in Bangladesh, which indicates that improved sanitation facility utilisation increased over the period from 2007 to 2014, but decreased by 2017-18. Access to improved sanitation was influenced by the gender of the household head, household wealth index, residential status, educational status, age of the household head, household size and location. More qualitative research is required to better articulate the recent decline in utilisation of the improved sanitation services in Bangladesh.

**Limitation**

The limitation of this study was data in the BDHS was acquired using cross-sectional methods, which restricts the potential of drawing causal inferences.

**List of abbreviations**

BDHS: Bangladesh Demographic and Health Survey; JMP: Joint Monitoring Programme; LMICs: low-and middle-income countries; Cis: Confidence intervals.

**Authors Contribution**

A.A., Q.N., S.E.A., A.E.R. and T.T. Conceptualised the study. A.A., T.S.T., A.S and F.R. wrote the manuscript. A.A., T.S.T., A.S., D.A.P., M.K.I., M.S.A., and M.S.B. reviewed and edited the manuscript. T.T., E.A., N.N. and A.T.A. conducted data analysis. Finally, all authors read the final version of the manuscript and approved accordingly.

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**Competing interests**

None

**Data availability statement**

All data are publicly available upon registration in DHS program supported by USAID at <https://dhsprogram.com/data/available-datasets.cfm?ctryid=1>

Specifically, the minimal data used for this study are available from the corresponding author on reasonable request.

**Consent for publication**

Not Applicable

**Funding**

None

**Ethics approval and consent to participate**

This study used publicly available data from DHS. Informed consent was obtained from all participants prior to the survey. The DHS Program adheres to ethical standards for protecting the privacy of respondents. The ICF International also ensures that the survey processes conform to the ethical requirements of the U.S. Department of Health and Human Services. No additional ethical approval was required, as the data is secondary and available to the general public.

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