Assessment of Public Perception for Drinking Water Quality and Its Safety in Dayarampur, Natore, Bangladesh

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Abstract: The primary requirement for healthy well-being is to have safe drinking water. Bangladesh is blessed with plenty of both surface and groundwater supply to support her entire population. Dayarampur, Natore is located in Bagatipara Upazila and is around 20 km away from Natore City in the south direction, a place where no water quality measure had not taken yet. About 32000 peoples are living in this area. So, drinking water is an important factor here because it significantly impacts the health of inhabitants. This research aims to assess the public perception of drinking water quality and safety in Dayarampur, Natore. A total number of 115 household surveys have been made. The results of this research show that the maximum households (49%) in this are used more than 200-liter water per day and most of them (78%) used maximum water at noon. The tubewell water of most households was free from taste (96%) and smell (88%). However, (40%) of tested water samples have color, 24% contain iron, and 12 % contain arsenic indicating the health hazards of this area. Most of the households (84%) didn't test their water although the maximum household and had no idea about the safety of water (69%). However, most of the households (53%) want improvements from the local government authority.

Keywords: *Perception; drinking water; water quality; water safety; Natore.*

Introduction: People never understand the water's value until the well is dry. Water can be called one of the foremost fundamental components for life, for the survival of living beings. There should be safe, accessible, and adequate availability of supplied water for a healthy lifestyle because health can become significantly benefitted by developing drinking water safety and accessibility [1]. There has been a consumer perception of the quality of drinking water for thousands of years. Providing secure drinking water to the residents is one of any government of any country's main public health priorities because it is linked to human health. Around 70% of human body mass consists of water excluding fat. On the other hand, water covers almost 71 percent of the earth's surface and is significantly essential for all forms of life. The earth comprises of only 2.5 percent of freshwater, 98.8 percent of which is found in ice and groundwater, and 0.3 percent of all freshwater is found in rivers, lakes, and atmosphere. In biological organs and produced products, 0003% or less of fresh water is present [2]. There is no access to excellent quality drinking water for more than 844 million individuals on earth and about 2.3 billion individuals still lack access to appropriate hygiene services [3,4]. Every day approximately 6,000 kids die from illnesses related to the absence of access to excellent quality drinking water, bad sanitation, and hygiene [3].

In Bangladesh the major source of surface water used as river and pond water which is used for the water supply system as well as the drinking water source. An estimated 795,000 million cubic meter (Mm3) of surface water discharge over a land area of 144,000 km2 of Bangladesh and about 1,288,222 ponds are situated in Bangladesh. [5,6]. Another important source of water is groundwater which is mainly withdrawn by tubewell. The water-bearing aquifers are found at depths varying from zero to 20 m below the ground surface [5]. However, most of the surface water is polluted now which is caused by the mainly human intervention [7] and groundwater is faced the dangerous arsenic pollution [8]. For providing a safe water Department of Public Health Engineering (DPHE), Bangladesh is working all around Bangladesh (except the area where WASA is working), providing alternative options for safe water supply are in affected areas [9]. In Dayarampur there is no water supply system and groundwater is used as a drinking water source which is withdrawn by tubewell.

According to the future plan of DPHE Natore, there will be a new water supply system installed at Gopalpur, Bagatipara, and Noldanga Upazila [10]. Dayarampur is situated in Bagatipara Upazila and could be included to install the water supply system in this area in the future. The public perception is an important parameter to justify the installation of the water supply system. But there is no research has done yet to get information about the water supply system. Therefore, the purpose of this study was to determine the public perception regarding drinking water quality, its safety, and their adopted measures to any issues regarding existing water quality in Dayarampur, Natore.

Methodology:

Study Area: The study area of this research was Dayarampur. It is a union of Bagatipara Upazila. Bagatipara is an Upazila of Natore District in the Division of Rajshahi, Bangladesh. The total area of Dayarampur is 6481 acres. It consists of 12 villages with a total population of 31254. There are around 7500 families in Dayarampur [11]. No 4 Doarampur union is bounded by Natore Sadar Upazila on the north, Boral River on the south, Baraigram Upazila on the east, Bagatipara Upazila on the west. Dayarampur is located between 88.56' and 89.02' E and 24.16' and 24.22' N [12].

