

Assessment of public health affected by municipal piped water supply in Old Dhaka, Bangladesh

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Abstract: This study was performed to assess the local public health impacts caused from the consumption of the municipal water supply in the study area. A field survey was conducted in Bangladesh National Hospital to get a statistical overview of the water borne health hazards' incidence rates among the dwellers of Sutrapur Thana. The study found that about 40% of all the patients in the hospital got admitted due to different types of water borne diseases. The most common water borne diseases observed were: diarrhea (about 40.7%), typhoid (about 32.3%), dysentery (about 6.6%) and hepatitis A (about 10.5%). Children were found to be the most vulnerable to these diseases. About 70% of the total water borne disease incidences was children. On the other hand, the incidence rate was highest (58.9%) in the wet season (June), whereas it was lowest (17.9%) in the dry season (January). However, when respondents from local community were asked to give their perception on the safety of the supplied water, 100% claimed that the water was unsafe for drinking purpose.

Keywords: Urban Water Supply, Environmental Health, Old Dhaka, Water Pollution, Water Borne Diseases

1. Introduction

Water quality is of paramount importance to protect public health. Since the quality of drinking water is closely associated with human health, providing safe drinking water has been one of the important public health priorities. The Millennium Development Goals (MDGs) included *target 7c* to 'halve by 2015 the proportion of the population without sustainable access to safe drinking water... [1]' since access to safe drinking water has been the most important determinants of health and international development policy.

Water is considered 'safe' when it is free from pathogenic agents, free from harmful chemical substances, and pleasant to taste, i.e. ideally free from color and odor, and usable for domestic purposes [2]. A drinking water system's water quality may be acceptable when the water just leaves a treatment plant. However, a variety of physical, chemical and biological transformations can happen once the water travels through a distribution system [3] [4]. Microbial contamination is widespread and affects all water source

types, including piped supplies [1]. Bain, *et.al.* estimates that 1.8 billion people globally use a source of drinking water that remains unsafe due to fecal contamination, and mentioned the contamination is most prevalent in Africa (53%) and South-East Asia (35%) [1]. Nearly 2.2 million people die every year globally due to diarrheal diseases. Of these, 1.8 million deaths occur alone in low-income countries [5]. Further, in low and middle-income countries, one of the tenth leading causes of death is attributable to diarrhea-related diseases [6]. Globally, diarrhea alone kills more children compared to malaria and tuberculosis together [5]. Bangladesh Demographic and Health Survey (2011) reveals that child mortality rate of >5 years age group due to diarrheal disease in Bangladesh is 2%, where the rate is 3.3% in its urban areas and 1.6% in rural areas [7].

Problems are acute in the urban areas due to increased rural-urban migration and increased economic growth as well. The bacteriological quality of piped water supply has been extremely unsafe for drinking purpose. The majority of the distribution system has been weak because of the intermittent water supply, leakage, and pollution from old and dilapidated

sewerage pipes and storm drains [8] [9] [10]. As a result, the incidence of waterborne diseases like diarrhea and typhoid is endemic among city dwellers [8].

The Old Dhaka is one of the densely populated areas of Dhaka South City Corporation area where piped water supply has become a major concern since the supplied water by Dhaka Water Supply and Sewerage Authority (DWASA) has become a suffering for the city dwellers both in terms of its quantity and quality. This situation is ideally representative in the territory of Sutrapur Thana which is one of the major administrative areas of this part of Dhaka city. The dwellers of Sutrapur Thana continuously face health problems from water borne diseases which not only have adverse impact on their health, but also on their socio-economic condition. At this context, the present study holds utmost importance to reveal the current situation. However, the study aims to conduct a survey to identify the incidence of water borne diseases in the study area; to identify the commonly occurred water borne diseases; to identify the vulnerable age group in the study area; and to have a perception of the local dwellers on the supplied water they consume. The upshot of the study is expected to aware the general people, and to attract attentions of the respective concerns which may help them taking necessary actions to bring the situation to a manageable level.

