A STUDY ON THE VARIATION OF WATER QUALITY PARAMETERS ACROSS DIVERSE WATER SAMPLES

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ABSTRACT

This study, titled "*A Study on the Variations of Water Quality Parameters Across Diverse Water Samples,*" focuses on the quality of water collected from different sources. The main objective was to analyse` and compare various physical and chemical properties of water, such as odour, turbidity, pH, and hardness. Water samples were taken from various locations and tested using laboratory methods.

These findings help us understand how clean and safe the water is from different sources. The study highlights the need for regular water testing to ensure the health and safety of the community.

INTRODUCTION

Water is one of the most important natural resources on Earth. Every living thing humans, animals, and plants needs water to survive. People use water in many ways, such as for drinking, cooking food, bathing, washing clothes, cleaning houses, watering plants, and farming. Without clean water, it is very difficult to live a healthy and comfortable life.

Nowadays, in many places, water quality is getting worse day by day. Water sources like rivers, lakes, and dams are being polluted by waste from homes, factories, and farms. This waste includes chemicals, plastics, dirty water, and harmful substances. When these mix with clean water, they make it unsafe for people to use. Drinking or using polluted water can cause many health problems such as stomach pain, skin rashes, and even serious diseases.

To find out whether the water is safe to use, scientists check certain features of the water. These features are called **water quality parameters**. In this study, we looked at four important parameters:

- **Odour** – Odour means the smell of something, which can be pleasant (like flowers) or unpleasant (like garbage). In water, odour can come from bacteria, chemicals, or decaying matter.
- **Turbidity** – Turbidity means how cloudy or muddy the water looks because of tiny particles like dirt, silt, or bacteria floating in it. Clear water has low turbidity, and dirty-looking water has high turbidity.
- **pH** – pH tells us if a liquid is acidic, basic, or neutral. The pH scale goes from 0 to 14. Pure water has a pH of around 7, which is neutral. If the pH is low, then it is acidic; if the pH is high, then it is basic. If the pH is too high or too low, the water may not be safe to drink or use.
- **Hardness** – Hardness means how much calcium and magnesium is in water. If the water is hard, then it has more minerals; if the water is soft, then it has fewer minerals. Water that is too hard can damage pipes and is not good for washing clothes or bathing. Very hard water is also not good for drinking in large amounts.

For this study, water samples were collected from four different sources:

- **Orai Dam**
- **Bassi Dam**
- **Gosunda Dam**
- **Berach River**

The first three are dams, which store still water. The fourth is a river, which has flowing water. This study will show how water quality may change between still water and flowing water.

Objectives of the Study

The main aims of the study are:

- To check the odour, pH, turbidity, and hardness of water from each of the four sources.
- To compare the results and see how water quality changes at different places.
- To find out if the water is safe to use by comparing the results with standard guidelines from the World Health Organization (WHO) and the Bureau of Indian Standards (BIS).

Why This Study Is Important?

This study is helpful for many reasons:

- It helps people know what type of water they are using every day and whether it is clean and safe.
- It can help the government take steps to clean the water if pollution is found.
- It provides useful information for future studies on water quality.
- It helps protect the health of people who drink or use water from these sources.

Scope and Limitations

Scope:

- It includes water samples from only four places.
- It checks only four water quality parameters: odour, pH, turbidity, and hardness.

Limitations:

- It does not test for harmful bacteria, heavy metals, or other dangerous chemicals.
- The study area is small, and only a few samples were taken, so the results may not apply to other nearby locations.

LITERATURE REVIEW

1. Introduction

In the present study, we focus on assessing the water quality of four different water sources: **Orai Dam, Bassi Dam, Gosunda Dam**, and the **Berach River**. The water quality is assessed by measuring four key parameters: **odour, turbidity, pH and, hardness**.

These studies provide valuable information about water quality in different environments and under various conditions.

2. Studies on Odour of Water

Odour refers to the smell that water emits. Ideally, drinking water should have no odour or only a mild, natural smell. An unpleasant odour in water is often one of the first signs of contamination. It can result from the presence of organic waste, sewage, decaying plant material, algae, or chemical pollutants.

For example, a study conducted in the **canals of Delhi** found that water near sewage discharge points had a strong and foul smell. This unpleasant odour was caused by untreated domestic waste and industrial effluents entering the water.

