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WATER QUALITY TESTING OF LOCAL DRINKING WATER SOURCES

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ABSTRACT

Access to safe and chemically and microbiologically acceptable drinking water is fundamental to public health. However, variations in source characteristics, geochemical conditions, anthropogenic activities, treatment efficiency, storage practices, and distribution systems can influence the quality of water available for domestic consumption. Consequently, systematic monitoring of drinking-water quality is essential for evaluating its suitability and identifying potential quality-related concerns.

The present study, entitled "Water Quality Testing of Local Drinking Water Sources," focuses on the systematic evaluation and comparative assessment of water samples collected from selected local drinking-water sources. The study incorporates a multidisciplinary analytical approach involving the determination of physical, physicochemical, chemical parameters. The investigated parameters include colour, pH, electrical conductivity, total hardness, calcium hardness.

Water samples will be collected using appropriately labelled sampling containers and handled according to suitable sampling and preservation procedures. Laboratory analyses will be performed using appropriate standardized analytical techniques, including instrumental measurements, complexometric titration, argentometric titration, acid–base titration, spectrophotometric/colorimetric methods, depending on the parameter under investigation.

The analytical data will be systematically compiled and subjected to appropriate statistical treatment to determine central tendency, variability, and differences among sampling locations. The obtained values will subsequently be compared with applicable drinking-water quality standards to assess the conformity of the investigated samples with recommended requirements. The study will also examine

variations among different sources and identify parameters showing comparatively elevated or reduced values.

The findings of this investigation are expected to provide a scientific overview of the quality characteristics of selected local drinking-water sources and contribute to greater awareness regarding water-quality monitoring, public health, environmental management, and sustainable access to safe drinking water. The study may also provide a baseline for further investigation involving seasonal monitoring, expanded geographical coverage, and correlation among physicochemical and microbiological parameters.

KEYWORDS: Drinking-water quality, physicochemical parameters, microbiological quality, water-quality assessment, TDS, electrical conductivity hardness, nitrate, fluoride, QA/QC, statistical analysis etc.

INTRODUCTION

Purpose of the Visit

The purpose of the community visit was to understand the drinking-water sources used by the local community and to gain practical knowledge about their water collection, usage, and storage practices. The visit was conducted as a part of the Community Engagement Programme (CEP) to establish a connection between academic learning and real-life community needs.

The visit aimed to identify selected local drinking-water sources, interact with community members, observe the general conditions surrounding the water sources, and collect relevant information for further investigation. Water samples from selected sources were considered for laboratory assessment to evaluate their overall quality.

The expected outcome of the visit was to develop a better understanding of the quality, usage, and management of local drinking-water sources and to identify possible areas requiring attention. The interaction also aimed to create awareness among the community regarding safe water handling, hygienic storage, sanitation, and the importance of regular water-quality monitoring.

Background Information

Access to safe drinking water is an important requirement for maintaining community health and well-being. The quality of water available to a community can be influenced by several factors, including the source of water, surrounding environmental conditions, sanitation, human activities, treatment practices, and storage methods.

Community interaction provides valuable information that cannot be obtained through laboratory analysis alone. Direct interaction with local residents helps in understanding their dependence on different water sources, common practices related to collection and storage, and their observations or concerns regarding water quality.

As part of the present CEP study, community-level observations are combined with scientific examination of selected water samples. The investigation focuses on assessing the physical, physicochemical, chemical, and microbiological quality of selected local drinking-water sources. This integrated approach helps relate the laboratory findings to the actual conditions and practices observed within the community.

The study is therefore significant not only from a scientific perspective but also from a community-health and environmental-awareness perspective. It provides an opportunity to apply theoretical knowledge in a practical situation while understanding the importance of safe and sustainable water management.

Scope of the Report

The present report covers the community interaction, field observations, identification of selected drinking-water sources, sample collection, laboratory investigation, analysis of results, and interpretation of the findings. The study includes the assessment of selected physical, physicochemical, chemical, and microbiological characteristics of the collected water samples.

The obtained results will be systematically recorded and compared with applicable drinking-water quality standards to understand the quality status of the selected sources. The report is limited to the selected locations, water sources, parameters, and study period included in the investigation. It does not represent the quality of all drinking-water sources in the wider region. The findings may, however, provide useful baseline information for future studies involving a larger number of locations, repeated sampling, and seasonal monitoring.

LITRETURE REVIEW

1.Tambe *et al.* (2008) – A Community-Based Bacteriological Study of Quality of Drinking-Water and Its Feedback to a Rural Community in Western Maharashtra, India

Tambe et al. conducted a one-year community-based study involving 313 water samples from wells, tanks, standposts, handpumps, streams and household sources in Maharashtra. The study demonstrated considerable variation in bacteriological quality and identified factors such as inadequate treatment, poor drainage and activities around water sources as contributors to contamination. The study is highly

relevant to the present CEP because it combines water-quality assessment with community participation and field observations.

2. Velrasu, Morande and Sthawarmath (2008) – Drinking Water Quality Issues in Maharashtra State – Problems and Policy

Velrasu *et al.* discussed drinking-water quality issues in Maharashtra from both public-health and environmental perspectives. The study emphasized that drinking-water management should consider not only the quantity of water supplied but also its quality, standards and monitoring. This provides useful background for the present study because the assessment of local drinking-water sources requires consideration of water quality, public health and appropriate standards.

3. Subbaraman *et al.* (2013) – The Social Ecology of Water in a Mumbai Slum: Failures in Water Quality, Quantity, and Reliability

Subbaraman *et al.* investigated water quality, quantity and reliability in an urban community in Mumbai. Water samples were collected from different points in the distribution system, including the municipal supply, distribution lines and household storage containers. The study examined microbiological and chemical quality along with community water-access conditions. This study is particularly relevant to the present Mira-Bhayandar project because it demonstrates the importance of considering urban water distribution, household storage and community conditions when evaluating drinking-water quality.

