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Water Supply and Sanitation Scenario of the Street Dwellers in Some Selected Locations of Dhaka City

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ABSTRACT: Street dwellers is the most vulnerable group considering health condition due to inadequate nutrition and also gaining limited access to safe water and sanitation. The primary objective of this study is to investigate the water and sanitation facilities for the street dwellers in Dhaka city with a view to exploring the concerning issues that directly or indirectly influence the health of the street dwellers. The obtained data from questionnaire survey among the street dwellers have been analyzed through Statistical Package for the Social Sciences version 26 software. The street dwellers depend to collect water for drinking and other household works mainly from public toilets (60.2%) and tap from mosques (20.1%). The dominant uses of toilet facilities among street dwellers are unsafe drainage/sewerage line near the living place (48.2%) which is followed by public toilet near the living place (19%). The females especially young group suffer a lot due to lack of separate toilet facility. Often, they suffer from different diseases. As inadequate sanitation and hygiene behaviour is very common among the study group, so necessary and effective steps should be taken in this regard.

KEYWORDS: water, sanitation, hygiene, disease, street dweller

I. INTRODUCTION

Bangladesh is experiencing rapid expansion of urban areas in last three decades. In 2020, the population of Dhaka city and adjacent suburban areas is now estimated at nearly twenty-one million. Dhaka has grown by more than three and half million in last five years, which represents a 3.60% annual change as per the latest revision of the UN World Urbanization Prospects. With the advancement of development, Dhaka has been undergoing with the challenges of sudden incursion of homeless, evicted, deprived and jobless people from across the country in quest of their work in Dhaka city. Lack of opportunity in rural areas, incidence of rural unemployment due to flood, drought, river erosion and such natural calamity, seasonal labour, landlessness, debt, lack of willingness to work in rural areas trigger people to come to the cities for a better future (Islam, M. R., 2014). A portion of these people has remained so impoverished to lead floating life here being unable to take shelter at any type of settlements in Dhaka city. Most of them have remained workless, beggars or in search of petty jobs with very low wages. They struggle a lot to meet their bare basic needs. They have started to build unauthorized shanty shelters in parks, abandoned land, khas or Government land, along the city road sides or along the side of railway etc. The street dwellers are mostly economic migrants to Dhaka driven by both 'push' (hardship, landlessness, cruelty towards them, natural calamities, etc.) and pull (employment chances in proper and casual sectors, better income opportunities, etc.) factors (Lee 1966). Major proportion of this migrant population land in the slums, but a substantial proportion squatter in the streets, becoming street dwellers or floating population. By definition, floating population are the mobile and roaming category of rootless people who have no permanent dwelling units however worse these are; these people are found on the streets, rail-station launch ghat, bus station, hat-bazar, mazar, staircase of public/government buildings, open space etc. (BBS 2014) Standards of health of the street dwellers are the worst not only due to less adequate nutrition but also because of gaining limited access to safe water and sanitation. Most individuals and households who live in streets lead their lives in most vulnerable situations. They suffer from lack of security, and even they have to live with constant threats to their miserable livelihoods.

Ensuring ease of use to clean drinking water and reliable sanitation is one of the least costly and most efficient way to improve public health and save lives (Montgomery and Elimelech 2007). Improved drinking & domestic purposes' water distribution and healthy sanitation facility both have significant impact on the health of the people. Inadequate hygiene practices and ineffective sanitary circumstances play major roles in the increased burden of communicable diseases among the community. Poor water, sanitation and environmental hygiene situations is the most common

scenario of the urban poor across the country. The poor families are forced to dedicate more time collecting water from public or other outside sources. Barriers to safe drinking water, alongside sanitation, have significant impact on health, nutrition, education, protection and other outcomes for children and adolescents.

The primary objective of this study is to investigate the water and sanitation facilities for the street dwellers in Dhaka city with a view to exploring the concerning issues that directly or indirectly influence the health of the street dwellers. To achieve this objective, its secondary objectives are to investigate the water and sanitation scenario, to ascertain the factors associated with the water and sanitation practices of the street dwellers, to investigate the relationship among different variables related to economic condition, water demand and sanitation facilities and to highlight any other findings that may be of interest and contribute towards the improvement of the existing situation of the street dwellers.

