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Water Analysis is Essential for Potable Water

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Abstract: ***Over two thirds of Earth's surface is covered by water; less than a third is taken up by land. As Earth's population continues to grow, people are putting ever-increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities, not so they take up less room, but so their quality is reduced. Poorer water quality means water pollution. As industrialization has spread around the globe, so the problem of pollution has spread with it. When Earth's population was much smaller, no one believed pollution would ever present a serious problem. It was once popularly believed that the oceans were far too big to pollute. Today, with around 7 billion people on the planet, it has become apparent that there are limits. Pollution is one of the signs that humans have exceeded those limits. Water pollution can be defined in many ways. Usually, it means one or more substances have built up in water to such an extent that they cause problems for animals or people. Not all of Earth's water is available on its surface, however. A great deal of water is held in underground rock structures known as aquifers, which we cannot see and seldom think about. Water stored underground in aquifers is known as groundwater. Aquifers feed our rivers and supply much of our drinking water. They too can become polluted. Groundwater pollution is much less obvious than surface-water pollution, but is no less of a problem. Surface waters and groundwater are the two types of water resources that pollution affects. There are also two different ways in which pollution can occur. If pollution comes from a single location, such as a discharge pipe attached to a factory, it is known as point-source pollution. A great deal of water pollution happens not from one single source but from many different scattered sources. This is called nonpoint-source pollution. Sometimes pollution that enters the environment in one place has an effect hundreds or even thousands of miles away. This is known as transboundary pollution. Some people believe pollution is an inescapable result of human activity: they argue that if we want to have development. Fortunately, not everyone agrees with this view. One reason people have woken up to the problem of pollution is that it brings costs of its own that undermine any economic benefits that come about by polluting. Pollution matters because it harms the environment on which people depend. The environment is not something distant and separate from our lives. The environment is everything that surrounds us that gives us life and health. Destroying the environment ultimately reduces the quality of our own lives and that, most selfishly, is why pollution should matter to all of us.***

Keywords: Squeezed, Water Pollution, Point Source Pollution, Non Point Source Pollution, Transboundary Pollution.

1. Introduction

Water pollution is an appalling problem, powerful enough to lead the world on a path of destruction. Water is an easy solvent, enabling most pollutants to dissolve in it easily and contaminate it. The most basic effect of water pollution is directly suffered by the organisms and vegetation that survive in water. On a human level several people die each day due to consumption of polluted and infected water. Water is polluted by both natural as well as man made activities. As the population has grown exponentially, so has the demand for housing, food, and cloth. As more cities and towns are developed, they have resulted in increasing use of fertilizers to produce more food, soil erosion due to deforestation, rise in construction activities, inadequate sewer collection and treatment, landfills as more garbage is produced, increase in chemicals from industries to produce more materials. In the present investigation water analysis is very necessary as some or other people of the residential locality are suffering from some gastrointestinal disease. Knowing the water pollution cause and effect their of one can take precautionary step to avoid the situation.