Questionnaire Survey: A questionnaire survey, based on a 30-question, was done to explore public perceptions of and attitudes towards drinking water quality and it's safety. The survey was conducted by taking direct interviews in the Dayarampur area, where the total number of households is 7500 [12] between December 1st, 2018, and January 25th, 2019. One hundred fifteen questionnaires were distributed in the study area. Questionnaire included the questions about the demographic information of the respondents, sources of drinking water, knowledge about drinking water. The questionnaires were categorized into general information, water quality, and waster safety issue.

Analysis of The Questionnaire Survey: Microsoft excel 2010 was chosen as an analysis tool after getting all the information from the questionnaire survey.

Result and Discussion

General Information

Family members of the household: In Fig. 1, it was seen that most of the households (54%) have 4 to 6 family members. According to the Household Integrated Economic Survey (HIES), in Bangladesh, the average number of family members in a family is around 4 persons [13]. There is only 36% of family members have 6 to 10 family members. And 10% of the family has 2 to 3 number of family members.
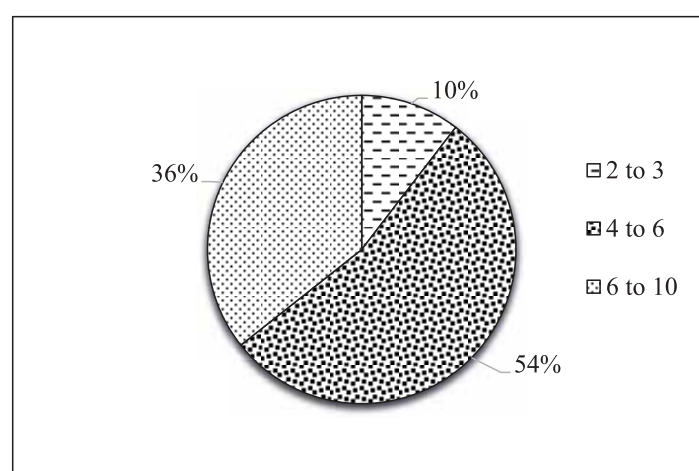

Fig. 1: Family members of the household.

Water consumption: Water consumption is related to socio-economic factors such as house quality, income, household size, etc. In Dayarampur about 49% of the households used 100-200 liters and 49% used above of 200 liters of water per day as shown in Fig. 2. Only 2% of families used less than 100 liters per day. It was reported that the daily per capita water consumption for the domestic user in villages is 83.17 liter per person per day (lpcd) [14].
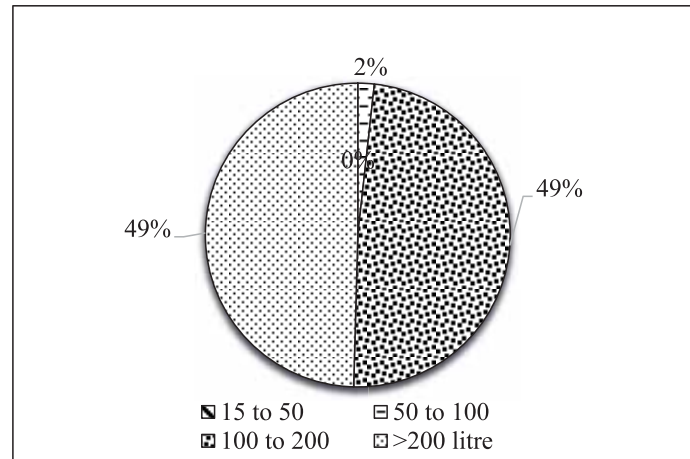
Fig. 2: Water consumption in a day households.