2. Methodology

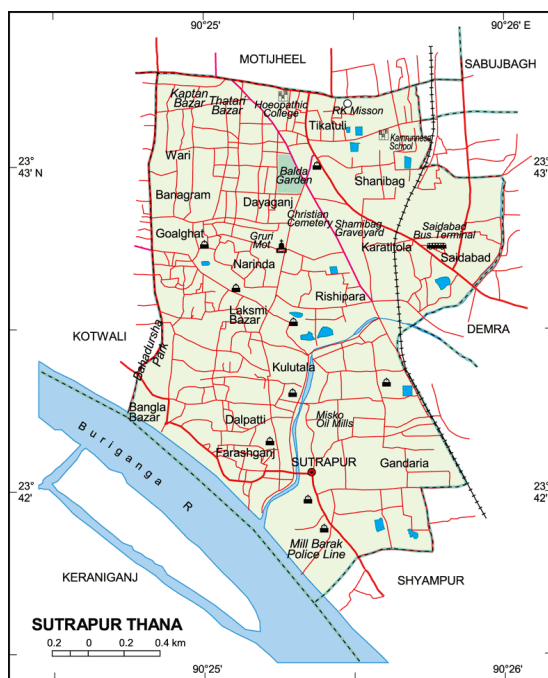


Figure 2.1. Study Area

The study is an empirical research based on both primary and secondary data. A hospital survey has been conducted to comprehend the water borne disease burden of the study area in the year of 2013 by reviewing the statistical information of the prevalence of water borne disease in Bangladesh National Hospital (BNH) (Longitude 90°24'44.77"; Latitude

23°42'38.74"), which is one of the oldest reputed and popular hospital in the study area (fig. 2.1). The survey also aimed to analyze the temporal and demographic variation of the disease incidence, and hence reviewed the hospital's log book of 2013 both in adult and pediatric sections. In addition, the same survey tried to determine the mostly occurred water borne diseases in the year of 2013. Besides, a structured questionnaire survey was conducted among 50 households of the study area. Different types of books, journals, articles, newspaper, thesis, publications and electronic data sources have also been accessed for literature review.

3. Results and Discussion

According to the Joint Monitoring Programme (2014) for Water Supply and Sanitation report, the national coverage of improved water in the urban areas of Bangladesh is 86% in which 32% is covered by piped water [11]. Despite this large coverage, the bacteriological quality of supplied piped water remains a question.

3.1. Community Perception on the Safety of the Supplied Water

When the target respondents were asked to tell about their perception on the safety of piped water supply in the vicinity of Sutrapur Thana, different perceptions were noticed depending on the purposes (i.e. drinking, cooking, washing and bathing) of their consumption. 100% respondents felt that the supplied water was completely unsafe for drinking purpose without a home based treatment (fig. 3.1). Again, 40% respondents considered that water safe for cooking, whereas the same proportion thought that it was not (fig. 3.1). On the other hand, no one felt that the water was unsafe for bathing and washing purpose. Most of them told that they consume the water directly from tap or tubewell for bathing and washing, while a few use sieves and some other use potash alum in their water reserve tank. Hence, 16% and 20% respondents considered the supplied water moderately safe for bathing and washing purpose respectively.

