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RESEARCH ARTICLE

NATURAL INFLUENCE OF GEOLOGY AND HUMAN ACTIVITIES ON THE QUALITY OF GROUND WATER AND HUMAN LIFE

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ABSTRACT

The quality of any body of surface or ground water is a function of either or both natural influences and human activities. Without human influences, water quality would be determined by the weathering of bedrock minerals, by the atmospheric processes of evapotranspiration and the deposition of dust and salts by wind. By the natural leaching of organic matter and nutrients from soil, by hydrological factors that lead to runoff, and by biological processes within the aquatic environment that can alter the physical and chemical composition of water. As a result water in the natural environment contains many dissolved substances and non-dissolved particulate matter. Dissolved salts and minerals are necessary components of good quality water as they help maintain the health and vitality of the organisms that rely on this ecosystem service. The distribution of water hardness, a water quality parameter that is most influenced by the geology of the surrounding drainage basin, in lake and river monitoring stations worldwide.

Water can also have certain substances that are harmful to life. These include metals such as mercury, lead and cadmium, pesticides, organic toxins and radioactive contaminants. Water from natural sources almost always contains living organisms that are integral components of the biogeochemical cycles in aquatic ecosystems. However, some of these particularly bacteria, protists, parasitic worms, fungi, and viruses, can be harmful to humans if present in water used for drinking.

Heavy metals are natural component of Earth's crust. They can not be degraded. To a small extent they enter our bodies via food, drinking water and air. Some metals are essential to maintain the metabolism of the human body. However at higher concentration they can lead to poisoning. The harmful effect to human life is mainly from drinking water which is contaminated naturally or from human activities.

INTRODUCTION

Water quality in aquatic environments remains within natural ranges is essential for maintaining viable, abundant and diverse communities of organisms. People have specific water quality requirements for drinking water, recreation, agriculture and industry, although the specific water quality requirements vary by sector. Degradation of water quality erodes the availability of water for humans and ecosystems, increasing financial costs for human users, and decreasing species diversity and abundance of resident communities. These changes in environmental quality can be associated with changes in water quality parameters. Poor water quality can be the result of natural processes but is more often associated with human activities. Although substances that can be harmful to life can have natural or human made sources, the contribution of some human produced chemicals to the natural environment far overshadows natural sources. To mitigate these problems, large urban centres began developing sewage networks and water treatment facilities. These facilities continue to be installed and expanded to accommodate increases in human population.

Groundwater is used for domestic, agriculture and industrial purpose in most parts of the world. The human activities like agriculture and domestic release large number of pollutants into the water bodies. In India ponds, rivers and ground water are used for the domestic and agriculture purposes [1]. In recent years, the growth of industry, technology, population and water use has increased the stress upon both our land and water resources. Locally, the quality of ground water has been degraded by municipal and industrial wastes, chemical fertilizers, herbicides and pesticides have entered the soil, infiltrated some aquifers and degraded the ground water quality. As the urbanization process continues water pollution problems have become increasingly evident and have led to serious ecological and environmental problems. Industrial products without adequate regard for environmental impacts has increased water and air pollution, and has led to soil degradation and large scale global impacts such as acid rain, global warming and ozone depletion. All metabolic and

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physiological activities and life processes of aquatic organisms are generally influenced by water temperature[2]. Some metals such as Fe, Mn, Cr, Ca & Mg are useful and required for proper functioning of metabolic activity in Human being but concentration more than permissible limit have been identified as deleterious to aquatic ecosystem and human health.

MATERIAL AND METHODS

The sample were collected in polyethylene bottles which had been thoroughly washed and filled with distilled water, and then taken to the sampling site. The bottles were emptied and rinsed several time with the water to be collected. Also, the sample bottles were partially filled with the collected water and vigorously shaken to note the odour. The sample bottles were covered immediately after collection and the temperature taken. The above said metals and ions have been analyzed using atomic absorption spectometer as per the standard methods [3]. In the present investigation the ground water samples from twenty villages of Raisen District in M.P. were collected & analysed for some metal ions Calcium Magnesium, Iron, Manganese & toxic metal Lead, Fluoride and Nitrate are also analysed as these ions pose a serious problem in higher concentration[4]. Agriculture is the most important activity in this district.

RESULT AND DISCUSSION

The concentration of some specific ion in ground water of study area are given in Table 1.

Table 1 Analytical Data Showing some ionic concentration in ground water samples of Mentioned villages of Raisen District in M.P

