



Available Online at

<http://www.ijcpa.in>

January-March 2019

DOI: <http://dx.doi.org/10.21276/ijcpa>

International Journal of
CHEMICAL AND PHARMACEUTICAL
ANALYSIS

eISSN: 2348-0726 ; pISSN : 2395-2466

Research Article

Volume-6

Issue-2

Article ID: 0009

ASSESSMENT OF DRINKING WATER QUALITY IN SATKHIRA DISTRICT, BANGLADESH

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Received: 12 August 2017 / Revised: 2 April 2018 / Accepted: 3 March 2019 / Available online: 31 March 2019

ABSTRACT

This study emphasized on ensuring quality of drinking water in Satkhira 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 CaCO₃. All measured parameters were compared with water quality parameters Bangladesh standards and WHO guidelines. From the experimental results it can be conclude that all 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, Satkhira district, Drinking water, Water quality parameters.

1. 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.

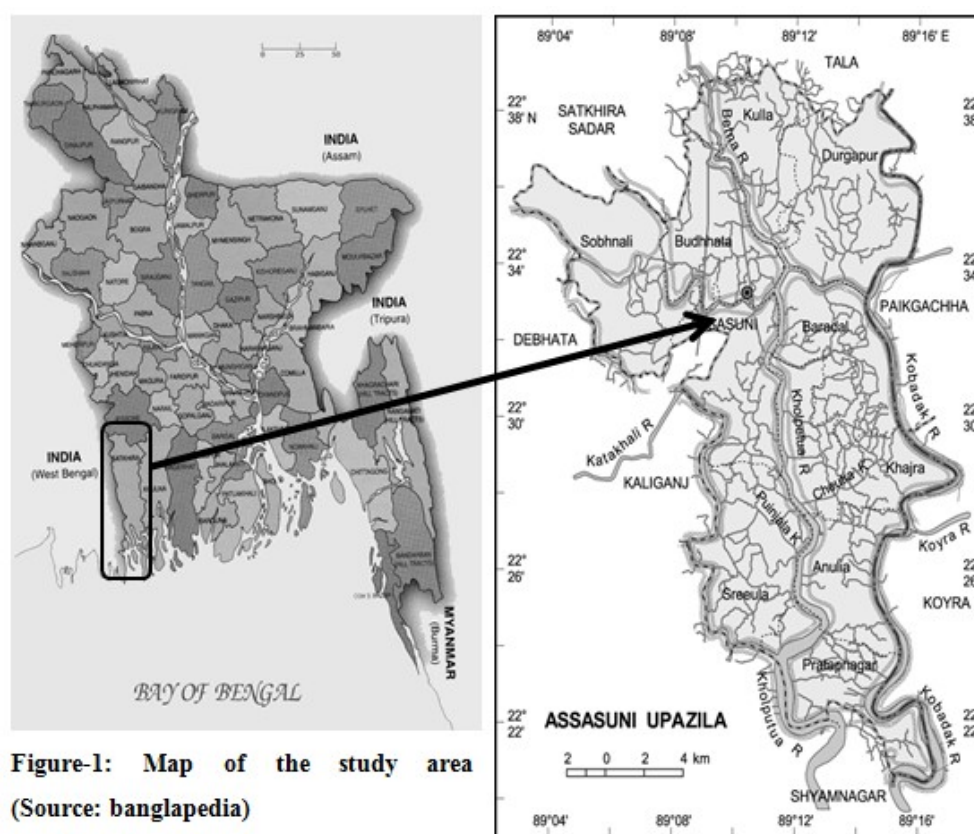
The environmental condition of Bangladesh is not at all equilibrium. It is different in different regions ³. Our study area Satkhira is a district in southwestern Bangladesh and is part of Khulna Division. It lies along the border with West Bengal, India. It is on the bank of the Arpanagachhia River ⁴. 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 household work. Due to arsenic, the underground water of different parts of Bangladesh has been polluted. The drinking water in Satkhira 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 ⁵. Keeping all this aspect in mind, the present study was designed to investigate drinking water quality in Satkhira 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.

