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RESEARCH ARTICLE

FOR OUR VERY SURVIVAL POLLUTION FREE WATER IS THE DIRE NEED OF THE DAY

***Dr. Ratna Roy (Pathak)**

Professor of Chemistry, Govt. M.L.B. Girls PG Autonomous College Bhopal M.P. India

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ABSTRACT

Water is one of the prime necessities of life. With increasing number of people depend on this resource; water has become a scarce commodity. Pollution makes even the limited available water unfit for use. Water is said to be polluted when there is any physical, biological or chemical change in water quality that adversely affects living organisms or makes water unsuitable for use. Sources of water pollution are mainly factories, power plants, coal mines and oil wells situated either close to water source or away from sources. They discharge pollutants directly or indirectly into the water sources like river, lakes, water streams etc. In all its forms, water shapes and nourishes life on Earth. Life on this planet first developed in water, and the world's unique biodiversity and human communities both depend on clean water's continued availability. However, less than one percent of the Earth's fresh water flows freely, and burgeoning human populations are making unsustainable demands on this vital resource. Demand for fresh water is already outstripping supply in many regions around the world. Both biodiversity and human communities are at risk: an estimated one out of every six people on Earth has no access to clean drinking water; Thus, water is a precious resource. Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water. Efforts have been made to collect water by building dams and reservoirs and digging wells; some countries have also tried to recycle and desalinate (remove salts) water.

INTRODUCTION

Groundwater is water that has drained through surface layers of soil and rock until it reaches a layer of rock material through which it cannot pass, or can pass only very slowly. This results in the accumulation of water in the rock layers above this impermeable layer. The water is stored in gaps in the rock, or between the particles of which the rock is composed. Rock which retains water in this way is called an aquifer. An aquifer may be as little as 30m from the surface, or as much as 300m. It costs more to pump water from the deeper aquifer but the water quality in the deeper one may be better than the shallower since contaminants which the water may be carrying are removed as the water moves through the rock. Historically, groundwater has been naturally very clean because of this filtering effect. However, increased use of chemicals in everyday life means that groundwater is now vulnerable to the same pressures as water at the surface. Since water continuously flows from one to the other, groundwater can become polluted with nutrients or chemicals when surface water carrying these substances drains into the groundwater environment. Diffuse sources of groundwater contamination include pesticide and fertiliser use.

****Corresponding author:*** **Dr. Ratna Roy (Pathak)**
Professor of Chemistry, Govt. M.L.B. Girls PG Autonomous College Bhopal M.P. India

Point-specific sources include industrial spills, leaking oil and chemical storage tanks and landfill sites. Normally it is easier to remedy a point-specific source since its point of origin can be relatively easily identified. The safe portable water is absolutely essential for healthy living. Groundwater is ultimate and most essential suitable fresh water resources for human consumption in both urban as well as rural areas. In recent years, an increasing threat to groundwater quality due to human activities has become of great importance. The adverse effects on groundwater quality are the over burden of the population pressure, unplanned urbanization, unrestricted exploration, unintentionally by domestic, agriculture and industrial effluents and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the groundwater (Ramachandraiah, 2004). The groundwater pollution is highest in urban areas than rural areas where large volumes of waste concentrated and discharged near to the urban lakes. The qualities groundwater resources vary naturally and widely depending on climate, season, geology of bedrock as well as anthropogenic activities (Pandey Sandeep, 2009). Water quality analysis is one of the most important aspects in groundwater studies (WHO, 2007). The objective of the present work is to discuss the physicochemical parameters of groundwater that is suitable for drinking and agricultural purpose in different villages of Raisen District.

