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**Original Article**

# Quantitative and qualitative bacterial analysis of underground water of Vijayapur

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**ABSTRACT**
The microbiological quality of underground water of Vijayapur was analyzed. Underground water was collected from different locations in the Vijayapur city. All water samples were subjected to bacteriological studies using standard bacteriological methods with little modifications. Twenty separate underground water samples were collected from the three different locations. The E coli concentration ranged from $10^2$ to 10-5 / 100 ml and it was found that eight of twenty samples were detected to contain salmonella. Microbial quality may vary rapidly and widely but short-term peaks in pathogen concentration may increase disease risks considerably and may also trigger outbreaks of waterborne disease.

Keywords: Vijayapur, coliform, microbiological, Salmonella, TDS

## INTRODUCTION

Water is essential to sustain life and a satisfactory supply must be made available to consumers [1]. The right to potable water is nowadays part of human rights [2]. In industrialized countries drinking water is ranked as food and high standards are set for quality and safety. The provision of effective sanitation programmes and access to safe drinking water have been major problems for many developing countries. Water is examined microbiologically to determine its sanitary quality and its suitability for general use. The aim, that it will be acceptable for internal consumption and other uses in contact with man [3]. Water may contain poisonous chemical substances, pathogenic organisms (infective and parasitic agents), industrial or other wastes or sewage and is referred to as being contaminated or polluted. Most of the infections in developing countries can be attributed to lack of safe drinking water (like cholera, typhoid, Hepatitis, Poliomyelitis etc [4-6].

The organisms in the total coliform group are called indicator organisms. That is, if present, they indicate that there is a possibility, but not a certainty, that disease organisms may also be present in the water. When absent, there is a very low probability of disease organisms being present in the water. The ability of the total coliform test to reliably predict the bacterial safety of water relative to the hundreds of possible diseases that might be present is critical since it is impossible, in a practical sense, to check separately for every disease organism directly on a monthly or a quarterly basis. The presence of only total coliform generally does not imply an imminent health risk but does require an analysis of all water system facilities and their operation to determine how these organisms entered the water system. Escherichia Coli (e-coli) is a specific species (subgroup) within the coliform family.

They originate only in the intestines of animals and humans. They have a relatively short life span compared to more general total coliform. Their presence indicates a strong likelihood that human or animal wastes are entering the water system, and have a much higher likelihood of causing illness. This kit could play an important role in the surveillance programme, epidemiological studies, leading to the identification of emerging pathogens, sources of etiological agents and susceptible populations. The specificity of Biotech water testing kit was evaluated by testing bacteriologically contaminated drinking water samples showing absence of E. coli.

Typhoid fever, also known as enteric fever occurs worldwide, primarily in developing countries, including Indonesia. Typhoid fever is a systemic infection caused primarily by Salmonella serotype Typhi. The disease remains an important public health problem in developing countries. In 2000, it was estimated that over 2.16 million episodes of typhoid occurred worldwide, resulting in216, 000

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deaths and that more than 90% of this morbidity and mortality occurred in Asia [7]. In Indonesia, the incidence of typhoid was 148.7 per 100,000 person / years [8] .The transmission of typhoid fever occurs by oral transmission via food or beverages handled by an individual who chronically sheds the bacteria through stool and via sewage-contaminated water sources which could possibly be due to fecal contamination from human and animal. The unsanitary practices of food and beverages processes lead to contamination of foods by Salmonella. The previous study showed that 25%-50% of beverage samples which are sold on the street food counters in Bogor, Indonesia, were contaminated predominantly by Salmonella paratyphoid A. The contamination of bacteria possibly comes from the uncooked water [9].

The increased frequency of food-borne Salmonella has been causing recurring outbreaks, sometime with fatal infections. The exceedingly variable manifestations of typhoid fever have lead to the development of numerous diagnostic techniques. The routine detection of Salmonella in the environment including in foods and beverages is a necessary component of public health programs. Testing preharvest water for Salmonella or Escherichia coli that comes into contact with, or is in close proximity to, produce production may be one component of an effective strategy to implement a risk-based approach to enhance produce safety. Large-volume water samples can be concentrated and screened preseason and preharvest and may provide information for management decisions to reduce the risk of initial contamination.