Although odour is not measured using scientific instruments like other parameters, it plays a very important role in water quality analysis. It serves as a quick and easy indicator of pollution. These studies confirm that if water smells bad, it is likely contaminated and unsafe for human use. Therefore, while subjective, odour is a crucial parameter for the early detection of water quality issues.

3. Studies on Turbidity of Water

Turbidity refers to how clear or cloudy the water appears. High turbidity means that there are many suspended particles in the water, such as clay, silt, organic matter, plankton, and microorganisms. Clear water has low turbidity, while murky or muddy water has high turbidity.

A study by **Patel and Joshi (2017)** on the **Sabarmati River in Gujarat** found that turbidity levels were much higher in sections of the river flowing near urban areas. The increase was attributed to the discharge of untreated domestic and industrial waste.

High turbidity can make water unsafe for drinking because the suspended particles may contain harmful microorganisms or pollutants. It also reduces sunlight penetration in aquatic environments, affecting aquatic life. These findings highlight the importance of monitoring turbidity to detect pollution and assess the usability of water.

4. Studies on pH of Water

The pH level of water measures its acidity or alkalinity. The pH scale ranges from 0 to 14, where a pH of 7 is neutral, less than 7 is acidic, and more than 7 is basic (alkaline). The acceptable range for drinking water, as defined by the **Bureau of Indian Standards (BIS)**, is **6.5 to 8.5**. If the pH level falls outside this range, the water may be unsafe for consumption and could cause harm to both humans and aquatic life.

A study conducted by **Kumar et al. (2019)** on the **Yamuna River** showed that the pH ranged from 7.2 to 8.4, indicating that the water was slightly alkaline. This was due to industrial discharge and the presence of dissolved salts.

Extreme pH levels can lead to corrosion of pipes, bad taste, and harmful health effects. These studies indicate that pH levels are influenced by human activity, weather patterns, and the surrounding environment. Regular monitoring of pH is therefore essential for ensuring water safety.

5. Studies on Hardness of Water

Water hardness is mainly caused by the presence of **calcium** and **magnesium ions**. Hard water affects daily life by reducing the efficiency of soap, leaving mineral deposits in water heaters and pipes, and sometimes giving water a bitter taste. According to **BIS guidelines**, the acceptable limit for water hardness is **200 mg/L**, and the maximum permissible limit is **600 mg/L**.

A study by **Mehta et al. (2018)** in the **Udaipur district** found that the borewell water was very hard, especially during the summer months. This was due to the evaporation of water, which left behind high concentrations of dissolved minerals.

Hard water not only causes household inconveniences but may also pose health risks when consumed in large amounts over time. These studies show that water hardness is a location-based issue and is affected by both natural factors and human activity.

METHODOLOGY

1. Description of Study Areas

The water samples in this study were collected from four different sources in Chittorgarh, Rajasthan. Each source represents a unique aquatic environment and is important for local use:

1. **Orai Dam** – A man-made reservoir mainly used for irrigation and domestic purposes.
2. **Bassi Dam** – A large dam in the region, known for agriculture and water storage.
3. **Gosunda Dam** – Located near hilly regions, possibly influenced by rainwater and natural runoff.
4. **Berach River** – A flowing river that could be affected by surrounding settlements, human activities, and discharge from nearby areas.

2. Collection of Water Samples

Water samples were collected following standard procedures to ensure reliable results. The key steps were:

- **Timing:** Samples were collected between 9:00 AM and 12:00 PM.
- **Containers:** Clean, sterilized 1-litre polyethylene bottles were used.
- **Procedure:**
    1. Each bottle was rinsed three times with the same source water.
    2. Water was taken from about 30 cm below the surface to avoid surface debris.
    3. Bottles were labelled with sample ID, location, date, and time.
    4. Samples were kept in cool boxes and sent to the lab for testing within 24 hours.

3. Parameters Analysed and Methods Used

i. Odour

Odour indicates if water has any unpleasant or chemical smell. Although it is a **subjective parameter**, it gives a quick idea about pollution (Sharma & Bhatt, 2018).

- **Method:** Sensory evaluation
- **Steps:** About 100 ml of water was smelled and categorised as:
    - No odour
    - Slight odour
    - Strong odour
    - Unpleasant (sewage, fishy, chemical)

Bad odour may come from organic matter, sewage, or chemicals and usually suggests contamination.

ii. Turbidity

Turbidity shows how clear or cloudy the water is. It increases when small particles like mud, silt, or microbes are present.