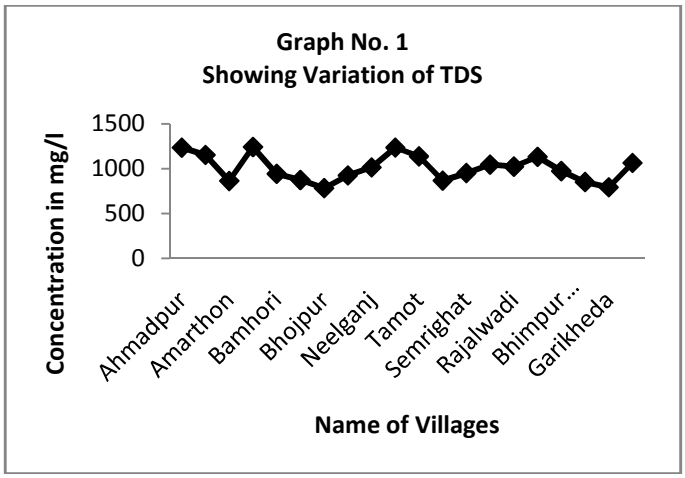
MATERIALS AND METHODS

The sample were collected in polythene 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 times with the water to be collected. The sample bottles were covered immediately after collection and the temperature taken. In the present investigation the ground water samples from twenty villages of Raisen District in M.P. were collected. Chemical analyses were carried out for the major ions, minor ions, and trace ions concentrations using the standard procedures recommended by American Public Health Association[4]. The analytical data can be used for the classification of water for utilitarian purposes and for ascertaining various factors on which the chemical characteristics of water depend.

Table 1.

S.No.	Parameter	BBS Guideline Value /Permissible	Range
1.	TDS	580-2000	784-1242
2.	Ca	200	163-242
3.	Mg	100	92-172
4.	As	0.05	0.02-0.06
5.	Cd	0.01	0.008-0.015
6.	Fe	1.0	0.85-1.58
7.	NO_3	45	42-92
8.	F	1.5	1.5-3.28

usually occurs in lesser concentration than calcium due to the fact that the dissolution of magnesium rich minerals is slow process and that of calcium is more abundant in the earth's crust.



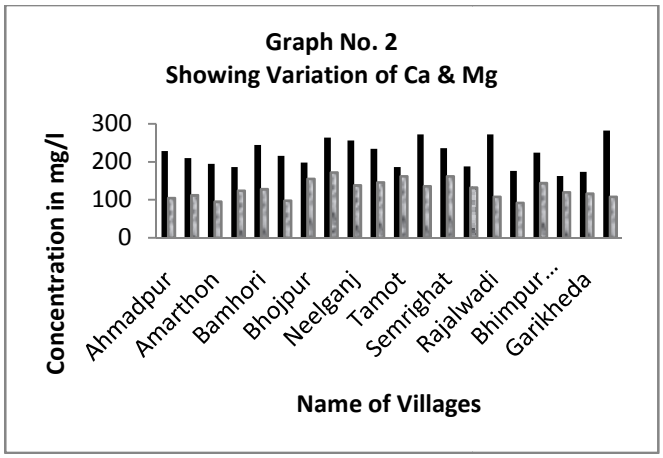
If the concentration of magnesium in drinking water is more than the permissible limit, it causes unpleasant taste to the water. Nitrate generally occur in trace quantities in surface water but may attain high levels in some groundwater. It is well known that the nitrogenous fertilizers[6] are one of the important sources for groundwater nitrate for the past two

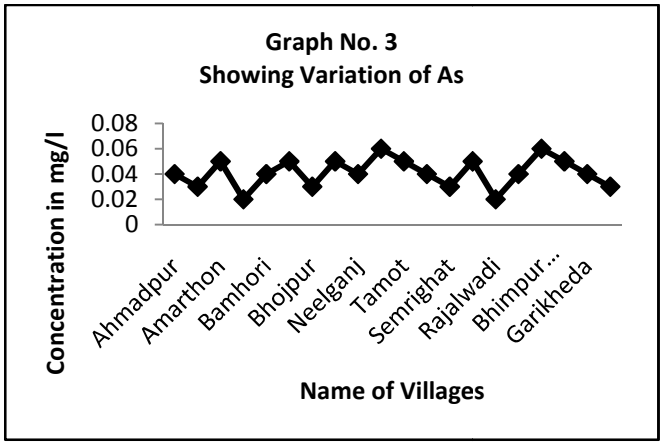
Table 2. Analytical parameters showing the concentration of various ions in ground water of some villages in Raisen District

