Analysis of Physical and Chemical Parameter of Tap Water at Jankipuram, Madiyaon and Chhata Mill in Lucknow District

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Abstract*— The quality of drinking water is one of the most important determinants of human health. Although in most countries the quality of drinking water varies, it is generally found to be on an acceptable level; however, in several others, especially those underdeveloped, the quality is not satisfactory and hence, overall poor-quality drinking water has led to many diseases. All of these studies focused on water quality Analysis and were conducted by some of the most recognized experts around the state. This Research work was related with water quality parameters such as pH, Turbidity, TDS, Odor, Taste, Chloride, Sulphate, Fluoride, Color, Zinc, Lead. Samples 3 of water were also taken from Jankipuram, Madiyaon and chhata mill (All in Lucknow). This special issue hopes to address some aspects of impact between the qualities of drinking water and public health so that appropriate actions may be taken toward improving conditions in various nations' qualities of drinking water. This editorial introduction discusses briefly some recent studies on the quality of drinking waters and public health summarized briefly the key points from each contribution contained within this issue and then some fields/research directions were identified as being necessary to promote further scientific investigation into quality drinking water and public health. The articles contained within this issue are both intriguing and cover a broad spectrum regarding this research topic; they will aid significantly in efforts toward sustainable protection of potable water quality.

Keywords— Raw water, pH, TDS, Potable water, Turbidity.

1. INTRODUCTION

The quality of drinking water has reduced, and this has affected the health of consumers. The reports indicate that at least 2 billion people in the world use drinking water sources contaminated with human feces (WHO 2018) [1]. Several developing countries have targeted reductions in waterborne diseases as an apex public health goal in recent years, along with some progress made in the past years; however, it is far from satisfactory- particularly in rural areas where small improvements may soon be offset by increased demand for clean water coupled with decreased supply due to population growth and economic development (Li and Qian 2018a) [2]. Everyone, without exception to nationality, religion, or creed must have access to safe drinking water as a basic human right. The transmission of diseases like cholera, diarrhea, dysentery, and polio is associated with contaminated drinking water and poor sanitation conditions (WHO 2018)[1].

Quality drinking water protection and management decision-making depends on understanding the factors that influence drinking water quality. Generally, the qualities mentioned above are influenced by the source water quality, pre-treatment at the water treatment plant before distribution, the distribution system of the water, containers or tanks for storing water, and household filters. Long et al. (2018) [3] . Investigated the impacts of dry and wet seasons and land use on water quality in a karst system of Mexico, and believed that water–rock interactions, hydrology, and land cover were more important factors on water quality than land use.

2. LITERATURE REVIEW

2.1Sajitha V. et al. (2021) *conducted a study on the quality of pond water in Surja District, Chhattisgarh. The study focused on several physical and chemical parameters to assess the water's suitability for domestic and drinking purposes. One of the key parameters examined was* ***pH****. According to BIS (IS 10500), the permissible pH range for drinking water is 6.5 to 8.5. However, the pH of the pond water ranged between 4.62 and 7.21, indicating acidity and potential contamination. The* ***Total Dissolved Solids (TDS)*** *in the pond water were found to range from 152.12 to 265.97 ppm, well within the permissible limit of 500 mg/L as set by BIS and WHO. Elevated TDS levels, if beyond the limit, may affect the taste, hardness, and safety of drinking water. The* ***Dissolved Oxygen (DO)*** *values ranged from 1.76 to 8.4 mg/L, whereas the minimum recommended DO level is 5 mg/L. Lower DO levels suggest the water may be under oxidative stress due to organic or microbial contamination. Water temperature in the ponds varied between 26.8°C to 29.6°C, which is relatively warm and conducive to microbial growth. These findings are consistent with studies conducted in Sasaram, Bihar, where temperatures ranged from 23°C to 27°C.* ***Magnesium*** *and* ***Potassium*** *concentrations were between 0–7.24 mg/L and 0–4 mg/L, respectively.* ***Chloride*** *levels ranged from 7.1 to 28.24 mg/L, which is well below the permissible limit of 250 mg/L, indicating the water is safe for irrigation.*

2.2Humaira Kanwal et al. (2020) *Humaira Kanwal et al.(2020) analyzed the drinking water quality in Sialkot, Pakistan, by testing physical and chemical parameters from three areas. Six water samples were collected from each location. The* ***pH values*** *were within the WHO permissible range of 6 to 8.5: A1 (6.54), A2 (6.8), and A3 (6.6).* ***Turbidity*** *values were slightly elevated: A1 (8.5 NTU), A2 (7.0 NTU), and A3 (5.2 NTU), while the permissible limit is 5 NTU. Despite this, water quality was considered satisfactory for drinking, as other parameters like* ***TDS****,* ***Chloride****, and* ***Sulphate*** *were within acceptable limits.*

