Reprint **ISSN 1997-2571 (Web Version)**

Journal of Innovation & Development Strategy (JIDS)

(J. Innov. Dev. Strategy)

Volume: 5 **Issue: 3** **December 2011**

J. Innov. Dev. Strategy 5(3):14-18(December 2011)

INVESTIGATION OF SUPPLIED WATER QUALITY AND SANITATION STATUS OF TANGAIL MUNICIPALITY, BANGLADESH

M.M.M. HOQUE, J.H.S.B. HAFIZA, J.H.S.B. AMEERUN NAHAR,
M.A.K. MIAH AND N. NAHAR

GGF
Nature is Power

An International Scientific Research Publisher
Green Global Foundation©
Publication and Bibliography Division
100 Leeward Glenway
Apartment # 1601
M3c2z1, Toronto, Canada
E-mails: publication@ggfagro.com, editor@ggfagro.com
http://ggfagro.com/ejournals/current issues

JIDS** issn 1997-2571, HQ:19-10 central place, saskatoon, saskatchewan, s7n 2s2, Canada

ISSN-1997-2571 (Online)
J. Innov. Dev. Strategy 5(3):14-18(December 2011)

INVESTIGATION OF SUPPLIED WATER QUALITY AND SANITATION STATUS OF TANGAIL MUNICIPALITY, BANGLADESH

M.M.M. HOQUE[1], J.H.S.B. HAFIZA[2], J.H.S.B. AMEERUN NAHAR[3], M.A.K. MIAH[4] AND N. NAHAR[5]

[1,2&3]Department of Environmental Science and Resource Management, Mawlana Bhashani Science and Technology University, Tangail-1902; [4]Department of Criminology and Police Science, Mawlana Bhashani Science and Technology University, Tangail-1902; [5]Department of Environmental Science and Health Management, Jessore Science and Technology University, Jessore 7408, Bangladesh.

[*] Corresponding author & address: Mir Md. Mozammal Hoque, E-mail: huqmbstu@yahoo.com
Accepted for publication on 15 November 2011

ABSTRACT

Hoque MMM, Hafiza JHSB, Ameerun nahar JHSB, Miah MAK, Nahar N (2011) Investigation of supplied water quality and sanitation status of Tangail municipality, Bangladesh. *J. Innov. Dev. Strategy* 5(3), 14-18.

Water is essential for living organisms for their survival. Access of adequate and safe water is a basic need of human beings. Inadequacy and unsafe water supply may cause various health problems. Tangail is one of the developing municipality of Bangladesh suffering shortage of safe water supply. Only 26% household of the municipality has an access to supply water. The coverage still remains very low because of limited progress in water supply activities in the municipality. As a result sanitation status is affected negatively. Supplied water of the municipality seems to be quite good at least in terms of physicochemical water quality parameters. Most of the physicochemical water quality parameters were within the Bangladesh drinking water quality standards. The survey showed that sanitation facilities are quite good. 71% of the respondents use pit latrines, 22% use septic tank latrine and only 7% use hanging latrine. People of the study area are not conscious enough for the disposal of household sewage and sludge. 84% of the respondents dispose their household sewage and sludge into municipal drainage system that cause cross-contamination, 3% dump it on the open field and only 13% buried the domestic wastes.

Key words: *sanitation, contamination, drainage system, sewage, sludge, domestic wastes*

INTRODUCTION

Water is very important component of the environment. Without water life on earth would not exist. Water occurs 97.2% in ocean as salty water; 2.09% in icecaps and glaciers, 0.6% ground water, 0.11% runoff and surface water. It is difficult to imagine clean and sanitary environment without water. Water requires in drinking, cooking and preparation of food, bathing, cleaning, washing and personal hygiene, watering in gardens, and water for livestock, sanitation. Various health problems may occur due to inadequacy and poor quality of supplied water. Infant mortality rate is high due to unsafe water supply (Ahmed and Rahman, 2000). Dirking water supply should be completely free from pathogenic microorganisms, element in concentration that causes health impacts. It should be fairly clear and aesthetically attractive -low turbidity and color. It should not to be saline, should not contain any compounds that cause offensive odor and taste, should not cause corrosion, scale formation, discoloring or staining and should not have a temperature unsuitable for consumption. Access to the safe water supply water is one of the most important determinants of health and socioeconomic development (Cvjetanovic 1986). Drinking water quality and sanitation management has been a key pillar of primary prevention for over one and a half centuries and it continues to be the foundation for the prevention and control of waterborne diseases. Water is essential for life, but it can and does transmit disease in countries in all continents-from the poorest to the wealthiest. The most predominant waterborne disease, diarrhea, has an estimated annual incidence of 4.6 billion episodes and causes 2.2 million deaths every year (WHO 2010). World Health Organization (WHO) statistics for 2003 reveal that 4% of all deaths and 6% of the global burden of diseases are the result of inadequate sanitation, water and hygiene. It thus is essential that people follow improved hygienic practices in order to reduce these diseases. There are several variants of the fecal-oral pathways of water-borne disease transmission. These include contamination of drinking-water catchments, water within the distribution system or of stored household water as a result of unhygienic handling (WHO 2010).