S.No.	Name of Villages	F^- mg/l	NO_3^- mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Mn mg/l	Pb mg/l
1.	Bhanpurganj	2.76	52	135.8	92.5	1.5	0.32	0.012
2.	Mohad	2.85	60	84.5	49.2	1.5	0.54	0.035
3.	Hardout	3.10	47	92.5	65.3	2.4	0.62	0.020
4.	Rampurkala	2.5	62	106.7	53.4	1.9	0.42	0.011
5.	Shobhapur	2.34	65	124.2	45.8	3.0	0.38	0.025
6.	Patan	1.58	57	115.6	68.2	4.2	0.35	0.032
7.	Parasia	2.68	68	170.3	122.4	5.1	0.46	0.022
8.	Devriganj	1.56	72	146.2	86.4	2.8	0.44	0.013
9.	Sankal	5.05	54	128.3	95.6	3.4	0.52	0.020
10.	Simariya	2.25	65	102.5	78.9	1.7	0.60	0.022
11.	Gorkha	6.87	58	96.3	62.2	2.8	0.63	0.034
12.	Markhandi	2.62	70	72.6	48.4	3.3	0.43	0.020
13.	Umarkhoka	1.7	56	80.4	62.6	1.8	0.58	0.014
14.	Khairpur	2.4	45	85.5	60.4	2.6	0.64	0.023
15.	Mandla	4.1	55	119.3	83.5	4.3	0.28	0.036
16.	Semra	9.9	63	162.8	76.7	3.8	0.36	0.021
17.	Dhimroli	3.52	51	154.6	62.7	2.7	0.47	0.012
18.	Sultanganj	3.45	59	124.2	58.4	1.7	0.45	0.015
19.	Thirpani	3.92	69	135.8	47.6	3.9	0.56	0.022
20.	Belai	5.68	74	142.6	50.8	5.0	0.65	0.033

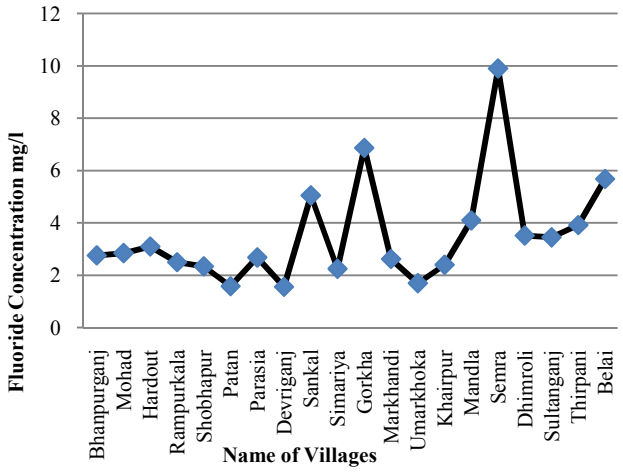
Calcium, Magnesium and total hardness in the ground water are inter related, calcium is an important element to develop proper bone growth. Calcium content is very common. in ground water because they are available in most of the rocks abundantly and also due to higher solubility. The desirable limit of calcium in drinking water 75mg/l. The range obtained in study area exceeds the limit. Magnesium usually occurs in lesser concentration than calcium due to the fact that the dissolution of magnesium rich mineral is slow process and that of calcium is more abundant in the earth's crust. It causes unpleasant taste if present more than permissible limit.[5,6]

Table 2 Desirable & Permissible Value of Constituent and its ranges in Ground Water Samples

S.No.	Constituent	Bureau of Indian Standard (IS10500:1991)		Range
		Desirable	Permissible	
1.	Ca (mg/l)	75	200	72.6 – 170.3
2.	Mg (mg/l)	30	100	45.8 – 122.4
3.	Fe (mg/l)	0.3	1.0	1.5 – 5.0
4.	Mn (mg/l)	0.1	0.3	0.28 - 0.65
5.	Pb (mg/l)	Toxic	0.05	0.011 – 0.036
6.	F (mg/l)	1.0	1.5	1.56 – 6.87
7.	NO_3 (mg/l)	45	100	45 – 74

The iron content is however more than permissible limit. The level of iron content could be the result of clay deposit in the area[7]. The high concentration of iron is also of concern, as large amount of ground water is abstracted by drilling water wells both in rural and urban area for drinking & irrigation. Also the presence of iron is responsible for the brownish – red color of water. Excess of iron will also influence the presence of bacteria in ground water [8]. The value of manganese is within the permissible limit except in few study area. However slight rise in its level may be accounted for by the influence of domestic waste natural geological rocks and effluent.[9,10]

It is well known that nitrogenous fertilizers are one of the important source for ground water nitrate for the past two decades. Further nitrogenous material are in geological system. In excess it contributes to illness known as methemoglobinemia in infants. The origin of nitrate is thus derived from agricultural area due to leaching process from plant nutrient, nitrate fertilizer & poor sanitary condition.[11,12,13] Bedrock containing fluoride mineral is generally responsible for high concentration of this ion in groundwater. Fluoride usually accumulates in the bones, teeth and other calcified tissues of human body. Excess of fluoride in water causes serious damage to the teeth and bones of the human body[14], which shows the symptoms of disintegration and decay, disease called dental fluorosis and skeletal fluorosis[15] Lead is highly toxic metal and should be present only in traces.