Current microbial water quality standards in the US produce industry rely on testing 100 ml of water for generic E. coli [10] rather than pathogen populations. It is likely that pathogen contamination of surface water occurs at low rates [11,12,13 and 14] large-volume samples may be required to provide a more realistic representation of the risk of common pathogen present in the body of water at levels relevant to the mode of application. Screening for the presence of pathogens is preferred to enumeration of indicator organisms in surface waters as no strong correlations between the presence and/or concentration of pathogens and indicator or index organisms have consistently been documented [15].

The objectives of this study were to concentration and detection of E.coli and salmonella in ground water in Vijayapur.

## MATERIALS AND METHODS

Ground water samples, collected from various locations of Vijayapur region were analysed for physicochemical parameters like pH, conductivity and total dissolved salts using standard methods [16]. All the samples were collected in sterilized bottles and were stored at $4^{o}C$ till further investigation. Microbiological analysis of water samples were conducted in our laboratory by using test kits supplied by Rakiro Biotech Pvt. Ltd. Bombay Research Laboratory. Microbiological analysis of water samples was started immediately after collection to avoid unpredictable changes in the microbial population [17].

## RESULTS AND DISCUSSIONS

Safeguarding drinking water supplies is a major health responsibility. The WHO guidelines place the greatest emphasis on the microbiological quality of drinking water. The concept of safe water eludes the common man. Consequently an outbreak of water born diseases remains a great burden in the society. The microbiological examination of drinking water is a sensitive method to assess its quality though it does not detect contamination with protozoa, viruses and fungi. Enumeration of Coli forms has been recommended by the Indian Council of Medical Research and has been the main method adopted by many workers [18].

According to the WHO, the lack of safe water supply and of adequate means of sanitation is blamed for as much as 80% of all diseases in developing countries. Sewage containing human excreta is the most dangerous material that pollutes water. The most important microbial diseases transmitted through water are Typhoid fever, Amoebic dysentery, bacillary dysentery, Cholera, Poliomyelitis and Infectious hepatitis [19]. Physicochemical and microbiological results are summarized in Table.1. pH is the scale of intensity of acidity and alkalinity of water and measures the concentration of hydrogen ions. In the present study the pH values varied between 5.6 and 9.6. The most remarkable observation of investigation was the alarmingly high level of total dissolved salts (TDS). The TDS of all the samples were in the range of 320-1240mg/lit, while the maximum permissible limiting value of TDS for potable water is 500 mg/lit, according to the WHO. High level of TDS in water used for drinking purposes leads to many excess salts [20].

Electrical conductivity is a measure of water capacity to transmit electric current and also it is a tool to assess the purity of water. Electrical conductivity found in the range of 61-213µs/cm. One of the reason of salinity is the high concentration of cat ions such as sodium, calcium and magnesium where as chloride, phosphate and nitrate as anions [21].

**Table 1.** Water Analyses Report From Under Ground of Vijayapur

| Sl No | Place of Sample Collected | pH | T D Smg/lit | Conductivity µs/cm | E.Coli/ 100 ml | Salmonella |
|---|---|---|---|---|---|---|
| **1** | Ganesh Nagar | 5.6 | 578 | 093 | $10^3$ | _ |
| 2 | Mallikarjun Ashram | 8.9 | 1240 | 212 | $10^5$ | _ |
| 3 | Indi Road | 9.0 | 739 | 139 | $10^2$ | +ve |
| 4 | Kulakarni Lay out Athani Road | 9.6 | 320 | 61 | $10^2$ | _ |
| 5 | Aishvarya Nagar | 9.2 | 502 | 94 | $10^4$ | +ve |
| 6 | Near Shanidevar Temple | 8.8 | 586 | 107 | $10^6$ | +ve |
| 7 | Near APMC South Gate,Shahapeth | 9.4 | 692 | 127 | $10^5$ | _ |
| 8 | Jai Karnataka Colony Near Sindagi Naka | 9.2 | 886 | 161 | $10^3$ | _ |
| 9 | Paschapur Road Opp Golagumbaj Near Shanmukh swami Math | 9.0 | 985 | 178 | $10^2$ | _ |
| 10 | Manguli wase Managuli Galli | 9.0 | 668 | 123 | $10^2$ | _ |
| 11 | Langar BazarNear Nissar Maddi | 9.3 | 916 | 166 | $10^3$ | +ve |
| 12 | Jaynagar,Boys Higher Pri School no-23 | 9.5 | 493 | 082 | $10^4$ | +ve |
| 13 | Gyangabawadi,Near K S R T C Depot -2 | 8.8 | 491 | 86 | $10^5$ | _ |
| 14 | Banagar Galli,Near Ishvar Temple Jorapur Peth | 9.1 | 536 | 97 | $10^5$ | _ |
| 15 | Near Vallabhabai Circle Jamakhandi road | 8.9 | 900 | 161 | $10^2$ | _ |
| 16 | Trimurthi Nagar,Near Chitradurga HighWay By- Pass | 901 | 658 | 122 | $10^5$ | +ve |
| 17 | Hemaraddi Mallamma Mangala Karyalaya,Ibrhimpur Railway Gate | 9.0 | 847 | 156 | $10^5$ | +ve |
| 18 | Near Hanuman Temple Kasageri | 8.7 | 1230 | 213 | 0 | +ve |
| 19 | Gangapuram Jail Road | 5.9 | 578 | 093 | _ | _ |
| 20 | K H B Colony | 602 | 598 | 093 | _ | _ |