MATERIALS AND METHODS

The experiment was conducted from August, 2010 to December.2010, at Water Quality Laboratory of the Department of Environmental Science and Resource Management, Mawlana Bhashani Science and Technology University, Tangail 1902, Bangladesh to study the water quality and sanitation status of the Tangail Municipal area. To investigate the water quality we collected 180 water samples from 18 wards (10 samples from each ward) randomly and analyzed. We also analyzed some samples in the Laboratory of DPHE, Tangail. The bottles used for collecting samples for metal analysis were filled with acid to keep the P^H of the water samples low while carried and kept in it. So, special caution were taken that sample water (with acid) may not overflow from the bottle. Collected samples were carried to the laboratory within the six hours of collection. To assess the P^H of collected samples digital P^H meter used. Electrical Conductivity (EC) measured by digital EC meter, Dissolved Oxygen (DO) measured by digital DO meter and digital TDS meter was used to determine Total Dissolved Solids (TDS). Simple laboratory method was applied to assess hardness, acidity and alkalinity. Arsenic and iron were determined by test kit developed by HACH Company, U.S.A. To count total coliforrm

and faecal coliform in the sample water, bacterial culture was formed in the Microbiology Laboratory of DPHE, Tangail. A field investigation and questionnaire survey of 100 respondents of the study area was done to determine the sanitation status of the Tangail Municipal area. During questionnaire survey randomness was strictly maintained.

RESULTS AND DISCUSSION

Physicochemical Properties

The measured value of different physicochemical properties of the collected water samples has summarized in the Table 1.

Table 1. Results of physicochemical parameters

Ward No.	P^H	EC (µS)	DO (mg/l)	TDS (µS)	Acidity (mg/l)	Acidity (mg/l)	Iron (mg/l)	Hardness (mg/l)	Arsenic (ppb)
1	6.2	556	2.6	540	16.66	210	0.8	236	ND
2	6.4	599	2.9	560	12.50	202.5	0.6	195.3	ND
3	6.7	392	2.5	390	15.00	192	0.8	194	ND
4	6.9	408	2.8	570	10.00	163.5	0.6	177.3	ND
5	6.7	562	2.5	550	13.66	208.3	0.6	212	ND
6	6.9	592	3.1	350	11.25	180	0.5	157.3	ND
7	6.7	369	2.9	560	13.33	201.5	0.6	215.3	ND
8	6.5	487	3.00	530	12.25	210	0.6	186.6	ND
9	6.4	556	2.7	520	11.66	213.3	0.7	210.6	ND
10	6.3	371	2.6	560	13.66	170	0.6	148.7	ND
11	6.6	551	2.6	390	17.5	225	0.6	233.3	ND
12	6.2	498	2.4	550	15.83	211.6	0.5	210.6	ND
13	6.8	515	2.8	360	11.25	195	0.6	148.7	ND
14	6.7	483	2.9	410	13.33	196.6	0.6	195.3	ND
15	6.6	465	2.5	490	14.16	193.3	0.8	173.3	ND
16	6.6	529	2.5	560	11.66	205	0.8	206.6	ND
17	6.4	542	2.4	540	15.83	195	0.7	214.6	ND
18	6.4	593	2.2	550	10.83	203.5	0.9	222.7	ND

EC = Electrical Conductivity; DO = Dissolved Oxygen; TDS = Total Dissolved Solids; ND = Not detected

