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RESEARCH ARTICLE

DETECT AND DEVELOP DRINKING WATER QUALITY TO PREVENT HEALTH HAZARDOUS EFFECT

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ABSTRACT

The volume of groundwater is much greater than that of all fresh water lakes and streams combined. Underground water plays an important role in the water balance of the earth. It is a primary source of fresh water in several urban and rural areas. The quality of ground water in some parts of the country, particularly shallow ground water is changing as a result of human activity. It is less susceptible to bacterial pollution than surface water, as the soil and rocks through which it percolates screen out most of the bacteria. But freedom from bacterial pollution alone does not mean that the water is fit to drink. Many dissolved mineral and organic constituent are present in ground water in various concentrations. Most are harmless or even beneficial; though occurring in frequently, others are harmful, and a few may be highly toxic. Ground water quality comprises the physical, chemical, and biological qualities of water. Naturally it contains mineral ions which slowly dissolve from sediments and rocks as the water travel along mineral surfaces in the pores or fractures of the unsaturated zone and the aquifer. These are referred to as Total Dissolve Solid. A list of dissolved solids in any water is long, but it can be classified into major constituents, minor constituents, and trace constituent. In water all of the dissolved solids are either positively charged ions or negatively charged ions. In recent years the growth of industry and technology has increased the stress upon both our land and water resources. Locally the quality of ground water has been degraded. Municipal and industrial waste entered the soil, infiltrated some aquifers, and degraded the ground water quality. In recognition of the potential for pollution, physical and chemical analyses are made routinely on water supplies. State and local agencies are taking steps to increase water quality monitoring. Analytical techniques have been refined so that early warning can be given, and plans can be implemented to mitigate water pollution.

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INTRODUCTION

Water is essential natural resource for sustaining life and environment. It makes up 50-97% of the weight of all plants and animals and about 70% of human body. Ground water is the most essential suitable fresh water resources in both urban as well as rural areas (WHO, 2004 and WHO, 1984). The property of groundwater is dissolving and carrying in solution a variety of chemical and other material. More than 90% of the rural population use ground water for domestic purposes. It is also a source used for agricultural and industrial sector nowadays. In recent years, an increasing threat to ground water quality due to human activities has become of great concern. The adverse effect on ground water quality are due to over burden of the population pressure, unplanned urbanization, unrestricted exploration and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water. It is highest in urban areas than rural areas. In urbanization the farming fields are also used as residential plots. Geologic formation and anthropogenic activities also influence the ground water quality. Now the pollution in ground water has become a major subject of public concern all over the world. The objective of the present work is to analyse and discuss the physical and chemical parameter of ground water that is suitable for drinking and agricultural purpose or not.

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Study Area

The study area comprises villages in Raisen District of 80 to 150 km from the city Bhopal. The geological formation of the land is mainly basalt rock. The locality is selected from Gairatganj, Begumganj and Silwani Block of Raisen District which is situated in North East direction of Bhopal.

MATERIALS AND METHODS

Ground water samples are collected from near the agricultural field. The collected samples were transferred into plastic container for analysis. These water samples were analysed for pH, electrical conductivity using pH and EC meter. Total dissolved solid (TDS) determine by computation depending on the relative concentration of ions; Total alkalinity was estimated by titrating with hydrochloric acid. Total hardness (TH) were analyzed volumetrically, using standard EDTA. Chloride estimated by standard $AgNO_3$ titration. Other ions were analysed by spectrophotometer as given by APHA, 1992.

RESULTS AND DISCUSSION

The result of chemical analyses of ground water sample from study area is represented in Table 1. The analytical data revealed that pH value ranges from 6.5 - 8.8 indicating alkaline nature. The electrical conductivity ranges from 745 to 1572micromho/cm at 25^{o} C lie within desirable limit for drinking purpose. TDS in most of the sample exceeds the desirable limit. Calcium and total hardness also is high. Fluoride and nitrate concentration shows high value in majority of area. Fluoride is important for the development of teeth and bones.