4. Vyas *et al.* (2015) – Physicochemical and Microbiological Assessment of Drinking Water from Different Sources in Junagadh City, India.

Vyas *et al.* assessed 22 drinking-water samples collected from different locations in Junagadh City. Parameters including electrical conductivity, TDS, salinity, pH, dissolved oxygen and hardness were investigated along with microbiological characteristics. The study demonstrated differences in water-quality characteristics between sampling locations and supports the use of a multi-parameter and multi-location approach in drinking-water assessment.

5. Singh *et al.* (2015) – What Are We Drinking? Assessment of Water Quality in an Urban City of Punjab, India

Singh *et al.* evaluated tap and filtered water from 50 households in an urban area of Punjab. Both physicochemical and bacteriological analyses were performed. The study found differences between tap and filtered water and reported microbiological as well as chemical quality concerns in some samples.

The study is relevant to the present investigation because it demonstrates the importance of assessing both physicochemical and microbiological quality of water used by urban communities.

6. Devaraja *et al.* (2017) – Variations of Drinking Water Quality Influenced by Seasons and Household Interventions: A Case Study from Rural Maharashtra, India

Devaraja *et al.* studied changes in drinking-water quality between the original water source and household points of consumption in Maharashtra. Water samples were collected from sources and household storage tanks and examined for fecal contamination. The study showed that water quality could deteriorate between the source and point of consumption, particularly during the monsoon, highlighting the importance of household treatment, storage and hygiene practices.

7. Khatri *et al.* (2018) – Physicochemical and Bacteriological Quality of Drinking Water in Drought-Prone Areas of Pune and Satara Districts of Maharashtra, India

Khatri *et al.* investigated drinking-water quality in drought-prone areas of Pune and Satara districts of Maharashtra using physicochemical and bacteriological parameters. The study demonstrated the importance of assessing chemical characteristics together with microbiological quality when determining the suitability of water for drinking purposes. Its Maharashtra-based findings provide useful comparative background for the present assessment of selected drinking-water sources in Mira-Bhayandar.

8. Koley et al. (2024) – Identification and Assessment of Critical Parameters Affecting Drinking Water Quality : A Case Study of Water Treatment Plants of India

Koley *et al.* assessed raw and treated water from water-treatment plants in India and investigated important parameters affecting drinking-water quality. The study reported seasonal variations, including increased turbidity during the monsoon and increased pathogenic load during the dry season. The researchers also used a Water Quality Index approach to evaluate overall water-quality status. This study supports the importance of multiple parameters, seasonal considerations and systematic data analysis in drinking-water research.

9. Central Ground Water Board (2024) – Annual Ground Water Quality Report 2024

The Central Ground Water Board's 2024 national groundwater-quality assessment used a standardized Standard Operating Procedure for groundwater-quality monitoring, thereby improving consistency in data collection, analysis and interpretation. The report provides an important national reference for understanding groundwater-quality assessment and monitoring practices. It is relevant to the present

project where systematic sampling, laboratory analysis and interpretation of water-quality data are required.

10. Koley *et al.* (2024) / Current Indian Drinking-Water Quality Assessment Literature

Recent Indian drinking-water research emphasizes integrated assessment of physicochemical and microbiological characteristics rather than relying on a single parameter. Modern studies increasingly incorporate multiple water-quality indicators, seasonal variation, treatment efficiency and quantitative interpretation of analytical results. Such approaches support the research-oriented methodology adopted in the present Mira-Bhayandar drinking-water quality assessment.

METHEDOLOGY

INTRODUCTION

Methodology refers to the systematic approach used to conduct a research study, collect relevant information, perform experiments, and analyse the obtained data.

The present study, entitled "Water Quality Testing of Local Drinking Water Sources," was conducted to assess the quality of drinking water available in selected localities of Mira-Bhayandar, Maharashtra. The study involved two major approaches: a community survey and laboratory investigation of selected drinking-water samples.

The community survey was conducted using a structured questionnaire to collect information from local residents regarding their drinking-water sources, perceived water quality, household treatment and storage practices, and awareness of water contamination. A total of 36 respondents participated in the survey.

The experimental component involved the examination of selected water samples using appropriate physical, physicochemical, chemical methods, depending on the availability of laboratory facilities. The collected data were organized into tables, analysed using suitable statistical methods, and compared with applicable drinking-water quality standards.

The methodology was designed to provide a systematic understanding of local drinking-water quality by combining community-level information with scientific laboratory analysis.

SURVEY METHOD

A community-based survey was conducted as part of the study entitled "Water Quality Testing of Local Drinking Water Sources" to understand the drinking-water sources, perceived water quality, household water-treatment practices, and awareness of water contamination among local residents of . A structured questionnaire containing 17 questions was used to collect information from 36 respondents. The

responses were systematically recorded and analysed using frequency counts, percentages, and suitable graphs to understand community perceptions and practices related to drinking-water quality.

Questionaire

1. What is the primary source of drinking water used by your household?

☐ Municipal water supply

☐ Borewell

☐ Tanker water

☐ Packaged/bottled water

☐ Combination of sources

2. How would you rate the reliability of your drinking-water supply throughout the year?

☐ Highly reliable

☐ Reliable

☐ Occasionally interrupted

☐ Frequently interrupted

☐ Highly unreliable

3. During which season do you notice the greatest change in water quality?

☐ Summer

☐ Monsoon

☐ Winter

☐ No noticeable seasonal change

☐ Cannot determine

4. How would you rate the overall quality of your household drinking water?

☐ Excellent

☐ Good

☐ Satisfactory

☐ Poor

☐ Very poor

5. How frequently do you observe changes in the color or appearance of drinking water?

☐ Never

☐ Rarely

☐ Occasionally Frequently

☐ Very frequently

6. Does your household treat drinking water before consumption?

☐ Always

☐ Usually

☐ Sometimes

☐ Rarely

☐ Never

7. Which method is mainly used for household water treatment?

☐ RO/water purifier

☐ Boiling

☐ UV treatment

☐ Filtration

☐ No treatment

8. How frequently is the household drinking-water storage container cleaned?

☐ Daily

☐ Weekly

☐ Every 2–4 weeks

☐ Occasionally

☐ Only when visibly dirty

9. Before this survey, were you aware that clear-looking water can still contain harmful microorganisms?

☐ Yes

☐ No

☐ Not sure

10. Which water-quality parameter are you most familiar with?

☐ pH

☐ TDS

☐ Hardness

☐ Turbidity

☐ Chloride

☐ Microbiological contamination

☐ None of these

11. Do you think water quality can change between the source and the point of consumption because of pipelines, transportation, or storage?