Table 2. Results of Coliform test

Ward No.	Parameter	
	Total Coliform(No./100ml)	Faecal Coliform(No./100ml)
	Drinking Water Quality Standard(ECR,97-Bangladesh)	
	0	0
1	34	16
2	26	22
3	27	18
4	32	14
5	22	16
6	18	11
7	19	10
8	23	14
9	24	13
10	25	15
11	23	10
12	17	13
13	13	11
14	16	12
15	19	14
16	13	16
17	12	12
18	16	11

Among the water samples the maximum P^H value 6.9 was found in the two samples collected from College Para (Ward no. 6), Dighulia (Ward no. 4) and minimum P^H value 6.2 was found in the two water samples collected from Deowla (Ward no.1) and Aadi Tangail (Ward no.12) (Table 1). Most of the tested P^H values were within the water quality standard value (6.5-8.5) of drinking water of Bangladesh (DoE 1993).

Electrical Conductivity (EC) of all water samples were within the standard value of drinking water in Bangladesh. In Bangladesh the maximum permissible value of Electrical Conductivity (EC) is 1200 µS (DoE 1993). Among 180 samples, the maximum value of Electrical Conductivity (EC) was 599 µS in the samples collected from North Akur Takur Para (Ward no.1). The minimum value of measured EC observed 371 µS in the sample collected from Kochuadanga (Ward no.11) (Table 1).

Measured maximum concentration of Dissolved oxygen (DO) was 3.1 mg/l in the water sample collected from College Para (Ward no.6), whereas the minimum concentration found 2.2 mg/l in the water sample collected from Sabalia (Ward no.18). The values of Dissolved Oxygen (DO) of all water samples were within the standard value of Bangladesh drinking water (6 mg/l or more; DoE 1993) (Table 1).

The maximum concentration of TDS found 570 µS in the water sample collected from Dighulia (Ward no.4) and the minimum was 350 µS in the water sample collected from College Para (Ward no.6) (Table 1). The TDS values of water samples of all sampling units were within the Bangladesh drinking water quality standard value of 1000 mg/l, DoE of Bangladesh. (1 µS=1 mg/l).

The maximum value of acidity 17.5 mg/l (as $CaCO_3$) found in the water sample collected from Berabuchna (Ward no.11). In Dighulia (Ward no.4) the value of acidity was 10 mg/l (as $CaCO_3$) and it was the minimum value too (Table 1). However, acidity of all the water samples was within the permissible value.

Test results of alkalinity of all water samples were within the water quality standard value of Bangladesh drinking water (200-500 mg/l as $CaCO_3$, DoE of Bangladesh). The maximum concentration of alkalinity as $CaCO_3$ was 225 mg/l in the water sample collected from Berabuchna area (Ward no.11) and the minimum concentration was 163.5 mg/l found in the water sample collected from Dighulia (Ward no.4) (Table 1).

Hardness in all supplied water samples were within the permissible value of the Bangladesh drinking water quality standard (200-500 mg/l as $CaCO_3$; DoE 1993). The maximum hardness concentration as $CaCO_3$ was found 236 mg/l in the water sample collected from Deowla (Ward no.1) and the minimum concentration was 148.7 mg/l l in the water sample collected from Thana Para (Ward no.13) (Table 1).

The level of iron concentration of all water samples was within the standard value of Bangladesh drinking water (DoE 1993; Bangladesh drinking water quality standard value of Iron is between 0.3-1 mg/l). The maximum concentration of Iron was 0.9 mg/l found in the water sample collected from Sabalia (Ward no.18) and the minimum concentration of Iron was 0.5 mg/l found in the two water samples collected from Aadi Tangail (Ward no.12) and College Para (Ward no.6) (Table 1).

Arsenic was measured by Field Kit Test which was developed by HACH Company; U.S.A. Arsenic concentration of all selected supplied water samples on color chart of Field Kit Test was non detected.

Of the total respondents, 26% use municipal water supply, 35% use both supply water and tubewell`s water, 2% use other sources. Therefore it can be inferred that 37% of the households depend on private tubewells. A detail of primary water sources for domestic use has shown in the Fig. 1

In the questionnaire survey conducted in the Tangail Municipality using the prepared questionnaires, the respondents sanitation status, awareness on health and hygiene also investigated. According to the questionnaire survey 51% of the respondents use filter and 10% boil making supplied water safer to drink. Rest of the 39% respondents let supplied water stand and settle. Respondent's activities making supplied water safer to drink has presented in the Fig. 2

