

Investigation of Physico-chemical parameters of water samples in Batala city

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ABSTRACT

Water is indispensable natural resource on the earth. With urbanization, chance of deterioration in quality of water is enhanced. Poor water quality is major threat to environment and inhabitants. In the present study, an attempt has been made to study water quality parameters of different water samples collected at different location of Batala city. Parameter to assess water quality are Colour, taste, odour ,total dissolved solids, pH, total hardness, electrical conductivity to verify whether water is potable or not. Emphasized was given to compare experimental data with bureau of Indian Standard(BIS) and WHO Standard. The study is concluded by saying that the avoidance of industrial and domestic effluent in ground water, definitely help in checking water pollution. For the maintenance of clean water, suitable methods are proposed to control water pollution like use of alum or ion exchange method

Keywords: Water parameters, Total dissolved solids, pH, Conductivity, BIS standard.

I Introduction

As water either inland surface water or ground water has much abstractive use in domestic, irrigation or Industrial purpose. No doubt, water has much non abstractive use in transport, food, recreational (swimming, picnic spot or water sports) or ecosystem. Impurities present in water has adverse effects on health related problems such as affecting mucous membrane, gastro intestinal irritation or encrustation in water supply structure, taste, decoloration , carcinogenic effects, water borne disease. As water get polluted by the addition of millions of litre of sewage, industrial, agricultural and domestic effluents. Availability of clean water is now challenging for better tomorrow. In the past few decades natural and polluted water have been analyzed all over the world^[1]. A number of parameters being used which determine the quality of water. These regular monitoring help to prevent spreading of disease and also check water resources from going further polluted. There are amazing facts - Around 2 million children below 5 years of age died in a year due to water borne disease and surprisingly India contribute 30%. Around 1600 children in India are dying per day due to water borne disease like diarrhea and pneumonia. The constituents responsible for contamination in water are clay, silt, humus, alkalinity, colour, pH, TDS, Ca, Mg, Fluoride, NO_3^- , Hardness, lead, Mercury, bacteria, viruses etc. Water can be contaminated in many ways. It could be contaminated due to presence of micro-organism like bacteria, virus which may be obtained from animal or human waste. Water can be contaminated due to presence of certain chemicals released from industries, Chemicals used in fertilizers ,when sprayed on the soil, can also enter and contaminate the water, Lead can also enter into the water through old rusted water pipes^[2]. In Indian homes, a number of submersible pipes being used to obtain drinking water but no precaution are taken to assess the quality of water. Submersible water could be contaminated by factors like what will be depth of submersible pump, location of pump, maintenance of pump or site nearby industrial activities. All these

factors will definitely deteriorate quality of water. There are some areas in which water is contaminated due o presence of lead. Even lead free pipes contain 8% lead.

Batala is a municipal council in Gurdaspur district in state of Punjab, India. Batala is one of leading cities in northern India in manufacturing of C.I casting and mechanical machinery. Batala is well known for foundry industries. In Batala city, sewage falls into 30 ft wide Hansli drain.

There are more than 700 small and middle industrial units including 400 foundries. All the effluents discharged by these units simply goes untreated. There is no **sewage treatment plant** (STP) and lack of STP is leading to water pollution in the city. So, people of Batala city are sitting on major pollution hazard and all the effluents discharged in to the river. The contaminated water or untreated water given to the farmers for agricultural purposes. We can also add that Drinking water supplied to private and government school in the region is not fit for consumption.

As far as contamination of water is concerned, in the year 2012, people of batala city suffered grave situation of Gastroenteritis, water borne disease. In the same year 2012, sixteen persons were died due to cholera outbreak, which is confirmed by State Health Authorities. In the year 2013, more than 30 dengue patients are confirmed. In recent days, several cases of Typhoid were reported in slum areas due to contamination of water. So there is always a need of water examination from door to door, especially in affected and slum areas and check pollution. The world health organization estimates that safe water could prevent million child deaths from diarrhea each year^[3]. Water, however, is not finite resource, but recirculated as potable water consumption. Therefore, degradation of drinking water needs an urgent basis prevention method which is possible by proper understanding and support from the end of each and every person living on the earth.

