Impact of Ground Water Total Coliform Provenance on Public Health in Kansua Area, Kota

Nupur Jain[1], Rakesh Duggal[2]
Asst. Prof., Department of Chemistry, Rajdhani Engineering College, Jaipur, Rajasthan, India[1]
Director, Poornima Group of Institutions, Jaipur, Rajasthan, India[2]

***Abstract*: Over last few decades water quality in Industrial Region has been a matter of second priority. Preliminary study in Kansua area is not indicating any concern for water standards of WHO. In this endeavor an area of 5 Sq. Km. has been selected for detailed study. Groundwater samples were collected in the from different bore wells & hand pumps and were analyzed for Total coli. The study related bearing of total coli generated by activities relating to agriculture, litho units and local environmental conditions with groundwater quality. The groundwater in this area has been found to be mostly affected by high coli. As such, suitability of groundwater for domestic, industrial and irrigation purposes was examined using WHO, Indian standards classification. It is observed that groundwater obtained from sampling sites were unsuitable for domestic as well as irrigation purposes.**

Keywords: Ground water, Total coli, suitability, irrigation.

I INTRODUCTION

Microorganisms are widely spread over earth and throughout its atmosphere. Microorganisms include bacteria, viruses, and protozoan parasites; they are microscopic and therefore invisible to the naked eye. They are also found in all surface waters, including lakes, streams, and rivers. They can be found in shallow and unprotected wells and springs and, less often, in deep and protected well waters. Many microorganisms can survive extremes of climate. Most microorganisms in the environment and found in water are not harmful, but enough of these are harmful. It forces us to keep drinking water nearly microorganism-free.

The significant microorganisms, called pathogens are the ones that cause disease and thus affect human health. It is not possible to test drinking water regularly for the presence of disease-causing organisms because they exist in very low numbers in water, are hard to isolate and detect, and there are so many different kinds it would be impractical and expensive to test for them all. Initial attempts by such studies carried out in different parts of Rajasthan also highlighted their impact on quality of water [1-9]. Thus, regular monitoring to check the status of groundwater for ascertaining the pollutants is the need of hour.

II MATERIALS AND METHODS

Kota is located along eastern bank of the Chambal River in the southern part of Rajasthan. The cartographic coordinates are 25°11′N 75°50′E/ 25.18°N 75.83°E. It covers an area of 318 km^2 (3.63 per cent of the Rajasthan State). It has an average elevation of 271 meters (889 ft). A total of 5 samples of groundwater used for drinking purpose were collected from different sources like hand pumps or open wells at different spots spread over Kansua area during all seasons in the Year,2014.(Table 1)

Table 1 Description of spots

Spot No.	Name of the spot	Source type
S1	Near Govt. Girls Senior Secondary School, Bombay Yogena, Kansua	Tube Well
S2	Near Bombay Yogena Colony, Kansua	Hand Pump
S3	Near Samudayik Bhawan, Near Maszid, Kansua	Hand Pump
S4	Near Shiv Mandir, Kansua	Hand Pump
S5	Near Govt. Senior Secondary School , Ram Nagar	Hand Pump

Microbiological quality of water was determined using most probable number (MPN) methods. The test was performed within 24 h of sample collection. The MPN method was used to determine the presence of gas producing lactose fermenters and most probable number of coliforms present in 100 ml of water. The standard MPN method (nine multiple tube dilution technique) was used for detection of total coliforms by inoculation of samples into tubes of lactose broth (LB) and incubation at 37°C for 48 h. The positive tubes were sub cultured into Brilliant Green Lactose Broth (BGLB) and were incubated at 44.2°C for 48 h and checked for total count. [10]

III RESULTS AND DISCUSSION

The most probable number is a suitable and most widely used method to determine the microbial quality of water.[6] Present investigations have rendered that maximum value was 2313.33 mpn/100 ml and minimum was 83.33 mpn/100ml during pre-monsoon whereas during monsoon and post-monsoon maximum values were 253.30 mpn/100ml, 2166.67 mpn/100ml and minimum values were 97.67 mpn/100ml, 150 mpn/100ml respectively. The observed values exceed permissible limits of WHO (0-50 coliforms/100 ml) significantly.[11-12] (Table 2, Figure 1) Therefore, it can be inferred that groundwater of study area is neither useful for drinking purpose nor for irrigation.

Table 2 Average value of bacteriological analysis in all seasons (MPN/100ml)

Parameter/Sampling spot	PRE	MONSOON	POST
S1	2300.00	97.67	2166.67
S2	2170.00	123.30	2033.33
S3	2135.00	253.30	1169.67
S4	2313.33	240.00	1984.00
S5	83.33	163.30	150.00

Municipal water supply sample S-4 (Near Shiv Mandir, Kansua) showed highest total coli was 2313.33 mpn/100ml that exceeds the limit prescribed thereby showing that it contains significant amount of organic matter that provides nutrition for the growth and multiplication of microorganisms. This was mainly due to the leakage of underground water supply line and sewage discharges. The same pattern has been observed for sampling spots S-1(Near Govt. Girls Senior Secondary School, Bombay Yogena, Kansua), S-2(Near Bombay Yogena Colony, Kansua), S-3(Near Samudayik Bhawan, Near Maszid, Kansua) while S-5(Near Govt. Senior Secondary School , Ram Nagar) appears to be somewhat in acceptable limits of WHO standards.