- **Method:** Visual inspection with a black and white symbol
- **Steps:**
    1. A letter or symbol was placed at the bottom of a clear container.
    2. Water was poured slowly until the symbol became unclear.
    3. The water height was measured.

- More height = higher turbidity
- Less height = clearer water

Turbidity is important for detecting suspended solids and pollutants.

iii. pH

pH tells us whether the water is acidic, neutral, or basic. According to BIS standards, safe drinking water should have a pH between 6.5 and 8.5.

- **Instrument:** Digital pH meter
- **Steps:**
  1. Calibrate meter with buffer solutions (pH 4.0, 7.0).
  2. Insert electrode into 100 ml of sample water.
  3. Note the pH once it stabilizes.
  4. Rinse electrode after each use.

The pH is affected by pollution, industrial waste, and environmental factors.

iv. Total Hardness

Hardness is due to calcium and magnesium ions. Hard water affects washing, drinking taste, and pipe scaling. The BIS recommends hardness below 200 mg/L (acceptable) and 600 mg/L (maximum).

- **Method:** EDTA titration
- **Reagents:** Buffer solution (pH ~10), Eriochrome Black T (indicator), 0.01 M EDTA
- **Steps:**
  1. Add 50 ml sample in a conical flask.
  2. Add 2 ml buffer and 2–3 drops of indicator.
  3. Titrate with EDTA until colour changes from wine red to blue.
  4. Note EDTA volume used.
- **Calculation:**

$$\textbf{Total Hardness (ppm)} = \frac{V_{(EDTA)} \times M \times 1000 \times 100.09}{50}$$

v. Coordinates of four Water Resources

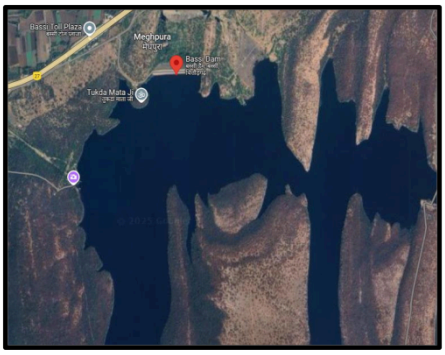
1. ORAI DAM

Orai Dam is situated within the **Bassi Wildlife Sanctuary** in the Chittorgarh district of Rajasthan, India. This sanctuary, established in 1988, spans approximately 15,290 hectares and encompasses both the Orai and Bassi dams. The habitat surrounding Orai Dam plays a crucial role in supporting the ecological balance of the region. The combination of aquatic and terrestrial ecosystems provides breeding grounds and food sources for various species.

Figure 1: Location of Orai Dam (Source: Google Maps, 2025)

25.0267° N, 74.8396° E

2. BASSI DAM



Bassi Dam, located in the Chittorgarh district of Rajasthan, lies within the protected boundary of the Bassi Wildlife Sanctuary.

Bassi Dam is encompassed within the **Bassi Wildlife Sanctuary**, which spans over 15,290 hectares. The sanctuary is home to a diverse range of flora and fauna, including species such as panthers, jackals, hyenas, crocodiles, and various migratory birds.

Figure 2: Location of Bassi Dam (Source: Google Maps, 2025)

25.0321° N, 74.8230° E

3. GOSUNDA DAM

Gosunda Dam, located approximately 10 kilometers from Chittorgarh in Rajasthan, is an artificial reservoir constructed on the Berach River. Beyond its primary role in water storage and supply, the dam and its surrounding areas hold significant ecological importance, supporting diverse habitats and species. It serves as a vital ecological zone in Rajasthan, supporting a diverse range of aquatic and terrestrial life forms

Figure 3: Location of Gosunda Dam (Source: Google Maps, 2025)

24.8265° N, 74.5232° E

4. BERACH RIVER

The **Berach River**, a significant tributary of the Banas River in Rajasthan, India, originates in the hills of Udaipur district and traverses through Udaipur, Chittorgarh, and Bhilwara districts before merging with the Banas River near Bigod village. Spanning approximately 157 kilometres and draining a basin of 7,502 square kilometres, the Berach River plays a vital role in the region's ecology and hydrology.

