

QUALITY OF DRINKING WATER AND ITS IMPACT ON HUMAN BEING AT KHAGAUUL CITY OF PATNA [BIHAR]

Raj Nitesh Kumar¹

1.Primary Health Center – Arwal [Bihar]

ABSTRACT

The present study deals with comparative quality of drinking water from different sources at khagaul city of patna (Bihar). Which is located on the bank of Ganga river at 25°35' N latitude and 85°03' E longitude. It has an average elevation of 55 meters. Khagaul is a nagar parishad city of patna (bihar). Water is essential for survival of life; up to 60% of the human adult body weight is water. Intracellular fluid is about 35 liters (40% of body weight) and extracellular fluid is about 15 liters (24% of body weight). The palatability of drinking water has been rated by panels of tasters in relation to its TDS level, excellent if less than 300 mg/liter; good if between 300 and 600 mg/liter; fair if between 600 and 900 mg/liter; poor if between 900 and 1200 mg/liter; and unacceptable if greater than 1200 mg/liter. The municipal supply water gets severely contaminated by waste water through rusted and damaged pipelines and the ground water through seepage from septic tanks and drains. The contaminants from these sources have deteriorated the quality of drinking water leading to spread of various water born diseases like Typhoid, Cholera, Dysentery, Jaundice, Amoebiasis. The Ground water in the city is within required desirable Physio-chemical limits and hence potable.

KEY WORDS: Drinking water, Human being, Total dissolved solids, Contamination, Seepage.

INTRODUCTION:

Drinking water also known as potable water, that is safe to drink or to use for food preparation. Parameters for drinking water quality fall within three categories: Physical, Chemical and Microbiological. Physical and chemical parameters include heavy metals; trace organic compounds, total suspended solids and turbidity. Microbiological parameters include coliform bacteria. Total dissolved solids (TDS) are the term used to describe the inorganic salts and small amounts of organic matter present in solution in water. The principal constituents are usually calcium, magnesium, sodium, and potassium ions and carbonate, hydrogen carbonate, chloride, sulfate, and nitrate anions. The presence of dissolved solids in water may affect its taste. The palatability of drinking water has been rated by panels of tasters in relation to its TDS level as follows: excellent if less than 300 mg/liter; good if between 300 and 600 mg/liter; fair if between 600 and 900 mg/liter; poor if between 900 and 1200 mg/liter; and unacceptable if greater than 1200 mg/liter. Water with extremely low concentrations of TDS may also be unacceptable because of its flat, insipid taste (WHO 1984).

Study area: Khagaul is a Nagar Parishad city of Patna (Bihar). Which is located at 25.58°N 85.05°E. It has an average elevation of 55 meters (180 feet).