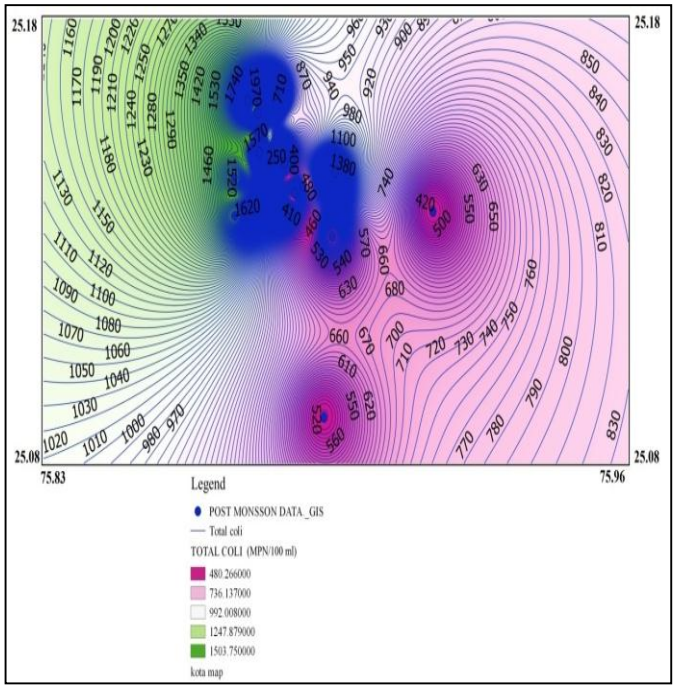

Figure1: Total Coli (MPN/100 ml) concentration distribution map

IV. CONCLUSION

The quality of groundwater of Kansua area of Kota is not safe for drinking purposes as it has total coli range of extreme variance(83.33 to 2313 MPN/100ml.) being on higher side from acceptable limits set by WHO and Indian standards. Thus, Coliform provenance in groundwater samples collected from spots under study appears to have an impact on public health in Kansua area. It is required that remedial actions like plugging leakages from sewage discharges etc. be immediately initiated at appropriate levels for ensuring safe water supply particularly meant for drinking purposes.

REFERENCES

[1]. Nupur Jain et.al.,"Physico-Chemical & Microbial Assessment Of Ground Water Of DCM Industrial Area and Its Adjoining Areas, Kota [India].Part-I", International Journal of Innovative Research in Science, Engineering and Technology,Vol. 3, Issue 11,pg.1333-1341, November 2014.

[2]. Nupur Jain et.al., "Evaluating Geochemistry By Multivariate Analysis Of Groundwater in DCM Industrial Area Kota, Rajasthan (India) " Aufau periodicals - Chemical Science Review and Letters, Vol 4,Issue 14,448-458 , June 2015.

[3]. Nupur Jain et.al. "Hydro-Chemical Analysis of The Ground Water Surrounding DCM Industrial Area and Its nearby Places, Kota, Rajasthan, India" published in International research journal of environmental science, Vol 4, Issue 8, 26-32, 2015.

[4]. Nupur Jain et.al., "Analysis Of Water Quality Of DCM Industrial Area Kota And Their Statistical Details" International Journal of Engineering science & research technology, vol 9, Issue 4, 444-452, 2015 .

[5]. Nupur Jain et.al., "Assessing Ground Water Quality in Winters of Industrial Zone, Kota, Rajasthan" Rasayan Journal of Chemistry, vol 8, No. 3,pp 339-345, September, 2015.

[6]. Nupur Jain et.al. "Seasonal Variation and Bacteriological Analysis of an Industrial City of Western India" International Journal of Engineering Research and Development, Vol. 11 (10), pp 49-54, October 2015.

[7]. Nupur Jain et.al. "Groundwater Quality Mapping at The Western Part Of India By GIS Modelling Technique", International Journal of Engineering Research and Development, Vol. 11, (11), pp 25-32, December 2015.

[8]. Nupur Jain et.al.," Groundwater Quality Mapping at the Western Part of India by GIS Modeling Technique" International Journal of Engineering Research and Development, Vol. 11, (11), pp 25-32, December 2015.

[9]. Nupur Jain et.al. "Groundwater quality and its suitability for DCM Industrial Area, Kota, Rajasthan, India – A GIS approach" International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 2, pp 392-398,February 2016.

[10]. APHA Standard methods for the examinations of water and waste water, pp 29-179, 2-4, 2007.

[11]. WHO, Guidelines for drinking water quality, Recommendations, World Health Organization, Geneva, 1, pp 188 (1996)

[12]. WHO, International Standards for Drinking Water, 3rd ed., Geneva, 2008.