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Drinking Water Practice among Increasing Number of Urban Private University Students in Bangladesh: Salient Accelerating Grounds for Health Risk and Financial Burden

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ABSTRACT

In this research, we have focused on the drinking water practices among university students and its relevance to waterborne diseases (Like – diarrhea, dysentery, hepatitis etc.) and financial burden. To pursue the research, we have randomly selected twenty-four private universities out of about 90 in Dhaka city and conducted face-to-face interviews of eighty-two in progress university students by employing 40 undergraduate data collectors beneath our direct supervision. For understanding the scenario, initially we have to depend on secondary literature sources which are access through ResearchGate, google scholar, PubMed, Wiley online library and even from online newspapers. Findings of this paper will let us understand the hidden grounds of health hazard among university students and its associate financial risks due to unhygienic drinking water practice. Moreover, the study result will play remarkable role in understanding the importance of safe drinking water and create a space for decision making about right type of drinking water source vis-a-vis necessary form of action plan by the authority. This paper will also play a vital role to make our students aware of drinking safe water and to develop self-consciousness to be part of the future sturdy workforce.

Keywords: *awareness, financial loss, safe water, health risk*

INTRODUCTION

Importance of safe water is known to all. In Bangladesh scarcity of safe drinking water is one of the vital problems. Such delinquent is more acute for population density urban area. From several secondary sources (Newspapers, periodicals, journals etc.), we can see the worst scenario during summer when people of several areas of Dhaka city started agitation in demand of safe water supply. On the other hand, in spite of million-dollar projects, we see temporary inundated situation is very common for several parts of Dhaka city during rainy

season which results in fresh-water contamination. As water is the most fundamental need for every living being, in this paper we will focus on the prevailing drinking water practice among urban private university students and its relevance to their health, future workforce and economy.

It is notable that there is no specific study regarding safe drinking-water mentioning incessant number of private university students in Dhaka city. Many low-income countries like – Bangladesh are suffering from this crucial safe drinking water crisis. More uniquely, urban epicenters are suffering a lot to ensure safe water for its inhabitants. In this regard, low income group of students are suffering more as they are relying on WASA supply water due to lack of adequate financial provision. Different scenario may observe among high or medium-income strata as they are able to pay more for potable water. Therefore, in this study we will focus on the potable water practice among rising number of private university students and it associated health risks, financial burden and try to elucidate the long-term sufferings of pupils due to mismanagement by policy makers in Dhaka city corporation. We have selected Dhaka as it is the capital and epicenter of private universities of Bangladesh.

CONCEPTUAL FRAMEWORK

Conceptual framework below depicts the variables which are responsible for affecting water borne diseases among private university students. So many issues are described in several literatures regarding water borne diseases. But in this study, we have focused on growing number of private university students drinking water practice and its associate risks. It is noteworthy to keep in account that only by ensuring a safe water drinking practice and sustainable supply chain, we can remarkably contribute to the reduction of water borne disease among private university students in Dhaka city which can remarkably reduce financial burden for the individual and state.

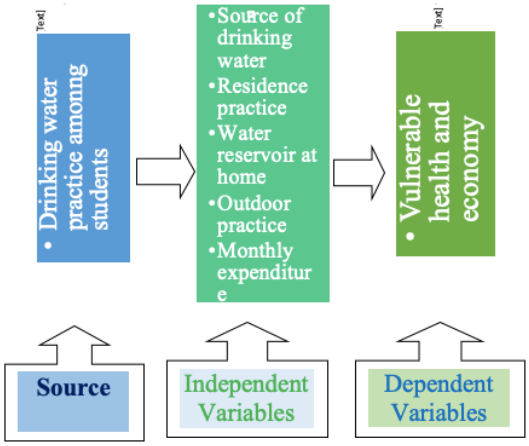

Figure 1: Flow-chart shows possible effects of drinking water practice among private university students in Dhaka city of Bangladesh

OBJECTIVE OF THE STUDY

In a nutshell, in this study we have focused on associate risks in drinking water practice among private university students in Dhaka city. More specifically we have emphasized on:

- Students access to safe drinking water at home, institutions and outing;
- Associate risks and financial burden because of inadequate fresh water supply;
- Alarming state of private university students in case of drinking water practice and its possible effect.