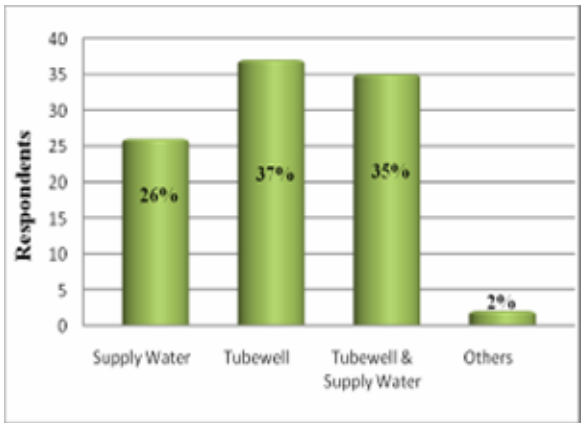

Fig. 1. Sources of drinking water of the respondents

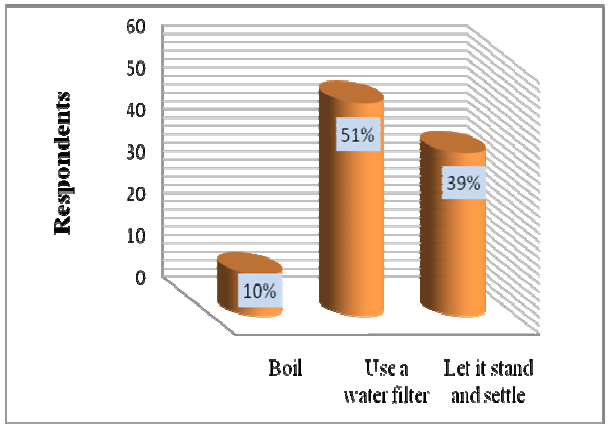

Fig. 2. Respondents activities to make water safer to drink

It was observed that most respondents of the municipal area have sanitary latrine. From the responses during the survey it was found that 71% of the respondents have pit latrine, 22% have septic tank latrine and only 7% have hanging latrine. Toilet facilities of the respondents have given in the Fig. 3.

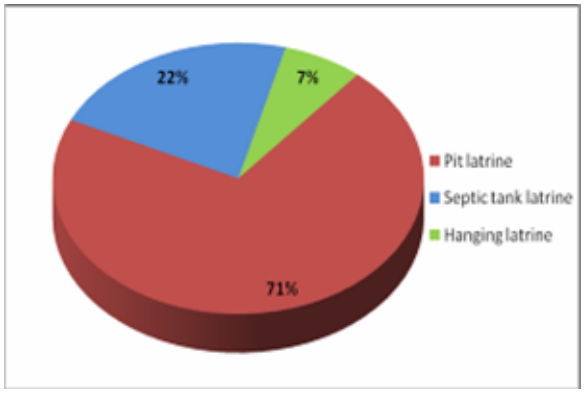

Fig. 3. Toilet facility of the respondents

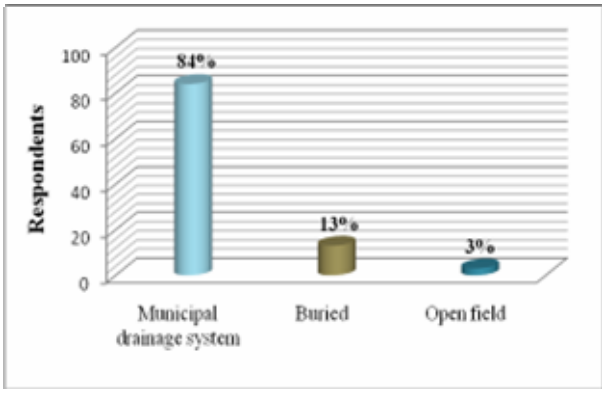

Fig. 4. Disposal of household sewage and sludge

84% of the respondents dispose their household sewage and sludge into municipal drainage system that cause cross-contamination. 3% dump it on the open field and only 13% buried. Disposal of househosewage and sludge has shown in the Fig. 4.

Based on the questionnaire survey it is found that 62% of the respondents dispose children's faeces into toilet, 32% thrown into garbage and rest of the 6% respondents buries children's faeces. A column chart has shown about disposal of children's faeces in the Fig. 5.

Through survey it is observed that municipal peoples are suffered by various water related diseases as lack of hygienic practices; because of inadequate, contaminated and unsafe supplied water. It is found that 37% of the respondents affected by diarrhoea (16% male and 21% female), 12% by dysentery (5% male and 7% female), 16% by skin diseases (6% male and 10% female) and rest of the 35% respondents have not suffered by any disease yet. Diseases suffered by the respondents have shown in the Fig. 6.

