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CORRELATION STUDY AMONG WATER QUALITY PARAMETERS OF KARWI TAHSIL, DISTRICT CHITRAKOOT AN APPROACH TO WATER QUALITY MANAGEMENT

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ABSTRACT
Water is an essential natural resource for sustaining life and environment but over the last few decades the water quality has been deteriorated due to it's over exploitation. Water quality is essential parameter to be studied when the overall focus is sustainable development keeping mankind at focal point. Groundwater is the major source of drinking water in rural as well as in urban areas and over 94% of the drinking water demand is met by groundwater. The study has been carried out to assess the ground water quality and its suitability for drinking purpose in most rural habitations of Karwi Tehsil of Chitrakoot district, Uttar Pradesh, India. For this purpose, 27 water samples being collected from hand pumps, open wells and bore wells of villages of study area were analyzed for different physicochemical parameters such as pH, electrical conductivity, total alkalinity, total hardness, chloride, nitrate, fluoride, phosphate, Iron and total dissolved solids.

KEYWORDS: Water quality parameters, regression equations, correlation, water quality Management.

INTRODUCTION
Ground water is one of the major sources of water which full fill the requirement of mankind in different sectors. It plays an important role to enhance the economic scenario of India and ensures food security. Due to rapid industrialization, urbanization and agricultural development causes several types of contamination in ground water resources in various part of country which results many harmful effects towards environment. The central ground water board is being monitored to check the quality and aspects of ground water samples in the country. Water of good drinking quality have basic importance to human physiology of man sustained existence depends very much on its availability (Tiwari *et al.*, 2003; Tiwari *et al.*, 2014; Dixit *et al.*, 2015; Tiwari, 2015 and Tiwari, 2016).

Unsafe drinking water contributed to number of health problems in developing countries such as the one billion or more incident of diarrhea that occur annually.

According to world health organization (WHO), there were estimated 4 billion cases of diarrhea and 2.2 million deaths annually. The consumption of unsafe water has been implicated as one of the major causes of this disease most gradual deterioration of water quality was resulted by the increase in human population and urbanization.

Ground water quality study
The international standard organization (ISO) has defined study as the programmed process of sampling, measurement and subsequent recording or signaling or bath, of various water characteristics, often with the aim of assessing, conformity to specified objectives. Study of ground water quality attempted to get knowledge on various chemicals which can be obtained through different samples of hydro geological units. Ground water mainly obtained through hand pumps and springs from hilly area and major parts of ground water get from wells. The main purpose of ground water quality study was to get data on distribution of water quality on

various regional skills and to create and backup information on different chemicals in ground water. (Murugesan et al., 2005), studied the characterization of ground water quality in Madurai region, (Kalra et al., 2012), studied the water quality index assessment of ground water in Kailwar block of Bhojpur (Gupta et al., 2014), studied the biochemical, physical and statistical analysis of hand pumps water quality in Banda (U.P.) (Chavan et al., 2014), impact of solid waste dump on ground water quality in the village Kasaba-Bawda, Kolhapur district.

Human activity commonly observed of sampling stations

The following human activities were observed during sampling of hand pump, bore-wells and wells at various locations, religious, bathing, washing, open defecation, cultivation, sand stone crushing, road construction, irrigation drinking etc.

MATERIAL AND METHODS

Ground water samples, collected from 27 different location of Tahsil Karwi, District Chitrakoot from various ground water sources for winter, summer and post monsoon seasons, were analys for physico-chemical parameters (pH, hardness, chloride, alkalinity, TDS, nitrate, Fluoride, Iron, phosphate, etc.). Parameters physical-chemical and biological will be studied as per method and techniques described (Saxena 1990, APHA 1992, NEERI 1986). To study the correlation between various water quality parameters, the regression analysis was carried out using computer software SPSS, version-7.5 and Sigma Stat 3.5.

RESULTS AND DISSCUTION

Correlation of physic-chemical parameter

In order to determine the correlation (R) between measured parameters for the value in study area at 27 sampling station (hand pumps -20, bore wells-3 and wells-4), are shown in table 1,2,3 respectively, bivariate correlation was evaluated using SPSS 16.0.

In order to determine correlation (R) between measured parameters for 27 sampling stations. Linear regressions were evaluated using Sigma Stat 3.5. The most informative correlations were with sulphate, which was a useful tracer for study area a strong correlation between total hardness and other typical parameters such as pH, Total hardness, Chloride, Alkalinity, Fluoride, Nitrate, Phosphate and Iron.

In the present study, the correlation coefficients (r) among various water quality parameters have been calculated and the numerical values of correlation coefficients (r) are tabulated in Table 1, 2, 3. Correlation coefficient (r) between any two parameters, x and y is calculated for parameter such as water pH, electrical conductivity, total alkalinity, total hardness, calcium hardness, magnesium hardness, chloride, nitrate, fluoride and total dissolved solids of the ground water samples.