LITERATURE REVIEW

Barbanell et al. (2013) described in a study at University of Utah, the sustainable management of water and its multifaced uses in comparison to demand and supply sources. Carnemark (2007) narrated that in Dhaka groundwater abstraction causing dropping of groundwater up to two to three meters each year. Craun et al. (2010) stated that in comparison to public and private water supply system, in America decrease number of outbreaks, reported in public water systems. Dey et al. (2018) focused that since 1995 Bangladesh is suffering from arsenic problem in drinking water as 20% of shallow wells were contaminated with arsenic. Guterres (2018) mentioned that by 2050 at least one in four people will live in a country where the lack of fresh water will be chronic or recurrent. WHO (2013) mentioned by improving water, sanitation and hygiene, it is possible to prevent about 9.1 % of global disease burden and 6.3% of all kind of diseases. It also targeted in MDG to reach people who are accessing unsafe water. WHO (2004) highlighted on eight major issues focusing on safe drinking water. Among these two important recommendations are –

i) Need to develop a holistic approach so that confidence level can be raised among people through proper risk assessment and risk management
ii) The guidelines focused on the requirement of safe drinking water for all sort of domestic purposes, including drinking, preparation of food, and individual hygiene.

Murcott (2005) described that insufficient household water treatment and safe storage may be people's key barrier in the prevention of waterborne diseases. Though household treatment and safe storage systems are capable of dramatically accelerating the microbial quality of drinking water and reducing diarrheal and other water prone diseases and death but awareness about the storage process and further steps still remaining neglected to even a group of educated people such as university students. Sobsey (2003) claimed that the importance of drinking water can easily understand when UN chief mention over one billion people around the world are struggling with managing safe drinking water. Mandour (2013) mentioned that the essence of water reflects in the report of WHO. It mentioned that about 80 percent of remaining diseases in human being are triggered by water. Frisbie et al. (2012) explained that in Japan lack of guideline creates threat for human health as manganese contamination in underground water sources. Fu et al. (2013) stated that research on drinking water contamination usually focused on arsenic, nitrate, fluoride, lead, and cadmium. Lu and Yuan (2017) pointed that Ca concentration in drinking water directly disrupt mineral contents in bone and high concentration of Ca in drinking water has significant chances to prevent rectal cancer, gastric cancer, breast cancer and acute myocardial injury. Fawell and Nieuwenhuijsen (2003) stated that drinking water source is contaminating from both natural and anthropogenic sources. As a result, we find odor or different tastes in our daily potable water. Rufener et al. (2010) mentioned that due to drinking water contamination about 1.6 million people are dying every year. In this case, developing countries are in most vulnerable situation as most of them are suffering from running water. Moreover, they have to face hardship to collect water from source. WHO (2016) claimed that all

over the world 783 million people are suffering from access to clean water. In addition, it also claimed that every year about 6 to 8 million people die from contaminated drinking water and water related hygiene issues. Jensen et al. (2004). mentioned that on a debate of diarrhea disease risk factors and its elimination, the authority shut down Broad Street pump about 150 year back. Dajani (2014) said that awareness starts with education, and Water4 (a non-profit organization which is focused on eradication of world water crisis) has created the perfect tool to draw attention to the global water crisis. Water4's education initiative offers hope and a solution. Markham (2014) mentioned that in every 21 seconds one child dies because of water-related illness and among others diarrhea is one of the vital reasons for developing world. Davies and Mazumber (2003) focused on greater water treatment practice to ensure safe water. Because waste, nutrients and chemicals are creating threat for drinking water. Charrois (2010) stated that from international best practice approaches regarding safe water supply, Scotland implemented an integrated approach to tackle public and private water supply system. Sohail (2003) focused on some major issues for ensuring community fresh water supply. Among others, he has focused on central water management, financial issues, technology, regulation and monitoring and role of PPP. Owen (2005) focused on Private Sector Participation (PSP) for urban areas of developing countries. He pointed that in this way government can ensure safe water for their municipalities. Okun (2005) mentioned that urban areas of developing countries have failed to reach the 'international drinking water supply and sanitation decade' announced by WB and WHO during 1980's. He also noted that developing country like Bangladesh do not have enough safety measures for ensuring safe supply water.