☐ Strongly agree

☐ Agree

☐ Neutral/Not sure

☐ Disagree

☐ Strongly disagree

12. Has your household drinking water ever been tested in a laboratory?

☐ Yes, within the last year

☐ Yes, more than one year ago

☐ No

☐ Don't know

13. In your opinion, how frequently should drinking water from local sources be scientifically tested?

☐ Monthly

☐ Every 3 months

☐ Every 6 months

☐ Once a year

☐ Only when a problem is noticed

14. Which type of water-quality testing do you consider most important?

☐ Physical testing

☐ Chemical testing

☐ Microbiological testing

☐ All of the above

☐ Not sure

15. If an affordable local water-testing facility were available, would your household be willing to test its drinking water?

☐ Definitely yes

☐ Probably yes

☐ Not sure

☐ Probably no

☐ Definitely no

16. How close is your drinking-water source to a possible pollution source such as sewage, drainage, waste disposal, or stagnant water?

☐ Very close

☐ Moderately close

☐ Far

☐ Very far

☐ Don't know

17. Which factor do you think poses the greatest risk to drinking-water quality in your locality?

☐ Sewage/drainage contamination

☐ Leaking or damaged pipelines

☐ Poor household storage

☐ Solid-waste pollution

☐ Industrial/commercial activity

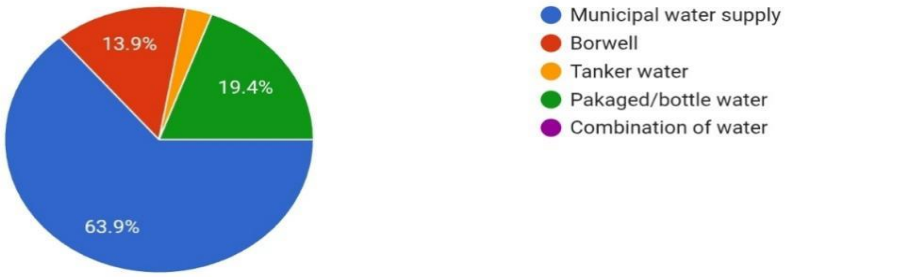
☐ Natural minerals in groundwater

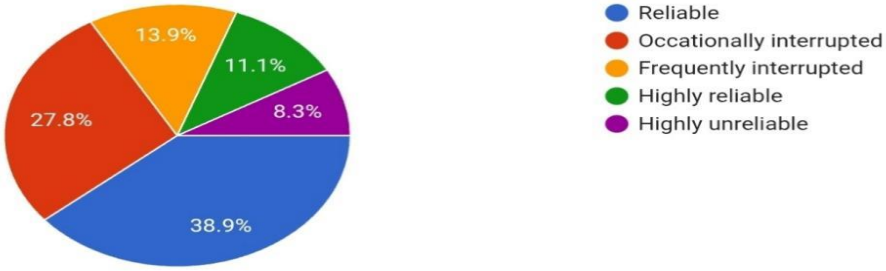
☐ Inadequate water treatment

☐ Other

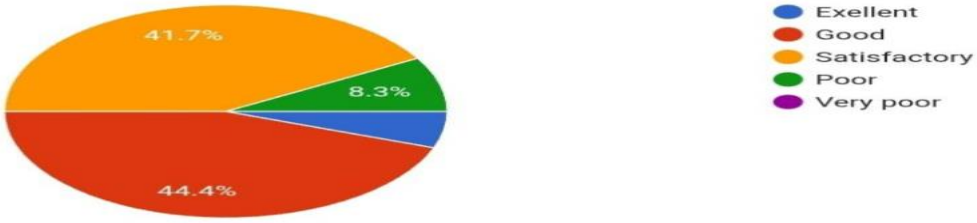
Graphical Representations

Pi Chart

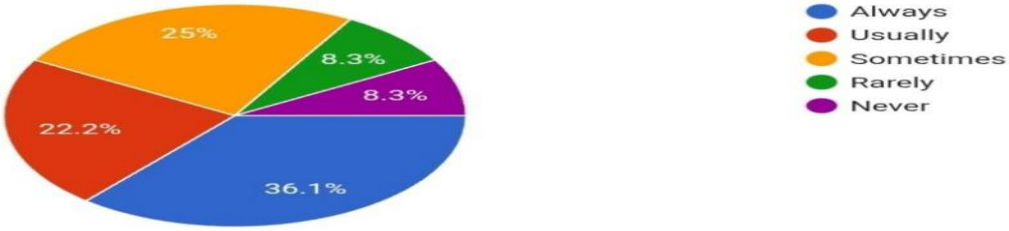






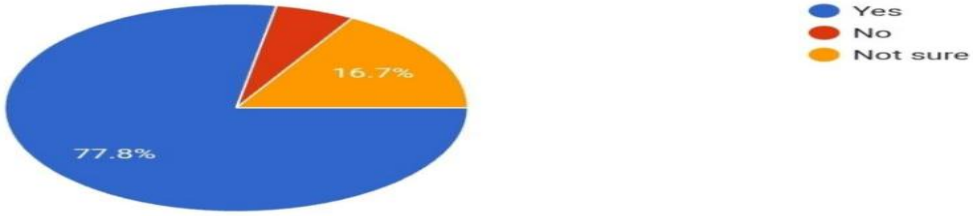







22.2%
19.4%
30.6%
25%
RO/water purifire
Boiling
UV treatment
Filtration
No treatment