The study is based on two hypothesis. First one is if the internal and external factors with their level of correlations concerned with the safe water and sanitation practices are clearly identified, then the situation becomes more favourable for the street dwellers. The second one is if the proper facilities for the water supply and sanitation facilities are assured, then the environmental condition of those areas are improved.

The study is planned to assess the factors influencing water and sanitation practices are to be considered during questionnaire preparation and in the study. The level of safe water and sanitation practices is influenced mainly by provided facilities to the street dwellers, but may also be affected by age, gender, economic conditions and related characteristics. In summary, the study will cover all the relevant issues for a better understanding of water and sanitation scenario of street dwellers in Bangladesh.

II. LITERATURE REVIEW

Street Dwellers Statistics

In April 2014, Bangladesh Bureau of Statistics counted street dwellers (according to their definition floating population) through special arrangements. As per Bangladesh Bureau of Statistics, number of floating population enumerated in the Slum Census 2014 was 16,621 of which 12,509 were males, 4078 were females and 34 belonged to the hijra community and that of slum census 1997 was 32,081 of which males were 24,439 and females were 7,642. Due to better economic condition of people, the floating population of 2014 became about 50% less than that of 1997. Comparison of street dwellers by census, sex and by locality is shown in Table 1 and Figure 1.

Table 1: Comparison of Floating Population by Census, Sex and by Locality (BBS)

Locality	Floating population enumerated in 2014					Floating population enumerated in 1997		
	Total	Percentage	Male	Female	Hijra	Total	Male	Female
National	16621	100	12509	4078	34	32081	24439	7642
Barisal City	108	0.65	81	27	0	-	-	-
Chittagong City	802	4.83	541	261	0	2377	1926	451
Comilla City	65	0.39	40	25	0	-	-	-
Dhaka City(N+S)	7247	43.60	5662	1575	10	14999	11717	328
Gazipur City	1316	7.92	1062	248	6	-	-	-
Khulna City	280	1.68	195	85	0	3971	3449	522
Narayanganj City	347	2.09	232	115	0	-	-	-
Rajshahi City	55	0.33	22	33	0	1347	844	503
Rangpur City	71	0.43	45	26	0	-	-	-
Sylhet City	114	0.69	84	30	0	-	-	-
Municipalities (all)	4222	25.40	2984	1226	12	4792	3402	1390
Other Urban Areas	1994	12.00	1561	427	6	-	-	-

The number of floating population in Dhaka (North +South) City Corporation was the highest numbering 7,247 and 14,999 and in Rajshahi City Corporation it was the lowest having 55 and 1347 in the Census of Slum Areas and Floating Population 2014 & 1997 respectively. In terms of percentage, Dhaka City has 43.60% and 46.75% and Rajshahi city 0.33% and 04.20% floating population in the census of Slum Areas and Floating Population 2014 and 1997 respectively Table 2.1 shows that female floating population is less than male floating population in both the slum census 2014 and 1997 and hijra is the highest in Dhaka City and it is 10 (29%) out of the total 34 (national). The employment condition of the floating population along with their main activities has been furnished in Figure 2.

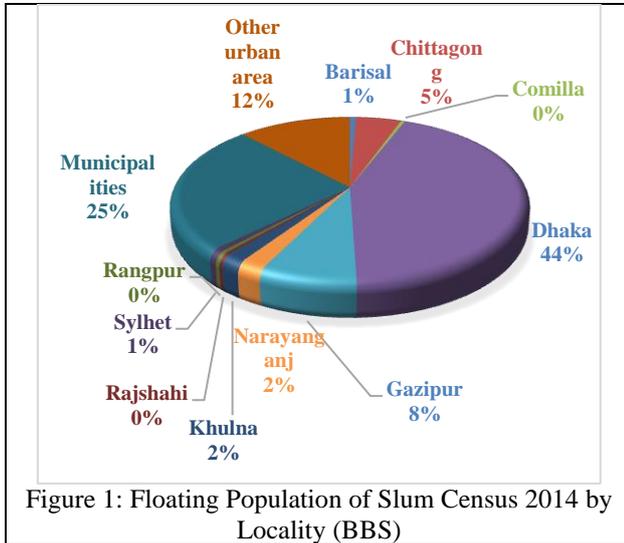


Figure 1: Floating Population of Slum Census 2014 by Locality (BBS)