Time of maximum-water consumption: For checking the maximum water consumption hour a day is divided into five categories. Those are Morning (6 – 9 hrs), Noon (9 – 15 hrs), Afternoon (15 – 19hrs), Evening (19 – 24 hrs), and Night (0 – 6 hrs). Fig. 3 shows that about 78% of the household have maximum water consumption at noon. People take bath, make food, wash clothes at noon and this is the reason for maximum water consumption at noon.
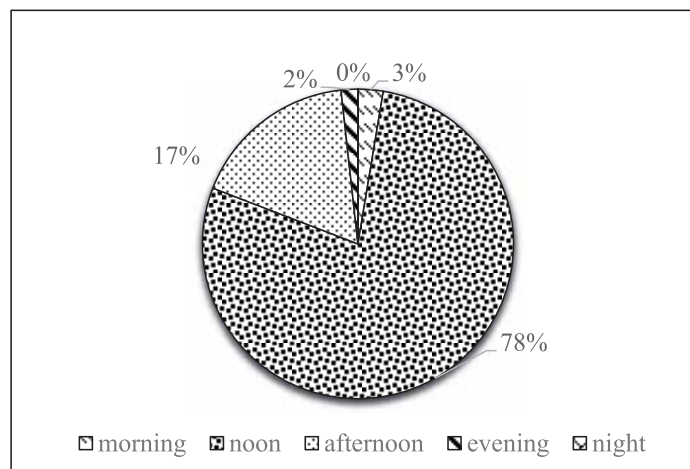
Fig. 3: Time of high-water consumption.

Duration of the existing water supply system: The duration of the existing water supply system is directly related to the life span of the individual house. That means the age of the water supply system is as same as the age with the houses. In Dayarampur most of the household's water supply system was new (1 – 4 years) which was 37% (Fig. 4). Around 7% of households using their system for more than 16 years.
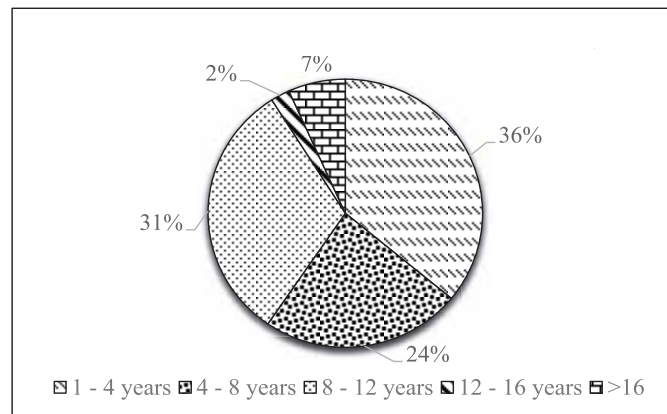
Fig. 4: Duration of the existing water supply system.

Physical Water Quality

Presence of iron in the water: In Dayarampur, about 24% of the households were facing an iron problem in the water (Fig. 5). It was reported in the study carried out by Ahmed and Kibra, (2019) [15] that in Lalpur Upazila, which is next Bagatipara Upazila had an iron concentration of 1-2.45 mgl-1 in 13.33% water samples.