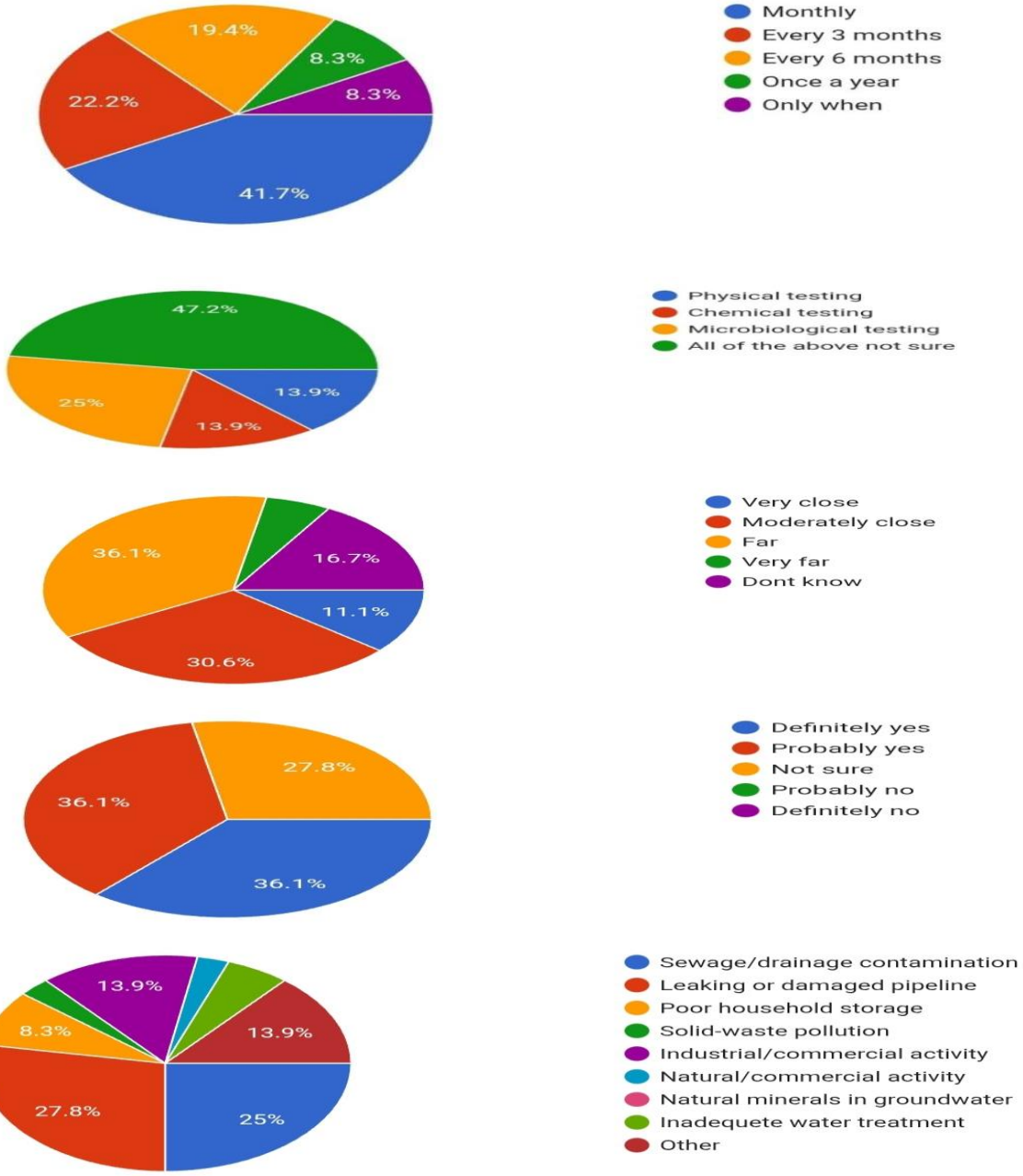

16.7%
11.1%
25%
41.7%
Daily
Weekly
Every 2-4 week
Occationally
Only when visible dirty


16.7%
77.8%
Yes
No
Not sure


8.3%
11.1%
16.7%
22.2%
33.3%
PH
TDS
Hardness
Turbidity
Chloride
Microbiological contamination
None of these


13.9%
47.2%
33.3%
Strongly agree
Agree
Neutral / not sure
Disagree
Strongly disagree
Testing and public health


25%
41.7%
19.4%
13.9%
Yes, within the last year
Yes, mor than one year
No
Dont know



OBSERVATIONS OF SURVEY

A community survey was conducted among 36 respondents from the selected study area to understand local drinking-water sources, perceived water quality, household treatment practices, and awareness regarding water contamination. The responses were collected through a structured questionnaire using Google Forms and analysed using pie charts.

- ❖ Water source: 63.9 % of respondents used municipal water supply.
- ❖ Water quality: 44.4 % rated their drinking water as good, while 41.7 % rated it satisfactory.
- ❖ Seasonal variation: 44.4 % noticed the greatest change in water quality during the monsoon.

