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Toxicity of Heavy Metals in Human Being

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ABSTRACT

Clean water is absolutely essential for healthy living. Adequate supply of clean drinking water is a basic need for all human being on the earth. Yet it has been observed millions of people worldwide are deprived of this. Freshwater resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. The main source of fresh water pollution can be attributed to discharge of untreated waste, dumping of industrial effluent, and runoff from agricultural field. Industrial growth, urbanization and increasing use of synthetic organic substances have serious and adverse impact on fresh water bodies. Developed & developing countries suffer from problems of chemical discharge into the water sources mainly ground water[1], and agricultural runoff in water sources. Polluted water causes problem in health. Nowadays heavy metal pollution[2] is a serious and most dangerous threat[3] to human being which can be prevented by taking some measures. Many areas of ground water and surface water are now contaminated with Heavy metals that have in adverse effect on Health. This study aims to detect the possibilities of ground water quality deterioration due to improper waste dumping with special reference to heavy metal pollution. Since it is well established fact that the heavy metal ions are potentially toxic[4,5] to human health and could be quite detrimental for human life.

Introduction

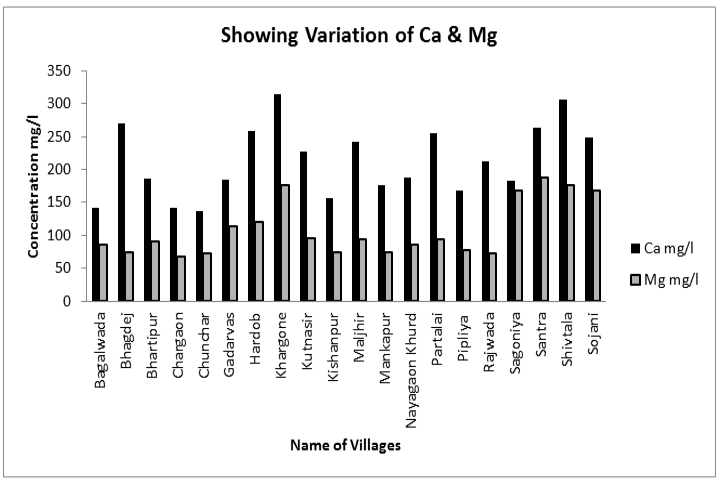
Water is required everywhere without which neither the life nor any development is possible. The daily demand of drinking water of a man is normally 7 percent of his body weight. Thus it is vital for healthy growth. But it may become harmful for life if one uses water contaminated with toxic or harmful element. Water bodies from which drinking water supplies are made may be lakes, dugwells, borewell or underground water source. Heavy metal occurs in water bodies either due to natural origin (eroded minerals within sediments, leaching of ore deposit and volcanisation) or of anthropogenic origin. Some of the metals are essential to life system. Some metals like cobalt, copper Iron, manganese molybdenum, zinc are needed at low level as catalyst for enzyme activities. However excess exposure can result in toxicity. But some metals like arsenic, lead cadmium are toxic heavy metal even in trace amount.

Heavy metal can cause serious health effects with varied symptoms, depending on the nature and quantity of the metal ingested. These metals produce their toxicity by forming complex with proteins in which amine (-NH_2) carboxylic acid (-COOH) & thiol (-SH) groups are involved. Those modified biological molecules lose their ability to function properly and result in malfunction or death of the cell. When metals bind to these groups they inactivate important enzyme system or affect protein structure, which is linked to the catalytic property of enzymes. These types of toxins may also cause the formation of radicals which are dangerous chemical that cause the oxidation of biological molecules.

The most common heavy metals that humans are exposed to are Aluminium. Arsenic, Cadmium, Lead and Mercury. In the present investigation some villages of Badi in Raisen District are selected to analyse certain ions where agriculture is the main profession for village people. Here paddy crop rice is also grown for some consecutive years.

Material & Methods

Groundwater samples were collected from twenty villages of Badi in Raisen district. These water samples 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 samples bottles were covered immediately after collection. These water samples were analysed for Ca, Mg, Fe and As using atomic absorption spectroscopy as per the standard method[6]. Fluoride and chloride were also detected. All the reagent used were of A.R. Grade.



Graph No. 1

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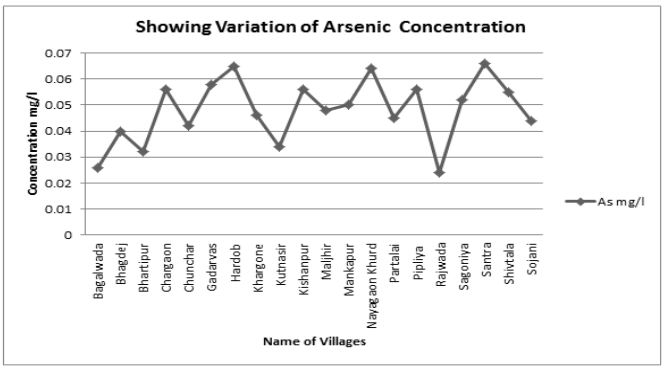
Analytical parameters showing the concentration of various ions in ground water of some villages in Badi of District Raisen (M.P.)