From above literature reviews we have found the ground to work on our proposed research. Because though there are several studies attempted on safe drinking water but we have noticed a major gap in our study focus i.e. the possible health and financial threats to increasing number of urban private university students in Dhaka city and the state, due to the lack of safe drinking water access. In doing so, we will focus on the students abrupt drinking water practice.

MATERIAL AND METHODS

Initially we have conceptualized different aspects and framing the research with the help of the secondary sources. A conceptual framework has been developed to guide the research work on the basis of reviewing existing literatures and primary investigation. To justify the objectives of the study we have followed quantitative method. For getting necessary data we have conducted a survey based on structured questionnaire as per purposive sampling, according to quantitative method of data collection. To obtain necessary outcome from survey data, we have administered SPSS software which provided us processed output for specific narration. In this regard, to rectify data relevance, we have run chi-square test and to justify the validity of variables we have run ANOVA test. In addition, form collected primary data, we have processed some other relevant SPSS output to validate our research more intensively to meet the expected need of social science research. In this research our respondents are several private university students of Dhaka city. Because in Bangladesh since 1990's number of private universities are

increasing over the years and mostly these are centered in Dhaka city. Findings of this paper will let people and more importantly the concerned authorities (Both University and City corporation) to evaluate the burning necessity of ensuring safe drinking water for the increasing number of private university students for the sake of future necessity of the state.

RESULTS AND DISCUSSION

Haq (2007) claimed that as a result of privatization, the number of private universities vis-a-vis number of students are increasing in Dhaka city. But there is no specific study regarding ensuring safe drinking water for these vast number of students. Keeping this statement in mind, in this research we have focused on the groundbreaking issues to justify prevalence drinking water practice and its associate risks to health and economy of private university students in Dhaka city.

Table 1: University and respondents' percentage of the study

Respondents Studying University	Frequency	Percent
Ahsanullah University of Science & Technology (AUST)	4	4.9
American International University Bangladesh (AIUB)	6	7.3
ASA University (ASA)	2	2.4
Atish Dipankar University of Science & Technology (ADUST)	4	4.9
Bangladesh University (BU)	2	2.4
BGMEA University (BGMEA)	2	2.4
BRAC University (BRAC)	6	7.3
Chartered University College (CUC)	2	2.4
City University (CU)	4	4.9
Independent University Bangladesh (IUB)	4	4.9
International University of Business Agriculture and Technology (IUBAT)	2	2.4
Northern University Bangladesh (NUB)	12	14.6
North South University (NSU)	4	4.9
Presidency University (PU)	2	2.4
Prime Asia University (PA)	8	9.8
Royal University (RU)	2	2.4
Soanagaon University (SU)	2	2.4
South- East University (SEU)	2	2.4
Stamford University (STU)	2	2.4
United International University (UI)	2	2.4
University of Information Technology and Sciences (UITS)	2	2.4
University of Liberal Arts Bangladesh (ULAB)	2	2.4
Uttara University (UU)	2	2.4
Victoria University (VC)	2	2.4
Total	82	100.0

Source: Field survey 2019

The above table shows number of private universities in Dhaka city from where necessary data collected. Here we see, total number of conducted universities and respondents are twenty-four and eighty-four respectively. As per percentage result, highest number of respondents are taken from NUB and second highest from PA, respectively 14.6% and 9.8%. In most cases, university wise respondents' participation consists of 2.4%.

