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Research Paper

WASH and MHM experiences of disabled females living in Dhaka slums of Bangladesh

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ABSTRACT

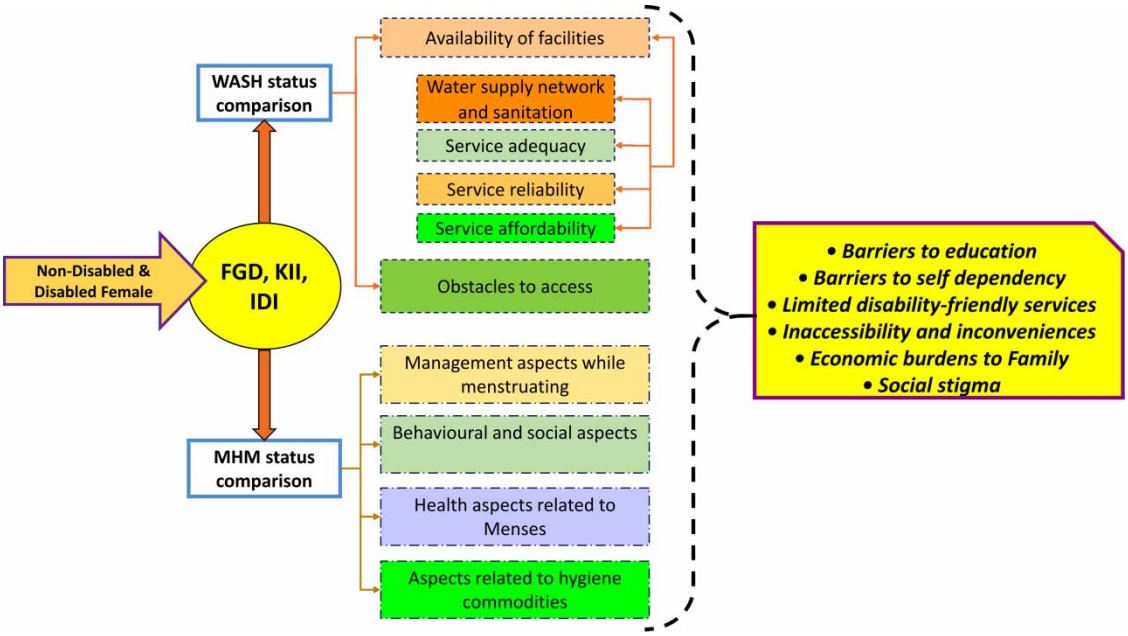
The rapid expansion of slums with increasing population density are the main barriers to scaling-up sustainable Water, Sanitation, and Hygiene (WASH) facilities in the megalopolis of Dhaka, Bangladesh. The improper arrangement of 'Cheap WASH' (i.e., water access, sanitation access, and hygiene practices) and unmanaged disposal of non-biodegradable menstrual hygiene wastes, single-use medical, and plastic usage at slums are making the environment of city surroundings unfavourable and vulnerable posing a great threat to public health. Among the slum-dwellers, particularly, females with a disability are mostly the worst affected and vulnerable due to unfavourable conditions and lack of necessary support. Following the backdrops, this study purposively selected two Dhaka slums, with and without disabled-friendly facilities, to investigate female perspectives on different aspects related to WASH and menstrual hygiene management (MHM) for females with a disability. In total, 30 in-depth interviews, 12 focus group discussions, and 22 key informant interviews were conducted at Korail and Kalyanpur slums. Case studies from the megalopolis of Dhaka, Bangladesh, capture the economic burden added to the budgetary deficits of the family with female-disabled. Discrimination in extra care needed for toilet facilities, MHM education, and transport and overlooking the caretaker's requirement or loss in income are found as additional burdens.

Key words: Dhaka slums, female with disabilities, gender inequalities, MHM (menstrual hygiene management), WASH (Water, Sanitation, and Hygiene)

HIGHLIGHTS

- Inaccessibility and inconveniences linked to WASH and MHM are barriers to self-dependency for disabled females.
- Economic burdens are adding to disabled families' budgetary deficits.
- Formal education beyond the primary level is commonly denied for menstruating disabled due to a lack of trained caretakers.
- High-plinth toilets made to avoid regular flooding exacerbates disabled accessibility to current public latrines.

GRAPHICAL ABSTRACT



1. INTRODUCTION

In the world, disabled persons constitute about 15% of the entire population, and more than 80% of them are living in less developed and developing countries (WHO 2011; UN 2018). In Bangladesh, censuses in 1982 and 1998 presented a national prevalence rate of disability of 0.64 and 1.60%, respectively (BBS 2015). Thereby, over the past few years, Bangladesh has made a major shift in paradigm in the government (GO) approach to fulfilling the rights to work and employment for the disabled through different initiatives. Legislative support from GO was received in the National Policy on Disability in 1995 and implementation guidelines were adopted in the National Action Plan on Disability in 2006. In 2013, the 'Rights and Protection of Persons with Disabilities Act 2013' (GoB 2013) was enacted replacing the 'Disability Welfare Act 2001' and had been giving new hope to the situation of disabled by protecting their dignity. However, according to the National Grassroots and Disabilities Organization (NGDO NCDW & BLAST 2015), the disabled in Bangladesh do not have access to basic social/health services and no reasonable progress could be made in practice to facilitate disabled for different types of policy implementation factors.

On top of that, disabled persons in slum areas, where 91% of slum-dwellers are poor and 37.5% of slum residents are living in extreme poverty, are highly deprived of all sorts of facilities due to their limitations (Talukder *et al.* 2013). They are mostly the worst affected and most vulnerable because of less support in the slum community, have insufficient Water, Sanitation, and Hygiene (WASH) facilities, and usually face maximum inequalities to get access to WASH (White *et al.* 2016). Among intensified present societal disparities in slums, disabled-female residents may turn out as the most fragile group to be deprived of equitable water and menstrual hygiene management (MHM) access.