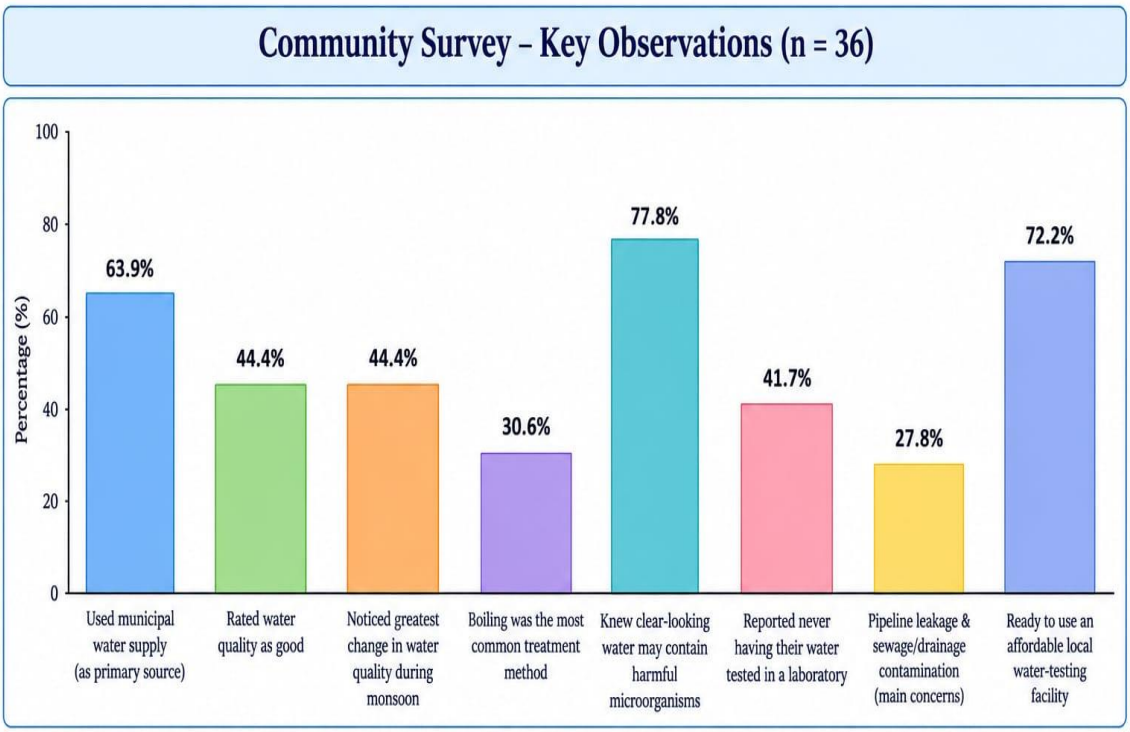
❖ Water treatment: Boiling was the most commonly reported treatment method (30.6 %).

❖ Scientific awareness: 77.8 % knew that clear-looking water may contain harmful microorganisms.

❖ Laboratory testing: 41.7 % reported that their household drinking water had never been tested in a laboratory.

❖ Water contamination risks: Pipeline leakage (27.8 %) and sewage/drainage contamination (25.0 %) were the leading perceived concerns.

❖ Willingness to test: 72.2 % were definitely or probably willing to use an affordable local water-testing facility.



Observation:

- 63.9% of respondents used municipal water supply as their primary source of drinking water.
- 44.4% rated their drinking water as good, while 41.7% rated it as satisfactory.
- 44.4% noticed the greatest change in water quality during the monsoon season.
- Boiling was the most commonly reported treatment method (30.6%).
- 77.8% knew that clear-looking water may contain harmful microorganisms.
- 41.7% reported that their household drinking water had never been tested in a laboratory.
- Pipeline leakage (27.8%) and sewage/drainage contamination (25.0%) were the leading perceived risks.
- 72.2% were definitely or probably willing to use an affordable local water-testing facility.

RESULT

The community survey was conducted among 36 respondents from different locations to understand people's perceptions and practices regarding drinking-water quality. The results showed that municipal

water supply was the most commonly reported source of drinking water (63.9%). Most respondents rated their drinking water as good or satisfactory, while some reported seasonal changes in water quality. Boiling was the most frequently reported household water-treatment method. Although 77.8 % of respondents were aware that clear-looking water may contain harmful microorganisms, 41.7 % reported that their household drinking water had never been tested in a laboratory. Pipeline leakage and sewage or drainage contamination were among the major perceived risks to drinking-water quality. Furthermore, 72.2 % expressed willingness to use an affordable water-testing facility.

Overall, the survey provided an overview of drinking-water practices and awareness among the participating respondents from different locations. Since the responses were collected from multiple locations, the findings represent the opinions of the surveyed participants and cannot be generalized to one specific locality. Laboratory testing is required to determine the actual quality of the selected water samples.

EXPERIMENTAL METHOD

TESTING THE WATER SAMPLE IN LABORATORY

INRODUCTION

The experimental method was adopted to scientifically assess the quality of selected drinking-water samples through laboratory investigations. This method involved the collection of water samples from selected sources and the determination of their physical, physicochemical, and chemical characteristics using appropriate analytical techniques. The experimental findings were intended to evaluate the measured water-quality parameters and compare them with applicable drinking-water quality standards.

Water Sample Collection

Water samples were collected from selected drinking-water sources for laboratory analysis. Each sample was assigned a unique identification code, such as S1, S2, S3, S4, S5 and S6 . Details regarding the sampling location Nalasopara , Bhayndar and Miraroad. Source type is Municipal tap water, date is 8 October 2026 were recorded. Appropriate containers and handling procedures were used to minimize contamination and changes in sample characteristics before analysis.



S1 : Normal filter water

S2 : Nalasopara municipal tap water

S3 : Mira road municipal tap water

S4 : borewell water

S5 : Packaged filter water

S6 : Bhayndar municipal tap water

Experiment 1: Color of The Sample.

SAMPLE NO.	SOURCES OF SAMPLE	OBSERVATION (COLOUR)
S1	Normal filter water	Colorless and transparent
S2	Nalasopara municipal tap water	Colorless and transparent
S3	Mira road municipal tap water	Colorless and transparent
S4	Borewell water	Colorless and transparent
S5	Packaged filter water	Colorless and transparent
S6	Bhayandar municipal tap water	Yellowish in color

Result : Out of the six water samples examined, five samples were colorless and transparent, whereas the college tap water sample (S6) showed a yellowish color.

Note: Colorless and transparent water is not necessarily safe for drinking. Further testing of pH, total hardness, alkalinity, and microbiological quality is required to assess water quality more fully.

EXPEIMENT 2: DETERMINATION OF PH OF DIFFERENT WATER SAMPLES .