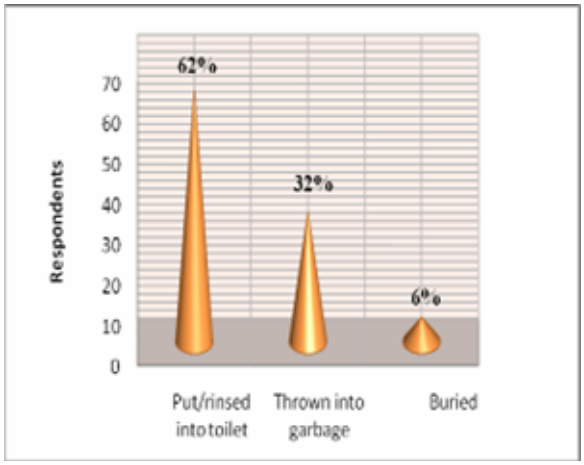

Fig. 5. Disposal of children's faeces

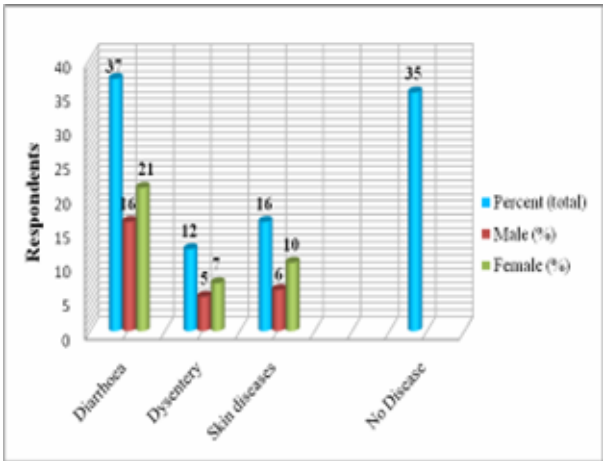

Fig. 6. Diseases suffered by the respondents

CONCLUSION

The water supply system in the municipality is not adequate and reliable as municipality covers only 26% of total households. In such situation municipal people depends on private tube-wells. Though the measured value of P^H, EC, TDS, acidity, alkalinity, hardness, iron and arsenic was mostly within the permissible range of Bangladesh drinking water quality standards, DO values of all the selected samples and P^H values of few samples were under Bangladesh drinking water quality standards. Sanitation facilities is improved as most of the municipal people have sanitary latrine. Some people of the municipality have been suffered by water related diseases like diarrhoea, dysentery and skin diseases because of consuming contaminated water and spend a lot for the medication of those diseases. The municipality with existing water supply coverage of only 26% needs to increase. So, Municipality should implement projects for rehabilitation of existing treatment plants and replacement of old pipes to ensure best water quality standards and increase water use efficiency for the municipal people.

REFERENCES

Ahmed MF, Rahman MM (2000) Water Supply & Sanitation, Rural and Low Income Urban Communities. (ITN-Bangladesh, Center for Water Supply and Waste Management, BUET, Dhaka, Bangladesh).

Bangladesh Water Utilities Data Book (2009) Benchmarking for Improving Water Supply Delivery.

Carr, Geneive M, Neary P (2006) Water Quality for Ecosystem and Environment, ISBN 92-95039-10-6.

Cvjetanovic B (1986) Health Effects and Impact of Water Supply and Sanitation, World Health Statistics Quarterly.

DoE (1993) Environmental Quality Standard for Bangladesh, Ministry of Environment and Forestry, Government Republic of Bangladesh.

Richman MIND (1997) Water Pollution ENVIRON. LAW PRACT., vol. 5, no. 2.

UNCED (1992) Protection of the Quality and Supply & Freshwater Resources: Application of Integrate Approaches to the Development, Management and Use of Water Resources. The United Nations Conference on Environment and Development.Chapter 18, Agenda 21.

World Health Organization (WHO) (2006) Guidelines for Drinking Water Quality.

World Health Organization and United Nations Children's Fund. (WHO and UNICEF) (2000) Global Water Supply and Sanitation Assessment 2000 Report. WHO and UNICEF Joint Monitoring Programme for Water Supply and Sanitation.