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Effect of Water Quality Parameters on Water borne diseases, with special Reference to Chandresal River, Kota

Meenu Mathur*

Assistant Professor, Department of Botany, Samrat Prithviraj Chauhan Government College, Ajmer

*Corresponding Author E-mail: meenu.mathur03@gmail.com

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ABSTRACT

Drinking water is one of the implicit requisites for a healthy human population. However, the growing industrialisation and extensive use of chemicals, has increased the burden of unwanted pollutants in the drinking water of developing countries like India. Water pollution management in Kota region has been a matter of great concern to Medical and health department of Government of Rajasthan. Environmental risk assessment in relation to community drinking water supply and population has been the concern of present study. In Kota region Hathikheda village situated at the bank of Chandresal River was selected and water was collected in different seasons. The water was analysed or various physio-chemical and biological parameters were determined. The results was compared to the table approved by Bureau of Indian standards for drinking water. Simultaneously PHC present in village was visited to find out the patients related to water borne diseases. The data was collected as number of patients per 1000 of population. Water sources in study area received untreated domestic sewages. Analysis revealed that source is contaminated and chemical parameters were not within acceptable water quality limits. Various parameters indicated their significance in the form of health hazards.

Keywords: *Drinking water, Contaminated, Water borne diseases, Health parameters.*

INTRODUCTION

It has been a universal fact that water serves as the second - natural medium for the growth of microorganisms and stands next to soil. The growth of microorganisms in water, mainly depends on the amount of available mineral nutrients and the dissolved oxygen present in it. It has been observed that as the amount of organic matter increases in water, the number of microorganisms also increases but up to certain limit. Moreover, the pH, temperature range and inorganic phosphate content as well as the situation of the lake and river also support the growth and cause a dense population of microorganisms. These organisms (bacteria, blue green algae, etc.) form heavy blooms under these conditions. The possible factors responsible for limiting the growth and density of microorganisms are the available amounts of zinc, copper, and the poor quantity of nitrate nitrogen etc.

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It has been noticed that the excess of calcium is harmful for the luxuriant growth of microorganisms, especially to algae in general. However, in spite of enormous quantity of the substance that exists, only a small proportion of it is actually usable by human beings. Humans use water in the home, in industry, in agriculture and for recreation.

The polluted water contains various metallic ions e.g., arsenic, molybdenum, lead, cadmium, mercury, nickel, barium, beryllium, cobalt, tin, vanadium, etc. Many of these are highly toxic and when present in river or pond water affect plant and animal life. Today many of the rivers of the world receive millions of litres of sewage, domestic waste and industrial and agricultural effluents with different concentrations of pollutants.

Eutrophication leads to increase in the growth of aquatic plants and often to algal blooms. Some important blue green algal genera forming bloom include *Microcystis, Anabaena, Oscillatoria* and *Aphanizomenon*. Algae from some other groups such as *Chlorella, Scendesmus and Kirchneriella* can also from blooms. Filamentous green algae, such as *Spirogyra, Cladophora* and *Zygnema* form a dense floating mat or "blanket" on the surface. The extensive algal growth have resulted fatal for fish by interfering the re-aeration, excluding light intensity necessary for photosynthesis by other aquatic plants and thereby preventing the release of oxygen into the water, or depleting the oxygen through decay or respiration within the bloom (Saxena, et al, 2008).

Water is also naturally polluted, for instance, at many places nitrates and fluorides are found in natural water in a concentration not safe for human use. There are many pockets in India especially in western Rajasthan, Haryana, Punjab, Tamil Nadu and Andhra Pradesh, where the water has a high fluoride content. People who use these waters with more than 1.5 ppm fluoride for drinking may suffer from fluorosis. In India, Rajasthan is one of the highest endemic states suffering from the presence of high fluoride contents in the ground waters in of its districts. In Rajasthan atleast 22 district have been identified as fluorosis prone areas. High levels results in permanent deformities, severe joint pains, general disability and other health hazards (Dadhich and Sharma 2003).

Chandresal river of Kota district have been selected to study the effect of water pollution on health or safety. Polluted waters, especially those polluted by domestic sewage and discharges from hospitals and slaughter houses etc., are potent source of infectious diseases. Most of the disease-causing bacteria enter the body of animals and those of human beings through water and develop serious diseases. This river is highly polluted due to many industrial and domestic effluents with heavy metals like Raipura nallah which got effluents from DCM factory of Kota. Study was conducted during 2010-2011.

STUDY SITE

Kota is located along eastern bank of the Chambal river in the southern part of Rajasthan. It is the 3rd largest city of Rajasthan after Jaipur. and Jodhpur. Kota once belonged to the princely state of Bundi under the rule of the Chauhans. Kota is well known for its ancient palaces, havelis or mansions and castles.

The exact cartographic coordinates are 25°11'N 75°50'E25.18°N 75.83°E. It covers an area of approximately 12,436 km² (3.63 per cent of the Rajasthan state). It has an average elevation of 271 meters (889 ft). Chandresal river originates from Alaniya river of Kota and merges into Chambal river at Manas Village, Kota. It is approx 45 Km in length. Or present study Hathikheda village, situated at the bank of Chandresal river was selected.