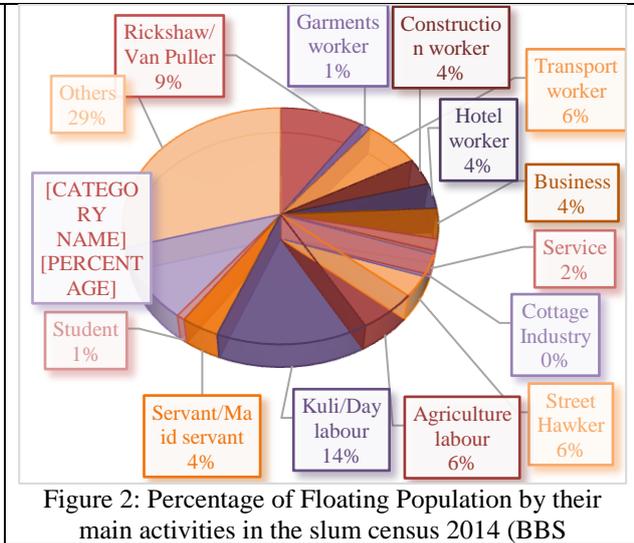


Figure 2: Percentage of Floating Population by their main activities in the slum census 2014 (BBS)

Water and Sanitation of Street Dwellers

Floating population has been increasing in Dhaka over the last three decades along with the growth and expansion of Dhaka city. However, water supply and sanitation facilities are very much unsatisfactory for them due to lack of proper water supply and sanitation system. Health status of the street dwellers is not satisfactory at all. The most common illnesses observed in the previous included joint pain or back pain, peptic ulcer disorder (PUD), dysentery, diarrhea, fever, cough, typhoid, scabies and other skin diseases, heart disease and hypertension, tuberculosis, ringworm, jaundice, tumors and cancers, pregnancy related complications, asthma, hydroceles, eye problems, dental complications (Nordqvist, C., 2019).

Previous study found that around 89% of the total population had admittance to drinking water and 63% had access to use enhanced sanitation in 2010 (WHO/UNICEF, 2014). Worldwide numerous countries implemented programs related to dependable water, sanitation and hygiene (Zaman SB., 2017) and reported significant advancement for better access to drinking water and hygienic sanitation. However, this expansion has reported to take the lead to a higher level of inequality among the wealthy and needy (Zaman SB, Hossain N., 2017). Urbanization along with continued expansion of population also contaminates the water and worsens sanitation infrastructure (People and the Planet, 2017).

Access to safe drinking water and sanitation is considered to be a fundamental human right that acts as a safety measure of health and human solemnity (OHCHR, United Nations, 2007). Dhaka Water Supply and Sewerage Authority (DWASA) of Bangladesh is supplying water to the Dhaka city dwellers through its distribution network after proper treatment of water drawn from the surrounded rivers and underground sources (Sabrina, M. et.al. 2013). Quality of drinking water is closely associated with human health and providing safe drinking water is one of the important public health priorities (Juthi, M. F. R et. al. 2013). Good sanitation and hygiene practices can make major differences in people’s health, education and socioeconomic development. Scientific studies indicate that diarrhoea cases decline by roughly 36 percent when households have basic sanitation (Fewtrell et al., 2005). The same review of studies showed that handwashing with soap can reduce the incidence of diarrhoea and have impacts on pneumonia, respiratory disease, trachoma, scabies, and skin and eye infections. Empirical studies have found that this practice can also reduce the incidence of diarrhoea by 44 percent (Fewtrell et al., 2005).