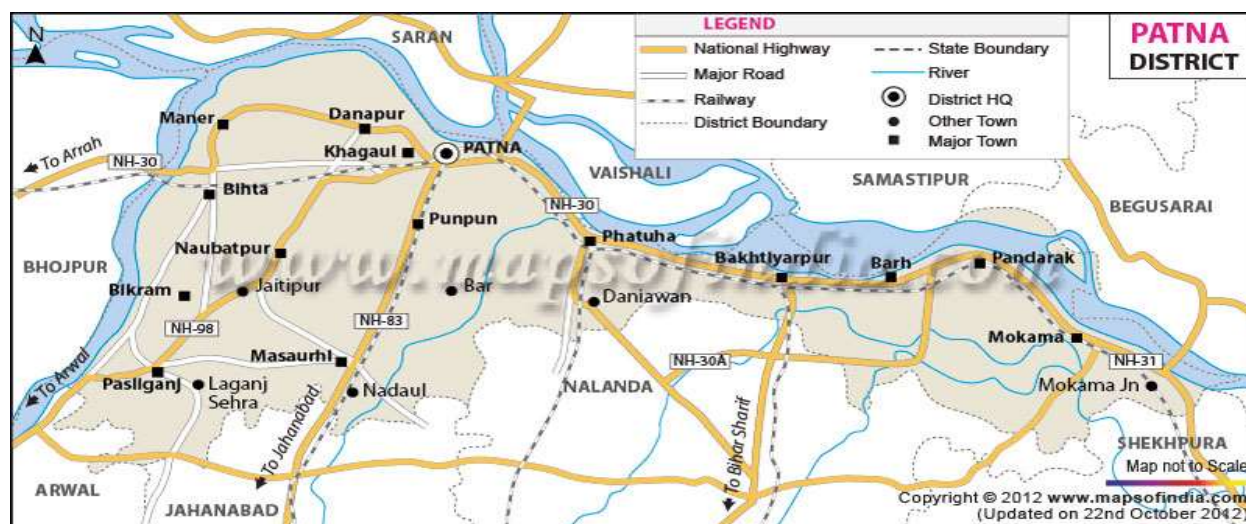


Fig. 1. Map of Patna

Patna district is situated in the South Bihar alluvial plains. The district is bounded in the north by river Ganga. The district falls in the Ganga Basin and is drained by the mighty Ganga in the north, by the Sone in the West, and by the Punpun, Phalgu and their tributaries in the central part of the terrain. The district forms a part of the Ganga basin. East of the district boundary Soils are predominantly sandy loam with clay loam at places with low to medium nutrient status. It is generally alkaline with pH value ranging from 6.3 to 8.2. Traditionally soils in an area are classified on the basis of mode of deposition. Soils are divided into three groups viz. (i) Recent alluvium (ii) Tal and (iii) Older alluvium. The soils of the district have developed on alluvial deposits transported from relatively younger geological formations where physical weathering is predominant and the soils developed in them are generally coarser in texture. The area is underlain by Quaternary alluvial formation comprising various grades of clay, silt, sand with occasional and gravel. From the groundwater potential point of view the entire district falls under good to very good category (S.N. Dwivedi, 2013).

Ground Water Quality: The water samples collected from the network of observation wells (dug wells) tapping water table aquifer and also from deep tube wells tapping confined or leaky confined 10 aquifer were subjected to chemical analysis in the laboratory of CGWB, MER, Patna. The quality of ground water aquifer is acceptable for various uses as per the quality criteria laid down by ISI. As nowhere it crosses the excessive limit. The ground water in the confined/semi-confined aquifers is better, as it is within the 'permissible' limit as per the quality criteria. The tube well water is recommended for drinking and other domestic purposes in the district. However, Arsenic concentration has been reported from Patna district. Central Ground Water Board has carried out deep exploratory drilling in Maner, Barh and Gayaspur villages (S.N. Dwivedi, 2013). Presence of Chemical constituents more than permissible limit (e.g., EC, F, As, Fe) Arsenic contamination affecting the shallow aquifer in parts of the district. The district falls in the Ganga Basin and is drained by the mighty Ganga in the north, where the city is located.

Water Quality of Patna District: EC($\mu\text{s}@25^{\circ}\text{C}$) 2200, P^{H} 7.6, CO_3 ND, HCO_3^- 329 mg/l, Cl^- 366 mg/l, Ca^{++} 48 mg/l, Mg^{++} 3263 mg/l, TH 380 mg/l, Na^+ 248 mg/l, K^+ 12.0 mg/l (S.N. Dwivedi, 2013).

The area of Khagaul city of Patna district is characterized by flat quaternary alluvial plain with average surface elevation of 55 meters to sea level. The soils of the district belong to two classes- Entisols (Younger alluvial soils) and Inceptisols (Calcareous alluvial soils). The soil of the district is rich in nitrogen and calcium and experiences a continental monsoon type of climate owing to its great distance from the sea (S.N. Dwivedi, 2013).

The drinking water supplied to a community is considered to be pure, wholesome and safe. People of Khagaul are fed by municipal and Tube-well ground water. Sewage and domestic waste water is discharged every day in the open area and river Ganga. During major part of the year, especially during the rainy season, people get unprocessed water for drinking as well as domestic purposes. The municipal supply pipelines are leakage at numerous places in the city and places these are mixed up with the drains. Water of other sources such as hand pumps, Tube-well also

get contaminated due to human interferences, pesticide, drains and septic tanks around the source (Aboo et al, 1968; Ebers and Bischofsberger, 1987). As a result, the physico-chemical and bacteriological properties of drinking water of different sources have deteriorated substantially.

Water is essential for survival of life; up to 60% of the human adult body weight is water. . Intracellular fluid is about 35 liters (40% of body weight) and extracellular fluid is about 15 liters (24% of body weight). Each day human must consume a certain amount of water to survive. Of course, this varies according to age and gender and also by where someone lives. Each day human must consume a certain amount of water to survive. Of course, this varies according to age and gender and also by where someone lives. Generally, an adult male needs about 3 liters per day while an adult female needs about 2.2 liters per day. So water is essential for survival of life (U. satyanarayana,2007).But contaminated water cause water borne diseases like Typhoid, Cholera, Dysentery, Jaundice, Amoebiasis occurs due to unhygienic drinking water. The cause of water borne disease is coliforms bacteria. Coliforms bacteria are defined as rod shaped gram –ve non spore forming and motile or non motile bacteria, always present in the digestive tracts of animals including humans and are found in their wastes. They are also found in plants and soil material (K. Park, 2017). Minerals are also essential for survival of life. Electrolytes are the compounds which readily dissociate in solution and exist as ions i.e +vely and –vely charged particles. Electrolytes are well distributed in the body fluid in order to maintain the osmotic equilibrium and water balance. But some minerals are harmful for life in improper proportion and some chemicals in water also have negative effects on our health. Pesticides can damage the nervous system and cause cancer because of carbonates and organophosphates that they contain. Chlorides can cause reproductive and endocrinal damage. Arsenic causes liver damage, skin cancer and vascular diseases

Aims and Objective: To evaluate the quality of drinking water of khagaul city of Patna district.