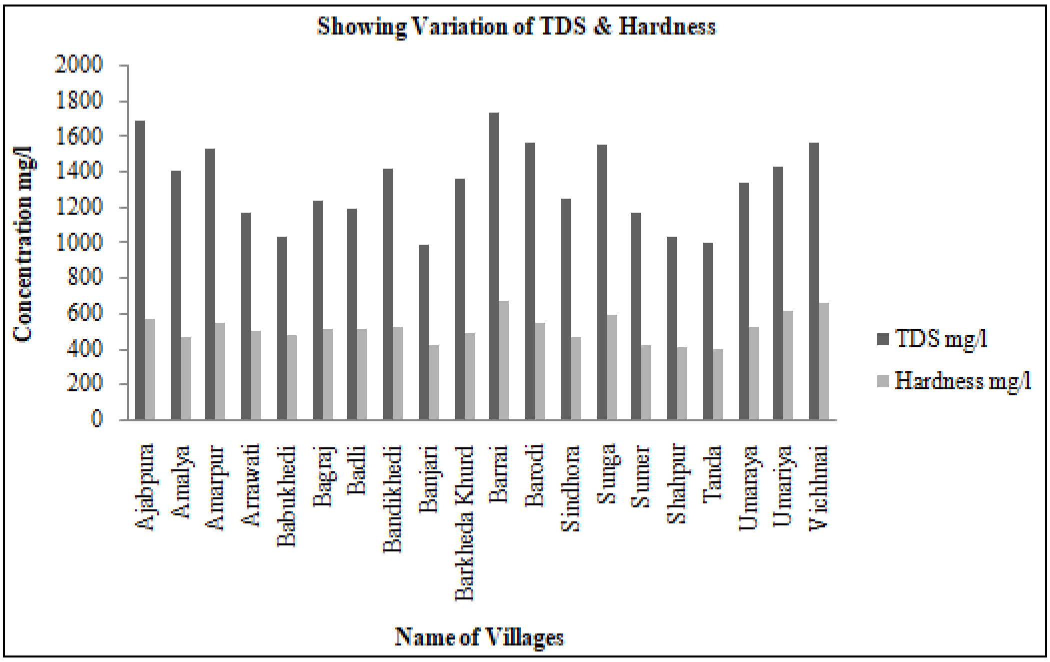
2. Material & Methods

Groundwater samples were collected from twenty villages. 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 sample bottles were covered immediately after collection. These water samples were analysed for Fe, Mn, Cr and Lead using atomic absorption spectroscopy as per the standard method given by APHA[1, 2]. Fluoride and Nitrate were also detected. All reagent used were of A.R. Grade.

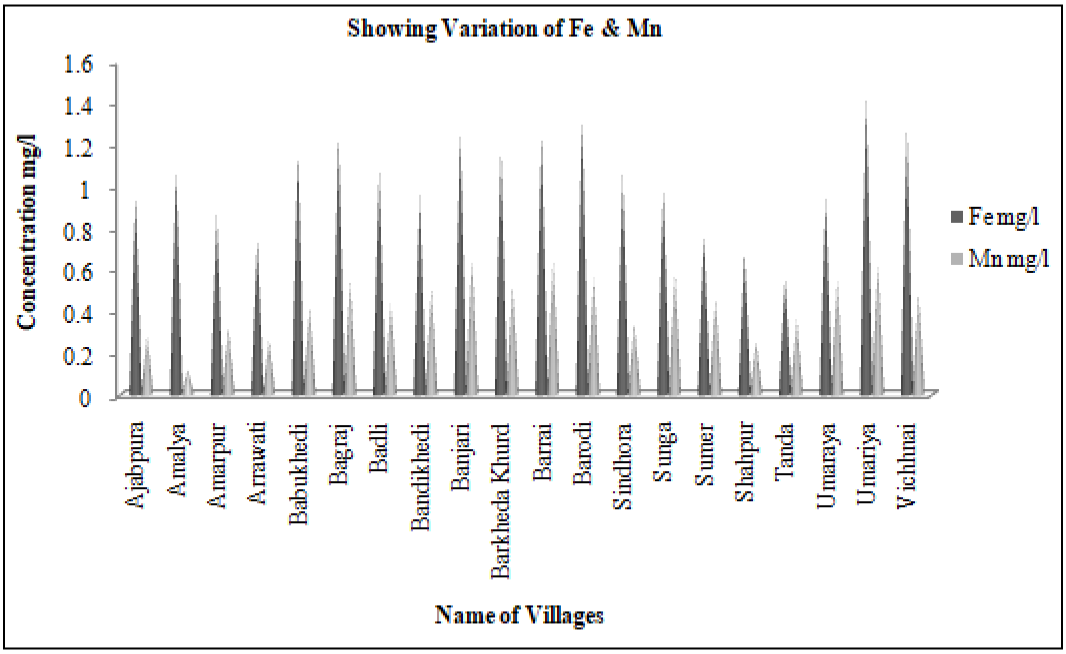
Analytical parameters showing the concentration of various ions in ground water of some villages in berasia of district Bhopal

S. No.	Name of Villages	TDS mg/l	Hardness mg/l	Fe mg/l	Mn mg/l	Cr mg/l	Pb mg/l	F mg/l	NO_3 mg/l
1.	Ajabpura	1685	565	0.95	0.28	0.04	0.03	1.72	50
2.	Amalya	1402	458	1.07	0.12	0.03	0.02	1.44	54
3.	Amarpur	1523	542	0.86	0.32	0.06	0.04	1.60	60
4.	Arrawati	1165	492	0.74	0.26	0.05	0.03	1.84	64
5.	Babukhedi	1028	474	1.16	0.42	0.02	0.04	2.06	48
6.	Bagraj	1234	514	1.24	0.54	0.03	0.02	2.18	46
7.	Badli	1185	506	1.08	0.44	0.07	0.05	1.98	56
8.	Bandikhedi	1412	518	0.95	0.50	0.06	0.04	1.86	64
9.	Banjari	988	422	1.26	0.65	0.08	0.06	1.76	68
10.	Barkheda Khurd	1352	485	1.18	0.52	0.07	0.05	1.64	70