III. METHODOLOGY

A research plan has been prepared based on the initial discussion with various stakeholders for outlining the scope of the work and the major information requirement for the study. Various relevant reports, project documents, existing literature would be reviewed. Field surveys would have been conducted to explore water supply and sanitation scenario of street dwellers in Dhaka City. The questionnaire was prepared into two types of questions. The first type contained questions regarding street dwellers’ socio-economic and background-related questions, which are the independent variables. The second type contained questions regarding street dwellers’ water and sanitation practices related questions which are the combination of independent and dependent variables. For questionnaire survey, a set of closed-

ended questionnaires (paper-and-pencil instrument) has been administered to the respondents. Respondents have been selected by Probability Sampling method for the study which gives each unit in the population a known, non-zero chance of being selected. Random Sampling would be adopted for the study. If we choose of p is the safest at 0.5, With $\alpha = 0.05$, $d = 0.05$, By using the formula $n = \frac{p(1-p)Z_{\alpha}^2}{d^2}$ a sample size is estimated to be 384. Our sample size is much more than that. A sample size of 452 individual dwellers (in 5 major locations where street dwellers mostly live) have been considered in the study.

Study Locations

Study locations of questionnaire survey are shown in Table 2 Some photographs have been included here to represent the temporary housing, water collection and storage situations of the street dwellers of the selected locations of Dhaka city. Photo 1 shows temporary settlement of street dwellers at Mirpur area. Photo 2 shows shows water Distribution using temporary pipe from of a public toilet at Malibagh. Photo 3 shows water storage in temporary settlements of street dwellers at High Court area.



Photo 1: Temporary Settlement of Street Dwellers (Location: Mirpur)



Photo 2: Water Distribution using temporary pipe from of a Public Toilet (Location: Malibagh)



Photo 3: Water Storage in Temporary Settlements of Street Dwellers (Location: High Court Area)

Table2: Locations of Questionnaire Survey of Street Dwellers

Locations of Survey	High Court Street (Doyel Chattar to Kadam Foara)	Moulana Bhasani Road and Kakrail Road, Ramna (Ramna Footover Bridge to Shahed Captain Monsur Ali Sarani)	Mouchak/ Malibagh (Malibagh Mor to Malibagh Rail Gate)	Paribagh (Shabagh Road, Kataban to Bank Asia, Poribagh Road Number 2)	Mazar Road and Mirpur Road, Mirpur (Hazarat Shah Ali Bughdadi (R) Mazar to Mirpur 10 Roundabout)
Latitude and Longitude	23°43'40.9"N 90°24'01.0"E to 23°43'47.6"N 90°24'18.5"E	23°44'04.4"N 90°24'02.3"E to 23°44'14.5"N 90°24'15.2"E	23°44'39.0"N 90°24'51.1"E to 23°45'00.1"N 90°24'46.6"E	23°44'19.0"N 90°23'31.9"E to 23°44'33.3"N 90°23'44.5"E	23°47'46.6"N 90°20'56.6"E to 23°48'25.3"N 90°22'06.2"E
Study Area Designation	SA-1	SA-2	SA-3	SA-4	SA-5

IV. RESULTS AND DISCUSSIONS

All the results obtained from questionnaire survey have been incorporated in Statistical Package for the Social Sciences version 26 software and results are analyzed through it.

Age, gender, Number of Family Members and Daily Income Range of the Respondent

The gender distribution of the respondent shown in Figure 3 states that 76.3% of the respondents are male and 23.7% of the respondents are female. Most of the respondent (34.7%) are in the age group of within 35 years and 44 years and the least of the respondents (4.9%) are of age more than 65 years. From the Figure 4, it is found that most of the family is of 3 members and daily income level within BDT 300 to 399 (19.3%) followed by family is of 4 members and daily income level within BDT 200 to 299 (17.5%). From the Chi square tests table as shown in Table 3, it is found that the Pearson’s Chi Square value is 470.4 and associated asymptotic significance is 0.000 which is less than 0.05. It states null hypothesis of there is no association can comfortably be rejected. So, it can be concluded that there is a strong evidence of association between daily income range with the number of family members.