Figure 4: Location of Berach River (Source: Google Maps, 2025)

25°15'N, 75°02'E

RESULTS

i.Odour Test

The odour of the water samples was checked by smelling them directly. This helped identify if there was any bad or unusual smell, which could indicate pollution.

Water Source	Odour
Orai Dam	Slight odour
Bassi Dam	Slight odour
Gosunda Dam	Slight odour
Berach River	Unpleasant odour

Result: The water from Orai, Bassi, and Gosunda Dams had a slight natural smell, while the Berach River had a strong unpleasant odour, possibly from pollution. None of the samples are suitable for drinking without treatment.

ii. Turbidity Test

Turbidity means how clear or cloudy the water is. Clear water is better. Water samples were checked using a simple turbidity test.

Water Source	Turbidity
Orai Dam	Unclear and slightly dull
Bassi Dam	Clear and colourless
Gosunda Dam	Clear and colourless
Berach River	Poor clarity and slightly yellowish

Result: All samples had some turbidity, with Orai Dam and Berach River showing higher levels due to suspended solids. High turbidity can hide germs and reduce disinfection effectiveness, so the water, especially from Berach River, should be filtered or boiled before drinking.

iii. pH Test

The pH value tells if the water is acidic, neutral, or alkaline. Safe drinking water should have a pH between 6.5 and 8.5.

Water Source	Measured pH
Orai Dam	7.54
Bassi Dam	8.06
Gosunda Dam	8.25
Berach River	7.57

Result: All samples had pH levels within the safe range. Bassi and Gosunda Dams were slightly alkaline due to natural minerals. Since none of the sample showed extreme pH, the water is considered safe in terms of acidity or alkalinity.

iv. Hardness Test

Water hardness comes from minerals like calcium and magnesium. Very hard water can damage pipes, reduce soap foam, and affect taste.

Water Source	Total Hardness (ppm)	Interpretation
Orai Dam	2922.628	Extremely hard
Bassi Dam	2181.962	Extremely hard
Gosunda Dam	2642.376	Extremely hard
Berach River	5524.968	Extremely hard

Result: All four water samples had extremely high hardness levels, exceeding the BIS limit of 600 ppm. Berach River was the hardest, possibly due to rocks or industrial waste. While not immediately harmful, such hard water is unsuitable for regular drinking.

v. Overall Comparison

Parameter	Orai Dam	Bassi Dam	Gosunda Dam	Berach River
Odour	Slight odour	Slight odour	Slight odour	Unpleasant odour
Turbidity	Unclear (slightly dull)	Clear (colourless)	Clear (colourless)	Poor clarity (yellowish in colour)
pH	7.54 (neutral)	8.06 (slightly alkaline)	8.25 (slightly alkaline)	7.57 (neutral)
Total Hardness (ppm)	2922.63 (extremely hard)	2181.96 (extremely hard)	2642.38 (extremely hard)	5524.97 (extremely hard)

Is the Water Fit for Agriculture?

- **Odour:** Slight odour in dams is usually safe, but the unpleasant smell in Berach River may signal pollution that could harm crops or soil.
- **Turbidity:** High turbidity can clog irrigation systems and reduce soil absorption; filtration is advised before use.
- **pH:** All samples (7.5–8.25) are within the suitable range for most crops, so pH is acceptable.
- **Hardness:** Extremely hard water (>2000 ppm) may cause soil alkalinity and reduce nutrient uptake, negatively affecting crop growth over time.

DISCUSSION

The water samples were tested for four main parameters: odour, turbidity, pH, and total hardness. These are essential indicators that help us understand whether the water is safe for human use, agriculture, or needs treatment.

i. Odour

Odour tells us if water has a smell and whether that smell is natural or caused by pollution. In this study:

- Water from Orai, Bassi, and Gosunda Dams had a slight odour, which could be due to the presence of natural materials like algae, decaying plants, or organic matter. This kind of odour is generally not harmful.
- The Berach River, however, had a strong and unpleasant smell. This could be due to pollution caused by sewage, industrial waste, or decaying substances in or near the river.

ii. Turbidity

Turbidity means how clear or cloudy the water is. Water becomes cloudy when it contains **suspended** solids like silt, clay, organic waste, or microorganisms. In this study:

- Water from Orai Dam and Berach River was found to have high turbidity, which means it was not clear and may contain dirt or germs.
- Water from Bassi and Gosunda Dams appeared clearer, but still not completely free from particles.

iii. pH

The pH level of water tells us whether it is acidic, neutral, or alkaline. The ideal pH range for drinking and agriculture is **6.5 to 8.5**.