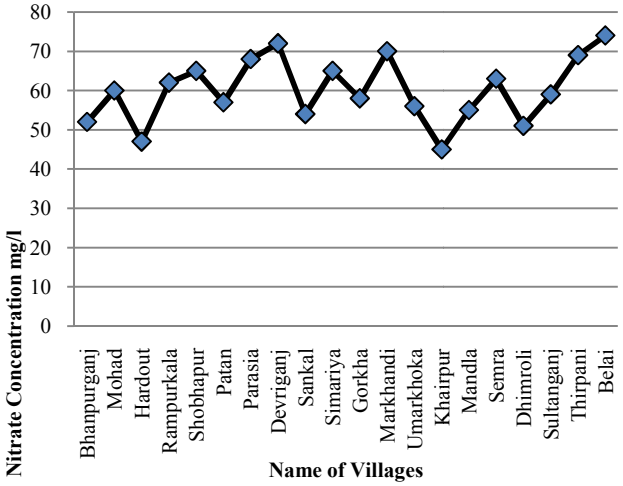


Graph 1showing variation of nitrate in different villages of raisen (m.p.)

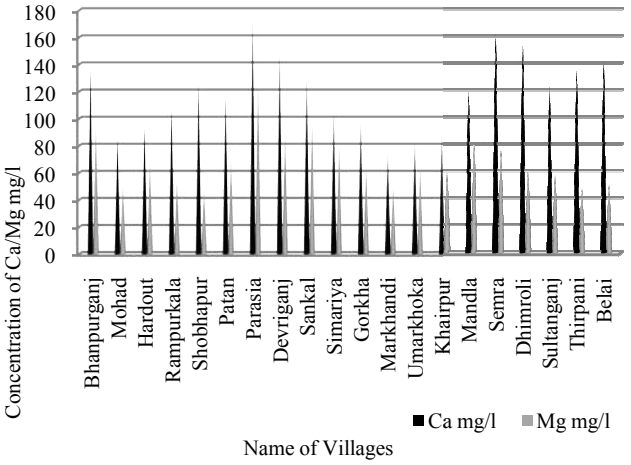
In the present study Pb is present at the most 0.036mg/l which is within the permissible limit. Lead is used primarily in the

manufacturing of lead acid battery, solders and alloys. Lead is also found in soil, vegetation, animals and food. It inhibits several key enzymes involved in overall process of haemosynthesis [16, 17] Lead contaminated is due to natural or human activities.[18]

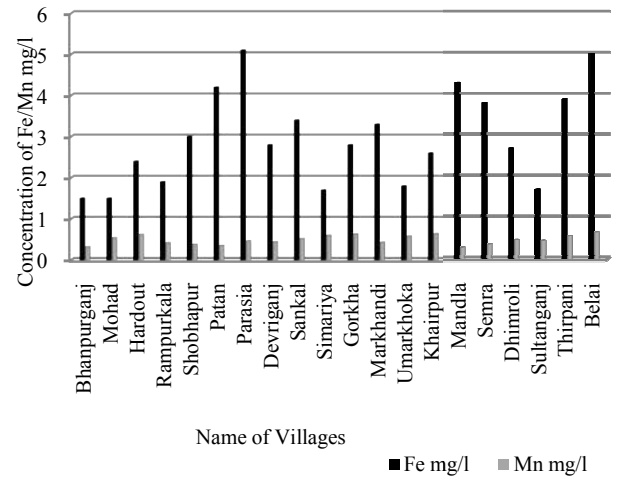
Showing Variation Of Fluoride In Different Villages Of Raisen (M.P.)



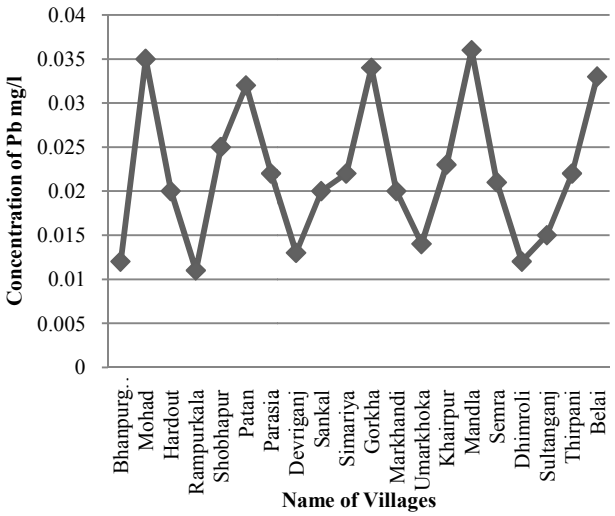
Graph 2 showing variation of ca/mg in different villages of raisen (m.p.)



Graph 3 Showing variation of fe/mn in different villages of raisen (M.P.)



Graph 4 showing variation of pb in different villages of raisen (m.p.)



Graph 5 Showing Variation of Pb In Different Villages of Raisen District (M.P.)

CONCLUSION

The ground water quality assessment helps to identify the significant parameter for getting information for the source of pollution. From the obtained result it is evident that at present the metal ion concentration (Table – II) is – high but not at the level which could be hazardous for human. Although Fluoride & Nitrate concentration is in excess, It can be checked & preventionary steps can be taken immediately. The condition of metal ion contamination is not very high at present ,+there may be problems if the same continuous in future and the ground water source will be completely polluted and become unfit for drinking and other purpose. Hence, this is high time to preserve and protect this precious resource. For this, precautionary measures should be immediately taken to avoid the consequences.

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