Following the global population trend, slums in Dhaka city of Bangladesh are gradually increasing but very unsystematically and haphazardly in an unhealthy manner. Such rapid expansion of slums is a barrier to scaling-up sustainable 'Cheap WASH' (World Bank 2020) and MHM facilities in this megalopolis. Here, 'Cheap WASH' is expressed as the improvement in water access in terms of water supply quantity, quality, and distance from houses; sanitation access in terms of a better-quality toilet with better maintenance/management of sludge; and hygiene practices, e.g., washing hands before and/or after eating food and defaecation, proper usage of soap (Ross *et al.* 2020). 'Cheap WASH' is considered sustainable only when the said improved facilities become achievable with cheaper options (Pickering *et al.* 2019).

About 80% of slums in Dhaka city are established on private land, while only 9 and 27% of slum residents have access to sewage and piped water supply facilities, respectively (icddrb 2016). Until today, slum-dwellers pay 7–14 times higher water fees than the price paid by those in formal housing, which is about 12–15% of their monthly income (Rahaman & Ahmed

2016). Surprisingly, slum-dwellers, in general, are documented using 8–10 times less water compared to a middle-class household consumer in Dhaka city (Nurul & Mohammad 2014). Recent works set guidelines either to bypass slum difficulties (Olthuis *et al.* 2020) or to upgrade their living condition (Alam & Matsuyuki 2017). Planning in favour of slums rests upon a number of premises ensuring cross-government and inter-sectorial coordination (Teague *et al.* 2014). Several studies are available on slums regarding WASH and MHM (icddrb 2016; Latif *et al.* 2016; Rahaman & Ahmed 2016; Farah *et al.* 2019; Raju *et al.* 2019; Haque *et al.* 2020) but studies focusing the female with disabilities are not so available.

This paper makes a primary claim that the agony of disabled females living in slums of developing countries has been grossly under-represented in both academic and public policies and they deserve more attention. To ensure sustainable management of WASH and MHM facilities for disabled female, it is very important to understand the prevailing condition of slums. Following the background, we use the case of Dhaka slums to safeguard this fragile group of disabled females and recommend WHO guidelines for immediate actions on ensuring right-to-water in the global south. Specifically, this study aims to understand problems and issues associated with disabled-female slum-dwellers regarding WASH and MHM facilities and review perspectives of both disabled and non-disabled females and experts on current obstacles that require immediate attention.

Given the importance of hygiene in WASH and MHM systems, Section 1 reintroduces the existing literature summaries on the living condition of slum-dwellers and policy progress so far made for disabled persons in Bangladesh. Section 2 describes the current state of human rights in two case study areas under consideration. The findings of this paper are discussed in Section 4 and organised as follows: (i) Section 4.1 depicts the respondent's socio-economic background and behaviour and (ii) Sections 4.2 and 4.3 compare WASH and MHM concerns, respectively, faced by both disabled and non-disabled females living in slums. Finally, in Section 5, the paper specifies the key messages of the study findings.

2. STUDY AREA

There are about 3,394 slums with more than 6 lakh people living in Dhaka city. Two slums, Korail and Kalyanpur, were purposively selected according to their size, lifespan, risk of eviction, and presence/absence of disability-friendly sanitation facilities, to provide a point of comparison. Korail slum is situated in the middle east of the city spanning a total land area of 0.81 km^2 (Figure 1(b)). The population of this slum varies enormously from more than 100,000 in 2010 (Jabeen *et al.* 2010) to approximately 200,000 in 2015 (Hanchett & Ahmed 2015), which points toward double growth with new entrants in only 5 years. On the other hand, Kalyanpur slum, located in the east of Dhaka, originated back in 1988 (Figure 1(c)). This slum is identified as a low-income (approximately $47–$118 per month, where $1 is equivalent to 85.71 taka) zone surrounded by upper-to-middle-income-generating residential areas.

3. METHODOLOGY

A reconnaissance survey was carried out followed by Participatory Rural Appraisal (PRA) approaches, such as Focus Group Discussions (FGDs), key informant interviews (KIIs), and In-Depth Interviews (IDIs). We considered only female slum-dwellers as respondents who experienced menstruation. In total, 12 FGDs and 22 KIIs were conducted with stakeholders, including teachers, health care providers, community leaders, and families having at least one disabled-female member. In total, 15 (i.e., calculated sample size under 90% confidence interval and 5% margin of error used in Equation (1)) disabled females were interviewed, of which 10 and 5 respondents were of Korail and Kalyanpur, respectively. Physically challenged disabled females were directly interviewed by the study team, while caregivers, e.g., mother and/or sister, were considered as the respondents in place of intellectually disabled females. The same semi-structured open-ended questionnaire was used for in-depth-interviewing 15 non-disabled randomly selected females. The sample size calculation formula is given in the following:

$$n = \frac{Z^2 \times P(1-P)}{\varepsilon^2} \tag{1}$$

where z score has 90% confidence interval, margin of error (ε) is 5%, and the population proportion (P) is 50%. Note that all ethical issues were carefully maintained during data collection and analysis. Written consent forms were also taken from the participants prior to the interview.