The pH has been found to show positive correlation with chloride, nitrate, phosphate and negative correlations with Iron, total hardness, fluoride, sulphate and alkalinity in hand pumps water samples, the pH has been found to show positive correlation with chloride, nitrate, phosphate, Iron, total hardness, sulphate, alkalinity and negative correlations with nitrate and fluoride in wells water samples, the pH has been found to show positive correlation with Iron and negative correlations with nitrate, chloride, nitrate, phosphate, total hardness, sulphate, alkalinity and fluoride in bore wells water samples.

Table 1: Correlations of water quality parameters in hand pump water samples Correlation matrix (R) of measured water quality parameters.

Parameters	pH	Total hardness	Chloride	Alkalinity	Fluoride	Nitrate	Sulphate	Phosphate	Iron
pH	1								
Total hardness	**-0.178**	1							
Chloride	0.134	0.041	1						
Alkalinity	-0.248	-0.007	-0.165	1					
Fluoride	-0.036	0.139	0.158	0.398	1				
Nitrate	0.172	0.099	-0.017	-0.054	-0.262	1			
Sulphate	-0.086	-0.286	**0.493***	0.405	0.446*	-0.267	1		
Phosphate	**0.575****	0.003	0.027	-0.182	-0.194	0.228	-0.311	1	
Iron	-0.156	**-0.405**	-0.138	0.203	-0.185	-0.030	**0.208**	-0.189	1

*****. Correlation is significant at the 0.01 level (2-tailed).***
****. Correlation is significant at the 0.05 level (2-tailed).***

Total hardness has been found to show negative correlations with alkalinity, sulphate and Iron while all other parameters are positively correlated with total hardness in hand pumps water samples, the total hardness has been found to show positive correlation with all water's samples in wells water samples, the total

hardness has been found to show negative correlation with Iron while all other parameters are positively correlated with total hardness in bore wells water samples. Out of the 27 correlation coefficients, 11 correlation coefficients (r) between the pH and phosphate (0.901), fluoride and nitrate (0.880), sulphate and Iron (0.893), total hardness and sulphate (0.985), chloride and alkalinity (0.896), fluoride and nitrate (0.998), phosphate and Iron (0.866), alkalinity and phosphate (0.844), total hardness and chloride (0.975), chloride and sulphate (0.921), fluoride and sulphate (0.826) are found to be with highly significant levels (0.8< r < 1.0), and 14 correlation coefficients give the significant (0.5< r < 0.6) level of r values. There is not any value of r which belongs to the moderate significant coefficient levels (0.6< r < 0.8). 62 cases were calculated out positive correlation while 46 cases were calculated out negative.

Table 2: Correlations of water quality parameters in well water samples Correlation matrix (R) of measured water quality parameters.

Parameters	pH	Total hardness	Chloride	Alkalinity	Fluoride	Nitrate	Sulphate	Phosphate	Iron
pH	1								
Total hardness	**0.717**	1							
Chloride	0.300	0.635	1						
Alkalinity	0.613	0.365	-0.460	1					
Fluoride	-0.150	0.351	-0.195	0.416	1				
Nitrate	-0.210	0.491	0.248	0.030	**0.880**	1			
Sulphate	0.501	0.234	0.669	-0.337	**-0.818**	-0.549	1		
Phosphate	**0.901**	0.454	-0.144	0.844	-0.069	-0.333	0.217	1	
Iron	0.671	0.136	0.313	0.031	**-0.834**	-0.778	**0.893**	0.556	1

Table 3: Correlations of water quality parameters in bore well water samples Correlation matrix (R) of measured water quality parameters.

Parameters	pH	Total hardness	Chloride	Alkalinity	Fluoride	Nitrate	Sulphate	Phosphate	Iron
pH	1								
Total hardness	**-0.992**	1							
Chloride	**-0.995**	0.975	1						
Alkalinity	**-0.848**	0.776	**0.896**	1					
Fluoride	-0.622	0.714	0.541	0.112	1				
Nitrate	-0.572	0.669	0.489	0.050	**0.998***	1			
Sulphate	**-0.955**	**0.985**	0.921	0.653	0.826	0.789	1		
Phosphate	-0.336	0.217	0.427	0.784	-0.529	-0.580	0.042	1	
Iron	0.180	-0.300	-0.082	0.369	**-0.882**	-0.910	-0.463	**0.866**	1

CONCLUSION

The result obtained during study was compared with BIS standards. Potable water is water safe enough to be consumed by humans or used with low risk of immediate or long-term harm. The study assessed the evolution of water quality in groundwater source of Karwi Tahsil. A comparative study of three type of bore well water, well water and hand pump water were carried out by taking certain important parameters like chloride, pH, alkalinity, fluoride, nitrate, sulphate, phosphate and total hardness. In this present investigation it was found that the maximum parameters were not at a level of pollution.

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