2.3Premlata Vikal et al. (2019) *investigated the waterquality of Pichhola Lake in Udaipur, Rajasthan. The study revealed that* ***Conductivity****,* ***Chemical Oxygen Demand (COD)****, and* ***Sulphate*** *concentrations exceeded WHO and BIS limits, rendering the lake water unfit for drinking. High* ***COD*** *levels point toward significant organic pollution, emphasizing the need for proper water treatment before human consumption.*

2.4Manjare et al. (2018) *studied the physico-chemical characteristics of water from the Tamaladge Water Tank in Kolhapur District, Maharashtra. All parameters, including* ***TDS****,* ***pH****, and* ***Chloride****, were within the prescribed limits, with only slight fluctuations. The water was deemed suitable for both domestic and irrigation purposes. This study shows that even in rural areas, tank water can meet safety standards if regularly monitored.*

2.5Basawaraja Simpi et al. (2017)*conducted a periodic analysis of water from the Hoshalli Water Tank in Shimoga District, Karnataka. Their results confirmed that water quality remained within permissible limits for*

*domestic and agricultural use. The study underlines the importance of **regular monitoring**, especially considering seasonal variations and human activities such as farming.*

***2.6Aryal et al. (2016)** Examined drinking water from various sources in Myadgi District, Nepal, and compared it with WHO standards. A major concern highlighted was the presence of **Coliform bacteria**, which indicates fecal contamination. This was attributed to poor sanitation and inadequate water treatment, emphasizing the urgent need for improved water sanitation infrastructure, especially in rural regions.*

***2.7G. Di Martino et al. (2015)** assessed the microbiological, chemical, and physical quality of water in three regions of Turkey. The **pH** values were consistently 7.6, within the safe range. However, **water hardness** varied between 240–252 mg/L, which is considered high and may affect taste and cause scaling in pipes. They also detected elevated levels of **iron** (1.1–2.3 µg/L) and **copper** (1.9–10.4 mg/L), which can lead to health issues such as gastrointestinal problems and liver damage if not controlled.*

3. METHODOLOGY

Study area of this research is ***Jankipuram, Madiyaon and chhata mil (All in Lucknow).***

Depth of water table varies from region to region. For drinking purposes water quality is checked by physical and chemical testing and samples are collected from different place. All three types of water sample from different 3 place have been selected of region for the study of different place respectively (Table 1).

Table 1 Respectively different sampling places:

SN	PLACE NAME	SAMPLE	
1.	***Jankipuram***	SAMPLE 1	J_1
			J_2
			J_3
2.	***Chhata mill***	SAMPLE 2	C_1
			C_2
			C_3
3.	***Madiyaon***	SAMPLE 3	M_1
			M_2
			M_3

Each site was sampled thrice to ensure reliability and consistency. The samples were analysed in the laboratory using standard procedures recommended by **BIS (Bureau of Indian Standards)** and **WHO** guidelines.

The analysis covered:

i. **Physical parameters**: pH, turbidity, taste, and odour.

ii. **Chemical parameters**: Total Dissolved Solids (TDS), chloride, sulphate, fluoride, zinc, and lead.

Parameter was measured using standard instruments:

i. pH meter for pH values, Measures how acidic or basic the water is.

ii. Turbidimeter for turbidity, Measures the clarity of water by checking suspended particles.

iii. TDS meter for dissolved solids, Measures the total amount of dissolved solids (like salts) in water.

iv. Spectrophotometer or AAS for fluoride, zinc, and lead. Detects and measures specific chemicals like fluoride, zinc, and lead by analysing light absorption.

4. DISCUSSION AND RESULTS

Water is collected from 3 sample of one selected area.

i. Sample 1 Blue **Jankipuram.**

ii. Sample 2 Orange **Chhatta Mill,**

iii. Sample 3 Grey **Madiyaon.**

4.1 ***Turbidity:*** *The turbidity of water indicates the presence of suspended particles; higher values reduce water clarity. As per BIS, the acceptable limit for drinking water is below 5 NTU. In the study:*

i. *Jankipuram: Turbidity ranges from 4.0 to 4.5 NTU*

ii. *Chhatta Mill: 4.4 to 4.8 NTU*

iii. *Madiyaon: 4.0 to 4.5 NTU*

All values are within permissible limits but close to the upper limit, indicating possible contamination from ***urban runoff or organic matter****, which may affect water quality if not treated properly.*

