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Drinking Water and Its Health Impact

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Abstract: ***Water is the vital resource, necessary for all aspects of human and ecosystem survival and health. Depending on the quality, bore water may be used for human consumption, irrigation purposes and livestock watering. The quality of bore water can vary widely depending on the quality of ground water that is its source. Pollutants are being added to the ground water system through human and natural processes. Solid waste from industrial units is being dumped near the factories, which react with percolating rainwater and reaches the ground water. The percolating water picks up a large number of heavy metals and reaches the aquifer system and contaminates the ground water. The usage of the contaminated bore water causes the diseases. Mercury, Arsenic and Cadmium are used or released by many industries. Many land based, water based activities and over exploitation are causing contamination of aquifers leading to unsafe ground water. In areas of high population density and intensive human use of land, ground water becomes especially vulnerable. The use of water includes water for drinking, cooking, bathing, washing and other purposes. Today, 1.1 billion people lack access to an improved water resource and over three million people, mostly children, die annually from water-related diseases (UNICEF, 2008). Therefore, it is obvious that water quality is of crucial importance to human health. Developed countries always take heed of the consumption of clean water. Unlike developing and least developed countries, most people drink and make use of tainted and unboiled water. Water quality refers to the basic and physical characteristics of water that determine its suitability for life or for human uses.***

Keywords: Ecosystem, Consumption, Livestock, Percolating, Contaminated

1. Introduction

It is perfectly clear that water quality has tremendous effects on human health both in the short term and in the long term. Short-term impacts of water quality refer to the sudden or in-day consequences of drinking and consuming water. Some illnesses do not appear after drinking or consuming unsafe water for several days, but those diseases lead to step-by-step damage to human organs such as liver, lung, bladder and kidney. In long time, people, from medical perspectives, will have hepatitis, emeritus and kidney problem. In some cases, the disease is a grave and incurable one which can put people's lives in danger. There is no doubt that poor quality drinking water poses a threat to human health. Chemical fertilizers and pesticides are used by farmers to protect crops from insects and bacterias. They are useful for the plants growth. However, when these chemicals are mixed up with water produce harmful for plants and animals. Also, when it rains, the chemicals mixes up with rainwater and flow down into rivers and canals which pose serious damages for aquatic animals.

2. Material & 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[1] as per the standard methods[2]. In the present investigation the ground water samples from twenty villages of Block Berasia, Bhopal District in M.P. were collected & analysed for some metal ions Calcium Magnesium, Iron & toxic metal mercury, Fluoride and Nitrate are also analysed as these ions pose a serious problem in higher concentration. Agriculture is the most important activity in this district.

3. Result & Discussion

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 permissible limit of calcium in drinking water 200mg/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 i.e. 100mg/l.

The iron content is however more than permissible limit in few location. The level of iron content[3] could be the result of clay deposit in the area. 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. The presence of iron in ground water is a direct result of its natural existence in underground rock formations and precipitation, water that infiltrates through these formations. As the water moves through the rocks some of the iron dissolves and accumulates in aquifers which serve as a source for ground water. However, in ground water, iron is the most common dissolved chemical. Although not considered to cause health problems in humans, its presence in potable water is rather unpleasant due to the bad odours feel on skin and hair, and its tendency to stain clothing. Iron is an essential nutrient for human[4], with a recommended daily intake of 5 milligrams. Therefore, the official water and environment agencies in many countries have established a secondary limit for iron in drinking water[5], which is based on aesthetic concerns.

In the present investigation the concentration of fluoride is little bit high. The chief sources of fluoride in groundwater are the fluoride bearing minerals in the rocks and the sediments. The high fluoride (Billins 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[6, 7]. The source of fluoride in the natural water can be traced to the occurance of fluorine-rich granite rocks and soils derived from those rocks.

Except for two three locations nitrate concentration is high. The prime sources of nitrate enrichment (Malik and Banerji, 1981) are leaching from (Wakida, 2006)[8] 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[9,10].