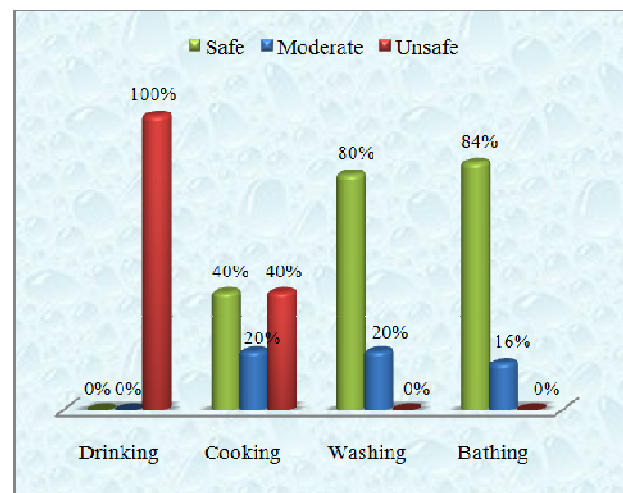


Figure 3.1. Respondents Perception on the Safety of Supplied Water

3.2. Incidence of Water Borne Diseases

From the log books of BNH, it was found that 953 patients got admitted in the wards including adults (>12) and children (0 or New born to 12). Among them 381 patients got admitted for different types of water borne diseases. This accounted for about 40% of the total admitted patients, which is undoubtedly a high ratio.

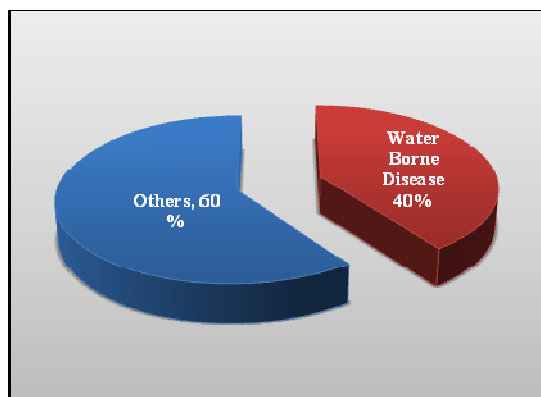


Figure 3.2. Incidence of Water Borne Diseases in 2013

3.3. Incidence of Different Water Borne Diseases

The most common water borne diseases observed in the hospital were – diarrhea (about 40.7%), typhoid (about 32.3%), dysentery (about 6.6%) and hepatitis A (about 10.5%) (fig. 3.3).

Diarrhea patients accounted for the highest percentage (about 40.7%) among all the patients admitted for water borne disease in 2013. In the global context, 43% of water-related deaths caused from diarrheal diseases [12]. However, the main cause of the high prevalence of diarrhea in the study area could be due to the contamination of supplied water from bacteria of certain strains of *Escherichia coli* (commonly *E. coli*).

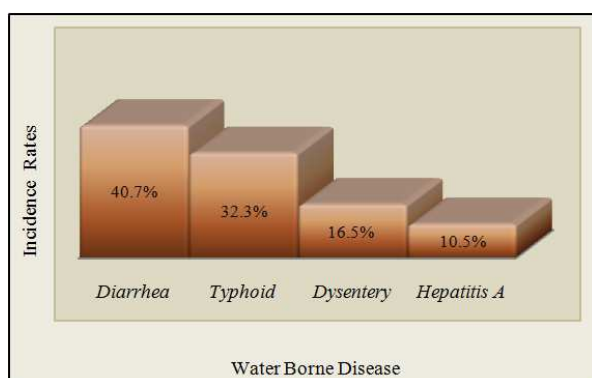


Figure 3.3. Incidence of Different Water Borne Disease in 2013

About 32.3% patients got admitted for typhoid occupying the second highest proportion of the patients admitted for water borne diseases in the surveyed hospital. Typhoid is a disease caused by ingestion of water contaminated with feces of an infected person [13]. So the main cause for the high prevalence of this disease might be due to cross

contamination of leaking pipes with sewerage networks.

Again, the percentage of dysentery patients was about 16.5%. Dysentery is caused through the ingestion of water contaminated with bacteria, especially by a number of species in the genera of *Shigella* and *Salmonella* [13]. However, the responsible authority of piped-water supply in the study area is DWASA. Hence, the prime cause of this disease among the dwellers of Sutrapur Thana could be the bacteriological contamination in the water supplied by DWASA.