MATERIALS AND METHODS

For present study water from different drinking sources was analyzed for various parameters, *viz.* Physical-colour, odour and temperature, chemical- total hardness, chloride, nitrate, dissolved oxygen and biochemical oxygen demand and biological parameter like most probable number (MPN). Various physico-chemical parameters were

determined by following methods devised by APHA (1976), Adoni (1985). Monthly water samples were collected for study of water quality (April 2010- March 2011), covering 3 seasons viz. winter, summer and monsoon.

Data were also collected about various water borne diseases as recorded by Primary Health Centre (PHC) hospital/dispensaries in the study area.

OBSERVATION AND RESULTS

Data are presented in the form of average values of some physio-chemical parameters and their correlation with total number of patients o water borne diseases, specially Diarrhoea and Jaundice in the studied village (Table 1; Fig. 1-5).

Table 1: Average Values of Some parameters and patients of Water borne diseases

Monthly Parameters	Total Hardness	Chloride	Nitrate	DO	BOD	MPN	Vomiting/ Diarrhoea	Jaundice	Total number of patients of Water borne diseases
April 10	521.5	217.5	28.3	6.11	310.32	167.5	297.98	17.3	315.28
May10	453.2	187.4	26	5.3	0.30	241.7	311.4	18	329.4
June 10	374.7	165.6	32.1	5.66	0.233	167.0	432.2	23	455.2
July 10	256.3	160.9	34	5.56	0.215	105.6	375.3	32.1	407.4
Aug 10	412.6	201.5	35.2	5.9	0.31	107.4	289.2	22.4	311.6
Sep. 10	390.2	187.5	28.9	5.53	0.24	98.7	322	33.2	355.2
Oct 10	299.1	167.4	30	5.8	0.26	87.99	354.2	32	386.2
Nov10	289.5	176.6	33	6.3	0.29	84.31	352.2	28.3	380.5
Dec 10	276.5	160.1	32	6.33	0.25	108.7	298.3	29.1	327.4
Jan 11	332.4	172.3	31.8	5.99	0.29	119.6	321.3	34	355.3
Feb 11	321.4	211.5	25.5	5.32	0.31	210.6	288.3	19.2	307.5
Mar 11	333.1	172.4	31	6.01	0.32	99.11	321.1	20.1	341.2

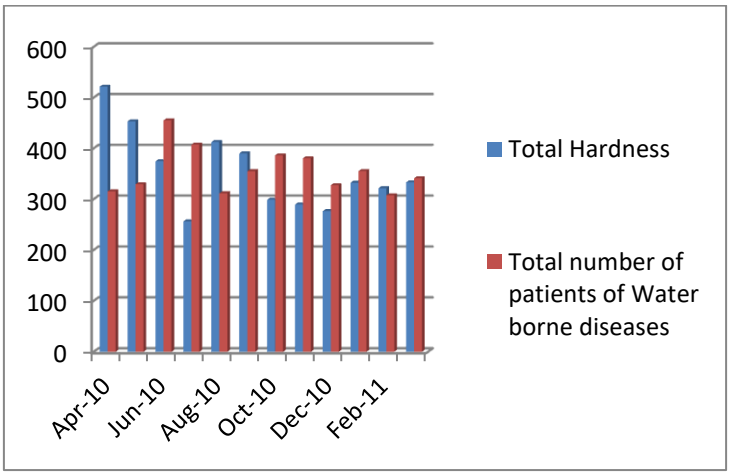

Fig. 1 : Correlation of Total Hardness with Total number of Patients of Water borne diseases

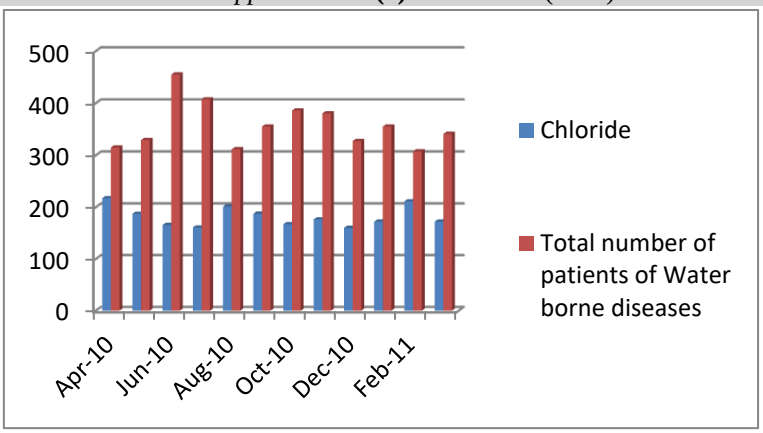

Fig. 2 : Correlation of Chloride with Total number of Patients of Water borne diseases