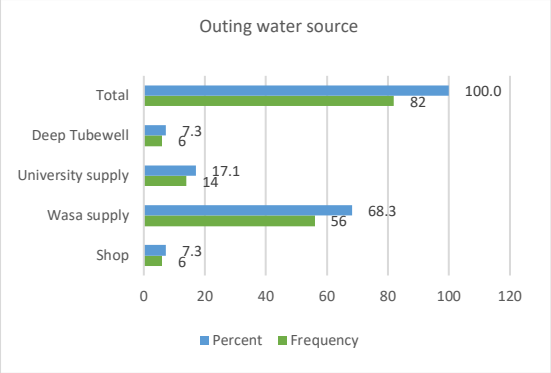

Figure 1: Outing water source (source: Field survey 2019)

From above figure we see, for outdoor water source private university students mostly depend on WASA supply water which comprises 68.3%. The second frequent source of water is university supply, which shows 17.1%. Rest two other sources mentioned by students are purchasing from shop and deep tubewell, which comprises 7.3% each. Islam (2017) stated that though Bangladesh has attained a lot to reach safe water and sanitation although it has to focus on sustainable management system to ensure the future demand.

Table 2: Residence water source

Source	Frequency	Percent
Jar supply	12	14.6
Boiling WASA Water	58	70.7
Water purifier	8	9.8
Bottle water	4	4.9
Total	82	100.0

Source: Field survey 2019

Above table shows, for residence water supply source maximum number of respondents depends on WASA supply water which stands 70.7%. The second usual source is supply Jar from several water supply companies. Rest two sources are water purifier and bottle water, which comprises 9.8% and 4.9% respectively. Islam (2013) pointed that however Bangladesh government improved the safe water provided services after WHO prescribed that ground water is safer than surface water. Despite that millions of people are still suffering from improved water sources and so many of them suffering from safe drinking water crisis.

Table 3: Reservoir container type at home

Material	Frequency	Percent
Pitcher	10	12.2
Water tank	20	24.4
Filter	52	63.4
Total	82	100.0

Source: Field survey 2019

Above table shows different types of reservoir for drinking water at household level. It is worth to see that 63.4% respondents are using water filter for drinking water. Rather it is also alarming that quite a large portion i.e. 24.4% of the respondents are using reserve tank water for drinking. Among others, only 12.2% respondents are using pitcher as water container at their residence. Aramini et al. (2000) focused on risk of microbial disease associated with drinking water as a key issue and in Canada research focused on ensuring qualified sticker to ensure water quality.

Table 4: Water borne diseases

Type of disease	Frequency	Percent

Diarrhea	46	56.1
Dysentery	32	39.0
Hepatitis	2	2.4
Typhoid	2	2.4
Total	82	100.0

Source: Field survey 2019

Data above shows among four mentioned diseases, highest number of respondents are complained about diarrhea and dysentery, which are consecutively stands 56.1% and 39.0%. Only 2.4% respondents mentioned about hepatitis and typhoid each. Benneyworth et al. (2016) claimed that in particular educated people in Dhaka city were suffering from waterborne diseases due to lack of awareness and scarcity of safe drinking water.

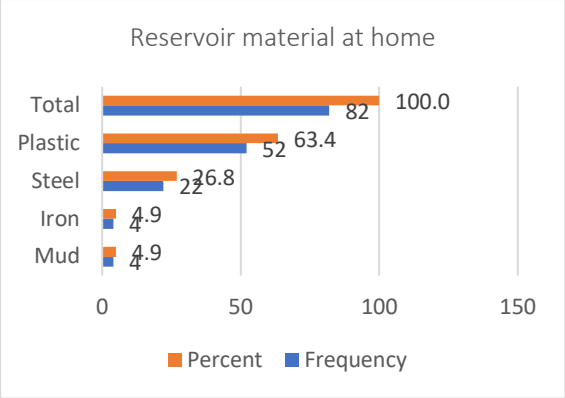

Figure 2: Reservoir materials at home

(source: Field survey 2019)

From above figure, it is noticeable that 63.4% respondents are using plastic materials for water reservoir at home. Whereas 26.8% respondents are using steel material and only 4.9% respondents are using mud and iron materials each. In this case it noteworthy to note that at household level most of the students are using plastic materials as drinking water reservoir. Now the doubt arises here is, if the plastic jar is not food graded then it will make serious health threat to the students.