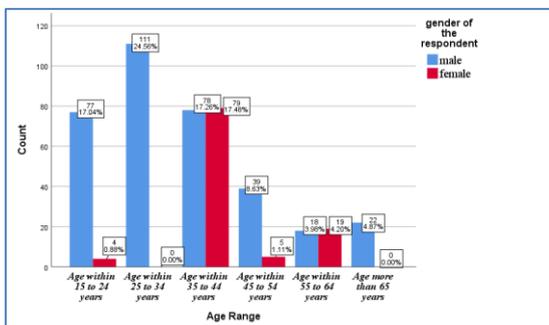


Figure 3: Gender and Age Range of the Respondents

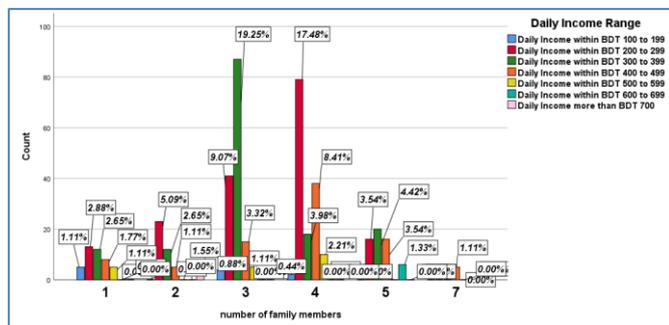


Figure 4: No of family members and Daily Income Range of the Respondents

Table 3: Chi – Square Test Results

	Chi – Square Test of No of Family Members and Daily Income Range of the Respondents			Chi – Square Test of Source of water and Storage Medium of Collected Water		
	Value	df	Asymptotic Significance (2-sided)	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	470.368 ^a	60	.000	74.259 ^a	8	.000
Likelihood Ratio	417.901	60	.000	86.338	8	.000
Linear-by-Linear Association	3.884	1	.049	30.938	1	.000
N of Valid Cases	452			452		
	a. 52 cells (66.7%) have expected count less than 5. The minimum expected count is .01.			a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .08.		

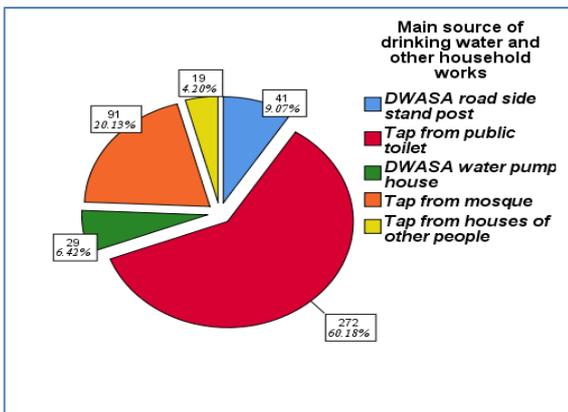


Figure 5: Main Source of Water

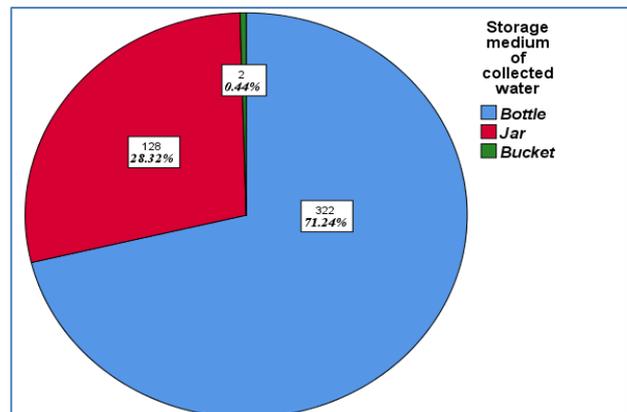


Figure 6: Medium of Water Storage



Main Source of Water and Storage Medium

As per survey outcome, main source of water for drinking and other household works come mainly from public toilet (60.2%) and Tap from mosque (20.1%) as shown in Figure 5. From Figure 6 it is found that most the respondents(71.4%) use bottles for water storage. From the Chi square tests table as shown in Table 3, it is found that the Pearson’s Chi Square value is 74.3 and associated asymptotic significance is 0.000 which is less than 0.05. It states null hypothesis of there is no association can be comfortably rejected. So, it can be concluded that there is a strong evidence of association between source of water with storage medium of collected water.