II. MATERIALS AND METHODS

1 Study area: BATALA: Batala is a municipal council in Gurdaspur district in state of Punjab, India. Batala city has

Location: Gurdaspur, Punjab(India)

Area: 42 Km²

Population: Around 1, 56,000.

Lattitude:31°49' N

Longitude: 75°14'E

As there are large number of industrial units in Batala and peripheral regions of the city. There is much high possibility of pollution in drinking water. This paper is based upon analysis of various Physico-chemical parameters present in water sample which will be collected from interior city of batala.

2 Selection of sampling sites: As Batala city is famous for industries, and choice of selection of sampling spot is very important. More attention is given to that site where population density is high i.e. interior of the city. Samples are also collected where industrial sites are more.

3 Sample Collection: As water samples are collected near residential sites and industrial sites. The samples are collected in sealed plastic container and kept in refrigeration at 8°C .This is done to avoid bacterial growth and samples under examination give better results. Table 1 shows collection of samples from different sources.

Table 1: Samples Collections From Different Locations

S.No.	Source	Location
S-1	Tube well water	Amritsar road Bypass
S-2	Tube well water	Aliwal road
S-3	Tube well water	Sri hargobindpur road
S-4	Tube well water	Batala-Jalandhar bypass
S-5	Tap water	Amritsar road Bypass
S-6	Tap water	Chakri Bazar
S-7	Tap water	SL Bawa DAV College
S-8	Tap water	Inside Nehru Gate
S-9	Hand Pump water	Amritsar road Bypass
S-10	Hand Pump water	Beriyam Mohalla
S-11	Hand Pump water	Qadi hatti Chowk
S-12	Hand Pump water	Mian Mohalla

4 Physico-Chemical parameters: The water samples are collected by standard techniques and laboratory analysis. The parameters used for water analyse are colour, taste, pH, Total dissolved solids, electrical conductivity ^[4].

III. Results and Discussions

1 Colour, Taste and Odour: As the taste and odour is chemical sense and depends upon actual contact with receptor organ, it can only be measured by tasting or smelling a sample. The physical examination of water samples are collected, given in Table II. The samples collected from hand pump are salty. The samples collected from tap water and tube well water are without any objection as per Bureau of Indian Standards. In the same way, the samples collected from hand pump have chemical taste because of soluble anions present in the sample.

2 ph: pH(Power of hydrogen) is measure of intensity of acidity or basicity. Most natural water are alkaline due to presences of excess carbonate ion. pH of natural water never remain same. It depends upon season or variation in photosynthetic activity (due to release of carbon dioxide). Generally natural water has pH around 6 to 8.5.If the value of pH is less than 7, then water is acidic. If pH is more than 7, then water is alkaline. Water with low pH makes it acidic and corrosive^[5]. Water with high pH shows disinfection in water. From the experimental analysis, pH values all drinking water samples lies in between range 7 and 8.5(Table III). This indicates that value of pH is within safe limits ^[6].

Table II: Drinking Water Specification (Bureau Of Indian Standard)

Sample	Colour	Taste	Odour	TDS(mg/l)	pH	Conductivity $\mu\text{s}/\text{Cm}$
Sample of tap water	5-25 hazen	Agreeable	unobjectionable	500	6.5-8.5	800
Sample of hand pump water	--	Agreeable	unobjectionable	500	--	---
Sample of tubewell water	--	Agreeable	unobjectionable	500	--	---

3 Total dissolved solids: Total dissolved solids are mainly composed of minerals present in water i.e. carbonate, sulphates, phosphates, chloride, bicarbonates and nitrates of calcium, magnesium etc^[8]. Actually, TDS is measure of dissolved salts present in water. The allowable limits of TDS according to BIS (Bureau of Indian standard) are 500 mg/litre.