Color of water: In Fig. 6, about 60% of the household water is clean. But 38% of water is yellowish and 2% is greyish. From research on the Rajshahi area, it was found that the color of water varies from 0 to 4.8 pt.-co. [16]. It was found that some of the water samples in Lalpur Upazila areas have water color was yellowish [15].
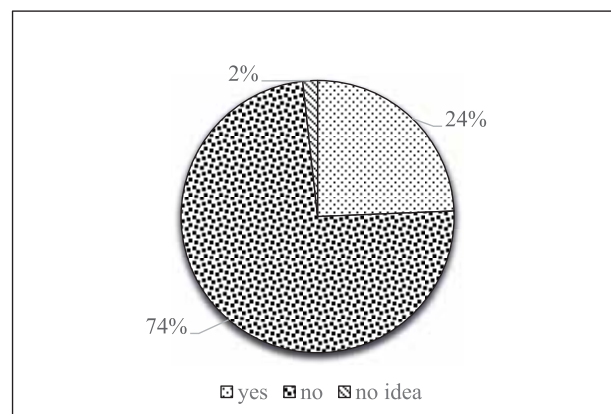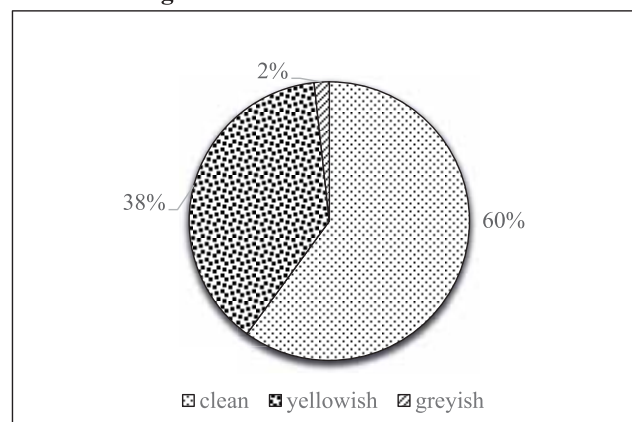

Fig 5: Presence of iron in the water.

Fig. 6: Color of water.

Taste of water: In Fig. 7 it is shown that about 96% of the households confirmed that the taste of the water is acceptable and only 4% complained that the taste of water is not good.
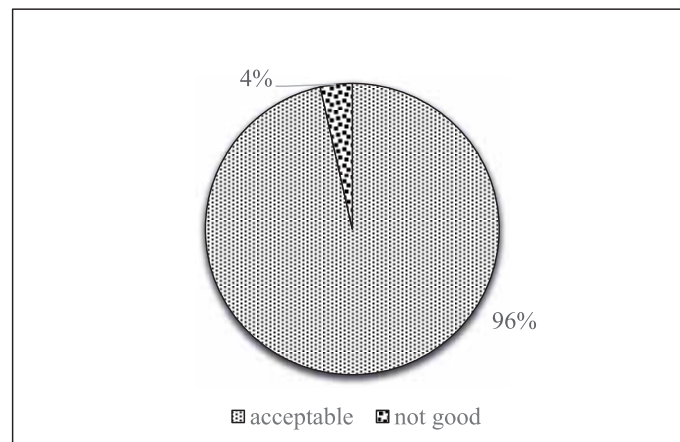

Fig. 7: Taste of water.

The smell of water (Odour): The smell is one of the important parameters of water and drinking water must be odourless. [17]. In Dayarampur about 88% of the households confirmed that the smell of the water is good and 12% confirmed that they have smell issues with the water as shown in Fig. 8. The presence of iron may be the cause of odour in water as 24% of the household facing iron problems as mentioned in "Presence of iron in the water" section.
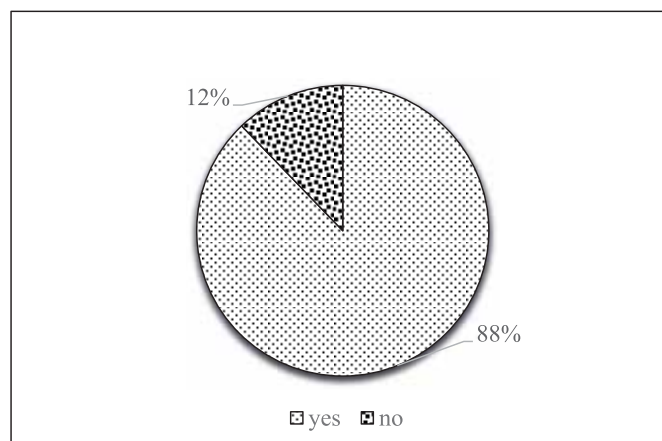

Fig. 8: Smell of water.