Factors Affecting Collected Water Amount

Collected water amount in litre/family/day is considered dependent variable shortly assume variable “collected water”. ANOVA test result and Regression coefficients are shown in Table 4 and 5. The regression equation is:

Collected water = 15.994 + 4.411 × family member + 0.013 × daily income + 0.182 × average time spent;

where all the significance levels are below 0.05 that means satisfactory for Regression Coefficient T Test(Individual Test). Significance of ANOVA F test as shown in Table 4 is 0.000 which is also satisfactory.

Table 4: ANOVA Test for Collected Water Amount Considering Three Independent Variables

ANOVA ^a						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16999.612	3	5666.537	28.420	.000 ^b
	Residual	89326.218	448	199.389		
	Total	106325.830	451			

a. Dependent Variable: collected water amount (litre/family/day)
 b. Predictors: (Constant), average time spent to collect water each day in minutes, number of family members, daily income of the household in BDT

Table 5: Regression Coefficients for Collected Water Amount Considering Four Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	15.994	2.719		5.883	.000
number of family members	4.411	.566	.339	7.795	.000
daily income of the household in BDT	.013	.006	.097	2.205	.028
average time spent to collect water each day in minutes	.182	.050	.159	3.635	.000

a. Dependent Variable: collected water amount (litre/family/day)

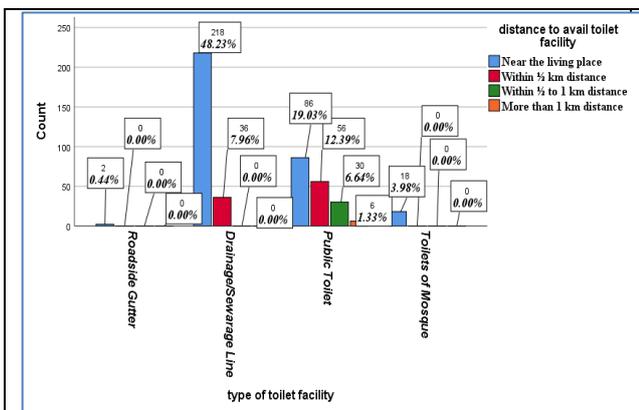


Figure 7: Type of Toilet Facility and Distance Travelled to Avail it

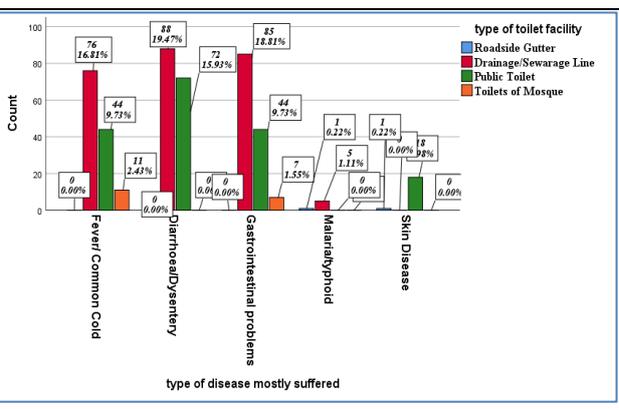


Figure 7: Type of Diseases Mostly Suffered and Type of Toilet Facility



Type of Toilet Facility, Distance to Access the Facility and Type of Disease Mostly Suffered by the Street Dwellers

As per survey outcome, the dominant uses of toilet facilities are unsafe drainage/sewerage line near the living place (48.2%) which is followed by public toilet near the living place (19%) which are shown in Figure 7. As per survey outcome shown in Figure 8, the unsafe drainage/sewerage line users suffer mostly in diseases. Most common disease is diarrhoea/dysentery among the street dwellers.

Factor Analysis of the Scaled Measurable Variables

A total of 7 scaled measured variables have been considered in the factor analysis. The measured variables have been divided in three factors which is shown in Table 6.