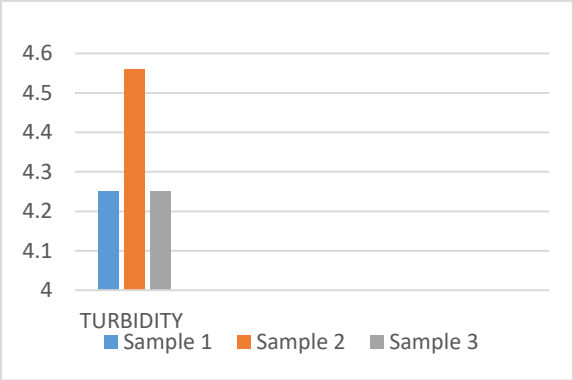

Figure 1. Turbidity at different places

4.2 ***pH:*** *The pH of water reflects its acidity or alkalinity; the safe range by BIS and WHO is 6.5–8.5. At 25°C*

i. *Jankipuram: pH ranges from 7.56 to 7.89*

ii. *Chhatta Mill: 7.48 to 7.56*

iii. *Madiyaon: 7.40 to 7.60*

All values are within the acceptable range, indicating neutral to slightly alkaline water, suitable for drinking and aquatic life, with no immediate concern regarding acidity or alkalinity.

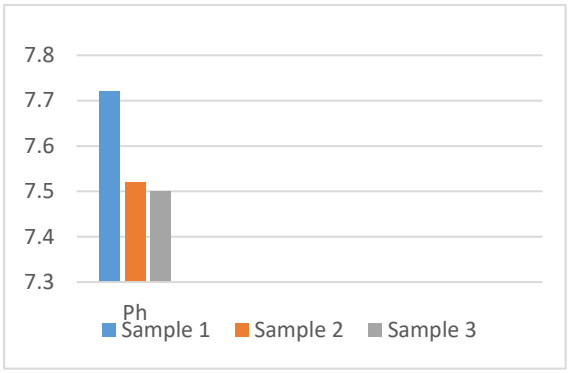

Figure 2. pH at different places

4.3 ***Total Dissolved Solids (TDS): indicate the amount of dissolved substances in water; the BIS limit for drinking water is 500 mg/L.***

i. *Jankipuram: TDS ranges from 340–350 mg/L*

ii. *Chhatta Mill: 360–366 mg/L*

iii. *Madiyaon: 325–332 mg/L*

All values are well within the permissible limit, indicating the water is ***safe and palatable****, with low chances of hardness or mineral-related issues.*

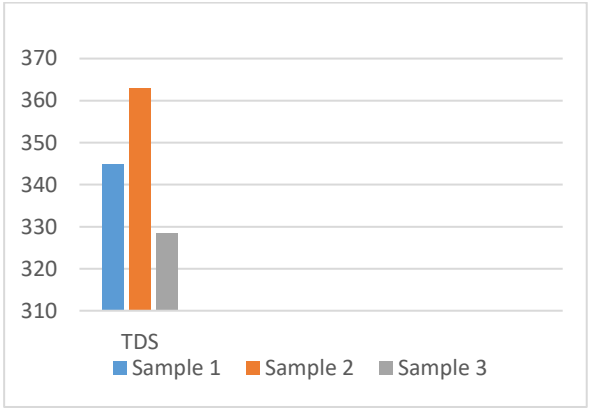

Figure 3. TDS at different places

4.4 ***Chloride (Cl^-):*** *in water affects taste and corrosion; the BIS permissible limit is 250 mg/L.*

i. *Jankipuram: 11.00–11.20 mg/L*

ii. *Chhatta Mill: 18.58–18.90 mg/L*

iii. *Madiyaon: 26.01–26.07 mg/L*

*All values are **well below the limit**, indicating **no risk** of salinity or taste issues; water is **safe for consumption** in terms of chloride content.*

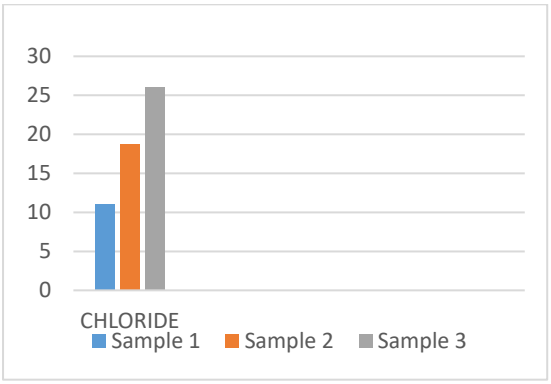

Figure 4. Chloride at different places

4.5 ***Zinc (Zn):*** *in water is essential in trace amounts; the **BIS limit is 5 mg/L**.*

i. *Jankipuram: 0.61–0.64 mg/L*

ii. *Chhatta Mill: 0.74–0.79 mg/L*

iii. *Madiyaon: 0.85–0.88 mg/L*

*All values are **well below the permissible limit**, indicating **no toxicity risk** and acceptable zinc levels in all samples.*