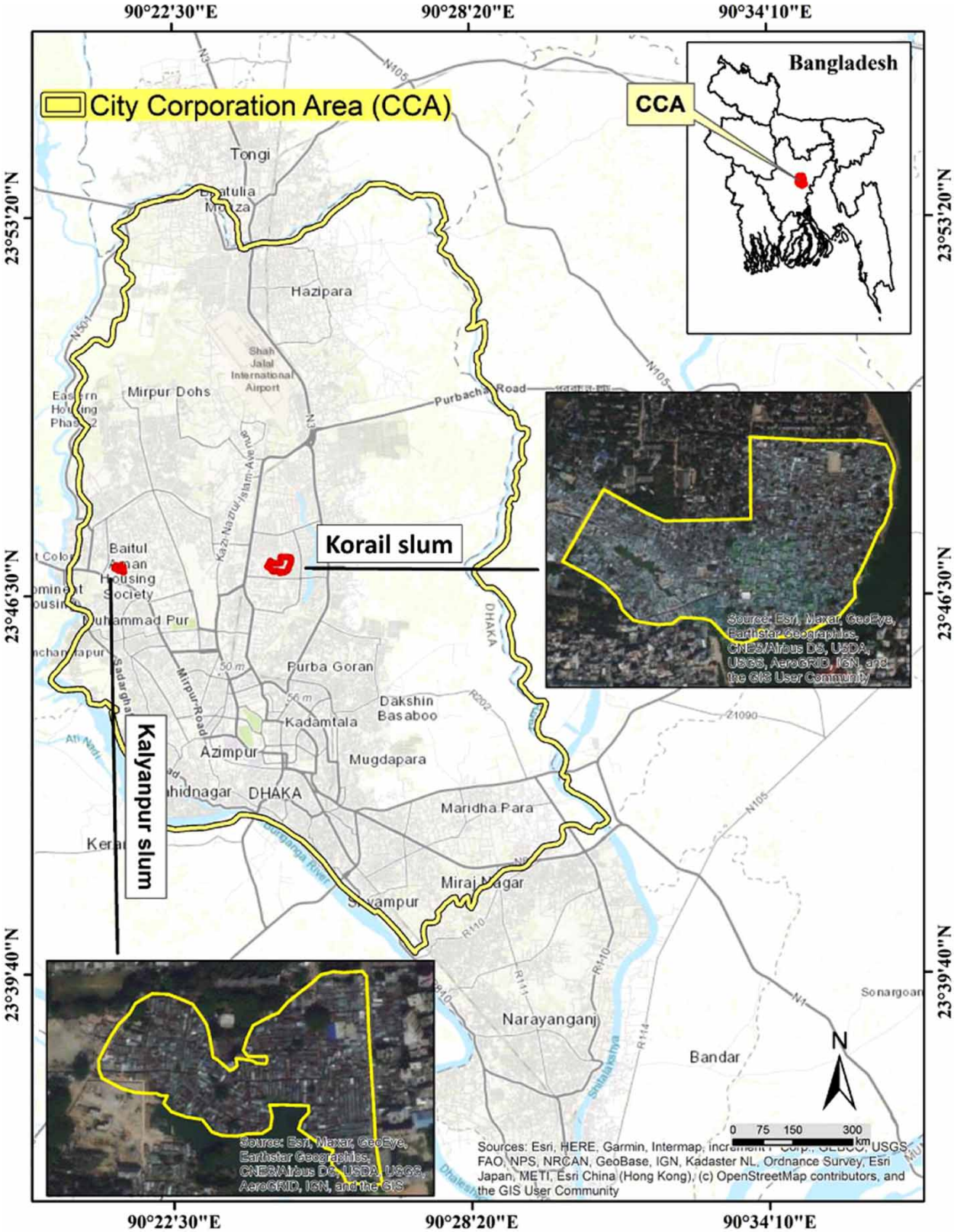


Figure 1 | Location of Korail and Kalyanpur slums under study in Dhaka.

4. RESULTS AND DISCUSSION

4.1. Society, economy, and behaviour

Around 31.5% of respondents are more than 30 years old, whereas 25% are between 18 and 23 years. Also, 68.8% of respondents without disabilities are married and 43.8% have no schooling background. In contrast, 86.7% of disabled females are unmarried with no educational background and the rest (13.3%) have schooling experiences up to primary level. The majority of disabled participants are beggars, while two are street vendors. Non-disabled females are mostly homemakers with few employed either as housekeepers or garment workers. In the cases of the economic background, the majority (43.8%) of non-disabled-female respondents have a personal income range starting from $71 up to $142 (Figure 2(a)). Most (86.7%) of disabled-female respondents have no income with personal expenditures less than $35 per month (Figure 2(b)). Regarding the income generation of the family, 56.3% of non-disabled-female respondents have family income between $118 and $177 per month, where they have 2–3 income-generating persons in a family (Table 1).

Furthermore, 5–6 families are reported to share a single room. Rents mostly vary depending on the category of houses the slum-dwellers share their facilities with. In cases of flat-type houses, 4–5 persons share a bathroom and pay $47–$59 per room. For tin-shed houses with brick-built side walls, people pay $29–$41 per room where 15–20 people share one bathroom. If the tin-shed house has side walls fenced with tin, people pay about $29–$36 per room on the condition of 20–30 persons sharing one bathroom. No differentiation is found in the rent rates of houses for differently abled females. But a tiny corner locally separated by a curtain inside the house for the private shower, wash, and change of menstrual clothes is a familiar scene in disabled-female houses.

Among all diversified problems, mobility constraints due to narrow spaces in between houses, unhygienic surroundings, weak financial conditions, fire hazards, population densities, unreliable water supplies, especially during the prolonged dry season, water logging during heavy rainfall events, lack of formal educational institutions, costly medications, etc. are common. The fears of the risk of eviction and fewer income opportunities are also major hindrances.

