

Evaluation of Drinking Water Quality in Jessore District, Bangladesh

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Abstract: This study emphasized on ensuring quality of drinking water in Jessore district. Drinking Water quality was evaluated by measuring 12 parameters. These parameters were Arsenic (As), Cadmium (Cd), Iron (Fe), lead (Pb), Dissolved oxygen (DO), Chemical oxygen demand (COD), Biological oxygen demand (BOD) Chloride, Calcium (Ca), pH, Salinity and Hardness CaCO_3 . All measured parameters were compared with water quality parameters Bangladesh standards & WHO guide lines. From the experimental results it can be conclude that all of the parameters were in standard ranges except Salinity, Arsenic, Iron, COD and BOD. The average value of Arsenic within permissible limits but other four parameters Salinity, Iron, COD and BOD average value were above the standard permissible limit.

Keywords: Water quality, Jessore district, Drinking water and water quality parameters.

Date of Submission: 28-08-2017

Date of acceptance: 08-09-2017

I. Introduction

Drinking water, also known as potable water, is water that is safe to drink or to use for food preparation, without risk of health problems. Globally, 91% of people had access to water suitable for drinking. Nearly 4.2 billion had access to tap water while another 2.4 billion had access to wells or public taps. Still 1.8 billion people use an unsafe drinking water source that may be contaminated for various reasons. As a result, people may be affected by diarrhea, cholera and typhoid diseases [1]. For this reason safe drinking water is essential for life. The amount of drinking water required is variable. It depends on physical activity, age, health issues, and environmental conditions [2].

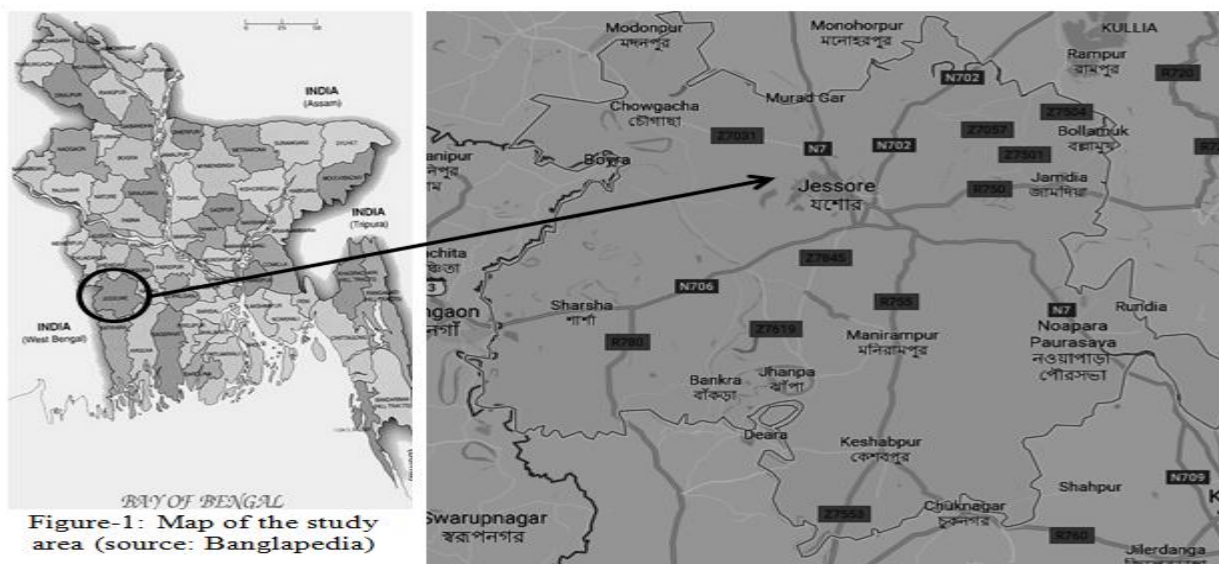
The environmental condition of Bangladesh is not at all equilibrium. It is different in different regions [3]. Our study area Jessore is a district in the southwestern region of Bangladesh. It is bordered by India to the west, Khulna District and Satkhira District to the south, Magura and Narail to the east, and Jhenaidah District to the north. It consists of 4 municipalities, 36 wards, 8 upazilas, 92 unions, 1329 mouzas, 1477 villages and 120 mahallas [1]. For drinking purpose most of the people in this district rely on underground water, such as tube well or tap water. The rest of the people drink water from various natural sources like ponds, rivers, canals etc. This surface water can be contaminated by industrialization, cultivation and various house hold work. Due to arsenic, the underground water of different parts of Bangladesh has been polluted. The drinking water in Jessore district can be contaminated due to geographical location, huge cultivation and industrialization. For this reason, checking the quality of drinking water is very important.

The term water quality is used to describe the condition of the water, including its chemical, physical and biological characteristics, usually with respect to its suitability for a particular purpose i.e., drinking, swimming or fishing [4]. Keeping all this aspect in mind, the present study was designed to investigate drinking water quality in Jessore district by measuring some important parameters like Arsenic (As), Cadmium (Cd), Chloride, Iron (Fe), Lead (Pb), Dissolved oxygen (DO), Chemical oxygen demand (COD), Biological oxygen demand (BOD), Calcium (Ca), pH, Salinity, Hardness.

