

Microbial Study of Groundwater Quality in Jasalpur Village of Narmadapuram (M.P.)

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Abstract: Water is essential for all life, and access to clean drinking water is crucial, as emphasized in the UN Millennium Declaration (2000) and Sustainable Development Goal 6, which focuses on clean water and sanitation. Water samples were collected from multiple sources, including hand pumps, tube wells and one open well in Jasalpur village of Narmadapuram. These samples were analyzed for the presence of indicator bacteria such as *Escherichia coli* and total coliforms using standard microbial techniques. The findings revealed that the microbial quality of groundwater in Jasalpur is poor, with elevated levels of indicator bacteria in many samples. The presence of *E. coli* and total coliforms indicates fecal contamination likely stemming from inadequate sanitation and waste disposal practices. The significant microbial contamination observed poses serious public health risks, as consumption of this contaminated water can lead to diseases such as diarrhea, cholera, and typhoid. This study underscores the critical need for interventions to ensure safe drinking water access in rural communities like Jasalpur to mitigate health risks associated with contaminated groundwater.

Keywords: Microbial study, ground water, Jasalpur, Narmadapuram.

1. Introduction

Water is essential for all life, and access to clean drinking water is crucial, as emphasized in the UN Millennium Declaration (2000) and Sustainable Development Goal 6, which focuses on clean water and sanitation. Providing safe drinking water remains a significant challenge, especially in developing countries like India, where groundwater supplies 85% of the rural population. ((Pahuja, 2010; Wyrwoll, 2012;)) Although cleaner than surface water, groundwater often suffers contamination from poor sanitation, animal waste, and

improper waste disposal (Grabow, 1996; Medema et al., 2003). The presence of coliform bacteria, indicators of fecal contamination, poses severe health risks, including waterborne diseases. In this study, we aim to assess the microbial quality of groundwater in Jasalpur village of Narmadapuram.

2. Methodology

Water samples were collected from multiple sources, including hand pumps, tube wells and one open well I Jasalpur village of Narmadapuram. These samples were analyzed for the presence of indicator bacteria such as *Escherichia coli* and total coliforms using standard microbial techniques. In addition, physiological parameters such as pH, turbidity and dissolved oxygen were measured to assess the overall quality of water.

The multiple tube fermentation technique is used to detect the presence of coliform bacteria in water samples. It involves a three-step process: the presumptive test, the confirmed test, and the completed test. Hi-media provides EMB agar, which is used in these tests.

3. Observation

The presumptive test was conducted to determine the presence of *Enterococcus* or gas-producing microorganisms in the water sample. The confirmatory test utilized Eosin Methylene Blue (EMB) agar, which demonstrated the presence of *E. coli* bacteria in the water sample.

A. Presumptive Test

First set of three test tube containing 10 ml of lactose broth liquid media and durham tubes were inoculated aseptically with 10 ml of water sample. Similarly, 1 ml and 0.1 ml water sample were inoculated aseptically into each of three test tube of second and third set respectively, each containing 5 ml lactose broth media and durhams tube. All test tube is incubated 37degree celcius for three days. Tubes were then observed for gas production after 24 and 48 hours. The presence of gas in any tubes after 24 hours is a positive presumptive test that indicate to presence of *E.coli*.

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B. Confirmation Test

The test was performed to both sample that give the positive and negative presumptive test. Prepare eosin- methylene blue agar(EMB) media for confirmation of E.coli after presumptive test to take least quantity of water sample inoculate on EMB media with streak plate method. Kept for overnight incubation at 37-degree Celsius temperature. After 24 hours of incubation the colored colonies with green metallic sheen colonies appeared on the plate. The confirmed test was considered positive.

C. Complete Test

From EMB agar plate, a single dark colored colony with metallic shine was picked up and inoculated into 5 ml peptone water and incubated at 37 degree Celsius. For confirmation of *E.coli* we perform Indole test because *E.coli* synthesize an enzyme, tryptophanase which form Indole, from tryptophan i.e. it is positive for Indole test. A bright pink colour in the top of layer indicate the presence of Indole. This confirms the presence of *E.coli*.

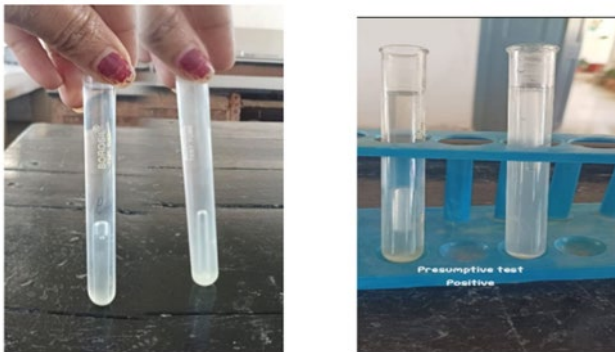


Fig. 1. Presumptive test for E.coli in lactose broth

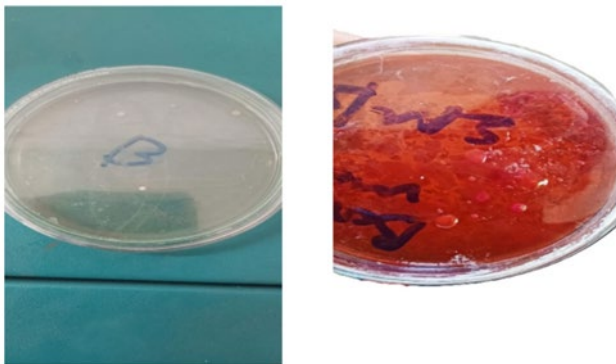


Fig. 2. Coliforms on NAM and E.coli on EMB medium

4. Results and Discussion

Our results indicate that the microbial quality of groundwater in the studied villages is poor, with high levels of indicator bacteria detected in many of the samples. The presence of *Escherichia coli* and total coliforms suggests fecal contamination, likely due to inadequate sanitation practices and

improper disposal of waste. Furthermore, the physicochemical parameters of the water also indicate poor quality, with high turbidity levels and low dissolved oxygen concentrations observed in several samples.

The high levels of microbial contamination in the groundwater of two hand pump of Jasalpur village of Narmadapuram pose a significant public health risk, as consumption of contaminated water can lead to waterborne diseases such as diarrhea, cholera, and typhoid. It is essential for local authorities to take immediate action to improve the quality of drinking water in these communities, including implementing proper sanitation measures, promoting hygiene practices, and monitoring water quality regularly.

5. Conclusion

In conclusion, our study highlights the urgent need to address microbial contamination in the groundwater of jasalpur village of Narmadapuram to protect public health and ensure access to safe drinking water. Further research is needed to identify specific sources of contamination and develop targeted interventions to improve water quality in these communities. Safeguarding the safety of borewell water is crucial for advancing public health and fostering sustainable development in Jasalpur.

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