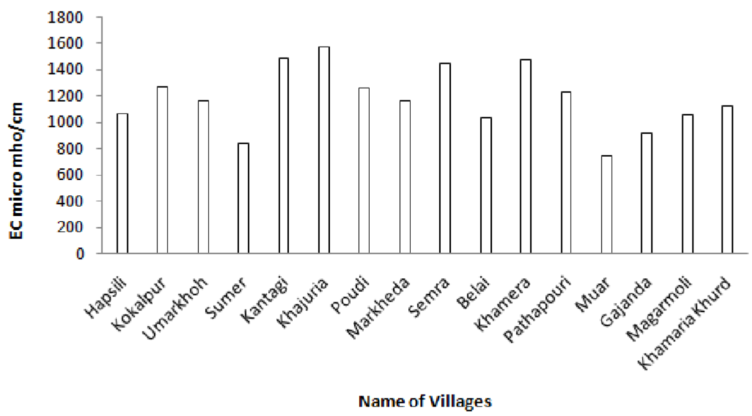

Fig. 1. Variation of EC in Study Area

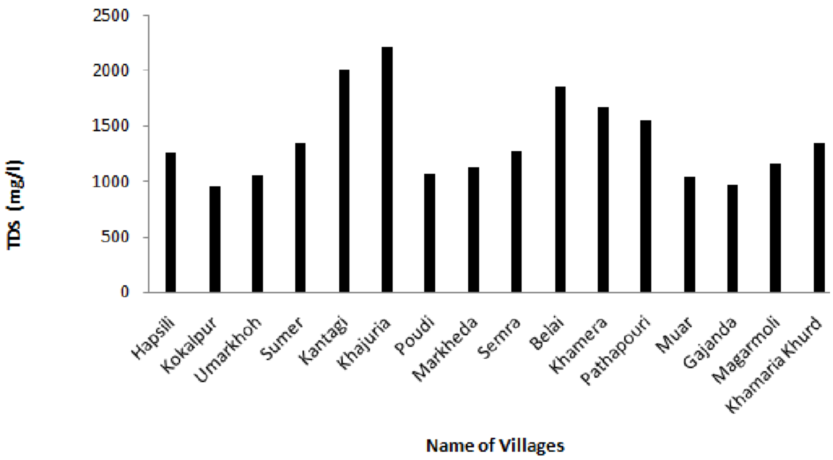

Fig. 2. Variation of TDS in Study Area

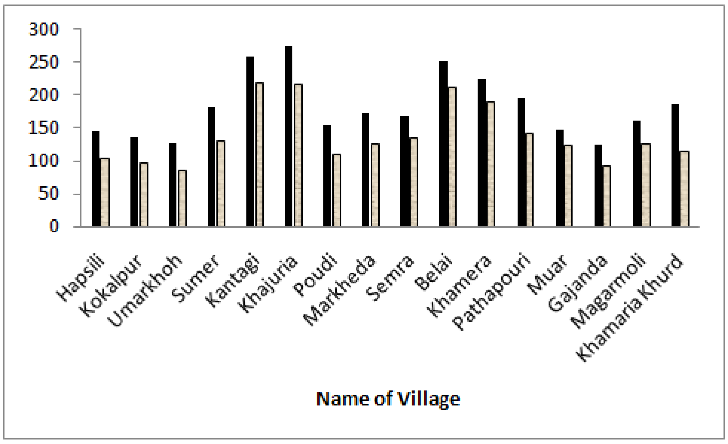

Fig. 3. Variation of Ca & Mg in Study Area

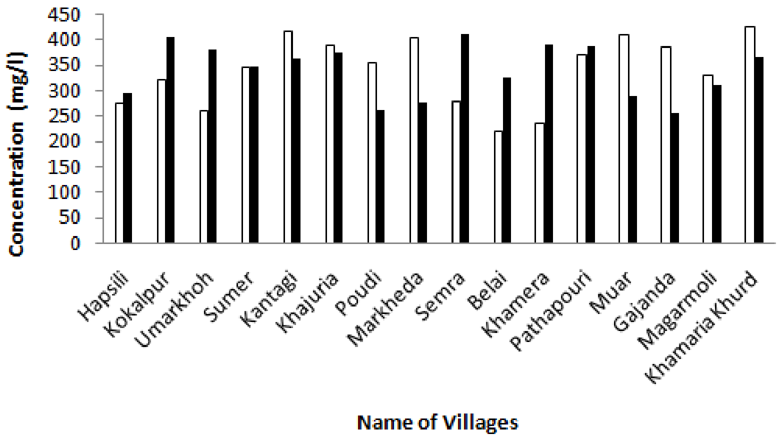

Fig. 4. Variation of Cl and SO_4 in Study Area

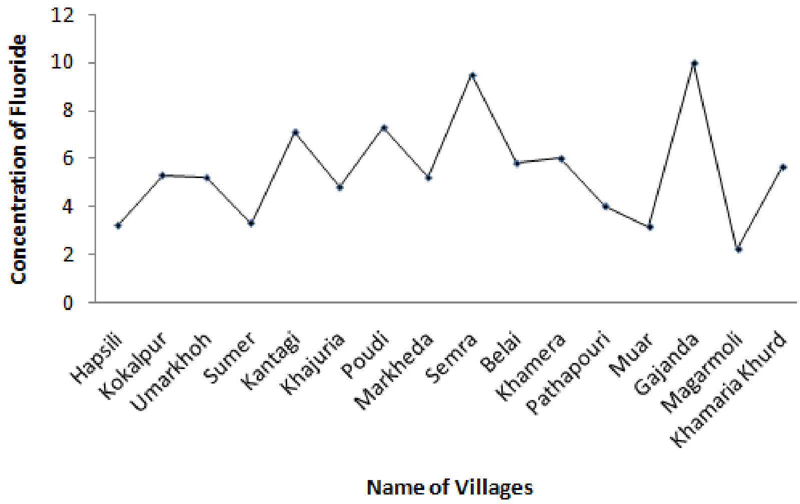

Fig. 5. Variation of Fluoride in Study Area

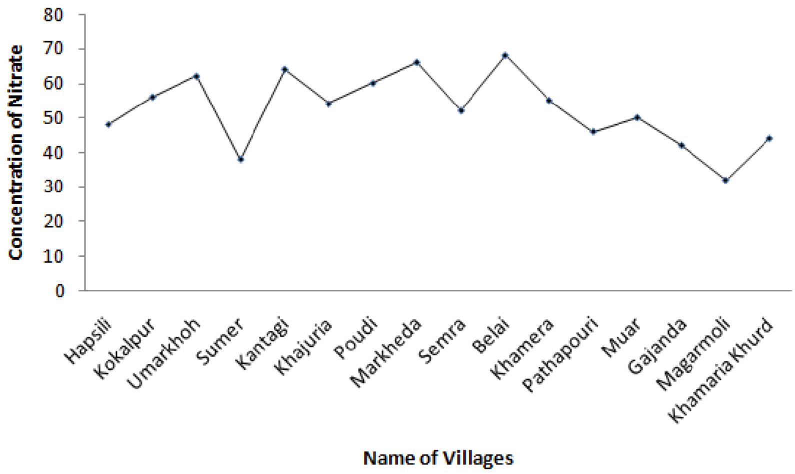

Fig. 6. Variation of Nitrate in Study Area

Concentration within permissible limit is beneficial by hardening the enamel and reducing the increase of caries but overdose cause dental and skeletal fluorosis (Czarnowski, 1999) (Deformation of Teeth and bones) and other disorder (Lu *et al*., 2000 and Billings *et al*., 2004). The major source of fluoride in ground water is fluoride bearing rock from which it get leached and contaminate the water. Nitrate (Malik and Banerji, 1981) generally occurs in trace quantities in surface