1. Aim

To determine the pH of six water samples collected from different sources using a calibrated pH meter.

2. Theory

pH is a measure of the acidity or alkalinity of a water sample. It is defined as the negative logarithm of hydrogen ion activity.

The pH value is expressed as:

$pH = -\log_{10} a(H^+)$

Where:

pH = Potential of hydrogen.

$A(H^+)$ = Activity of hydrogen ions in the solution.

The pH scale generally ranges from 0 to 14:

pH below 7: Acidic

pH equal to 7: Neutral

pH above 7: Alkaline

A pH meter measures the pH of water using an electrode. Before measurement, the instrument is calibrated using standard buffer solutions to improve the reliability of the readings.

3. Requirements

Apparatus:Digital pH meter, pH electrode,Clean beakers, Glass rod , Wash bottle, Tissue paper

Chemicals:Standard buffer solution of pH 7.00, Standard buffer solution of pH 4.00 and/or 10.00 as required,. Distilled water, Six water samples.

4. Procedure

1. Six water samples were collected from different sources and labelled S1 to S6.
2. The pH meter was calibrated using standard buffer solutions according to the instrument instructions.
3. The electrode was rinsed with distilled water.
4. A sufficient quantity of the first water sample was taken in a clean beaker.
5. The electrode was immersed in the sample without touching the bottom of the beaker.
6. The reading was allowed to tabilize, and the pH value was recorded.
7. The electrode was rinsed with distilled water before testing the next sample.
8. The same procedure was repeated for all six water samples.
9. All readings were recorded in the observation table.

Observation Table

Sample no.	Source of water	pH	Nature of water
S1	Normal filter water	7.35	Slightly alkaline
S2	Nalasopara municipal tap water	8.00	Alkaline
S3	Miraroad municipal tap water	7.31	Slightly alkaline
S4	Borewell water	7.57	Slightly alkaline
S5	Package filter water	6.60	Slightly acidic
S6	Bhayndar municipal tap water	7.45	Slightly alkaline

RESULT

The pH of the six water samples ranged from 6.60 to 8.00. Sample S5 (packaged filter water) showed the lowest pH of 6.60, while sample S2 (Nalasopara municipal water) showed the highest pH of 8.00. The remaining four samples had pH values between 7.31 and 7.57.

The readings indicate that most of the samples were slightly alkaline, while S5 was slightly acidic. However, pH alone cannot determine whether water is safe for drinking; other physical, chemical, and microbiological parameters must also be considered.

Conclusion of pH Analysis and Suitability for Drinking

The pH values of the six water samples ranged from 6.60 to 8.00. According to the commonly used BIS drinking-water specification (IS 10500), the acceptable pH range is 6.5–8.5. Therefore, all six samples fall within this pH range based on the recorded readings.

Final conclusion : Based on pH alone, all six samples meet the acceptable pH range for drinking water. However, this does not confirm that they are safe to consume. Total hardness, alkalinity, other relevant chemical parameters, and microbiological testing are also needed before determining their overall drinking-water suitability.

EXPERIMENT 3 : DETERMINATION OF ELECTRICAL CONDUCTIVITY OF WATER WATER

1. Aim

To determine the electrical conductivity of six water samples collected from different sources using a conductivity meter and to compare their conductivity values.

2. Theory

Electrical conductivity (EC) is the ability of water to conduct an electric current. It depends mainly on the concentration of dissolved ions, such as calcium, magnesium, sodium, chloride, and bicarbonate ions.

Water containing more dissolved ions generally exhibits higher electrical conductivity, whereas water containing fewer dissolved ions generally exhibits lower conductivity. Electrical conductivity is measured using a conductivity meter and is commonly expressed in µS/cm (microsiemens per centimetre) or mS/cm (millisiemens per centimetre).

The relationship between the units is: 1 mS/cm = 1000 µS/cm

Conductivity testing helps compare the ionic content of water samples. However, conductivity alone cannot identify individual dissolved substances or establish whether water is safe for drinking.

3. Requirements

Apparatus:Electrical conductivity meter (Equiptronics EQ 660B), Conductivity electrode, Clean beakers, Wash bottle, Tissue paper, Glass rod, if required, Chemicals and Samples, Distilled water, Six water samples collected from different sources.

4. Procedure

1. Six water samples were collected and labelled S1 to S6.
2. The conductivity meter was switched on.
3. The instrument was checked and calibrated according to the laboratory procedure and instrument instructions.
4. A sufficient quantity of the first water sample was taken in a clean beaker.
5. The conductivity electrode was rinsed with distilled water.
6. The electrode was immersed in the water sample according to the instrument instructions.
7. The appropriate range was selected, and the reading was allowed to stabilise.
8. The conductivity reading was recorded.
9. The electrode was rinsed with distilled water before testing the next sample.
10. The same procedure was repeated for all six water samples.

5. Observation table

Sample No.	Source of water	Conductivity reading
S1	Normal filter water	0.13
S2	Nalasopara municipal tap water	0.28
S3	Miraroad municipal tap water	0.20
S4	Borewell water	1.12
S5	Package filter water	0.08
S6	Bhayndar municipal water	0.34

6. RESULT

The electrical conductivity of six water samples was measured using a conductivity meter. The highest reading was observed in borewell water (S4: 1.12), while the lowest reading was recorded for packaged filter water (S5: 0.08). The other samples showed intermediate readings, indicating variations in their electrical conductivity.

7. CONCLUSION

The experiment revealed differences in electrical conductivity among the water samples collected from different sources. Borewell water showed the highest reading, whereas packaged filter water showed the lowest. These differences may be related to variations in dissolved ionic substances present in the samples. However, conductivity results alone are insufficient to determine drinking-water safety; further chemical and microbiological testing is required.

EXPERIMENT 4 : DETERMINATION OF TOTAL HARDNESS OF WATER

1. Aim

To determine the total hardness of six water samples collected from different sources by the EDTA complexometric titration method.