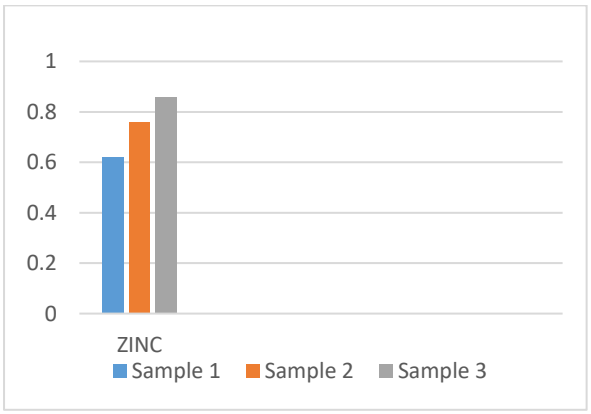

Figure 5. Zinc at different places

4.6 ***Sulphate (SO_4^{2-}):*** *Sulphate in water can affect taste and cause laxative effects at high levels; the BIS limit is 200 mg/L.*

i. *Jankipuram: 7.65–7.78 mg/L*

ii. *Chhatta Mill: 12.45–12.91 mg/L*

iii. *Madiyaon: 33.8–34.87 mg/L*

All values are well within safe limits, indicating no health risk and good sulphate quality in the water across all locations.

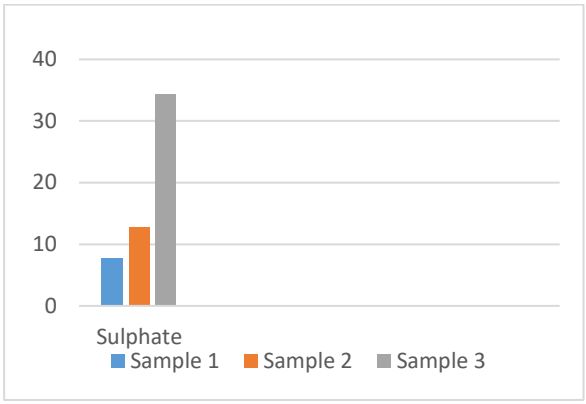

Figure 6. Sulphate at different places

4.7 ***Fluoride (F^-)*** *in water is essential in small amounts but harmful in excess; the BIS limit is 1.0 mg/L.*

i. *Jankipuram: 0.69–0.74 mg/L*

ii. *Chhatta Mill: 0.82–0.86 mg/L*

iii. *Madiyaon: 0.90–0.95 mg/L*

All values are ***within the safe range****, indicating* ***no risk of fluorosis*** *and adequate fluoride levels for dental health.*

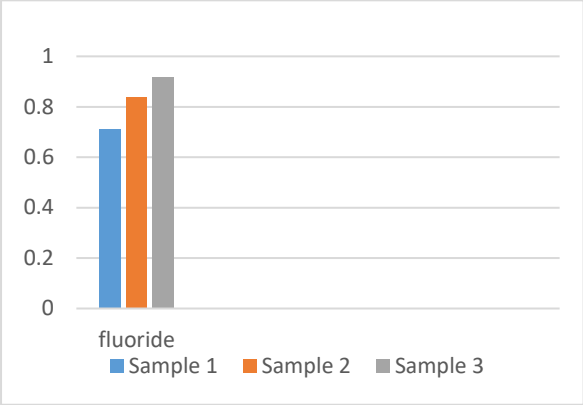

Figure 7. Fluoride at different places

4.8 ***Lead (Pb)*** *is toxic even in small amounts; the BIS limit is 0.01 mg/L.* ***Jankipuram, Chhatta Mill, and Madiyaon****: All samples show* ***BLQ (Below Limit of Quantification, LOQ = 0.001 mg/L)***

This indicates ***non-detectable levels of lead****, meaning the water is* ***safe from lead contamination*** *in all areas.*