Table 1. Physicochemical Parameter of the Ground Water of the Study Area

Name of Villages	pH	EC micro mho/cm	TDS mg/l	Ca mg/l	Mg mg/l	Cl mg/l	F mg/l	SO_4 mg/l	NO_3 mg/l
Hapsili	6.8	1064	1257	145	104	275	3.2	295	48
Kokalpur	7.2	1276	955	136	98	320	5.3	405	56
Umarkhoh	7.6	1168	1052	128	86	260	5.2	380	62
Sumer	8.1	842	1344	182	132	345	3.3	345	38
Kantagi	8.5	1484	2016	260	220	415	7.1	360	64
Khajuria	8.4	1572	2206	276	218	390	4.8	372	54
Poudi	8.6	1258	1062	155	112	355	7.3	260	60
Markheda	7.4	1164	1134	172	128	405	5.2	274	66
Semra	6.5	1448	1280	168	136	280	9.5	410	52
Belai	7.8	1034	1854	252	212	220	5.8	325	68
Khamera	8.6	1474	1670	224	190	235	6.0	390	55
Pathapouri	7.7	1234	1555	195	142	370	4.0	386	46
Muar	6.9	745	1049	148	124	410	3.14	288	50
Gajanda	8.3	922	975	124	94	385	10.0	255	42
Magarmoli	8.8	1056	1162	162	126	330	2.2	310	32
Khamaria Khurd	8.0	1128	1342	186	116	425	5.65	365	44

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

Sl. No.	Constituents	Bureau of Indian standard (IS-10500:1991)	Range
1.	pH	6.5 – 8.5	6.5 – 8.8
2.	EC (μmhos/cm)	700 – 3000	745 – 1572
3.	TDS (mg/l)	500 – 2000	955 – 2206
4.	Ca^{2+} (mg/l)	72 – 200	124 – 276
5.	Mg^{2+}(mg/l)	30 – 100	116 – 258
6.	Cl^-(mg/l)	250 – 1000	220 – 425
7.	SO_4^{2-}(mg/l)	150 – 400	255 – 410
8.	NO_3^-(mg/l)	45	32 – 68
9.	F (mg/l)	1.5	2.2 – 10.0

water but may attain high level in some ground water (Handa, 1983). The nitrogenous fertilizers are one of the important sources for ground water nitrate. Leaching of nitrate (Mehta *et al*., 1990) to ground water is mainly due to excessive application of nitrogen fertilizer, the absence of proper soil and water management practices. The result shows that the concentration of EC, Total dissolved solid, Total Hardness, Calcium, Nitrate and fluoride are exceeding the permissible limit for drinking purpose (McCasland, 2007). Ground water quality (ISI, 1983) is strongly influenced by geologic formation and climate, but may also be attributed to the impact of agricultural pollution.

Chloride is a widely distributed element in all types of rock in one or other form therefore its concentration is high in ground water. Mostly the Chloride are found in the form of Sodium Chloride in the Ground Water and soil.

Conclusion

Groundwater quality (Groundwater, 2007) is strongly influenced by bedrock geology and climate, but may also be attributed to the impacts of agricultural pollution. The present water availability situation in the study area is under great threat.

The chief sources of fluoride in groundwater are the fluoride-bearing minerals in the rocks and the sediments. The high fluoride (Billings *et al*., 2004) content in the groundwater of this area has affected villagers in the form of primary level of fluorosis resulted in stained and darkened tooth enamel. The source of fluoride in the natural water can be traced to the occurrence of fluorine-rich granitic rocks and soils derived from those rocks.

The high fluoride content in the drinking water should also be given attention and defluoridated (Chaturvedi *et al*., 1998) (treatment for removal of high concentration of fluoride) water should be provided for drinking purposes in the rural areas. Some areas are prone to have high fluoride content due to its geological formation. Hence the need to mark out areas with low, recommended and high level of fluoride in water should not be underestimated. Preventionary steps / methods for removing fluoride to acceptable limit is most essential. The methods to remove excess of fluoride can be broadly categorized into three techniques

- Using Activated Alumina,
- By reverse osmosis where the source of water is plenty.
- By Electrodialysis reversal process.

