

A study on Bacterial characterization and water quality analysis of contaminated Potable water from different sources.

Minor Research Project

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Executive Summary

The most common and widespread health risk associated with drinking water is contamination; directly or indirectly, by human or animal excreta, particularly faeces. If such contamination is recent, and if those responsible for it include carriers of communicable enteric disease, some of the pathogenic microorganisms that cause these diseases may be present in the water. Drinking the water, or using it in food preparation, may then result in new cases of infection. The pathogenic agents involved include bacteria, viruses, and protozoa, which may cause diseases that vary in severity from mild gastroenteritis to severe and sometimes fatal diarrhea, dysentery, hepatitis, or typhoid fever, most of them are widely distributed throughout the world. Faecal contamination of drinking water is only one of several faeco-oral mechanisms by which they can be transmitted from one person to another or, in some cases, from animals to people.

In the different areas of Changanacherry municipality, the population use non chlorinated water for drinking mainly from open wells which are found very close to paddy fields and agriculture lands so there is a chance of intrusion of different types of bacteria in well water. Examples of bacteria that can pollute water in this way are *Escherichia coli*, *Salmonella*, *Shigella*, and *Vibrio cholerae*. Warm-blooded animals other than humans can also contribute protozoan parasites to the water via their faeces. There are number of human diseases like typhoid fever, cholera, jaundice and other diarrhea which are water borne. Since a number of human diseases are caused by bacteria in water, it is necessary to employ treatment facilities to purify water and to provide safe drinking water. In order to prevent the out breaks of water borne diseases and to maintain community health, constant surveillance of water quality of rural, sub urban and urban area is of great significance. Recently the people of Kottayam district are being encountered with the outbreak of jaundice, dengue fever, hepatitis

etc which are all found to be water borne. Since this problem is of much significant and thought provoking we initiated to engage in such investigation.

The main objectives of the investigation are the (1) Physio- chemical analysis of water samples and (2) Bacteriological study of drinking water from various sources in the Changanacherry Municipal region. The study was conducted in five areas of Changanacherry municipality of Kottayam District in Kerala, namely Kurisummodu, Perunna, Valiyakulam, Madhumoola and Puzhavath. A total of 250 water samples from each of the five regions were subjected to the Physio- chemical and bacteriological studies.

The first phase of the study involves analysis of Physio- chemical parameters of water samples. The parameters studied include temperature, pH, conductivity, Total dissolved solids (TDS), Dissolved oxygen, Salinity and Turbidity following the APHA methods. The second phase involves bacteriological study of collected drinking water from various sources in the study area. Bacteriological examination is performed sequentially in three stages; the first is the presumptive test, the most probable number (MPN) method using MacConkey broth. The second is the confirmed test in Eosin Methylene Blue (EMB) Agar. The third is the completed test in which colonies from the EMB agar were inoculated back into MacConkey broth and nutrient agar slants, followed by gram staining. Other enterobacteriaceae groups grown in EMB Agar culture, which were not coliforms but gram negative in nature, are further identified by using specific media and biochemical test using Himedia KB003 HI 25 Enterobacteriaceae Identification Kit which comprises 25 biochemical tests. It is a comprehensive test system that can be used for differentiation of gram negative Enterobacteriaceae species. This kit can be used for screening pathogenic organism from water samples. The tests are based on the principle of pH change and substrate utilization.

The physio-chemical parameters studied shows results which are within the acceptable limits. But most of the drinking water sources were severely contaminated in the region. The total coliform MPN index is in the range of three to >2400 in different regions of Changanacherry municipality. Out of the total 1250 water samples analysed, from five different regions 66% water samples were contaminated. A total of 14 gram negative pathogenic enterobacteriaceae groups were identified from the study site. These include *E.coli*, *Enterobacter aerogens*, *Klebsiella sp*, *Shigella dysenteriae*, *Proteus vulgaris*, *Proteus mirabilis*, *Salmonella typhimurium*, *Faecal Streptococcus*, *Citrobacter diversis*, *Pseudomonas aeruginosa*, *Serratia*

rubidasea, *Enterobacter cloaca*, *Serratia ficaria*, *Enterobacter geroviae*. *Vibrio* sp was not isolated from any of the water samples studied. The occurrence and distribution pattern of microbial species varied greatly in different regions. Besides the above identified groups there are 15 variant forms of the gram negative EMB culture grown pink colonies yet to be identified which were preserved in stab cultures. They should be further subjected to genetic analysis for identification.

As per the desired limit of WHO (1984) classification based on total coliform content, of the polluted 66% water samples in the study area, 50% were heavily polluted, 12.5% polluted, 25% slightly polluted and 12% satisfactory. This indicates the danger of pollution and the consequent hazard of contracting diseases through pathogenic organism from contaminated drinking water.

The study clearly suggests that people of the study region are under the threat of water borne diseases. The continuous use of polluted water would cause serious health risks in local residence of these areas especially in infants. Hence the safety of potable water has to be checked thoroughly in order to give better awareness among the people regarding the need of using safe drinking water and the maintenance of proper health and hygiene. Public awareness programmes, effective management of drainage, sewage and sanitation system and measures needed for disinfection of water samples should be done routinely by the municipal authorities to maintain a better public health in Changanacherry municipal region.