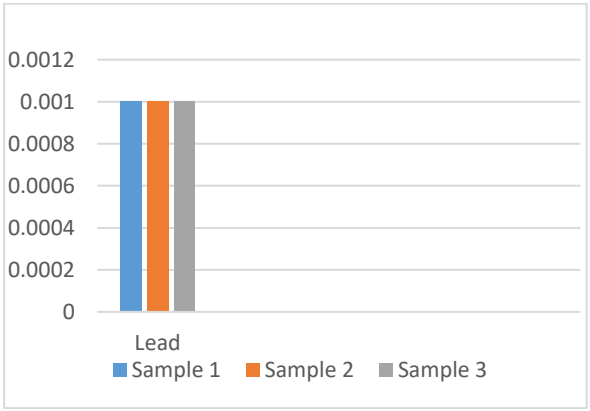

Figure 8. Lead at different places

The water quality parameters from three areas Jankipuram, Chhatta Mill, and Madiyaon were analyzed *pH, Turbidity, TDS, Odor, Taste, Chloride, Sulphate, Fluoride, Color, Zinc, Lead* parameters. (Figure 9- Jankipuram, Figure 10- Chhatta Mill, Figure 11 - Madiyaon).

Parameter	Sample J1	Sample J2	Sample J3	Unit
Odour	Agreeable	Agreeable	Agreeable	-
Taste	Agreeable	Agreeable	Agreeable	-
Turbidity	BLQ (LOQ=0.1)	BLQ (LOQ=0.1)	BLQ (LOQ=0.1)	NTU
pH Value @25°C	7.66	7.56	7.69	-
Total Dissolved Solids	346	340	350	mg/L
Chloride as Cl^-	11.15	11.00	11.20	mg/L
Sulphate as SO_4	7.78	7.70	7.65	mg/L
Fluoride as F^-	0.74	0.70	0.69	mg/L
Colour	BLQ (LOQ=1.0)	BLQ (LOQ=1.0)	BLQ (LOQ=1.0)	Hazen
Zinc as Zn	0.63	0.61	0.64	mg/L
Lead as Pb	BLQ (LOQ=0.001)	BLQ (LOQ=0.001)	BLQ (LOQ=0.001)	mg/L

Figure 9. Results of chemical and physical parameter of drinking water **Jankipuram Sample 1**

Parameter	Unit	Sample C1	Sample C2	Sample C3
Odour	—	Agreeable	Agreeable	Agreeable
Taste	—	Agreeable	Agreeable	Agreeable
Turbidity	NTU	4.4	4.5	4.8
pH value at 25°C	—	7.48	7.50	7.56
Total Dissolved Solids (TDS)	mg/L	366	360	363
Chloride (as Cl^-)	mg/L	18.58	18.90	18.70
Sulphate (as SO_4^{2-})	mg/L	12.91	12.80	12.45
Fluoride (as F^-)	mg/L	0.82	0.85	0.86
Colour	Hazen	BLQ (LOQ = 1.0)	BLQ (LOQ = 1.0)	BLQ (LOQ = 1.0)
Zinc (as Zn)	mg/L	0.74	0.75	0.79
Lead (as Pb)	mg/L	BLQ (LOQ = 0.001)	BLQ (LOQ = 0.001)	BLQ (LOQ = 0.001)

Figure 10 Results of chemical and physical parameter of drinking water in **Chhata Mill Sample 2**

Parameter	Unit	Sample M1	Sample M2	Sample M3
Odour	—	Agreeable	Agreeable	Agreeable
Taste	—	Agreeable	Agreeable	Agreeable
Turbidity	NTU	4.8	4.2	4.0
pH (at 25°C)	—	7.44	7.40	7.60
Total Dissolved Solids (TDS)	mg/L	338	325	332
Chloride (as Cl^-)	mg/L	26.01	26.05	26.07
Sulphate (as SO_4^{2-})	mg/L	34.87	34.80	35.00
Fluoride (as F^-)	mg/L	0.93	0.90	0.95
Colour	Hazen	BLQ*	BLQ*	BLQ*
Zinc (as Zn)	mg/L	0.88	0.85	0.87
Lead (as Pb)	mg/L	BLQ**	BLQ**	BLQ**

igure 11. Results of chemical and physical parameter of drinking water in **Madiyaon Sample 3**

5. CONCLUSIONS

i. **All water samples meet BIS and WHO standards**, indicating they are generally safe for drinking and domestic use.

ii. **Turbidity levels are close to the upper safe limit**, suggesting the need for regular monitoring to prevent future issues.

iii. **pH, TDS, sulphate, chloride, fluoride, and zinc values** in all three areas remain well within permissible limits, reflecting good chemical water quality.

iv. **Lead levels are below detectable limits**, ensuring there is no heavy metal contamination risk in the sampled areas.

v. Overall, **water quality in Jankipuram, Chhatta Mill, and Madiyaon is suitable for consumption**, but continuous observation is recommended to maintain safety standards.

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