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SHORT COMMUNICATION

Microbiological assessment of pre-monsoon and post-monsoon open well water quality in Karumalloor panchayat, Ernakulam, Kerala

Liji THOMAS[1], Devika RAVINDRANATH[1], Ranjit KANJUR [1*]
[1]Department of Life Science Studies, SNGIST Arts and Science College,
Manakkappady, Karumalloor P.O., Ernakulam - 683 520
*Corresponding author email: ranjitkay@gmail.com

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ABSTRACT
Ground water is a source of potable water among the rural population in Kerala. This study was carried out among the rural population of Karumalloor panchayat in Paravoor Taluk, Ernakulam district. Bacteriological analysis of water from open wells was carried out in two consecutive years as part of department programme, once during post-monsoon and other during pre-monsoon season. Twenty three percentage of post-monsoon water samples tested were potable however only 5% of pre-monsoon samples were potable.

KEY WORDS: *open well, ground water, MPN, potable, pre-monsoon, post-monsoon*

Introduction

Water is the basis of existence of life and fresh water is just 3% of the water on the planet. Safe drinking water is essential for healthy life. India falls under the "water stressed" countries (Subramanian, 2000). The population of India amounting to over 1 billion is at risk, quantitatively and qualitatively from unsafe drinking water. Urban and rural areas depend on ground water as major fresh water source for their activities. Water borne diseases due to consumption of contaminated drinking water are one of the major concerns. Persistent Organic Chemicals (POP), heavy metals and microorganisms are major contaminants of drinking water sources.

In rural areas of Kerala, microbiological contamination of ground water sources are mainly due to the lack of sanitation, closeness of wells to waste dumps, cattle sheds and latrines (Reed *et al*., 2007, Mani *et al*., 2006). Seasonal variation also affects ground water quality; the level of contamination is higher during pre-monsoon than post-monsoon, primarily due to water scarcity (Kannan and Joseph, 2009).

Kerala has two monsoons, southwest and northeast monsoon during the middle and end of the year respectively, with rainfall averaging 300 cm annually. In the summer month of March, lowering of water table and subsequent water scarcity is observed (Shaji *et al*., 2009). It has been reported that 76% of population of Kerala depends on ground water sources for fresh water and 60% of households use well water for drinking and other domestic use (Prakasham, 2013, Kerala ENVIS Centre, 2013). The rural populations of Kerala are more dependent on ground water than urban population. The ground water quality of Kerala is generally potable, Kerala has 140 open wells per square kilometer, highest in the country, and coastal areas have up to 200 open wells per square kilometer (Harikumar and Chandran, 2013). Water borne diseases occurring due to

contaminated ground water includes diarrhea, dysentery, typhoid, worm infestations and infectious hepatitis (Kunhikannan and Aravindan, 2000).

This study was carried out in Karumalloor panchayat in Paravoor Taluk, Ernakulam District, Kerala state, India where the college is situated. The study was conducted as part of a health and water analysis programme conducted by the department among the local population. This programme is conducted every academic year in the department. Data collected during sample collection for the programme included drinking water source and water treatment methods employed. The local population depends mostly on open wells for water for all purposes. Each house has their own open well and they preferred untreated water for consumption.

The samples for the study were collected during the programme held in the academic year 2012-13 (December, 2012) and in the next academic year 2013-14 (March 2014). The period of collection was categorized as post-monsoon season in December 2012 (D12) and pre-monsoon season in March, 2014 (M14). The samples were collected and the microbiological quality, particularly presumptive coliform count was analyzed by standard method (APHA, 1995). In the first phase, 87 samples were analyzed and in the second phase 43 were analyzed (Fig. 1).

The samples were grouped into three categories based on the MPN results; Good - those with all tubes negative, without gas and turbidity (0 MPN/100ml), moderate - those with MPN values from 1-1000 MPN/100ml and poor - those with MPN values above 1000 MPN/100ml. The percentage of good quality and moderate quality samples in post-monsoon D12 was 23% and 53%, whereas that of poor quality was 24%. The M14 samples collected during winter had more contamination compared to the earlier samples. The percentage of samples falling in moderate and poor category was 51% and 44% and that of good quality was 5%.

Moderate contamination in ground water was observed in a study of well waters near industrial area in Kollam district, Kerala, India (Shaji *et al*., 2009). The authors sampled four open wells radiating away from the industrial site and observed coliform contamination in all the wells. The wells had moderate contamination level that ranged from 80 to 280 MPN/100 ml. In the present study, 77% of post-monsoon samples and 95% pre-monsoon samples were either moderate or poor quality.

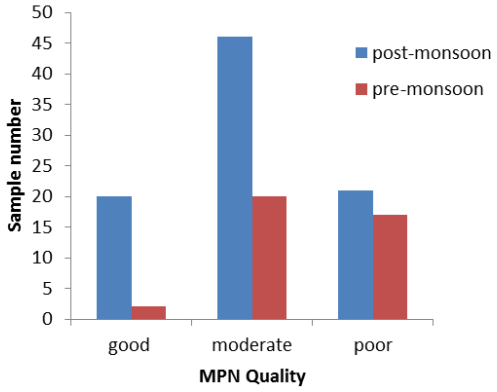

Figure 1: Number of samples that fall under different categories is shown.

A study conducted during the pre-monsoon season in rural area of Mayyanad and Edamulakkal panchayats in Kollam district in Kerala, found contamination in open wells due to proximity of wells to either untreated waste dumping in backyard or cattle waste pit (Prakasam, 2013). The dependence of population on open wells was more than 90%, however, the tests revealed that wells they sampled were contaminated with coliforms and faecal coliforms in the range of 200 – 1200 MPN/100 ml and 40 to 150 MPN/100 mL respectively. These findings are similar to the pre-monsoon contamination level found in this study. In another study, 50 ground water samples were collected and analyzed from five wards of Kodiyathur village in Kozhikode district (Megha *et al*, 2015). The authors found 90% samples to be contaminated with E. coli in one of the wards, 80, 70, 50 and 30% contamination in the rest of four wards. Those wards having major ground water contamination was due to poor planning and design of the wells and improper siting of wells from latrines. The results of the present study shows that further study is required for analyzing the reason for heavy ground water contamination in the study area during pre-monsoon season.

In a study conducted in 19 wards of Vadakkekara panchayat

(Sleema and Babu, 2009), the various physiochemical parameters of water quality of dug wells, tubes well and municipal supply was tested. They observed BOD values within permissible limit in all the water samples.

In this study, high coliform content was observed in water samples collected from open wells in the rural area of Karumalloor panchayat. Higher coliform content was observed in samples collected during pre-monsoon than during post-monsoon. Further detailed study is required to assess the contamination level in ground water in this rural area, as well as the effect of monsoon in contamination level and other details such as proximity of open wells to animal waste pits and latrines.

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