2. Theory

The hardness of water is mainly caused by the presence of dissolved calcium and magnesium salts. Hard water does not readily form lather with soap and may cause scale formation in pipes and household appliances.

Total hardness is determined by the EDTA complexometric titration method. EDTA forms stable complexes with calcium and magnesium ions present in water.

In this method, Eriochrome Black T (EBT) is used as an indicator, and ammonia buffer solution is added to maintain the pH at approximately 10. Initially, the solution appears wine red. At the endpoint, the colour changes from wine red to blue. The total hardness of water is expressed in mg/L as calcium carbonate ($CaCO_3$).

3. Requirements

A. Apparatus:-Burette, Pipette, Conical flask, Measuring cylinder,
Beakers, Funnel etc.

B. Chemical :- 0.01 M EDTA solution, Ammonia buffer solution (pH 10), Eriochrome Black T (EBT) indicator, Distilled water, Water samples.

4. Procedure

1. Six water samples were collected from different sources and labelled S1 to S6.
2. The burette was rinsed and filled with 0.01 M EDTA solution.
3. A 10 mL portion of the first water sample was transferred into a clean conical flask using a pipette.
4. A suitable quantity of ammonia buffer solution was added to maintain the pH at approximately 10.
5. A few drops of EBT indicator were added to the sample.
6. The solution developed a wine-red colour in the presence of hardness-producing ions.
7. The sample was titrated against EDTA with continuous swirling.
8. The titration was continued until the colour changed from wine red to blue.
9. The volume of EDTA consumed was recorded.
10. The same procedure was repeated for all six water samples.

5. Observation **:- Volume of water sample taken = 10 mL**

Concentration of EDTA = 0.01 M

Observation Table

Sample no.	EDTA Consume (mL)
S1	**0.6**
S2	**2.2**
S3	**1.8**
S4	**3.0**
S5	**0.5**
S6	**1.5**

6. Calculation

The formula used to calculate total hardness is:

TOTAL HARDNESS = $V \times M \times 100000 / V_S$

WHERE : V = Volume of EDTA consumed (mL)

M = Molarity of EDTA

V_S= Volume of water sample

Given : M = 0.01 M

V_S = 10 ml

Total hardness (mg/L $CaCO_3$)

S1 = normal filter water

Total hardness = 0.6 x 0.01 x 100000 / 10

= 600 / 10

= 60 mg/L as $CaCO_3$

S2 = Nalasopara municipal tap water

Total hardness = 2.2 x 0.01 x 100000 / 10

= 2200 / 10

= 220 mg/L as $CaCO_3$

S3 = Miraroad municipal tap water

Total hardness = 1.8 x 0.01 x 100000 / 10

= 1800 / 10

= 180 mg/L as $CaCO_3$

S4 = Borewell water

Total hardness = 3.0 x 0.01 x 100000 / 10

= 3000 / 10

= 300 mg/L as $CaCO_3$

S5 = Package filter water

Total hardness = 0.5 x 0.01 x 100000 / 10

= 500 / 10

= 50 mg/L as $CaCO_3$

S2 = Bhayandar municipal tap water

Total hardness = 1.5 x 0.01 x 100000 / 10

= 1500 / 10

= 150 mg/L as $CaCO_3$

Calculated Observation table

Sample no.	EDTA used (mL)	Total hardness (mg/L $CaCO_3$)
S1	0.6	60
S2	2.2	220
S3	1.8	180
S4	3.0	300
S5	0.5	50
S6	1.5	150

7. RESULT

The total hardness of the six water samples was calculated and found to range from 50 to 300 mg/L as $CaCO_3$. Borewell water (S4) showed the highest calculated hardness of 300 mg/L, while package filter water (S5) showed the lowest calculated hardness of 50 mg/L each.

8. CONCLUSION

The experiment showed variations in total hardness among the six water samples. Borewell water exhibited the highest hardness, indicating a comparatively greater concentration of hardness-producing ions, mainly calcium and magnesium. Package filter water exhibited the lowest calculated hardness.

Interpretation:

S1, S3, S5: Soft water

S2, S6: Moderately hard water

S4: Hard water



DESCRIPTION OF THE COMMUNITY INTERACTIONS, OBSERVATIONS AND ANALYSIS

A. Community Interaction and Engagement

The community interaction was an important part of the Community Engagement Project titled "Water Quality Testing of Local Drinking Water Sources." The main purpose was to understand the drinking-water sources used by people, their perceptions of water quality, household water-treatment practices, and awareness regarding water contamination.

A questionnaire-based survey was conducted among 36 respondents from different areas. The questionnaire included questions about drinking-water sources, perceived water quality, seasonal changes, household treatment methods, awareness of microorganisms, water testing practices, possible causes of contamination, and willingness to use affordable water-testing facilities.

The respondents shared information about their daily drinking-water practices and concerns regarding the quality of water supplied to their homes. Their responses helped identify common practices and areas where further awareness and water-quality monitoring may be beneficial.

In addition to the survey, water samples were collected from different sources for laboratory examination. The samples included home-filtered water, municipal water from Nalasopara, municipal water from Mira Road, borewell water, packaged filtered water, and college tap water. These samples were labelled S1 to S6 to maintain proper identification during testing.

The community survey and laboratory work were considered complementary activities. The survey provided information about people's experiences and awareness, while laboratory testing helped examine selected physical and chemical properties of the collected water samples.

A. Observations Related to Fieldwork

The fieldwork consisted of two major activities: community survey and laboratory testing.