56.3% of the non-disabled-female respondents claim of not facing frequent diseases or sickness in the last 1 year, whereas 33.3% of disabled females have a frequent fever with regular body pain and 26.7% have skin diseases (Figure 2(c)). Notably, fever, jaundice, skin diseases, back pain, and diarrhoea are the common diseases found in the slums of Bangladesh (Latif *et al.* 2016; Badhan *et al.* 2017). For this particular study, 80% of the sample size have intellectual disabilities, whereas the rest of the 20% have mobility-related challenges. Here, 25.1% of non-disabled females spend less than $24 per month for medical purposes, whereas 53.3 and 40% of disabled females pay less than $24 and $24–$47 per month, respectively (Figure 2(d)). Families of the disabled female state that they need about $71 per month to maintain regular medical expenses. According to a mother of a disabled female in Kalyanpur slum,

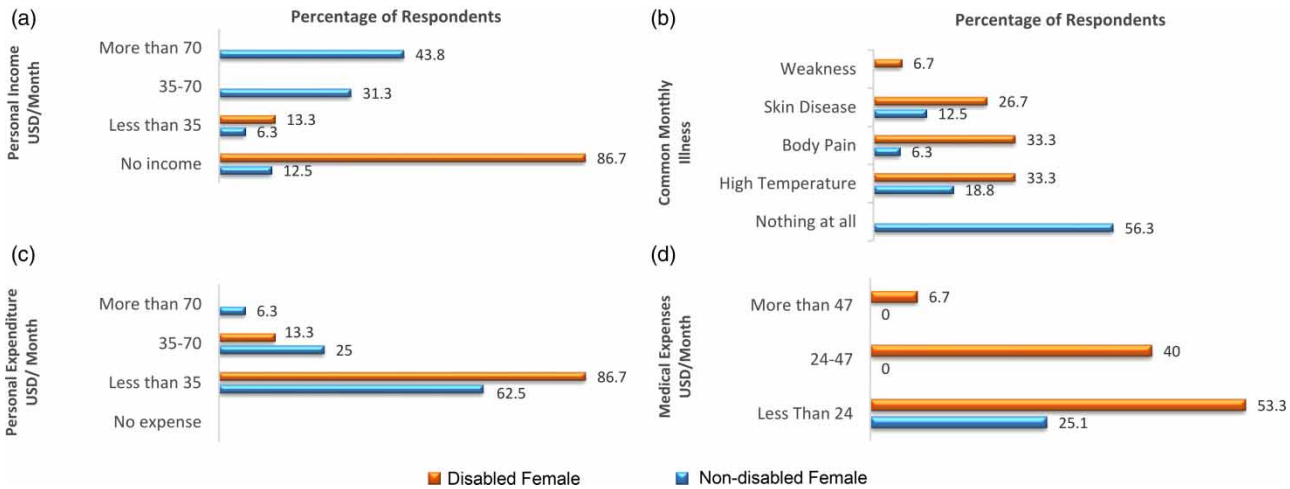


Figure 2 | History of financial and health aspects for disabled females: (a) personal income, (b) personal expenditure, (c) common illness, and (d) medical expenses.

Table 1 | Family background of the respondents regarding income generation in the family

SI	Aspects		Non-disabled female (%)	Disabled female (%)
1	Family income (US$/month)	Less than 82	–	13.3
		83–117	6.3	13.3
		118–177	56.3	46.7
		≥178	31.3	26.7
2	Number of income-generating person in the family	1	25	46.7
		2–3	56.3	26.7
		4–5	12.5	26.7

'*My crippled daughter requires BDT 300 per course for her regular physiotherapy in the Centre for the Rehabilitation of the Paralysed (CRP). On top of this fee, the regular transportation cost to CRP which is located 25 km away from us is not affordable for us.*' (Mrs Nurjahan Begum, Kalyanpur slum)

Among the disabled-female respondents, 93.3% are found to be economically dependent and in the majority (73%) of cases, their mothers are responsible for taking care of them (Figure 3(a)). Here, all disabled females are beggars except two females who are small-scale businesswomen. Decreasing income opportunities also imposes a burden on the family members that have a dependent like disabled female. The study observes 42 and 25% of families experience a loss of less than $6 per month and more than $35 per month, respectively (Figure 3(b)).

The number of disabled females in both slums has decreased. Particularly, in Korail, about 280 disabled people were reported to exist in 2016 which currently has decreased to approximately 55, of which 14 were females. It is because many have returned to their villages due to a lack of access to care and voluntary community services and a high cost of living. Also, the apathy in voluntary community service acted as a driving force. Powerlessness and voicelessness often lead to receiving little or no support for developing their condition. Notably, being trapped in illegal and informal status, poor government services regarding disability-friendly (e.g., playground, school, entertainment, WASH) facilities further exacerbate the despair of the disabled females. According to slum-dwellers, a disabled-female's care/attention needs demand a full-time dedication. Because intellectually disabled females are more vulnerable, in fact, at twice the risk of suffering physical and sexual abuse compared to females without disabilities when there is no caretaker (source: FGD). But volunteer caretakers are almost non-existent in slums and full-time engagement of a family member as a caretaker is expensive for living in Dhaka compared to leaving both members (i.e., caretaker and disabled family persons) in villages. All these dynamics are driving the reverse, i.e., city-to-rural migration of disabled females, though there is no precise disaggregated data to this claim to be statistically valid.

Despite having different forms of obstacles related to social and economic aspects, some in slums carry false conceptions about disabled females. Superstitions are attached to these disabled becoming disabled due to a curse or 'Batash laga' (which

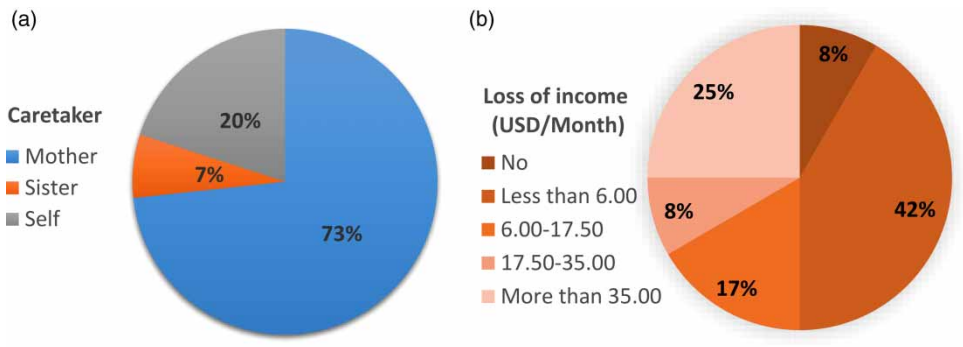


Figure 3 | (a) The percentage of the responsible person that acts as the caretaker for a disabled female and (b) the percentage of personal loss of income of the caretaker.