Table III: Experimental Data Of pH And Total Dissolved Solids

Sample	pH	Total dissolved solids(mg/l)
S-1	7.2	640
S-2	7.9	430
S-3	7.6	310
S-4	8.2	360
S-5	7.9	415
S-6	8.1	970
S-7	7.9	620
S-8	7.5	495
S-9	7.0	540
S-10	7.3	420
S-11	7.5	230
S-12	7.8	300

If the concentration of TDS in water is very high ^[11], it make water corrosive and result in the scale formation of boiler in industries and electrical appliance in houses^[9]The experimental values obtained from the samples are within permissible limits (Table III) except the sample collected from tap water of chakri bazaar has high TDS value, This shows that water in chakri bazaar is unfit for drinking purpose.

4 Electrical conductivity: Conductivity is measure of capability of water to pass electric current. Conductivity is directly related to concentration of ions present in water. More is total dissolved solids, more will be electrical conductivity..It means that more is the number of ions like chloride, sulphates, carbonate, more will be conductivity..Generally it is expressed in $\mu\text{s}/\text{Cm}$ or ms/cm . Pure distilled water has conductivity of $0.05 \mu\text{s}/\text{cm}$ while sea water has conductivity of $60,000 \mu\text{s}/\text{cm}$ because high concentration of dissolved salts present in water. According to Bureau of Indian standard and world health organization ^[8], conductivity of drinking water is 200 to $800 \mu\text{s}/\text{cm}$. According to NDWQS standard, electrical conductivity of drinking water is $1000 \mu\text{s}/\text{cm}$ ^[10]Table IV shows conductivity data of different sample collected. The sample(S-6)

collected from chakri bazaar is found to have high conductivity which directly indicates high concentration of dissolved salts and inorganic salts. Also, sample(S-9) collected from hand pump near Amritsar road bypass has high conductance (989 μ s/cm) which clearly indicate high concentration of inorganic salts. Sample (S-1) shows high electrical conductivity. Samples collected from other sites are also above threshold value, which is alarming sign .Only few samples are within safe limits and fit for drinking purpose.

5 Hardness: Hardness in water are dissolved polyvalent metallic ions such as calcium and magnesium ions, two principal ions. Total permanent hardness is equal to permanent calcium hardness and permanent magnesium hardness^[12]. Other minor ions such as Aluminium, Barium, Iron, Mangnese, Zinc also contribute to hardness in water. The threshold value of hardness is 300mg per litre^[13].

Table IV: Experimental Data of Electrical Conductivity

Sample	Total Hardness(mg/l)	Electrical conductivity(μ s/cm)
S-1	288	1030
S-2	190	530
S-3	201	685
S-4	195	760
S-5	295	810
S-6	410	1635
S-7	290	1050
S-8	310	880
S-9	285	989
S-10	205	835
S-11	159	260
S-12	275	775

Natural sources of water has concentration exceeding 100 mg per litre^[14]. Hard water has a great tendency to cause corrosion of metal surface and pipes. In industries, hard water affects boilers, cooling towers, and other equipment that handle water^[15]. In homes, hard water does not form leather with soap. The total hardness of different samples were studied and found in the range from 150 to 420 mg per litre (Table IV). The sample (S-6) has hardness found more than threshold value. Total hardness in water is determined by complexometric titration by titrating the solution against standard solution of EDTA using Eriochrome Black-T as indicator.

IV Conclusion:

The present results of investigation of water shows that water sample of some area of Batala city is highly contaminated due to excess total dissolved solids and hardness. The high TDS could present health risks^[16]. These can be easily prevented by testing the water periodically. High TDS can be managed: if there is high concentration of calcium and magnesium ions^[17], then water softener may be used and if there is high concentration of nitrate ion, then reverse osmosis can be used. It is important to monitor TDS and pH of drinking water^[18]. If water has high TDS or low pH, it is likely that harmful contaminants present in water. Hardness of water can be removed by following ways:

1. Ion exchange method with activated alumina, can remove minerals such as calcium, Magnesium which are responsible for hardness of water[2].
2. Reverse osmosis method also help to remove nitrate ion and sodium,
3. Carbon filters can be used to remove organic contaminants which affect taste.
4. Distillation method in which water first boils and then condensed to get pure distilled water.
5. Treatment with alum, also help to make water potable.

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