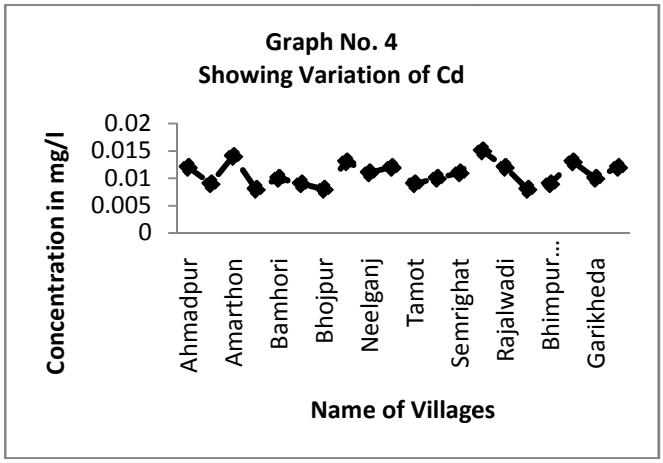
S.No.	Name of Villages	TDS mg/l	Ca mg/l	Mg mg/l	As mg/l	Cd mg/l	Fe mg/l	NO3- mg/l	F- mg/l
1.	Ahmadpur	1235	228	105	0.04	0.012	1.14	48	2.52
2.	Noorganj	1154	210	112	0.03	0.009	1.25	52	2.06
3.	Amarthon	864	195	95	0.05	0.014	0.86	46	1.88
4.	Baquaspur	1242	186	124	0.02	0.008	0.94	62	1.98
5.	Bamhori	944	244	128	0.04	0.010	1.32	74	1.75
6.	Bandrehuha	875	216	98	0.05	0.009	1.02	84	2.12
7.	Bhojpur	784	198	155	0.03	0.008	1.04	72	1.54
8.	Damdongri	926	264	172	0.05	0.013	1.16	56	3.28
9.	Neelganj	1015	256	138	0.04	0.011	1.24	66	2.47
10.	Satlapur	1236	234	146	0.06	0.012	1.06	75	1.52
11.	Tamot	1138	186	162	0.05	0.009	1.32	84	1.78
12.	Santro	868	272	136	0.04	0.010	1.12	92	2.25
13.	Semrighat	952	236	162	0.03	0.011	1.46	86	1.58
14.	Jamgarh	1046	188	132	0.05	0.015	1.58	77	1.62
15.	Rajalwadi	1024	272	108	0.02	0.012	1.50	42	1.82
16.	Chhawaria	1132	176	92	0.04	0.008	1.42	86	1.75
17.	Bhimpur Kanjar	974	224	144	0.06	0.009	1.54	77	1.56
18.	Magardha	852	163	120	0.05	0.013	1.07	70	1.54
19.	Garikheda	794	174	116	0.04	0.010	0.85	80	1.92
20.	Gurela	1065	282	108	0.03	0.012	0.98	46	2.05