MATERIALS AND METHODS:

Altogether two sites, viz. municipal water and tube-well water, were selected of populated areas. The samples were collected from Jan 2019 to Dec 2019 between 08:00AM to 11:00AM. The guideline of World Health Organization was followed for the frequency of sampling.

Following parameters have tested for analysis of quality of water:

1. The water temperature was recorded with the help of mercury thermo meter graduated up to 1100 C.
2. pH was determined by pH meter.
3. TDS is measured by TDS meter.
4. Dissolved oxygen was estimated by Winkler's modified method.
5. Detection of coliforms microbes by multiple fermentation tube technique.

RESULTS AND DISCUSSIN:

Ten samples of two categories of water are collected from different area of khagaul which is tested for analysis of quality and following results are observed

Table: 1- Test results of different water samples of khagaul city of Patna (Bihar)

Test results of different water sample of khagaul city of Patna (Bihar)					
samples	parameters				
---	temp	pH	TDS	BOD	Coliforms
Municipal supply water site A	27.70 ⁰ C	7.60	480	8.7ppm	12.132x10/L
Municipal supply water site B	28.48 ⁰ C	7.52	493	9.4ppm	11.113x10/L
Municipal supply water site C	26.00 ⁰ C	7.57	496	8.5ppm	12.232x10/L
Municipal supply water site D	27.29 ⁰ C	7.62	476	9.2ppm	12.488x10/L
Municipal supply water site E	26.20 ⁰ C	7.54	496	8.8ppm	12.632x10/L
Tube-well water site A	23.78 ⁰ C	7.56	511	2.9ppm	3.107 x 10/L
Tube-well water site B	23.11 ⁰ C	7.61	587	3.6ppm	2.945 x 10/L
Tube-well water site C	22.45 ⁰ C	7.58	608	3.3ppm	2.675 x 10/L
Tube-well water site D	22.98 ⁰ C	7.57	592	4.3ppm	2.728 x 10/L
Tube-well water site E	22.28 ⁰ C	7.50	582	4.7ppm	2.758 x 10/L

The maximum temperature was (28.48⁰C) in municipal water and minimum (22.28⁰C) in Tube-well water. The pH value was alkaline during major part of the investigation all the sources. The TDS varies between 608ppm to 476ppm. The concentration of dissolved oxygen varied between 2.9ppm to 9.4ppm, maximum in municipal water and lower in tube well water. As compared to surface water, the average values of dissolved oxygen were significantly lower in underground and sub surface water. The higher values in municipal water may be due to direct contact of ambient oxygen during the filtration process and in the distribution system. The total bacterial density was maximum in municipal water (12.632x10/L) and lower in Tube-well water (2.675 x 10/L). The maximum value found in municipal water was possibly due to the higher concentration of the microbial Population, adding through domestic waste water. Possible way of contamination was through the rusted, damaged pipelines located parallel and closer to the drains. The outbreak of several water borne diseases in different parts of khagaul may be attributed to this concentration. Other than supply water, the average value of total bacterial density was also significantly higher in Tube-well water. This may possibly be due to seepage from septic tanks and drains. Some 21 mineral elements are known or suspected to be essential for human (U. Satyanarayana, 2007). This number includes four Cl⁻, PO₄⁻³, MoO₄⁻², F⁻ that function physiologically as anions and eight that function in their simple cationic form i.e., Ca⁺², Zn⁺², Na⁺, K⁺, Fe⁺², Cu⁺², Mn⁺², Mg⁺². Unacceptable amount of these minerals are also harmful to life. But khagaul city of Patna (bihar) have minerals in limited amount and have also TDS 476ppm to 608ppm which is good and potable. But in microbiological parameters water is unhygienic and poses some risk of water born diseases like Typhoid, Cholera, Dysentery, Jaundice, Amoebiasis.

CONCLUSION:

Present study revealed that the drinking water from different sources at khagaul city of patna (bihar) is satisfactory in all parameter except coliforms microbes. For the purpose of human consumption Tube well water is satisfactory. Municipal water is unhygienic and poses some risk of water born diseases like Typhoid, Cholera, Dysentery, Jaundice, Amoebiasis.

ACKNOWLEDGEMENTS:

The author is thankful to Dr D.K Paul Assistant professor, Department. of zoology, Patna University for guidance and Packed drinking water plant, phulwarisariiff (patna) to provide facilities.

REFERENCES:

- [1] Aboo, K.M., Sastty, C.A and Alex. P.G.:A study of well water in bhopal city. Environ. Health. 1968; 10, 189-203.
- [2] S.N. Dwived: Ground water information booklet, patna-Bihar [Central ground water board Med Eastern region-Patna] 2013.
- [3] Ebers. T and Bischofsberger. W: Contamination of ground water by septic tank percolation system Wat. Sc. Tech. 1987; 19,1275-1279.
- [4] K Park,: Park' Textbook of Preventive and Social Medicine, 24th edition 2017; P 28-75.
- [5] U. Satyanarayana : Biochemistry, Third Revised Edition 2007; P 403-423.
- [6] WHO: Guideline for drinking water quality, world health organization Geneva. 1984;(1)138.