Table 5: Monthly expenditure for drinking water

Expenditure	**Frequency**	**Percent**
1 – 100	16	19.5
101 - 200	16	19.5
201 - 300	22	26.8
301 - 400	20	24.4
401 - 500	8	9.8
Total	82	100.0

Source: Field survey 2019

As per data above several range of expenditure observed among respondents regarding individual monthly expenditure for drinking water. Among these the highest percentage of monthly expenses ranges in between 201 to 300 takas, which stands 26.8%. The second and third highest expenses ranges from 301 to 400 takas (24.4%) and 101 to 200 takas (19.5%) consecutively. The expenditure portion

stand in highest expenditure range 401 to 500 takas, which comprises to 9.8%. Above result shows that in case of crisis like water logging, drinking water cost is not affordable to most of the students. Because during such crisis they had to depend on bottle water or need to use different water purifier options.

Table 6: Asymmetric relation between outing water source and water borne disease

Crosstab

			Outing water source				Total
			Shop	WASA supply	University supply	Deep Tubewell	
Water borne disease	Diarrhea	Count	0_a	38_b	$4_{a, c}$	$4_{b, c}$	46
		% within Water borne disease	0.0%	82.6%	8.7%	8.7%	100.0%
		% within Outing water source	0.0%	67.9%	28.6%	66.7%	56.1%
	Dysentery	Count	6_a	16_b	$8_{a, c}$	$2_{b, c}$	32
		% within Water borne disease	18.8%	50.0%	25.0%	6.2%	100.0%
		% within Outing water source	100.0%	28.6%	57.1%	33.3%	39.0%
	Hepatitis	Count	$0_{a, b}$	0_b	2_a	$0_{a, b}$	2
		% within Water borne disease	0.0%	0.0%	100.0%	0.0%	100.0%
		% within Outing water source	0.0%	0.0%	14.3%	0.0%	2.4%
	Typhoid	Count	0_a	2_a	0_a	0_a	2
		% within Water borne disease	0.0%	100.0%	0.0%	0.0%	100.0%
		% within Outing water source	0.0%	3.6%	0.0%	0.0%	2.4%
Total		Count	6	56	14	6	82
		% within Water borne disease	7.3%	68.3%	17.1%	7.3%	100.0%
		% within Outing water source	100.0%	100.0%	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of outing water source categories whose column proportions do not differ significantly from each other at the .05 level.

Source: Field survey 2019

Above crosstab result shows among four types of diseases, percentage within the group for diarrhea is highest among others, which stands 82.6% for the respondents who are using WASA supply water. In case of dysentery, again highest number of respondents are suffering who depends on WASA supply water, which stands 50%. 100% respondents who mentioned about hepatitis is noticed the reason is for university supply water. Finally, those who responded about typhoid, absolutely focus on WASA supply water for the disease. From several newspaper reports we came to know that every year WASA takes mega projects to mitigate water crisis of urban commuters. But in a nutshell, we can say, improper planning and mismanagement depriving urban residents to avail the facility and government is losing ample amount of money every year. Islam (2015) focused on the awareness of students in Dhaka city. Because the years old water supply pipeline is damaged due to over usage. Even it is noticeable that WASA authority is suggesting boiling water before drinking.

Table 7: Significance test between residence water source and water borne disease

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.775	1	1.775	4.174	.044[b]
	Residual	34.029	80	.425		
	Total	35.805	81			

a. *Dependent Variable: Residence water source*

b. Predictors: (Constant), Water borne disease

Source: Field survey 2019

The analysis of variance result shows that water source has moderately direct impact on disease. Here significance result is .044, which shows partial positive impact between variables. We have to take in mind that pollute water is not only enhancing individual suffering but also it is directly affecting our economy by hampering routine work and by laming healthy workforce.