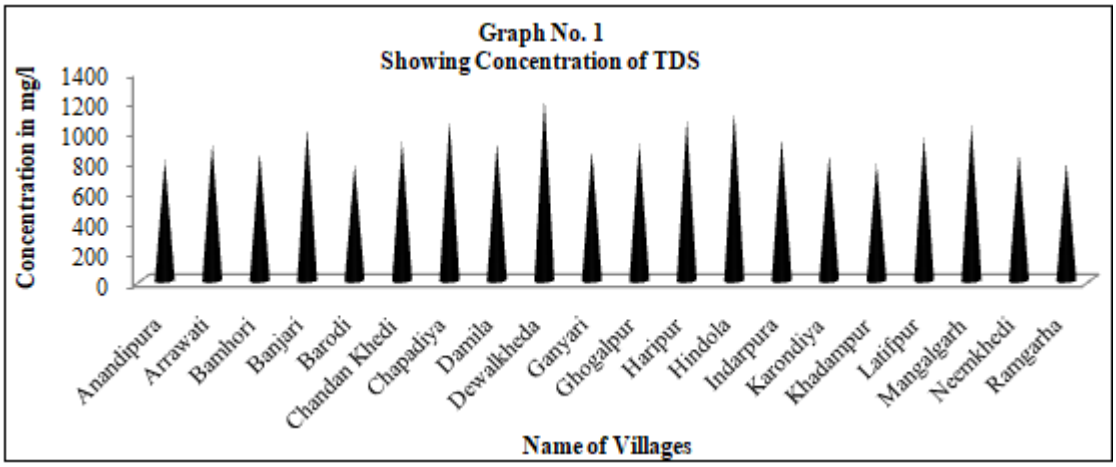
Mercury, a heavy metal, occurs naturally in the earth's crust. Volcanic activity, weathering of rocks naturally releases mercury into the environment. But in the current world, human activity is the main cause of mercury release like coal-fired power stations, residential coal buring for heating and cooking, industrial processes, waste incinerators. Mercury in its all forms such as inorganic form, organic form as methyl mercury is highly toxic to humans when consumed or inhaled. Mercury can cause Respiratory, Nervous and Renal damages. Also it causes disease even when exposed to small amounts and can affect the fetus in utero.

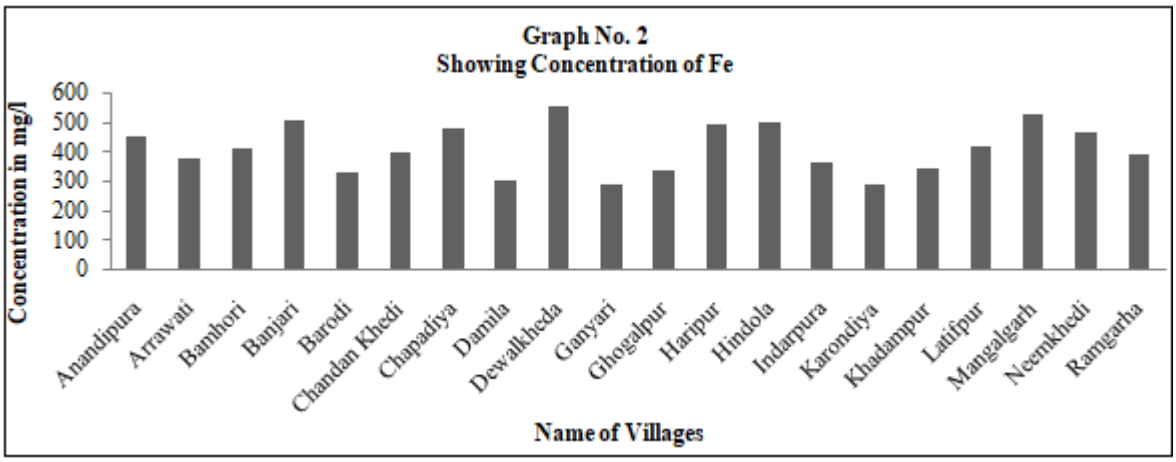
Mercury is a toxic metal and is the only metal which is liquid at room temperatures. Mercury can volatilize and enter into the air and, through air, it can enter water and the soil system. If a liquid effluent contains mercury it can directly deposit it in water and soil. Some bacteria found in soil and water can change mercury to its organic form, which is called methyl mercury, which is then taken in by live forms.