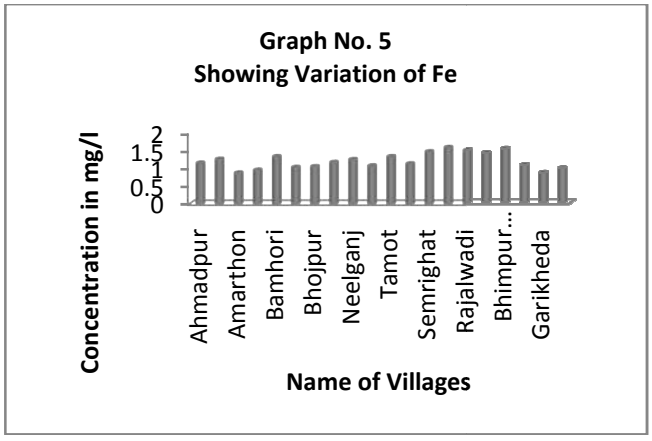
RESULTS AND DISCUSSION

The total dissolved solids TDS observed from this area is between 784 and 1242 mg/pl that is moderate. TDS much higher value can cause gastrointestinal problem & prolonged intake may cause kidney problem (Ramesh, 2012). Table I & II shows Calcium & Magnesium constituent is high in some villages of study area. The presence of calcium in the groundwater is from silicate mineral group, such as pyroxene and amphibole in the igneous rocks. Calcium content is very common in groundwater, because they are available in most of the rocks, abundantly and also due to its higher solubility. However, the range of its availability depends on the solubility of calcium carbonate and sulphate. The permissible limit of calcium in drinking water is 75 mg/l. Magnesium (Mg2+) decades. Further, nitrogenous materials are rare in geological system. In excessive limit it contributes to the illness known as methenglobinemia in infants (Wakida, 2006). The permissible limit of nitrate is 45 mg/l prescribed by BIS standards. Fluoride concentration in Raisen District is generally found to be very high but now those tubewells or borewells containing high fluoride concentration are sealed off. In study area the concentration of fluoride in few villages are found to be within permissible limit but others are beyond the limit of course not very high. One of the main trace elements in groundwater is fluoride which generally occurs as a natural constituent. Bedrock containing fluoride minerals is generally responsible for high concentration of this ion in groundwater. Fluoride normally accumulates in the bones, teeth and other calcified tissues of the human body.

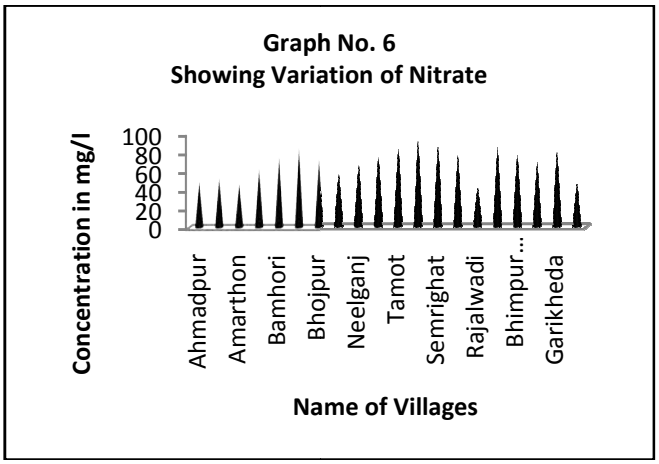


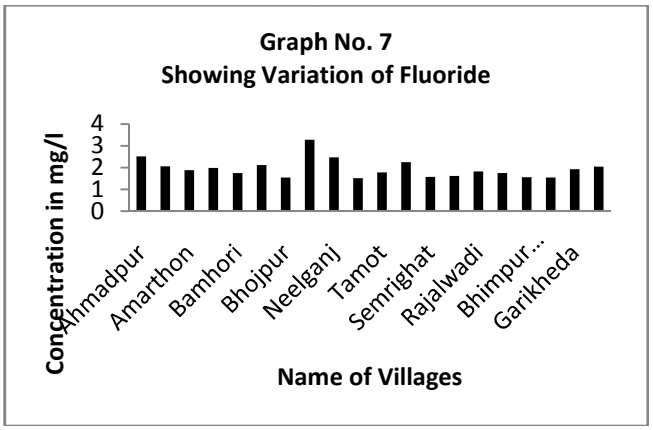






Excess of fluoride in water causes serious damage to the teeth and bones of the human body, which shows the symptoms of disintegration and decay, diseases called dental fluorosis and skeletal fluorosis (Siddiqui, 1972). The higher intake of fluoride may change the metabolic activities of soft tissues (brain, liver, kidney, thyroid and reproductive organs) (Whitford, 1990). The permissible limit of fluoride in drinking water is 1.5 mg/l. Water containing more than 1.5 mg/l of fluoride cause mottled tooth enamel in children and are not suitable for drinking purpose (Cautley, 1995).