Table 08: Significance test between water reservoir material and water borne disease

Chi-Square Tests			
Reservoir material at home * Water borne disease	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.576[a]	9	.000
Likelihood Ratio	35.912	9	.000
Linear-by-Linear Association	7.873	1	.005
N of Valid Cases	82		
a. 12 cells (75.0%) have expected count less than 5. The minimum expected count is .10.			

Source: Field survey 2019

As per above hypothesis test result, it is clear that there is a significant relation between reservoir material and water borne disease. Because the result is .000, which means variables (water reservoir and disease) are highly dependent on each other. From above significant test result we can say only by ensuring safe water reservoir we can remarkably reduce water borne diseases. In doing so we need to make awareness among the increasing number of private university students.

From finding of the study we can assume the relevance of waterborne diseases, water supply system, drinking practice at home and outing have made significant impact on health and illness of urban private university students in Dhaka city. This is not merely a health problem, because this unruly water management system also enhancing financial burden to the society and national economy. The fact is, to ensure people's health safety government has to sanction remarkable amount of budget allocation. If we can ensure safe water practice among rising number of private university students then it will not only make space for healthy livelihood but also contribute to the future demand of robust work force of the country. So, systematic action plan is necessary to ensure safe water practice among university going students. In doing so, besides institutional awareness programs, government have to set long-term sustainable master plan and have to execute it on priority basis. As a result, we can avail healthy generation vis-a-vis economic boom through vigorous and skilled workforce.

CONCLUSION

It is noteworthy that only by developing safe drinking water practice, we can remarkably contribute to the reduction of water borne diseases among urban private university students, which will ensure both health safety and robust financial condition for them. Trevett et al. (2007) stated that despite water source, water reservoir is also important to ensure safe water for enduring healthy life. In this study we have noticed most of the respondents are using plastic reservoir to preserve water. It is remarkably noticeable that plastic materials are more fungal prone and without regular maintenance it can easily generate health hazard to the users. Another remarkable issue is individual consciousness. Because if any students make a habit of collecting drinking water abruptly, such as – having drinking water from road side tea stall or even from filthy varsity supply sources, then water borne sickness could affect him / her frequently. As a result, he or she has to suffer from unexpected health and financial loss vis-a-vis loss of valuable study time for lifetime preparation. Though it is a matter of self-consciousness to access safe drinking water sources although concerned authorities cannot avoid their responsibilities to ensure safe water sources to its pupil. Finally, we can say, by ensuring inhouse water purification system, university fresh water supply system, implementing necessary number of Dhaka WASA water supply projects, proper management by city corporation and conscious outing behavior, we can save our students from getting sick by water borne diseases and can save valuable time and money which will help them to attain better future.

RECOMMENDATION

As we see, students are not relying on one individual source for drinking water supply. So, multiple steps need to be addressed to

save our students suffering from frequent water borne diseases and loss of valuables. For ensuring best drinking water practice among ample number of private university students, following steps should consider with importance.

Firstly (Immediate steps),

i. City corporation and university authorities should take different awareness programs like – flier distribution among students, circulating poster, arranging seminar, and alike programs to make them aware of safe drinking water.
ii. Authorities (both universities and city corporation) have to regulate monitoring system to check the safety level of water sources.
iii. Enough circulation in national dailies by mentioning not to drink water from direct source supplied by WASA. Because most respondents mentioned it is the key source for affecting water borne diseases in Dhaka city.

Secondly (Intermediate level steps),

i. Authorities (Both city corporation and universities) should take immediate actions against those who are responsible for supplying unsafe drinking water.
ii. City corporation should take immediate action plan to expand its water supply capacity for the day to day increasing number of populations.
iii. University authorities can ensure safe water supply channels by their own capacities.

Thirdly (Long-term steps),

i. As city population growth is a continuous process, so city corporation must have to take necessary action plan to meet the need of future demand.
ii. University authorities should consider safe drinking supply issue on a priority basis and if possible, should ensure individual water supply system.
iii. WASA authority should revise their water supply channels and should modernize the distribution system to ensure safe water for urban residents.

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