S.No.	Name of Villages	TDS mg/l	Ca mg/l	Mg mg/l	Fe mg/l	As mg/l	F mg/l	Cl mg/l
1.	Bagalwada	634	142	86	0.76	0.026	2.1	350
2.	Bhagdej	742	270	75	0.94	0.040	1.8	402
3.	Bhartipur	656	186	91	0.88	0.032	1.4	284
4.	Chargaon	824	142	68	1.42	0.056	6.2	516
5.	Chunchar	922	136	72	1.26	0.042	3.2	414
6.	Gadarvas	752	185	114	1.32	0.058	2.4	344
7.	Hardob	694	258	120	1.54	0.065	2.0	534
8.	Khargone	728	314	176	0.86	0.046	1.5	522
9.	Kutnasir	624	228	95	0.92	0.034	1.8	364
10.	Kishanpur	544	156	74	1.16	0.056	1.9	290
11.	Maljhir	674	242	94	1.02	0.048	1.7	446
12.	Mankapur	874	176	75	0.95	0.050	1.6	372
13.	Nayagaon Khurd	586	188	86	1.36	0.064	1.2	452
14.	Partalai	674	256	94	0.84	0.045	1.4	288
15.	Pipliya	726	168	78	1.46	0.056	2.3	406
16.	Rajwada	536	212	72	0.68	0.024	3.1	378
17.	Sagoniya	616	182	168	1.16	0.052	2.6	424
18.	Santra	806	264	188	1.52	0.066	2.1	326
19.	Shivtala	668	306	176	1.12	0.055	1.7	356
20.	Sojani	742	248	168	0.90	0.044	1.9	434



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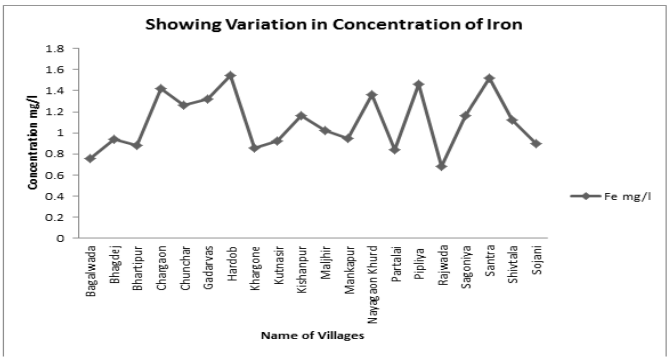

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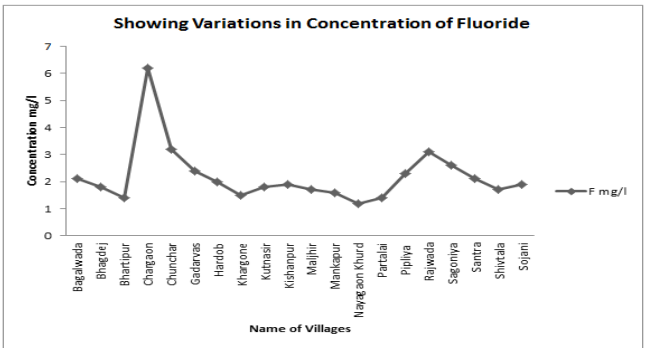

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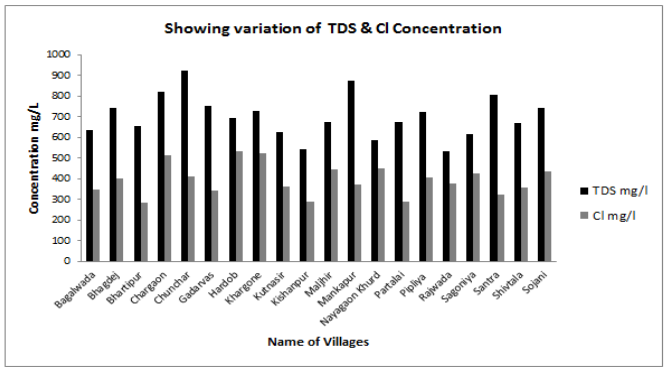