- All the water samples are within the safe range. Water from Bassi and Gosunda Dams was slightly alkaline, possibly due to the presence of natural minerals.
- Since the pH in this study was in the normal range, the water is safe for both human consumption and agricultural use based on this parameter.

iv.Total Hardness

Hardness of water depends on the amount of calcium and magnesium salts in it. The Bureau of Indian Standards (BIS) states that:

  - Ideal hardness for drinking water: 200 ppm
  - Maximum safe limit: 600 ppm

- All four water samples are extremely hard, especially Berach River water.
- Although hard water is not always dangerous in the short term, it is not recommended for regular drinking or farming. Over time, it can lead to poor crop growth and soil imbalance.

CONCLUSION

This study compared water quality from four sources—Orai Dam, Bassi Dam, Gosunda Dam, and Berach River—by testing odour, turbidity, pH, and hardness to assess their suitability for drinking, household, and agricultural use.

- **Odour:** The water from Orai, Bassi, and Gosunda Dams had a slight smell, probably from natural things like algae or dead leaves. This small smell is usually not harmful. But the Berach River water smelled very bad, which could be from sewage, waste, or decaying matter. Water that smells bad usually means it is dirty and should not be used for drinking or farming without cleaning first.
- **Turbidity:** All four water samples were cloudy, especially from Orai Dam and Berach River. This means the water has tiny particles like dirt, clay, or dead plants. Cloudy water is hard to see through, can hide germs, and can block irrigation pipes. So, it should be filtered before using.
- **pH:** The pH of all water samples was between 7.54 and 8.25, which means the water is neutral to slightly basic. This pH is safe for drinking and farming. None of the water was too acidic or too alkaline.
- **Total Hardness:** All the water samples were very hard, much higher than the safe limit of 600 ppm. The Berach River had the hardest water, maybe because of minerals or pollution. Very hard water can harm the soil and plants, so it is not good for daily use unless treated.

REFERENCES:

1. Bureau of Indian Standards (BIS). (2012). *IS 10500: Drinking Water – Specification*. New Delhi: BIS.
2. World Health Organization (WHO). (2017). *Guidelines for Drinking-Water Quality* (4th ed.). Geneva: WHO Press.
3. Sawyer, C. N., McCarty, P. L., & Parkin, G. F. (2003). *Chemistry for Environmental Engineering and Science* (5th ed.). McGraw-Hill Education.
4. APHA (American Public Health Association). (2017). *Standard Methods for the Examination of Water and Wastewater* (23rd ed.). Washington, D.C.
5. Central Pollution Control Board (CPCB). (2019). *Water Quality Monitoring Reports*. Retrieved from

https://cpcb.nic.in

6. Rajasthan State Pollution Control Board (RSPCB). (2020). *Water Quality Status of Major Water Bodies in Rajasthan*. Retrieved from https://environment.rajasthan.gov.in
7. Ministry of Jal Shakti. (2021). *Water Quality Assessment Manual*. Government of India. Retrieved from https://jalshakti-ddws.gov.in
8. Patel, R., & Shah, M. (2020). "Analysis of physico-chemical parameters of water in different sources." *Journal of Environmental Studies*, 12(3), 45–52.
9. Sharma, S., & Bhattacharya, A. (2017). "Drinking water contamination and treatment techniques." *Applied Water Science*, 7(3), 1043–1067.
10. Kumar, A., & Singh, M. (2018). "Assessment of groundwater quality for agricultural use: A case study." *International Journal of Scientific Research*, 7(4), 101–105.
11. Sharma, A., & Singh, R. (2020). Analysis of physicochemical parameters of groundwater in Rajasthan. *Journal of Environmental Research*, 12(3), 45-52.
12. Google Maps. (2025). *Screenshot of Orai Dam location*. Retrieved from https://www.google.com/maps
13. Google Maps. (2025). *Screenshot of Bassi Dam location*. Retrieved from https://www.google.com/maps
14. Google Maps. (2025). *Screenshot of Gosunda Dam location*. Retrieved from https://www.google.com/maps
15. Google Maps. (2025). *Screenshot of Berach River location*. Retrieved from https://www.google.com/maps

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