locally means blow of a bad wind) (source: FGD). The common supernatural belief of removing such a curse involves hanging a dry beef bone at the entrance of their house, as seen in Figure 4. Following the issue, a father of one disabled female in Korail slum states,

> '*My daughter is a victim of 'Batash laga'. Since the abnormality was noticed at her 2 years of age, we visited all kind of specialists viz., spiritual kabiraj (traditional healer/herbalist), quack doctor, and allopathic doctor for her treatment. Her neighbour believes something/someone invisible is living with her, so she has no control of her body movement*'. (Mr Rashid Mollah, Korail slum)

A limited number of programmes are run by various non-government organisations (NGOs) in support of disabled females, but menstrual health issues remain stigmatised – although to a lesser degree than prior to the initiatives taken by the GO. Palliative care service, monthly medical supply, regular health check-up and treatment, occasional food and clothing distributions, etc. are well received in Korail. Besides, different NGOs and GO projects conduct various menstruation awareness programmes on small scales. But, all of the NGO activities in Kalyanpur are related to water and sanitation only. Menstruation is found to be overlooked. The significant findings of our community-based field research are described into two main categories, i.e., concerns related to (a) WASH and (b) MHM as follows.

4.2. WASH status comparison concerning disabled females

A brief synthesis of the WASH design and service adequacy, reliability, affordability, and access for different disabilities of females living in slums is presented in Table 2. The table narratives in the backdrop of socio-economic characteristics and cultural prejudices are provided in the following Sections 4.2.1 and 4.2.2.

4.2.1. Availability of facilities

4.2.1.1. Water supply network and sanitation. Water supply services traditionally have not been mandated by formal authority due to their informal tenure but network connections are found all over the slums with several communal standpoints with water supplied via tube pump. Water is commonly stored underneath a local compound or plot and withdrawn via public tap or borehole tubewell (see Figure 5(a)). Slum-dwellers receive utility services through informal markets operated by intermediaries. Sanitation is without any doubt below standard except few. Luckily, there is no more open defaecation in Korail except for a few hanging toilets, which are still situated by lakes over temporary structures. Due to the lack of tenure and the risk of shattering encroached structures located near the lake, the owners of those hanging toilets (nearby the bank) are not improving their defaecation facilities. However, most people living inland have community toilets where they have separate facilities for males and females. Very few numbers of inhabitants have

Figure 4 | A hanging dry beef bone in the doorway of a disabled-female house at Kalyanpur slum to dissuade 'bad wind' from entering a home.

Table 2 | A brief synthesis matrix of the WASH design and service adequacy, reliability, affordability, and access for differentially abled females living in slums

Aspects	Non-disabled female	Disabled female
Water Supply Network and Sanitation	Private sanitation access is few. Common services include pipe supply into compound or plot, public tap, and borehole.	Mostly settled near WASH facilities.
	Community toilets are below standards but have separate facilities for males and females.	No pipe-line water services inside toilets increase the work burden.
	Very few numbers of inhabitants have in-house toilets.	An isolated in-house corner is preferred/prepared for intellectually disabled females.
Service Adequacy	73.3% have WASH facilities at a distance fewer than 25 ft.	56.2% have WASH facilities at a 5–10 minutes distance of 25–49 ft.
	Accustomed to the collection of water and carrying a water pot for cleanliness/toilet.	Settle near water sources and toilets to lessen risk and work burden.
	Voluntarily manage toilet complex with responsibility shuffled among the various households sharing the same facility.	75% of disabled-friendly toilets are found to remain out of service due to managerial problems.
	Low-level services are mostly linked to poor drainage facilities and network maintenance.	Disability-friendly facilities are fewer compared to the actual demand.
Service Reliability	Households living closer to the water source points are accused of dragging extra volume of water; hence, end users get less amount.	A family with a disabled member settles near a water source and toilet complex.
	Regular water supply stops working, especially during the prolonged dry season.	Difficult for the disabled as standing for long in a crowd is troublesome.
	Leakage in old pipes from the water distribution network creates an odour problem during daytime.	The same applies to disabled women.
Service Affordability	Poor income opportunities but has to spend 13–23% of their average monthly income on water.	Limited to no income opportunities but pay the same rate of $1.18 per 1,000 litre of water like non-disabled.
	43.8% with an income of $71–$142 per month have budgetary deficits to avail private toilet/MHM facilities.	86.7% with an income of $0–$35 per month have become an economic burden added to the budgetary deficits of the family.
	Common sicknesses (i.e., fever, jaundice, skin diseases, back pain, and diarrhoea) are not considered as diseases and medical expenses per month are minimal.	$71 per month to maintain regular medical expenses and decrease in income opportunities causing a loss of $6/month in family income (for 42%), imposing an economic burden.
	62% (i.e., 37.5 + 25%) pay water bill more than $1.18 per month.	53.3% pay water bills less than $1.18 per month.
Access to water and sanitation	56.2 and 43.8% experience hurdles in accessing water sources and sanitation, respectively.	73.3 and 66.7% experience hurdles in accessing water sources and sanitation, respectively.
	25% complain of long queues and crowd collecting water.	46.7% complain of harassment while using extra water volume or time for cleaning/toilet.
	Major obstacles include water logging in the wet season and floating sludge in severe rain events.	Major obstacles include physical limitations not compatible with the available transport system, high platform/plinth of toilets, slipping risk from overloaded toilet.
	Due to regular flooding, higher plinth toilets are preferred for better maintenance.	Higher plinth toilets are not disabled-friendly.
	Crowd and long queue in water collection is considered as a loss of opportunity cost.	Loss of both time and health as they find difficulties standing for long in a crowded water collection point, especially in the morning.
	Uneven muddy roads during the monsoon and accidental floating sludge on the road due to rain is manageable.	High risk of slipping and accidents during rain.

in-house toilets. At least 10 families (of an average of 40 persons) use one-chamber/pit hole of toilet/bathroom with no pipe-line water services inside. So, carrying water inside for cleanliness is a must and often difficult for independent disabled females. This increases the work burden and, often, the health (comorbidities) burden. In the case of intellectually

Figure 5 | (a) A borehole tubewell in a common plot that serves a specific section of the Korail slum, (b) an indoor facility for an intellectually autistic female in Kalyanpur slum to bathe, wash, and change menstrual cloths, and (c) disability-friendly toilet complex in Kalyanpur slum where 75% are not in working condition.

challenged autistic females, as mentioned earlier in Section 4.1, an isolated corner inside a room/house (without sanitation facilities) is personally maintained for private bath, wash, and menstrual use (Figure 5(b)).