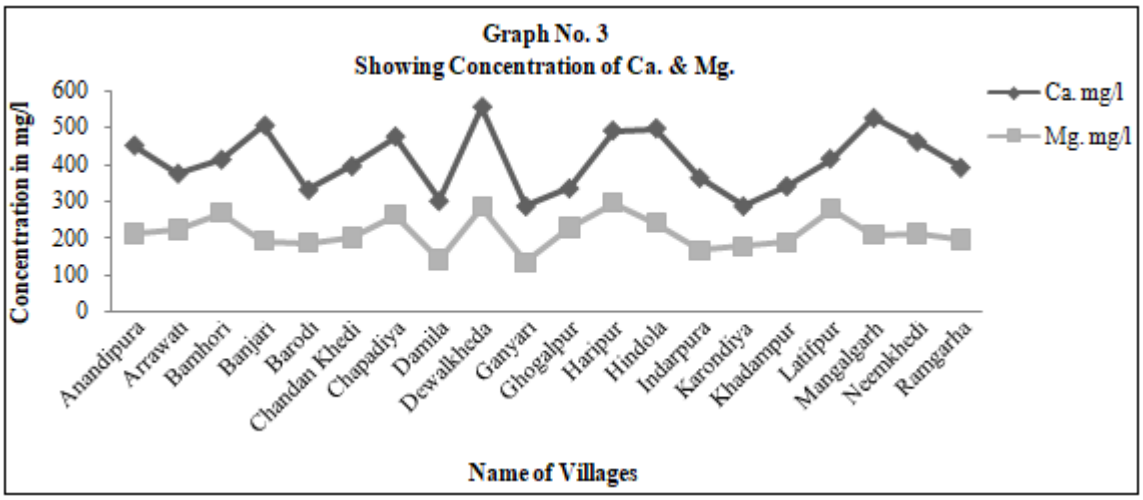
Analytical parameters showing the concentration of various ions in ground water of some villages