Results of the bacteriological analysis( Fig.1) shows that E.coli in water samples ranged from $10^2$ to $10^6$/ 100ml. E.coli analysis of underground water was highly polluted.

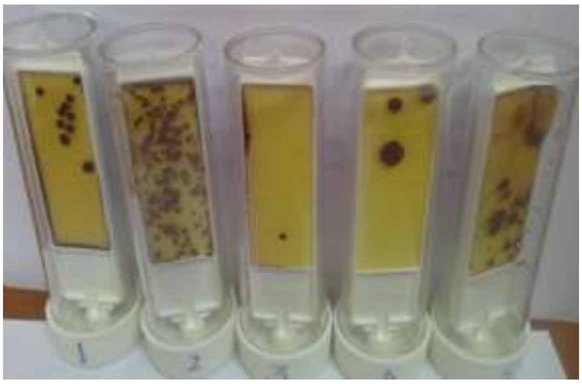


Fig.1


Fig.2

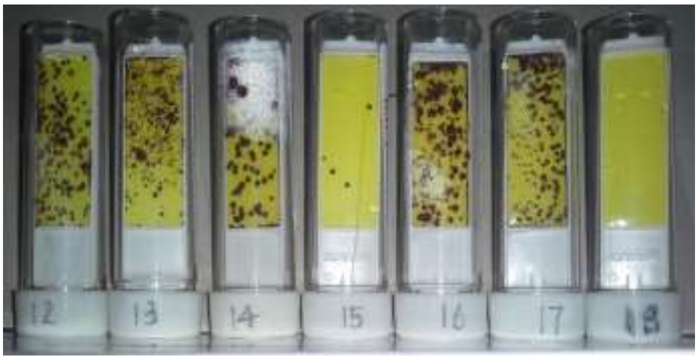

Fig.3

It may be due to contamination in water by fecal matter due to open defecation or due to the percolation of contaminated water in these resources. Satihal et al [22], Tambekar et al [23] showed the microbial pollution in water samples. Eight of twenty samples were detected to contain salmonella. Bacterial qualities of different bore wells are shown in Fig.2.

Fig.4

Fig.5

Presence of Salmonella was observed only in those samples, which showed high densities of coliforms [24] (Polo et al., 1998), which were seen especially at Chaitanyanagar and Wamannagar sites.

**CONCLUSION AND RECOMMENDATION**

In conclusion, proper bore well location and control of human activities to prevent sewage from entering water body is the key to avoiding bacterial contamination of drinking water. It is evident that water born diseases are due to improper disposal of refuse contamination of water by sewage surface run off, therefore programmes must be organized to educate the general populace on the proper disposal, treatment of sewage and the need to purify our water to make it fit for drinking and educative programmes must be organized by researchers and government agencies to enlighten the Vijayapur people. Thus the study reveals that raw ground water is not safe for human consumption. In order to meet the potability of ground water it is recommended that continuous, effective treatment combined with constant monitoring is essential to ensure that it meets the standards of drinking water.

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