4.2.1.2. Service adequacy. The number of disability-friendly facilities is fewer compared to the actual demand. Hence, families having disabled females are found to move toward houses that have a toilet in the vicinity. Fortunately, the landlords are commonly found to be considerate in asking less rent for tenants that have a disabled-female member. Therefore, available public lavatories are about 5–10 min away for most of the disabled females living in slums. Help from neighbours sharing public water sources is common. Additionally, local girls do not report feeling any insecurities for using the community toilets in either of the slums under study.

Water sources and toilets are found closer to the house of the disabled females in Korail compared to Kalyanpur. In Korail, water supply comes with a metering system for each 10–20 families sharing one water reservoir for their daily purposes. Non-disabled female voluntarily manages the toilet complex and washing space with responsibility shuffled among the various households sharing the same facility. In an earlier study by Biplob *et al.* (2011), WASH status in Korail is improving at a slower rate, where the drainage system is mostly neglected. In the case of Kalyanpur, only one unit (i.e., in between the administrative block nos 8 and 9) enjoys disability-friendly toilet facilities (Figure 5(c)). Nevertheless, most of the disabled females living in other parts of the slum cannot use those due to the remoteness with a poor entrance. On top of that, 75% of disability-friendly toilets are found to remain out of service due to managerial problems with cleanliness. According to the study, 73.3% of disabled females have access to water and toilet facilities at a distance less than 25 ft, whereas, 56.2% of disabled females have the same facilities at a distance of 25–49 ft (Figure 6(a)).

4.2.1.3. Service reliability. Nowadays, in Korail, inequitable water distribution is causing most of the troubles. Not everyone enjoys a constant supply of water. Especially, people living closer to the water source points are accused of dragging extra volume of water; hence, end users get less amount. In some cases, houses nearer to the water source points are found selling water to others in exchange for money. Still, non-disabled females are somewhat more or less accustomed to regular water supply, except for scarcity issues in prolonged dry seasons. However, those who receive continuous water have complained about the poor quality of supply. During noontime, the odour problem of water becomes more severe compared to the water supply that comes at other times. Hence, females prefer to preserve the water that comes at night and dawn for drinking purposes. Leakage in pipe-lines (stemming from no/low maintenance) is suspected to be the main reason behind such odour problems. According to the respondents, domestic uses, such as washing, bathing, cleaning, etc., get high at noontime, which is transmitted through leakages of distribution pipe-lines causing such odour problems. Often, the water collection points are not far from the sewer and drainage lines.

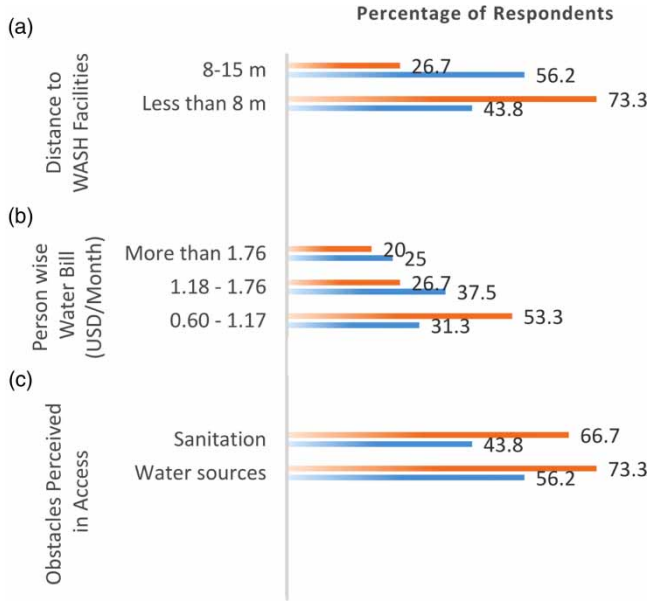


Figure 6 | Survey statistics on (a) distance to WASH facilities from the house, (b) water bills borne per month by each person in slums, and (c) obstacles perceived by the female while access to water sources and sanitation.

4.2.1.4. Service affordability. During the study, slum sites are found to pay $1.18 per 1,000 l of water, whereas nearby formal housings pay $0.14 for the same amount. Notably, Korail dwellers pay about 13–23% of their average monthly income for domestic water supply. Water consumption per month by 62.5% (i.e., 37.5 + 25%) of non-disabled females require to pay more than $1.17 but the majority (53.3%) of disabled females spend less ($0.60–$1.17) than that (Figure 6(b)).

The government of Bangladesh has been working to improve the situation of disabled females for a long time. Disabled females receiving a regular stipend of $8.24 per month is worth mentioning. Different organisations like palliative caregiving are reported to support intellectually disabled girls with medicine (mostly sleeping pills though) once a month in Kalyanpur to help with irritability. However, caretakers find them to be insufficient as the provided pills work only for half of a month. Specifically, hyperactivities and irritable behaviours make caretaker's life hard to handle the hygiene of intellectually disabled autistic girls. So, the family is bound to bear the cost of the pills for the rest of the month. In general, the disabled female is dependent on the earning member(s) of the family, but families face difficulties in ensuring medical treatments due to their own unstable financial situations. For example, treatment from CRP requires $3.50 per course, which is hard to afford for slum-dwellers in addition to the burden of commutation costs. Further, females with intellectual disabilities depend on their family members, starting from collecting water to using the toilet and maintaining hygiene during menstruation. Due to the prevalence of intellectual autism, the disabled females have greater severity of learning disability. As a result, most of their families are found to experience a loss of monthly income. Plausible earning member is found to do extra part-time jobs because at least one family member has to ensure 24/7 caretaking of the disabled female.