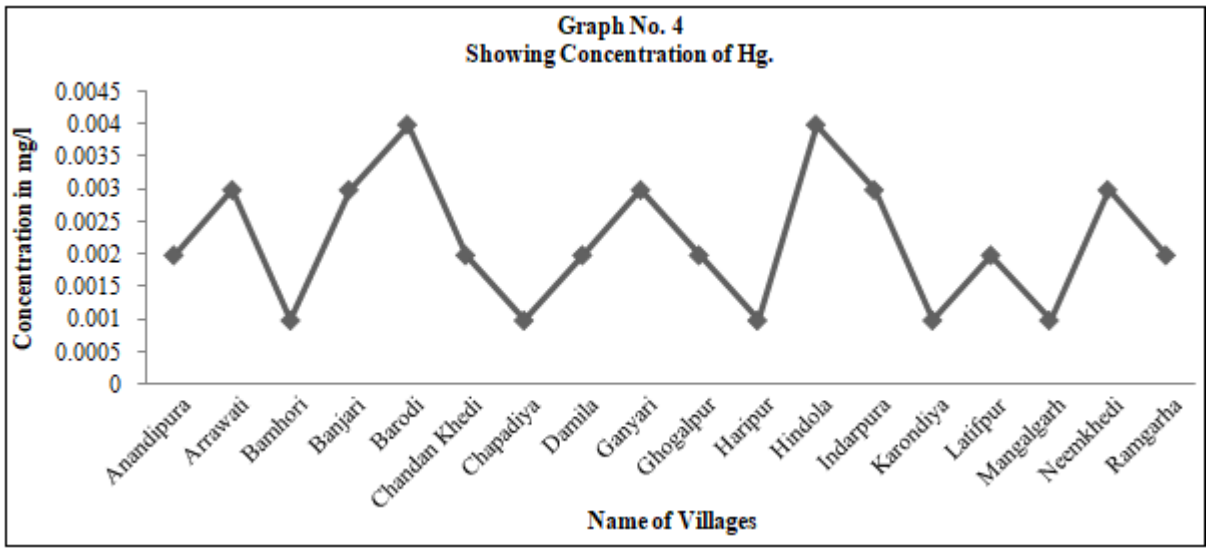
Surrounding Bhopal

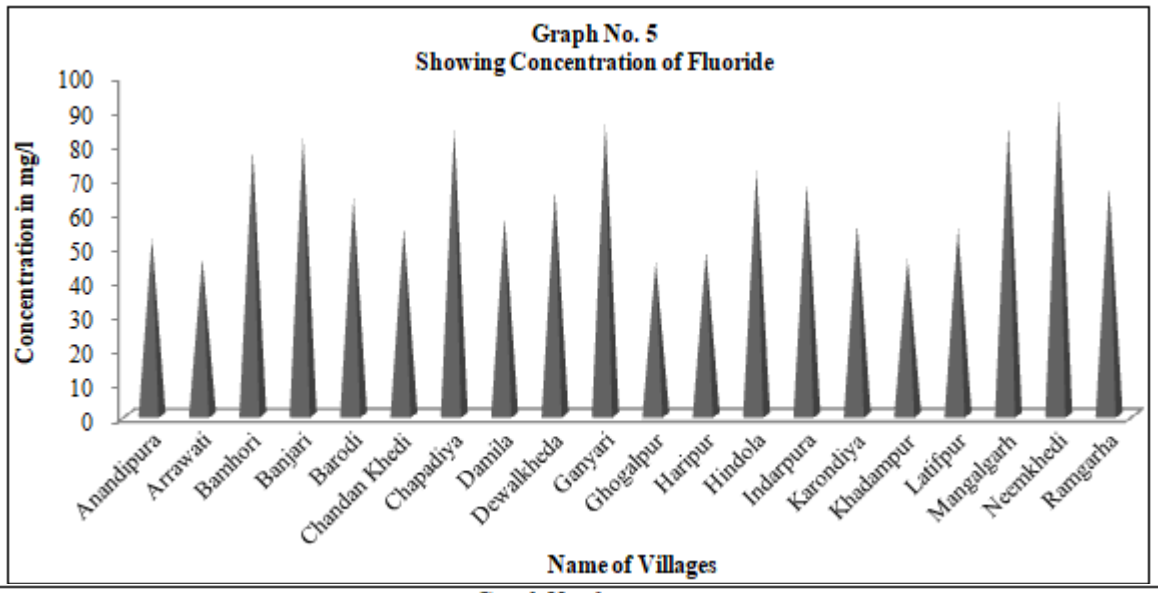
S. No.	Name of Villages	TDS mg/l	Fe mg/l	Ca mg/l	Mg. mg/l	Hg. mg/l	F- mg/l	NO3 mg/l
1	Anandipura	806	0.85	452	212	0.002	2.56	52
2	Arrawati	914	0.74	376	224	0.003	2.04	46
3	Bamhori	856	0.92	414	268	0.001	2.12	78
4	Banjari	1015	0.86	506	192	0.003	1.82	82
5	Barodi	774	1.05	332	186	0.004	1.65	64
6	Chandan Khedi	932	1.12	396	202	0.002	1.76	55
7	Chapadiya	1064	1.08	476	264	0.001	2.24	84
8	Damila	918	0.96	302	142	0.002	2.45	58
9	Dewalkheda	1206	0.87	556	286	NT	2.16	66
10	Ganyari	864	0.78	288	134	0.003	1.92	86
11	Ghogalpur	922	0.66	336	228	0.002	1.86	45
12	Haripur	1072	0.75	492	296	0.001	1.65	48
13	Hindola	1124	0.56	498	242	0.004	2.52	72
14	Indarpura	945	0.48	364	166	0.003	2.58	68
15	Karondiya	836	0.94	288	176	0.001	3.36	56
16	Khadampur	782	1.22	342	188	NT	3.42	46
17	Latifpur	962	1.16	416	282	0.002	3.64	55
18	Mangalgarh	1042	0.58	526	208	0.001	1.76	85
19	Neemkhedi	846	0.88	462	212	0.003	1.62	92
20	Ramgarha	788	0.98	392	196	0.002	2.78	67