Excess fluoride may also lead to fluorosis that can result in skeletal damage. The permissible allowable limit of Iron is 1.0mg/l. In the investigated area 50% villages exceed the limit. Ground water is contaminated by iron mainly from weathering of ferruginous minerals of igneous rocks such as basalt and sulphide ores of sedimentary and metamorphic rocks. Laterites are soil types rich in Iron formed in hot and wet tropical areas. Nearly all laterites are rusty red because of Iron oxides. It develops by intensive and long lasting weathering of the underlying parent rocks. Industrial effluent, acid mine drainage, sewage and land fil leachate may also contribute Fe to local groundwater. Iron is an important chemical to measure, as many processes that occur in groundwater are affected by Iron (International Organization for, Standardization water quality determination of Iron, 1988). Iron concentration also provide an indication of chemical condition occurring in ground water. For example trace inorganic chemicals that pose a potential health concern such as arsenic, boron and lead are associated with iron in ground water. Presence of high concentration of Fe2+ also reflects reducing condition in Ground Water (Life Sciences, 1980). Arsenic is showing its presence although within permissible limit in these location where groundwater is rich in Iron. Arsenic is introduced in ground water during weathering of rocks & minerals followed by subsequent leaching and runoff (Smedley, 2002). Arsenic contamination is understood to be of

geogenic origin and use of arsenic containing insecticide. It is actually the specific geochemical condition that aid in the release of AsIII into ground water. Arsenic release from sediments is attributed mainly to desorption or dissolution of arsenic from iron oxide. This happens mainly due to reducing conditions in aquifers below the so called redox zone or transition between oxidising and reducing conditions a few meters below the water table. Here the higher oxidized AsV reduced to AsIII which is released into ground water. The reason for onset of reducing conditions are several, rapid burial of organic matter, high microbial activity or recent anthropogenic activities. Some or all of these contribute to the reduction process and mobilization of AsIII which is then released into relatively deeper ground water. The latest WHO evaluation concludes that arsenic exposure via drinking water is casually related to cancer in the lungs, kidney, bladder and skin, the last of which is preceded by directly observable precancerous lesions (*Arsenic in drinking water seen as threat,* 2007 and Mukherjee, 2006). Cadmium concentration is found to be very low in the study area but its low concentration is also toxic. The Cadmium concentration is groundwater is mainly due to anthropogenic activities (Heavy Metal Poisioning, 2016). Its concentration is not in alarming situation but one should be very alert in using nickel cadmium batteries. Cadmium compounds are currently mainly used in rechargeable nickel-cadmium batteries. Cadmium emissions have increased dramatically during the 20th century, one reason being that cadmium-containing products are rarely re-cycled, but often dumped together with household waste. Cigarette smoking is a major source of cadmium exposure. Natural as well as anthropogenic sources of cadmium, including industrial emission and the application of fertilizer and sewage sludge to farm land, may lead to contamination of soils, and to increased cadmium uptake by crops and vegetables, grown for human consumption. The uptake process of soil cadmium by plants is enhanced at low pH. During recent years, new data have emerged suggesting that also relatively low cadmium exposure may give rise to skeletal damage, evidenced by low bone mineral density (osteoporosis) and fractures. Recent data indicate that adverse health effects of cadmium exposure, primarily in the form of renal tubular damage but possibly also effects on bone and fractures, may occur at lower exposure levels that previously anticipated. Therefore, measures should be taken to reduce cadmium exposure in the general population in order to minimize the risk of adverse health effects.

Conclusion

Analysis of ground water helps to assess the quality of water on which the life of population of the area depend. The analytical parameters shows calcium & magnesium value is little bit high for some villages. Nitrate and Fluoride concentration is also high in some of the villages. To control nitrate concentration, use of fertilizers should be minimized. To reduce fluoride concentration preventionary steps should be taken. The concentration of Iron, Arsenic and cadmium is not alarming but the residential population should be very alert and after regular certain interval the water should be analysed for heavy toxic metal ions.

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