4.2.2. Obstacles to access

In comparison to the non-disabled female, 73.3 and 66.7% of disabled females perceive extra obstacles in getting access to water sources and sanitation facilities, respectively (Figure 6(c)). 46.7% of disabled females report of experiencing harsh comments (Table 3). Disabled females, in general, require more time to use the toilet, but not all people have the patience to understand this special need. Neighbours sharing common water sources do not accept the issue of wasting water easily. Some dwellers complain about disabled females taking more time in using water/cleaning if caretakers do not pay attention. On the other hand, 53.3% of disabled females inform that physical limitation is their key problem in using sanitation facilities, whereas 18.8% of the non-disabled females complain about poor road communication (as seen in Supplementary material, Figure S1a). Based on these issues, one respondent states,

Table 3 | Different types of obstacles to get access to water sources and sanitation in slum

SI	Aspect		Non-disabled female (%)	Disabled female (%)
1	Obstacles to access water-point source	Harsh comments	12.5	46.7
		Challenging to use tubewell	–	13.3
		Poor road communication	12.5	6.7
		Long queue with amorphous crowd	25	6.7
2	Obstacles to access sanitation facilities	Poor road communication	18.8	6.7
		Long queue in the morning	12.5	–
		Distance to the toilet	6.3	–
		Absence of light at night	6.3	–
		Unfriendly facility	–	6.7
		Physical impairment	–	53.3

'*My disabled-daughter requires extra time using bathroom/toilet like other disabled females in my area. Our neighbours do not always have patience accepting this delay, hence, do not prefer sharing the same toilet or water source point with her/them.*' (Mrs Fatima Khatun, Kalyanpur slum)

During the prolonged dry period, the regular water supply stops working. Women and children collect water from distant locations, where they have to wait in long queues. Physically impaired females find difficulties standing for long in an amorphous crowd, especially in the morning rush hours. Existing public infrastructures are not disability-friendly, lack suitable water collection points, and do not have inclusive toilet facilities. Notably, disabled women and girls commonly slip over and have accidents when using toilets on the higher plinth. However, due to regular flooding, slum-dwellers find toilets to be hygienic if constructed at a high platform for better maintenance. Hence, these high-plinth toilets are not inclusive for disabled females. Investment in disability-friendly handrails or any type of support or getting back to traditional horizontal pits may be an immediate solution to their existing risk of slipping. In addition, disabled females face other obstacles, including uneven muddy roads during the monsoon (Supplementary material, Figure S1b) and accidental floating sludge on the road due to rain and faecal sludge overflow in the toilet.

4.3. MHM status comparison concerning disabled females

4.3.1. Management aspects while menstruating

A majority (68.8%) of non-disabled respondents are able to manage their menstrual hygiene independently, compared to only 20% of disabled participants. Sixty percent of disabled respondents and 18.8% of non-disabled respondents seek the help of their mother (Supplementary material, Table S1). In most cases, females with intellectual disabilities find it hard to maintain hygiene during menstruation. In general, mostly the mother and often the sister/caretaker does changes menstrual clothes twice a day, but inside the house/room. Mothers bathe their daughters once daily, preferably at night. Due to the fear of daughters with mental autism showing off used menstrual products to neighbours and causing irritation, mothers are reluctant to use sanitary products. Following these issues, a mother of a girl with intellectual disability states,

'*My daughter cannot express her pain during menstruation, but I must understand differences in her behaviors. I try to take special precautions as she cannot keep clean and change menstrual clothes in a dignified healthy manner.*' (Mrs Most. Joytun, Korail slum)

4.3.2. Behavioural and social aspects

The majority, i.e., 50% of the non-disabled females and 80% of the disabled females, find both family and their surrounding society very helpful (Figure 7). However, 13.3% of disabled females describe otherwise: saying that society is not so respectful regarding menstruation. Accordingly, schools under this particular study area welcome only the preadolescent disabled girls who have not yet experienced pubertal changes. On top of that, adolescent girls with intellectual disabilities are strongly discouraged from taking part in schools due to the lack of skilled caretakers. Besides, schoolteachers are unwilling to disclose

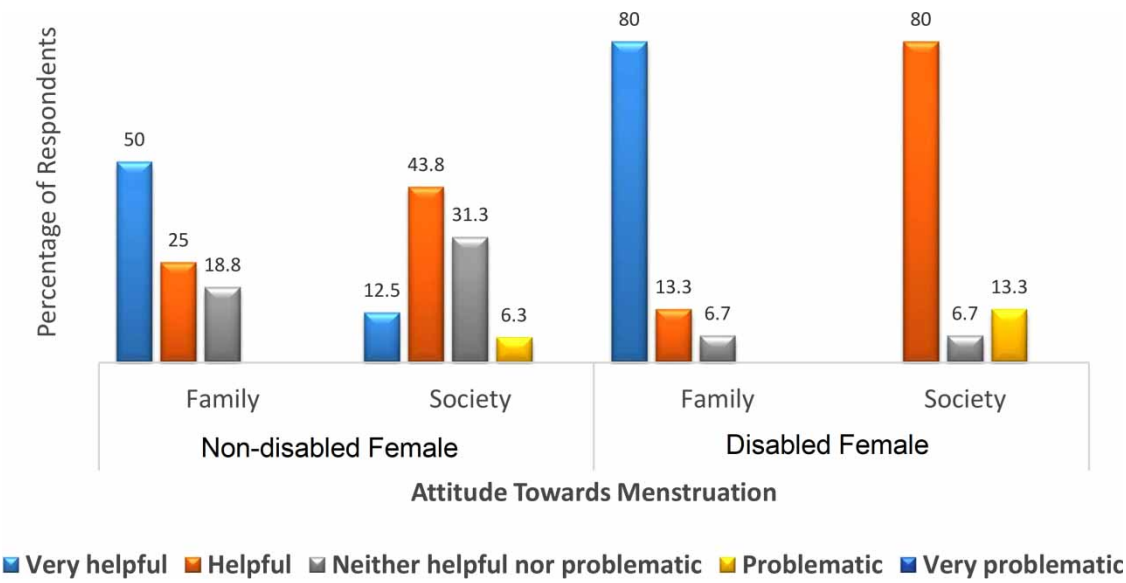


Figure 7 | Attitude of family and society towards females during menstruation.