Table 6: Rotated Component Matrix for Factor Analysis

	Component		
	1	2	3
age of the respondent	.595	-.436	.160
number of family members	.668	-.002	.004
daily income of the household in BDT	.204	.246	.651
average time spent to collect water each day in minutes	.201	.748	.092
collected water amount (litre/family/day)	.835	.110	.034
money spent to collect water every day (BDT /day/family)	-.091	-.173	.829
money spent to avail toilet facility every day (BDT /day/family)	-.181	.705	-.024
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 4 iterations.			

From the table 6, three factors can be considered in the study.

Variables to be considered in Factor 1 includes age of the respondent (0.595), number of family members (0.668) and collected water amount in litre/family/day (0.835). Variables to be considered in Factor 2 includes average time spent to collect water each day in minutes (0.748) and money spent to avail toilet facility every day in BDT/day/family (0.705). Variables to be considered in Factor 3 includes daily income of the household in BDT (0.651) and money spent to collect water every day in BDT/day/family (0.829).

V. CONCLUSIONS

Uninterrupted inflow of migrated people in Dhaka city has been generating additional burden on existing water supply, sanitation and living facilities of Dhaka. Street Dwellers lead a very unhygienic and unhealthy life maintaining a very low standard of living. They are not even aware of the health and hygiene practice, proper sanitation system and cleanliness measures. As a result, pure water collected from source becomes contaminated because of improper handling, malpractice adopted during usage and storage (Chowdhury F. et al. 2017). From the questionnaire survey and field visit, some key findings of the study are as follows:

- The collected water amount by the street dwellers is very low in comparison with minimum water requirement to lead a healthy life.
- Street dwellers have to pay money for water and sanitation though it is very low but sometimes it becomes burden to them. So, they sometimes practice multiple use of same water which are very much risky for health.
- Due to lack of money, they sometime avoid using public toilet and use roadside gutters or open defecation. Disposal of solid wastes and wastewater in open space and open drains also causes a severe perilous condition.
- The females especially young group suffer a lot due to lack of separate toilet facility. Often, they suffer from different diseases.
- Some correlation among different factors have been identified in the study.
- Street dwellers are fighting against poverty and trying to improve their economic condition and standard of living.
- The level of sanitation knowledge and practice has been found to be extensively low among the street dwellers.
- Relentless water pollution of the water bodies, canals and drains occurs due to open disposal of human excreta.
- For lack of sufficient water sources, some people alternatively use unsafe water sources like Ramna lake which cause sufferings from diseases.



• Due to the intervention of various NGO's in street dwellers development program, some are getting access to water supply, sanitation and solid waste management services, although these are still inadequate.

• The wastewater disposal service is the most neglected one in the study areas.

On the basis of the study, some recommendations can be proposed.

• Planned low-cost structures for the street dwellers should be built and sanitation and drainage facilities can be developed by two city corporations of Dhaka city to give the, a healthy living environment.

• Proper steps should be taken to discourage migration to the Dhaka from rural areas.

• Initiatives for private and NGOs participation should be promoted in the distribution of water and sanitation services through movable toilet vehicles to the street dwellers.

• As inadequate sanitation and hygiene behaviour is very common among them, so necessary and effective steps should be taken in this regard. Unhygienic hanging latrines and open defecation should be discouraged. Public toilet facilities are to be increased involving street dwellers, NGOs and DWASA.

• Enthusiastic hygiene education program should be imparted to street dwellers and social mobilization programmes should be undertaken to make people aware of the bad effects of unhygienic situations.

• Government as well as non-government organization should work together to understand and analyze the urgency of this critical situation and incorporate some pragmatic solutions

• To assess quality of drinking water and water for domestic use, water samples should be tested in the laboratories which is recommended for further studies.

• The study should be carried for a longer period specially in the rainy seasons to get complete scenario for the environmental hazards that is also recommended for further studies.

• Finally, there should be a coordinated plan considering all the stakeholders like Government, Dhaka North City Corporation, DWASA, NGOs, the street dwellers, environmental conservation groups and service providers to authorize the activities of different stakeholders for improving overall development programmes for the street dwellers.

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