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Result & Discussion

Table I shows the iron content is high in some villages. Iron may be present as soluble ferrous or insoluble ferric form. Ground water is contaminated by iron mainly from weathering of ferruginous minerals of igneous rocks[7], 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.[8]

The Arsenic concentration is also showing slight upward trend in some villages producing paddy crop, rice for some consecutive years. There is some specific tendency of roots of rice plants to absorb arsenic from ground water. In these location ground water is also rich in Iron. Arsenic is introduced in ground water during weathering of rocks and minerals[9] followed by subsequent leaching and run off. In one or two villages the concentration of Arsenic is increasing a little bit but not in alarming situation. In most of the villages arsenic concentration is found to be within permissible limit[10]. Gradual increase is due to overexploitation of ground water and excessive use of arsenic containing insecticides / pesticides. Arsenic contamination is understood to be of geogenic origin[11].

In these locations water is found to be hard and high TDS values, Calcium content is very common in ground water

because they are available in most of the rocks abundantly and also due to higher solubility[12]. 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 calcium is more abundant in the earth crust.

The permissible limit of fluoride is 1.5 mg/l. From result it is observed that most of the places exceeds the limiting value[13]. Here in this District most of the underground water source containing high fluoride content is sealed off and discarded for the use of drinking purpose. Although fluoride values within the limit is beneficial for hardening the enamel and reducing the increase of carries but if the value exceeds it cause dental and skeletal fluorosis[14]. Increase in fluoride is entirely due to basalt rocks which is due to the geologic formation of these areas. Chloride concentration is higher than desirable limit but within permissible limit.

Conclusion

Ground Water analysis helps to assess the quality of water as the residential population totally depend on ground water for drinking, irrigation and household purpose. The analytical result shows Calcium, Magnesium and T.D.S. value is high. The iron concentration is more than desirable limit in most of the villages, fluoride concentration is also more than permissible limit. In few villages it is only within permissible limit but in some locations where its concentration is very high, the tube wells were sealed and discarded. Iron is an essential element and required within permissible limit (1mg/L) by human being.

Arsenic concentration in these villages is found to be still very low. As rice production is increasing here in consecutive years, we should be very alert and after certain interval the water should be tested for toxic ions.

Arsenic is introduced into soil and groundwater during weathering of rocks and minerals followed by subsequent leaching and runoff. It can also be introduced by anthropogenic resources. Many factors control arsenic concentration, To understand it, geochemistry and geo-environmental condition of aquifer is essentially required for evolving sustainable solutions.

References

[1] Central Ground Water Board, *Bhu-jal News* Vol. **24** No. 4, egwb.gov.in/ documents/Bhujal_News_24_4.pdf (2009)

[2] Chowdhury BA Chandra R.K. "Biological & Health, implication of toxic Heavy metal and essential trace element interaction" *Prog Food. Nutr sci 11(1)* PP 55-113 (1987).

[3] "Heavy Metal Poisioning". *National Organization for Rare Disorders*. 2015. Retrieved 11 February 2016.

[4] Houlton S. Chemistry World 11 (12) : 48-51 (2014).

[5] Heavy Metal Toxicity (*http://emedicine.medscape.com/article/814960-overview*) at eMedicine (2014).

[6] A.P.H.A. Standard method for Examination of water, *American Public Health Association*, Washington D.C. part 2320; 2340, 4500. (1998)

[7] International Organization for, *Standardization water quality determination of Iron.* Geneva; (150 6322; 1998) (1988).

[8] Life Sciences. Research office *Evaluation of health aspect of Iron & Iron salts as food ingredients*. Washington D.C. food and drug administration (PB 80-178676) (1980).

[9] Smedley, PL; Kinniburgh, DG. *"A review of the source, behaviour and distribution of arsenic in natural waters"*. *Applied Geochemistry* 17 (5): 517-568. doi:10.1016/S0883-2927(02)00018-5 (2002).

[10] "*Arsenic in drinking water seen as threat,*" (http://usatoday30.usatoday.com/news /world/2007-08-30-553404631_x.html) USAToday.com, August 30, 2007. (2007)

[11] Mukherjee A., Sengupta M.K., Hossain M.A. "*Arsenic contamination in groundwater : A global perspective with emphasis on the Asian scenario*" (PDF). *Journal of Health Population and Nutrition* 24 (2): 142-163. (2006)

[12] Ramesh et al *Int. J. Res. Chem. Environ* 2(3) 113-122 (2012).

[13] Cautley J.A., Murphy P.A., Riley J.J., Buhari A.M., Effect of fluoride in Drinking water *J. Bone, Min, Res.* 10: 1076-86 (1995).

[14] Siddiqui A.H. *Dental Fluorides in an Indian area with high natural fluoride*: 51 : 21-24 (1972).