The prime sources of nitrate enrichment (Malik and Banerji, 1981) are leaching from (Wakida, 2006) the sewage effluents being utilized extensively for irrigation, leakage from sewerage systems, septic tanks and natural drains carrying municipal wastes (Wakida, 2005), and application of more than required fertilizers (Handa, 1983). Prevention methods must be considered to protect groundwater aquifers from nitrate leaching. Many devices and techniques, through ion-exchange and other processes (Chaturvedi *et al*., 1998) can rehabilitate already contaminated water. Regular monitoring of water quality is recommended to improve understanding of nitrate pollution (Mehta *et al*., 1990 and McCasland, 2007) in the groundwater in these villages and in surrounding region. Exposure of high level of nitrate in the drinking water has been linked to a variety of effects ranging from enlargement of the thyroid to 15 types of cancer and two kinds of Birth defects and even hypertension. Research shows a definite relationship between increasing rate of stomach cancer with increasing nitrate intake. Contamination of water (Anon, 1993) cause 80% disease of the world and result in more than one third of the total deaths. It has been already elaborated that quality of ground water (Groundwater, 2007) is very much dependent on several factors. The water used for drinking purpose should be free from any toxic elements, living and non living organism and excessive amount of minerals to avoid furtherance of health hazard.

REFERENCES

Anon, 1993. *Geology and Mineral resource of Anantapur District., A.P. Department of Mines and Geology and A.P.M.d.C. ltd., Govt. of Andhra Pradesh*.

APHA, 1992. Standard methods for the examination of water and wastewater, *American Public Health Association, Washington,* DC.

Billings R.J., Berkiowitz R.J. and Watson G. 2004. *Teeth., Pediatrics* 113: p. 112-117.

Chaturvedi, A.K., Pathak K.C. and Singh V.N. 1998. *Fluoride removal from water by adsorption on china clay, Appl.Clay. Sci.*, 3: p. 337-346**.**

Czarnowski, W., Krechniaki, J., Urbanska, B., Stolarska, K., Taraszewsks-Czunowska, M., Murasko-Klaudel. 1999. *The impact of water-borne fluoride* on bone density, 32:p.91-95**.**

Garret, J. 2006. *Enviresearch Limited, A case study Vol* 62(12): 1138-1149.

Groundwater, 2007. Wikipedia http://en . *wikipedia. org/wiki /Groundwater.*

Handa, B.K. 1983. *Effect of festiliser on groundwater quality in India*. In: Symp. on groundwater Development – A perspective for the year 2000 A.D. imivevsly 06 Roorkee, India.

ISI, 1983. *Indian standard specification for drinking water,* ISI 10500, ISI, New Delhi.

Lu, Y., Sun, Z.R., Wu, L.N., Wang, X., Lu, W. and Lru, S. S.S. 2000. *Effect of high fluoride water on intelligence of children,* 33(2)L: p.74-78**.**

Malik, S. and Banerji S. 1981. *NItrate pollution of ground water as a result of agriculture development in Indo-Gango Plain, India,* In : proc; Int. symp. on Quality of Groundwater the Nether lands**.**

McCasland and Margaret, 2007. *"Nitrate: Health Effect in Drinking Water". Water Encyclopedia.*

Mehta, B.C., Singh, R.V., Srivastava and Das, S. 1990. *Impact of fertilizer use on groundwater quality in parts of Ganjam District, Orrisa,* Bh-Jal News, **5,** p.44-48.

Wakida, F.T. 2005. *Non agricultural source of groundwater nitrate: a review and case study, Water Research* Vol. 39 No.l: 3-16.

Wakida, F.T. 2006. *Potential nitrate leaching to ground water. Hydrological Processes* 20: 2077-2081.

WHO, Guidelines for drinking water quality, Vol 12. *Health criteria and other supporting information, World Health Organization, Geneva,* 1984.

WHO, *Guidelines for Drinking- Water Quality. Third Edition. World Health Organization. Geneva* 2004.

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