Arsenic in water: About 12% of the household water has arsenic and 87% of the water does not have arsenic (Fig. 9). In 2001, the Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP) tube well water screened all the villages of Lalpur and Bagatipara, two Upazila (sub-districts) of Natore district (a southeastern district of Bangladesh) and identified that tubewell whose concentration was 100 ppb in 5 or more tubewell from each village [18]. This confirmed that arsenic is present in some of the Dayarampur area.
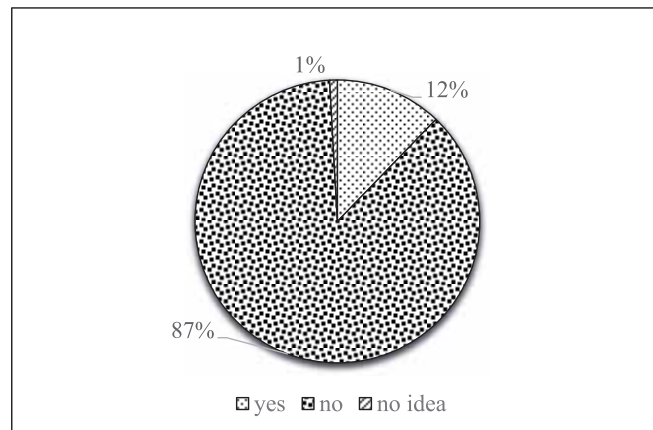
Fig. 9: Arsenic in water.

Safety Issue

Water testing status and source of drinking water: It is a very alarming fact that most of the households (84%) never tested the water as shown in Fig. 10. As the maximum household (59%) used the same source of water (Fig. 11), it is may vulnerable as they are not tested yet.
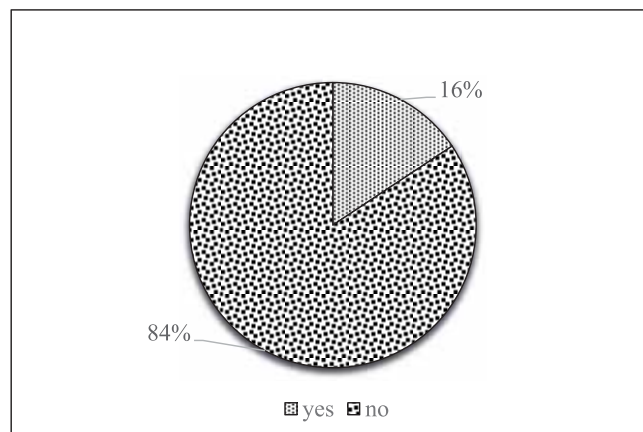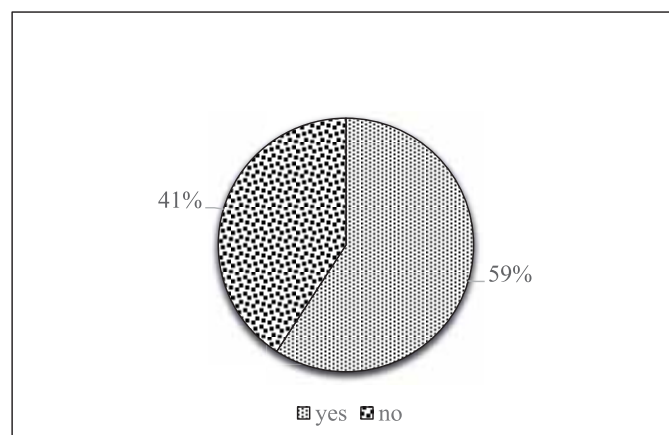

Fig. 10: Water testing status.

Fig. 11: Same sourced used for drinking and sanitary purposes.

An idea about the safe water: In Fig. 12, it is shown that about 69% of families do not have any idea about safe water. Their opinion is like if the water is clean and odourless than it is safe to drink.
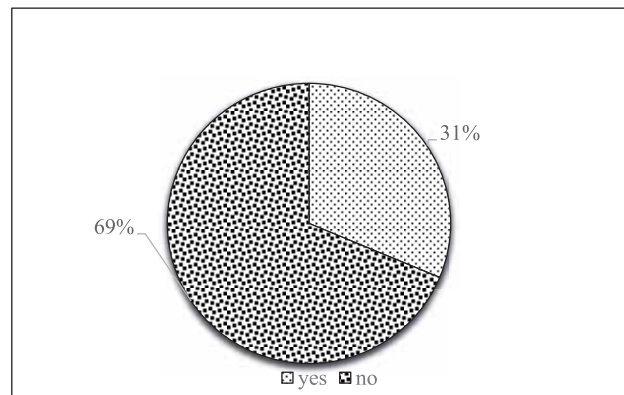

Fig. 12: Idea about water safety.