2. MATERIALS AND METHODS

2.1 Study area

The study area Satkhira district is located at 22.35 ° North latitudes and 89.08 ° east longitude in south-western region of Bangladesh (fig. 1). The Nickname of Satkhira is historical town. It is composed of approximately 3,817.29 km² area, where 2,079,884 people live in. Water samples were collected from 40 stations in Satkhira district, considering the industrial area, populated area, the area of cultivation and normal area.



2.2 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 Satkhira 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.

2.3 Analytical Method set-up

In the experimental works, all of the parameters were measured by using standard Instrumental, Spectroscopic and titration methods (Table-1) ⁶. 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

3. RESULTS AND DISCUSSION

The results obtained from the experiment of drinking water of Satkhira district have been compared to the Bangladesh Drinking Water Standards (BDWS), the World Health Organization's Drinking Water Standard (WAODWS), as shown in Table 1⁷.

Parameters	Experimental value Mean (Range)	Bangladesh Standards (mg/L)	WHO Guideline
Arsenic (As)	0.039 (0.001-0.38)	0.05	0.01
Cadmium (Cd)	Below 0.04	0.005	0.003
Iron (Fe)	2.16 (0.16-5.5)	0.3-1.0	-
Lead (Pb)	Below 0.04	0.05	0.01
Hardness CaCO ₃	350 (230-694)	200-500	-
Chloride	123 (58-622)	150-600	-
Calcium (Ca)	52.0(16.0-380)	75	-
pH	7.4 (6.3-8.1)	-	6.5-8.5
Salinity	0.15 (0.0-0.32)	(0.005-0.06) %	-
DO	6.4 (5.0-7.7)	6.0	-
BOD	1.7 (0.0-3.9)	0.2	-
COD	6.2 (3.2-7.3)	4.0	-

During study period, the pH value of drinking water was varied from 6.3 to 8.1 with mean 7.4. 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 (230 to 694) mg/L, (58 to 622) mg/L and (16 to 380) mg/L with mean 350 mg/L, 123 mg/L and 52mg/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 ⁸. 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 (0.001-0.38) mg/L with mean 0.039 mg/L and Iron (0.16-5.5) mg/L with mean 2.16 mg/L. Lead and Cadmium concentration was below 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 has led to widespread arsenic poisoning in Bangladesh⁹. 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 standard¹⁰. However, consumption of high level of Arsenic may cause cancer¹¹. Other minor element Iron in drinking water can give unpleasant metallic taste when present in large amount. Iron is an essential element in human nutrition but higher amount in drinking water may include warding off fatigue and anemia¹².

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

4. CONCLUSION

Considering all measured parameters, it can be concluded that the drinking water quality of Satkhira district is 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 are 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.

REFERENCES

1. Drinking water, "Water Fact sheet N°391" (2014). Wikipedia, Website: https://en.wikipedia.org/wiki/Drinking_water.
2. Grandjean AC. Water requirements, impinging factors, and recommended intakes. *Nutrients in drinking water*. 2005;25.
3. Diersing N, Nancy F. Water quality: Frequently asked questions. Florida Brooks National Marine Sanctuary, Key West, FL. 2009.
4. Islam S, editor. *Banglapedia: national encyclopedia of Bangladesh*. Asiatic society of Bangladesh; 2003.
5. E.A. McBean, Global Climate Change, Its Projected Impacts on Water Resources, In *Proceedings of Plenary Presentation, 3rd Iran Water Resources Management Conference*, Tabriz, Iran, 2008.
6. APHA, *Standard Method for the Examination of water and Waste Water*, (14th edition), American public Health Association, New York, 1992.
7. Water Quality Parameters Bangladesh Standards & WHO Guidelines, Website: https://www.dphe.gov.bd/index.php?option=com_content&view=article&id=125&Itemid=133.
8. Definition of Salinity, <https://www.google.com/search>.
9. Polya D. A. *Meharg Venomous Earth. How Arsenic caused the World's Worst Mass Poisoning*. Macmillan, 2005.
10. Henke K. *Arsenic: Environmental chemistry, health threats and waste treatment*. John Wiley & Sons; 2009.
11. Lamm SH, Engel A, Penn CA, Chen R, Feinleib M. Arsenic cancer risk confounder in southwest Taiwan data set. *Environmental health perspectives*. 2006 ;114(7):1077-82.
12. S.G. Karen, *Health Effects of Iron in Drinking Water*, 2015.