menstrual issues, let alone talk about puberty with boys and girls together. No school has yet taken any measure to provide education associated with girls' puberty or menstruation.

4.3.3. Health aspects related to menses

Most (53.3%) of disabled females confirm exaggeration with mood swings while menstruation is ongoing (Supplementary material, Table S2), with 40% feeling abdominal pain. Painful menstruation, gastrointestinal problems, and cramps are sometimes the source of stress/depression, but adolescent girls do not visit the medical centre to get any service. On the other hand, 18.8% of the non-disabled female merely visit a doctor while suffering through any sort of physical problem. Similarly, none of the disabled females ever approve of going to the medical centre during menstrual periods. Willingness to pay for doctoral fees for such common symptoms is found null. Menstruation pain and/or blood is considered something to be hidden. Remedies are sought from local spiritual Kabiraj. Common pain management superstitious practices include hanging dry plants to ward off the evil eye or evil spirit and restricting movement outside in the evening.

4.3.4. Aspects related to hygiene commodities

Among the sanitary pad users, 18.8% of the non-disabled females are economically independent (Supplementary material, Table S3) and 40% of disabled females depend on another female individual of the family for access to sanitary pads. Moreover, most of the respondents, irrespective of having a disability or not, state that they do not have enough space in their households to change the pad or cloth during menstruation. Despite inconveniences, 60% of disabled females mention they change their pads or clothes in a room inside the house.

Through several NGO activities, most women in the slums are aware of the use of sanitary pads. However, due to poor financial conditions, willingness to pay for menstrual hygiene (MH) commodities is null. This financial constraint is the main issue behind their poor hygiene. Although almost all school-going girls and young working women mostly use sanitary pads due to the long-lasting absorbent nature of the napkins. Middle-aged mothers and homemakers still prefer using clothes for themselves, presumably to save money for the younger family members to buy sanitary napkins. Used pads are carefully disposed of in the garbage after wrapping them up with a plastic bag, which is not very common across the slums. Notably, no woman is found to have fungal, urogenital, urinary, or any other kind of infection. Though, the taboo behind disclosing such infectious diseases may be a reason for such responses.

The monthly cost for a packet of sanitary napkins ranges between $0.94 and $1.18. Most of the disabled females cannot afford MH commodities, hence, use clothes. On top of that, for both outgoing girls and women, frequent changing of the sanitary pads is troublesome. Often, public toilets are found unclean and unsuitable for regular use, let alone changing menstrual

pads. Most of the time, intellectually disabled autistic girls keep wearing a piece of cloth or a single pad for the entire day because of their caretaker's busy schedule. Besides, there is a taboo of keeping the sight of the used, washed-up clothes away from the other male family members, causing them to hang the clothes in hidden corners or behind the doors.

5. CONCLUSION

Among intensified present societal disparities in slums, disabled-female residents in this study are found as the most fragile group to be deprived of equitable water and MHM access. Despite having many interventions of GO and NGOs, there are still some challenging WASH and MHM aspects identified during the study that are hampering this fragile group. The most detrimental key research highlights are as follows:

- Most (93.3%) of disabled females depend on family members and sometimes are treated as burdens regarding expense and daily activities. Particularly, results confirm 53.3% of disabled females pay extra up to $24/month for medicine and 33.3% of caretakers experience loss in income of ~$6/month.
- Monthly allowances from the government for disabled females are appreciated but are insufficient to cover medical expenses. Despite being well aware of the hygiene concerns, fewer use sanitary pads because commercial MH products are expensive to afford.
- Disability-friendly toilets are not sufficient in number, poorly maintained, and the access road to those structures is not at all welcoming with their unpaved nature and narrow spacing. They are bound to use common public toilets that are generally built-in high platforms to avoid regular flooding. Because slum-dwellers find high-plinth toilets to be hygienic and better to maintain.
- Awareness programmes against MH-related common superstitions are found to be organised by NGOs only, but these are not many.
- The improper arrangement of 'Cheap WASH' and unmanaged disposal of non-biodegradable MH wastes, single-use medical, and plastic usage at slums are making the environment of city surroundings unfavourable and vulnerable posing a great threat to public health.

Existing policies consider either female or disabled or urban residents or pro-poor as a separate component and do not receive any attention towards integrating the necessary strategies for all components together where 'no one will leave behind' or create any pressure on such socially excluded groups with extra economic burden in future. There is a scope to incorporate such unheard voices in SDG (Sustainable Development Goal) tracker, 'UN Convention on the Rights of the Persons with Disabilities'; national legal frameworks like the revision of Pro-Poor Strategy for Water and Sanitation 2020, etc. In particular, incorporating observations from this study in Dhaka Detailed Area Plan (2016–2035) can help accelerate prioritising structures for low-income-group and thus leverage the momentum of meeting the SDG targets 3 (good health and well-being), 5 (achieve gender equality and empower all women and girls) and 6 (clean water and sanitation). In this context, the study recommends analysing site-specific Strengths, Weaknesses, Opportunities, and Threats (SWOT) of current situation of urban pro-poor disabled females. By ensuring right-to-water, more precisely, water justice, a foundation of social justice can be employed.

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DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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