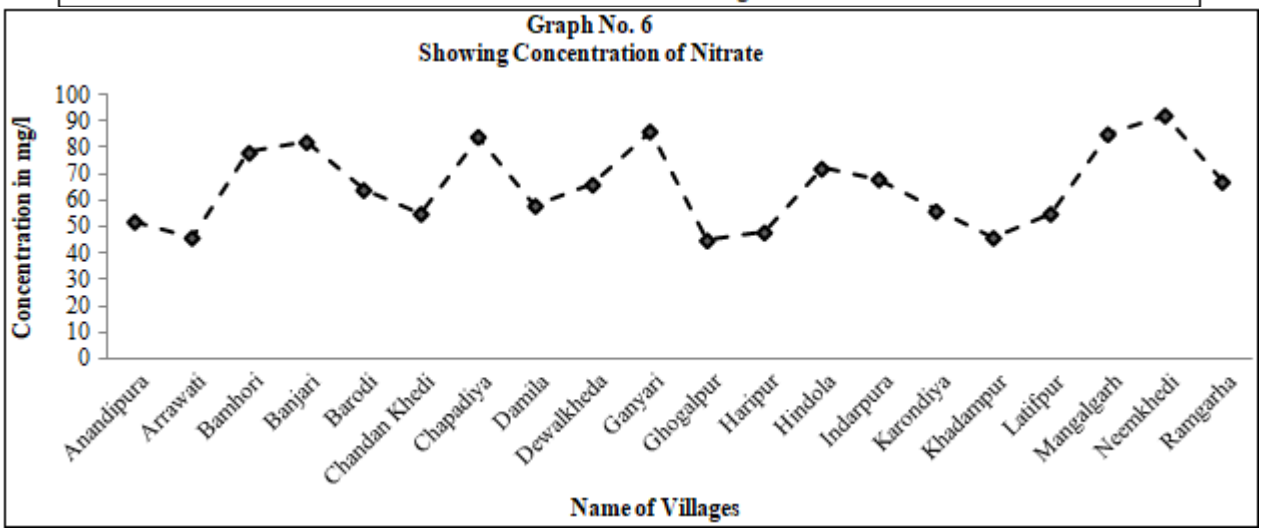












4. Conclusion

Some of the metals are essential for the normal growth, development, reproduction and various other physiological functions of the body. However, their excess or deficiency in the body might lead to adverse biological effects but some metals are toxic even in trace amounts. Human being can be exposed to certain metals through environment and also to higher doses during their occupation or accidental exposure. Human are exposed to mercury from various man made and natural sources. A substantial number of human are exposed to low doses of mercury through dental amalgam and professionals of dentistry are also exposed while preparing and filling up amalgam containing mercury. Organic mercury compounds are readily absorbed in the body through all the available routes. Permissible concentration of mercury as recommended by the National Institutes of Safety and Health, USA for occupational exposure is 0.05 mg/m$^{!}$ (NIOSH, 1973). There is an urgent need to bring in some policy for gradual shift from mercury containing equipment to safer alternatives. Presently, India is the second-largest user of mercury in the world. Two properties that make mercury extremely unmanageable are bioaccumulation and bio-magnification. Bioaccumulation is the retention of the toxic substance in the tissues, especially muscles. Bio-magnification is the process by which the toxic metal increases in concentration as it moves up the food chain. In the present investigation in two studysites mercury is not traceable and except two sites it is found in very-very low concentration, but the villagers and urban people should be very careful & the potable water should be analysed at regular interval to avoid the situation of impact on health.

The high fluoride content in the drinking water should also be given attention and defluoridated. 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[11]. Using Activated Alumina, by reverse osmosis where the source of water is plenty and by Electrodialysis reversal process. Prevention methods must be considered to protect groundwater aquifers from nitrate leaching[12]. Many devices and techniques, through ion-exchange and other processes (Chaturvedi et al., 1998)[11] can rehabilitate already contaminated water. Regular monitoring of water quality is recommended to improve understanding of nitrate pollution. 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[13].

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[14,15] (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.

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