II. Experimental method

Study area:

The study area Jessore district is located at 23.17 ° North latitudes and 89.20 ° east longitude in southwestern region of Bangladesh (fig. 1). The Nickname of Jessore is historical town. It is composed of approximately 2606.94 km² area, where 2,764,547 people live in. Water samples were collected from 40 stations in Jessore district, considering the industrial area, populated area, the area of cultivation and normal area.



Sample collection:

From January 2017 to July 2017, water samples were collected from forty different sites based on the characteristics of the different locations of Jessore district. Water samples were collected from selected sample sites, also considering deep tube wells, tap, ponds, rivers, canals etc. Water samples were conducted very carefully in such a way that no significant changes were organized before the test. The sample was stored in a black box for maintain room temperatures.

Analytical Method set-up:

In the experimental works, all of the parameters were measured by using standard Instrumental, Spectroscopic and titration methods (Table-1) [5]. Replicate analysis of water sample was performed during the study to avoid errors.

Table-1: Sample analysis methods

Parameters	Analytical Method
Arsenic (As)	Atomic absorption spectroscopy
Cadmium (Cd)	Atomic absorption spectroscopy
Iron (Fe)	Atomic absorption spectroscopy
Lead (Pb)	Atomic absorption spectroscopy
Calcium (Ca)	Atomic absorption spectroscopy
Hardness CaCO ₃	Titrimetric method
Chloride	EC meter
pH	pH meter
Salinity	Refractometer
Dissolved Oxygen (DO)	Winkler's method
Biological Oxygen Demand (BOD)	Winkler's method
Chemical Oxygen Demand (COD)	Reflux Titration method

III. Results and Discussion

The results obtained from the experiment of drinking water of Jessore district have been compared to the Bangladesh Drinking Water Standards (BDWS), the World Health Organization's Drinking Water Standard (WAODWS), as shown in Table 1 [6].

Parameters	Experimental value Mean (Range)	Bangladesh Standards (mg/L)	WHO Guide Line
Arsenic (As)	0.026 (0.001-0.29)	0.05	0.01
Cadmium (Cd)	Below 0.04	0.005	0.003
Iron (Fe)	1.67 (0.11-4.5)	0.3-1.0	-
Lead (Pb)	Below 0.03	0.05	0.01
Hardness CaCO ₃	320 (250-670)	200-500	-
Chloride	112 (50-552)	150-600	-
Calcium (Ca)	47.0(14.0-310)	75	-
pH	7.3 (6.4-7.8)	-	6.5-8.5
Salinity	0.112 (0.0-0.25)	(0.005-0.06)%	-
DO	6.5 (5.1-7.2)	6.0	-
BOD	1.5 (0.0-3.2)	0.2	-
COD	5.6 (3.0-6.3)	4.0	-

During study period, the pH value of drinking water was varied from 6.4 to 7.8 with mean 7.3. That means the drinking water at sample sites was slightly alkaline but within acceptable limits. The major three element parameters Hardness CaCO₃, Chloride and Calcium values were varied from (250 to 670) mg/L, (50 to 552) mg/L and (18 to 410) mg/L with mean 320 mg/L, 112 mg/L and 60mg/L respectively. All three major element parameters average values were within standard permissible level for drinking purpose. But another important drinking water parameter Salinity average value was above the permissible levels. Salinity is the saltiness or amount of salt dissolved in a body of water [7]. It has recently become a major concern in the southern part of our country.

There are minor elements (0.01 mg/L to 1.0 mg/L) in drinking water and we were measured four minor elements Arsenic, Lead, Cadmium and Iron for assessing drinking water quality. During study area Arsenic was ranged (0.001-0.29) mg/L with mean 0.026 mg/L and Iron (0.11-4.5) mg/L with mean 1.67 mg/L. Lead and Cadmium concentration was below 0.03 mg/L and 0.04 mg/L. Two minor elements Lead and Cadmium was ranged within standard limits but other two parameters Iron and Arsenic was ranged above the permissible level. Extensive arsenic contamination of has led to widespread arsenic poisoning in Bangladesh [8]. It is estimated that approximately 57 million people in the Bengal basin are drinking groundwater with arsenic concentrations elevated above the World Health Organization's standard and Bangladeshi standard [9]. However, consumption of high level of Arsenic may causes cancer [10]. Other minor element Iron in drinking water can give unpleasant metallic taste when present large amount. Iron is an essential element in human nutrition but higher amount in drinking water may include warding off fatigue and anemia [11].

We also measured water quality in our study area by the measuring of oxygen demanding parameters. The oxygen demanding parameters DO average values was within standard limits but other two parameters COD and BOD average values was above the standard permissible limits. This high value of COD and BOD indicates that the drinking water polluted by degradable organic wastes from various sources.

IV. Conclusion

Considering all measured parameters, it can be concluded that the drinking water quality of Jessore district within standard limits except Salinity, Arsenic, Iron, COD and BOD. The average values of arsenic were in the permitted limits but in some measurable points, the level of arsenic was above the permitted limit. On the other hand average Iron, Salinity, COD and BOD values were above the permissible standard level. So we have a little concerned about Arsenic, Salinity, Iron, COD and BOD levels. But this is not easy to pinpoint the quality of water by measuring some parameters. However, current research results may be helpful in baseline information for future monitoring, management and conservation of drinking water quality.

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Siddhartha sarder. "Evaluation of Drinking Water Quality in Jessore District, Bangladesh." *IOSR Journal of Biotechnology and Biochemistry (IOSR-JBB)* , vol. 3, no. 4, 2017, pp. 59–62.