The incidence of hepatitis A was lowest (10.5%) may be because of the age preference of this disease among children and young adults. However, hepatitis A is caused by hepatitis A virus (HAV), which can manifest itself in water (and food). HAV are endemic where there is a high risk of fecal contamination. Hence, the reason for this disease in the dwellers of Sutrapur Thana could be due to cross contamination of leaking in DWASA pipes.

3.4. Month-wise Incidence of Water Borne Diseases

The highest incidence rate of water borne disease was observed in the month of June (58.9%), whereas the lowest incidence rate was observed in January (17.9%) (fig. 3.4). It happened possibly because of the interrelation between bacteriological growth and the seasonal variability of temperature and water availability. If explained further, water is a very essential requirement for bacterial growth and energy which is needed to dissolve the food they consume [13]. On the other hand, the optimum temperature for common pathogenic bacterial growth is 37°C [13]. The monsoon in Bangladesh starts near around the month of June and offers a favorable environment for the optimum growth of pathogenic bacteria. The water availability in this period remains higher with a relatively higher temperature (national mean 31°C), whereas the January is a dry season having the coldest temperature in a year [14].



Figure 3.4. Month-wise Incidence of Water Borne Diseases in 2013

The highest incidence rate (14.2%) of diarrhea was manifested in March, whereas the lowest (1.9%) was in January. The incidence rate of typhoid patients was highest in the month of August (16.3%) and was lowest in January (2.4%). The incidence rate of hepatitis A was observed highest (22.5%) in the month of June, and lowest (about 0%) in December.

3.5. Age-wise Incidence of Water Borne Disease

Due to low development of immune systems, children are more vulnerable to diseases. Worldwide 3.575 million people die each year from water-related diseases where 84% of the deaths are in children of ages between 0 – 14 years [12]. The children death rate from diarrheal disease in Bangladesh accounts for more than seven thousand per year [15].

The current study found 70% of the patients admitted in BNH for waterborne diseases were children. Among all the diarrhea patients, children accounted for 73%. As diarrhea can cause death in immunocompromised individuals, and the very young and the elderly are more susceptible due to dehydration from prolonged illness, the rate of admission in hospital was higher for the two mentioned age groups. However, the children incidence rate was 71.5%, 58.7% and 75% among the typhoid patients, dysentery patients, and hepatitis A patients respectively (fig. 3.5). The high incidence rate of hepatitis A in children group is because of the age preference of this disease in children and young adults [2].

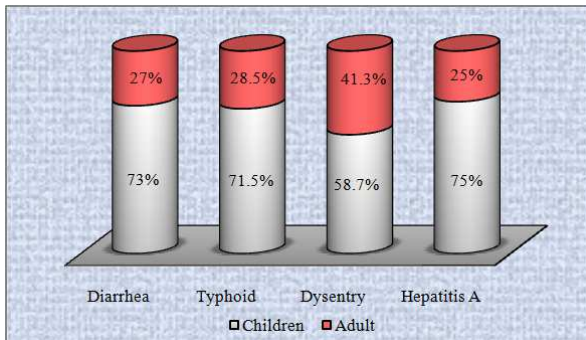


Figure 3.5. Age-wise Incidence of Water Borne Disease in 2013

4. Conclusion

The water quality supplied by DWASA at Sutrapur Thana is highly risky for the community health of that area due to its severe bacteriological contamination. Other than public awareness, this problem should be taken into consideration by DWASA. To do this, DWASA should not solely rely upon its treatment plant's efficiency. DWASA's piped water supply systems are generally buried with complex reticulations which are difficult to operate and maintain. Nevertheless, these pipelines are equally important as water resource and treatment facilities to ensure the supply of safe drinking water. Continuous monitoring mechanisms should be in place in the distribution system in order to protect those facilities. The authority should also conduct regular monitoring program to prevent possible contamination of water along its distribution network by cross connections, cross contamination by leaking pipes, improper domestic storage etc. Public awareness can definitely play an important role to prevent such problems. The situation may aggravate in near future if the authority does not pay attention and take immediate actions to restore water quality in the distribution system.

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