Use of Filter: It is shown in Fig 13 that, about 87% of households do not use filter the water before drinking and only 13% of the household use filter before drinking water. The household that uses filters is the ceramic base commercial filter.
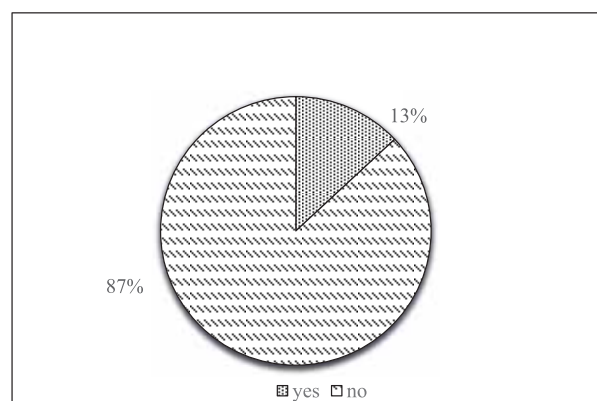

Fig. 13: Use of filter households.

Expectations from local government authority: In Fig. 14 it was seen that about 53% of the household want improvements from the local government authority. They mainly want improvement in terms of installing a central water supply system. However, 47% of the households are satisfied with the authority for using the present water supply system as they are afraid of the cost of the water supply system.
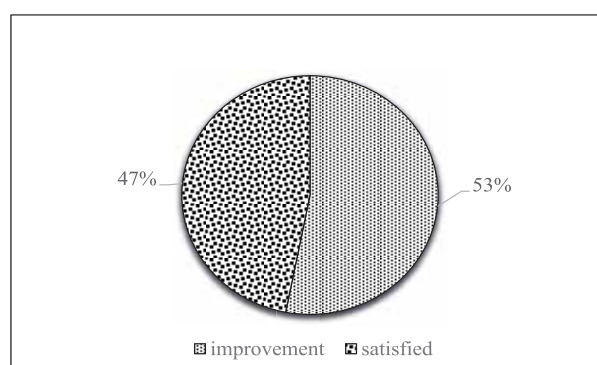

Fig. 14: Expectations from local government authority households.

Conclusions: The purpose of this study was to determine the public perception regarding drinking water quality and its safety issues regarding existing water quality in Dayarampur, Natore. The summary of the findings of this research is below:

- It was seen that most of the households (54%) of the Dayarampur area have 4 to 6 family members and used more than 200 liters of water per day (49%). Maximum water consumption in this area was found at noon (78%). Most of the household's water supply system was new (1 – 4 years) which was 37% but some of them were more than 16 years old (7%).
- In the case of water quality, it was found that most of the households were free from taste (96%) and smell (88%). However some of the household yellowish (38%) or greyish (2%) color problems in their water. Very few households face iron (24%) and arsenic (12%) contamination in their water.
- In case of safety issues, it was found that most of the households (84%) didn't test their water although maximum household (59%) used the same source of water for drinking and sanitary purpose. However, most of them (69%) don't have any idea about the safety of the water. Only 13% of households use filters for drinking water purposes.
- Most of the households (53%) want improvements from the local government authority.

From the above information, it can be concluded that the public perception of drinking water quality and its safety is not emerging in the Dayarampur area as most of them didn't test their water although most of them not facing any color, odour, iron and arsenic problem. These may be vulnerable as the drinking water source may be contaminated with impurities which can be revealed after water quality analysis. People in this area need to be educated about the safety of water before local authority wants to install a new water supply system. This information can be useful for designing a water supply system in the future.

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