1. Community survey observations

- Drinking-water sources: Municipal water supply was the most commonly reported source, accounting for 63.9 % of survey responses.
- Perceived water quality: 44.4 % of respondents rated their drinking-water quality as good, while 41.7% considered it satisfactory.
- Seasonal changes: 44.4 % of respondents reported noticing the greatest changes in water quality during the monsoon.
- Water-treatment practices: Boiling was reported by 30.6 % of respondents as a household water-treatment method.
- Awareness of contamination: 77.8 % of respondents knew that clear-looking water may still contain harmful microorganisms.
- Household testing: 41.7 % of respondents reported that their household water had never been tested in a laboratory.
- Perceived contamination risks: Pipeline leakage was identified by 27.8 % of respondents, while sewage or drainage contamination was identified by 25.0 %.
- Willingness to use testing facilities: 72.2 % of respondents were definitely or probably willing to use an affordable local water-testing facility.

These observations indicate that respondents had different experiences and levels of awareness regarding drinking-water quality. Although many participants rated their water quality positively, concerns about seasonal changes and possible contamination were also reported.

2. Laboratory fieldwork observations

Six water samples from different sources were collected and examined. The following tests were performed as part of the practical investigation:

- Visual examination of colour
- Determination of pH using a calibrated pH meter
- Determination of total hardness using EDTA titration
- Electrical conductivity measurement using a conductivity meter

The recorded color observations indicated that samples S1 to S5 appeared colorless and transparent, while S6 appeared yellowish.

The recorded pH values ranged from 6.60 to 8.00. The calculated total hardness values ranged from 50 to 300 mg/L as $CaCO_3$, based on the EDTA volumes recorded during the experiment.

These observations relate to the parameters actually examined. They do not establish whether the samples are completely safe for drinking.

B. Analysis of Community Interactions

The community survey provided useful information about drinking-water practices and public awareness.

First, municipal water supply was the most commonly reported drinking-water source. This highlights the importance of maintaining the quality of supplied water and monitoring it regularly.

Second, most respondents rated their water quality as good or satisfactory. However, these ratings represent personal perceptions and cannot replace laboratory analysis. Water that appears clear and acceptable may still contain dissolved contaminants or microorganisms.

Third, the monsoon was frequently identified as a period of noticeable water-quality changes. This observation indicates the importance of monitoring water quality during seasonal changes and checking for possible contamination.

Fourth, the survey revealed a gap between awareness and testing practices. Although 77.8% of respondents knew that clear water could contain harmful microorganisms, 41.7% reported that their

household water had never been tested in a laboratory. This suggests that awareness alone may not ensure regular testing.

Finally, the willingness of 72.2 % of respondents to use an affordable water-testing facility indicates potential community interest in accessible testing services. Such services could help people obtain scientific information about their drinking water.

C. Relevance of Fieldwork to the Selected Topic

The fieldwork was directly relevant to the selected topic because it combined community-level information with scientific investigation of drinking-water quality.

The survey helped identify the sources of drinking water, common household treatment methods, public awareness, and concerns about possible contamination. Laboratory testing provided measurable information about selected physical and chemical characteristics of the collected samples.

The pH test helped assess the acidic or alkaline nature of the samples. The total hardness test provided information about the combined contribution of calcium and magnesium salts. Visual colour examination and conductivity measurements provided additional information about the samples' observable and electrical properties.

D. Analysis of data collected

The survey responses showed that people use different methods to obtain and treat their drinking water. Although many participants were satisfied with their water quality, concerns about seasonal changes and possible contamination were also reported. This indicates that people's satisfaction with water does not necessarily confirm that the water is safe.

The laboratory investigation provided a scientific perspective on the collected samples. Differences in pH and total hardness showed that water from different sources did not have identical characteristics. For example, the borewell sample (S4) had the highest calculated total hardness, at 300 mg/L as $CaCO_3$, while samples S3 and S5 had the lowest values, at 50 mg/L as $CaCO_3$. The yellowish appearance of sample S6 also showed the importance of examining the physical characteristics of water.

When the survey findings were considered alongside the laboratory observations, it became clear that community awareness and scientific testing serve different purposes. The survey helped identify people's concerns and practices, whereas laboratory tests helped measure specific water-quality parameters.

Overall, the collected data helped fulfil the main objectives of the project by identifying drinking-water practices, examining selected water characteristics, and recognising the importance of regular testing.

CONCLUSION AND REECOMMNDATION

Conclusion

The Community Engagement Project on "Water Quality Testing of Local Drinking Water Sources" helped me understand the importance of drinking-water quality and its impact on the community. Through community surveys, field visits, and laboratory experiments, I gained practical knowledge about different water sources and the methods used to examine their quality.

The study showed variations in the physical and chemical characteristics of the collected water samples, particularly in pH, total hardness, and colour. The community survey also highlighted the importance of public awareness, regular water testing, and proper water-handling practices.

This project helped me apply theoretical chemistry concepts to a real-life environmental issue and improved my skills in sample collection, laboratory testing, observation, and data analysis. Overall, the study emphasised that drinking-water quality should be assessed through scientific testing rather than appearance alone. Further chemical and microbiological investigations are necessary to determine the overall safety of the tested water samples.

Tag Line : " See The Drop, Test The Truth "

RECOMMENDATION

1. Regular Water Testing: Drinking-water sources should be tested periodically to identify changes in physical, chemical, and microbiological characteristics.
2. Public Awareness: Awareness programmes should be conducted to educate people about water contamination, safe drinking-water practices, and the importance of laboratory testing.
3. Proper Water Storage: Drinking water should be stored in clean, covered containers to reduce the risk of contamination during storage and handling.
4. Seasonal Monitoring: Water quality should be monitored carefully during the monsoon, when changes in water supply and possible contamination may occur.
5. Further Laboratory Investigation: Additional tests for chloride, nitrate, fluoride, iron, and microbiological contamination should be performed wherever facilities are available to obtain a more complete assessment of water quality.

6. Accurate Experimental Procedures: Laboratory tests should be performed using properly calibrated instruments, standard solutions, and repeated measurements to improve the reliability of results.

7. Protection of Water Sources: Leakage in pipelines and possible contamination from sewage or drainage should be reported to the appropriate authorities for timely inspection and corrective action.

8. Future Research: Further studies should include more samples from different locations and seasons to develop a broader understanding of local drinking-water quality.

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