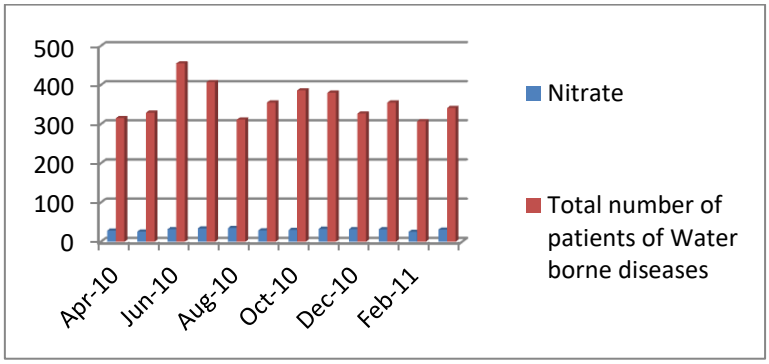

Fig. 3 : Correlation of Nitrate with Total number of Patients of Water borne diseases

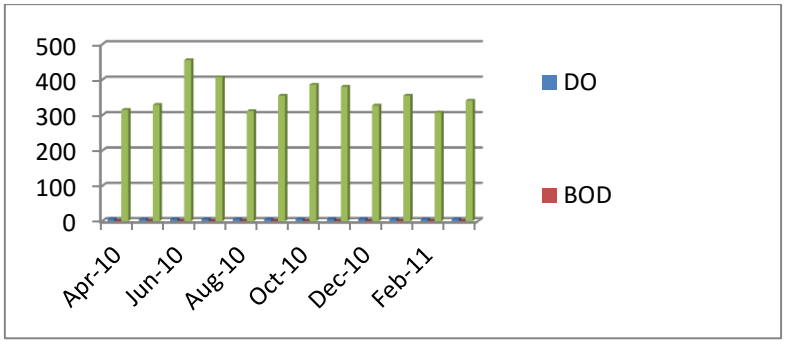

Fig. 4 : Correlation of Dissolved Oxygen and Biological Oxygen Demand with Total number of Patients of Water borne diseases

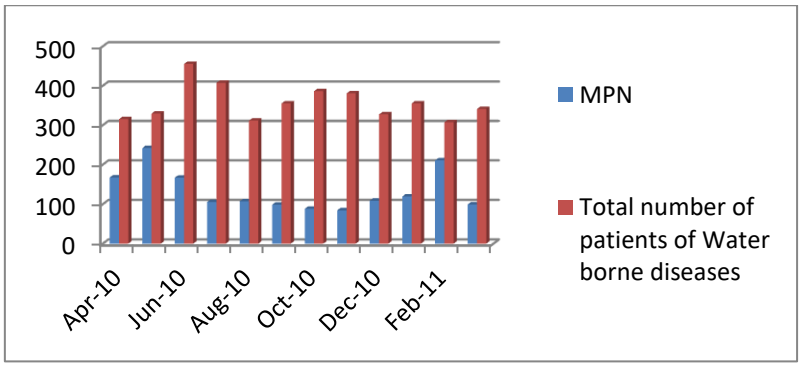

Fig. 5 : Correlation of Most Probable Number with Total number of Patients of Water borne diseases

DISCUSSION AND CONCLUSION

Total hardness values are above permissible limit leads to increase in diseases. Nitrate values are also above the permissible limit according to WHO, which shows a direct correlation with water borne diseases.

Most probable number and nitrate was positively and significantly correlated with diarrhoea vomiting. The highest correlation between diarrhoea vomiting and most probable number was indicates that most probable number largely contributed to diarrhoea vomiting. There were no correlation between total hardness, chloride, dissolved oxygen, biochemical oxygen demand inferring that these parameters were not related to infection of disease. Further, there were no correlation between total hardness, chloride, dissolved oxygen and biochemical oxygen demand inferring that these parameters were not related to the infection of disease.

Jaundice was positively and significantly correlated with most probable number and nitrate. The highest correlation between jaundice and most probable number indicates that most probable number largely contributed to jaundice. There were no correlation between total hardness, chloride, dissolved oxygen and biochemical oxygen demand resulting that these parameters were not related to infection of disease.

The patients of Jaundice were high in number in the months of July, September and in January which may be due to rainy season as more nallah's enter into the river in rainy season on the other hand in January, too much cold is also responsible for it. As Jaundice is related to liver, which may be infected due to water borne bacteria's. Problems related to vomiting and diarrhoea were very much specially in children, in the months of Summer and monsoon period Diarrhoea is usually an acute disease associated with passage of frequent liquid stools or having more stools per day than is normal for that person. When diarrhoea persists for more than 14 days, then it is known as *chronic diarrhea*.

There are distinct seasonal patterns of occurrence of diarrhoea in many geographical areas. Usually towards the end of summer and early rainy season, seasonal diarrhea is common. In temperate climate, bacterial diarrhoea occurs more frequently during the warm season, whereas viral diarrhoea, particularly diarrhoea caused by rotavirus reaches its peak during the drier, cool months (Annual Report, 2011).

In general most probable number was found to be positively and significantly correlated with all the water related diseases. Its higher values largely contributed to diarrhoea vomiting whereas no correlations could be established in a generalized pattern with other water quality parameters like total hardness, chloride, nitrate, dissolved oxygen and biochemical demand etc.

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