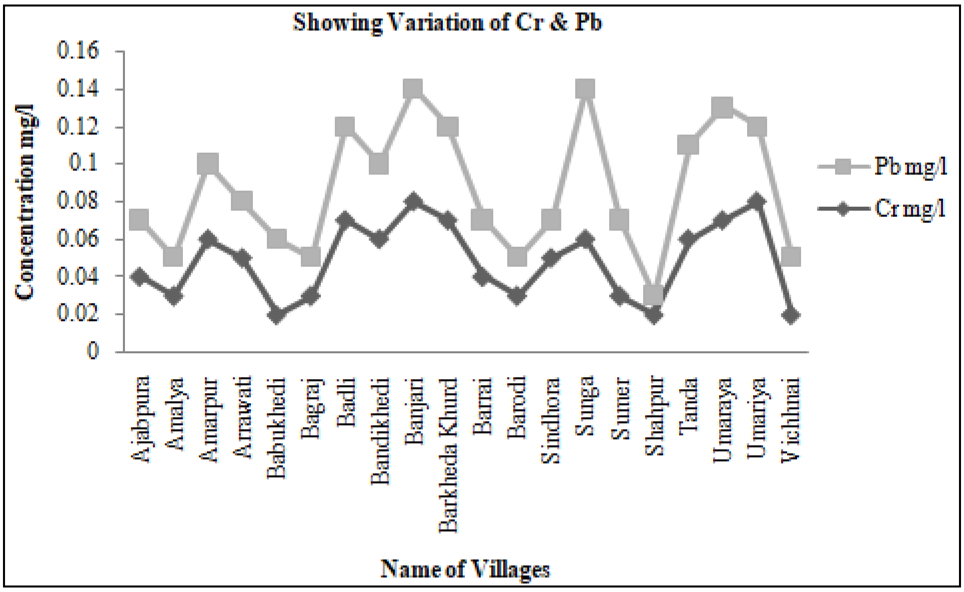
11.	Barrai	1724	672	1.25	0.64	0.04	0.03	1.58	46
12.	Barodi	1556	548	1.32	0.56	0.03	0.02	1.44	70
13.	Sindhora	1242	462	1.05	0.34	0.05	0.02	1.62	75
14.	Sunga	1544	585	0.98	0.58	0.06	0.08	1.75	80
15.	Sumer	1162	414	0.76	0.46	0.03	0.04	1.86	85
16.	Shahpur	1024	408	0.68	0.25	0.02	0.01	1.24	82
17.	Tanda	992	394	0.56	0.36	0.06	0.05	1.35	76
18.	Umaraya	1338	525	0.94	0.55	0.07	0.06	1.56	84
19.	Umariya	1424	612	1.42	0.62	0.08	0.04	1.95	90
20.	Vichhnai	1562	654	1.28	0.48	0.02	0.03	2.28	92



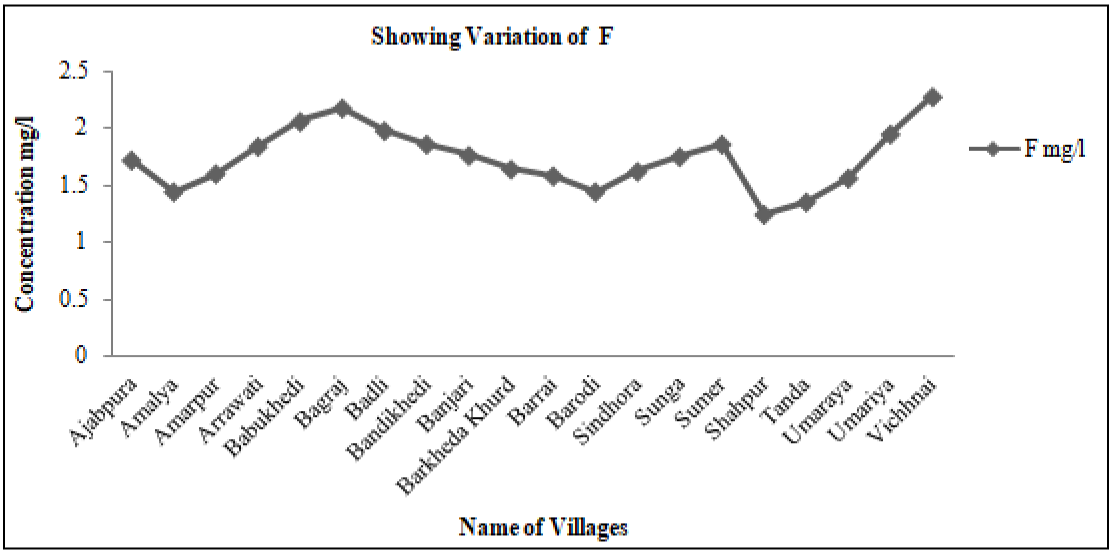
Graph 1



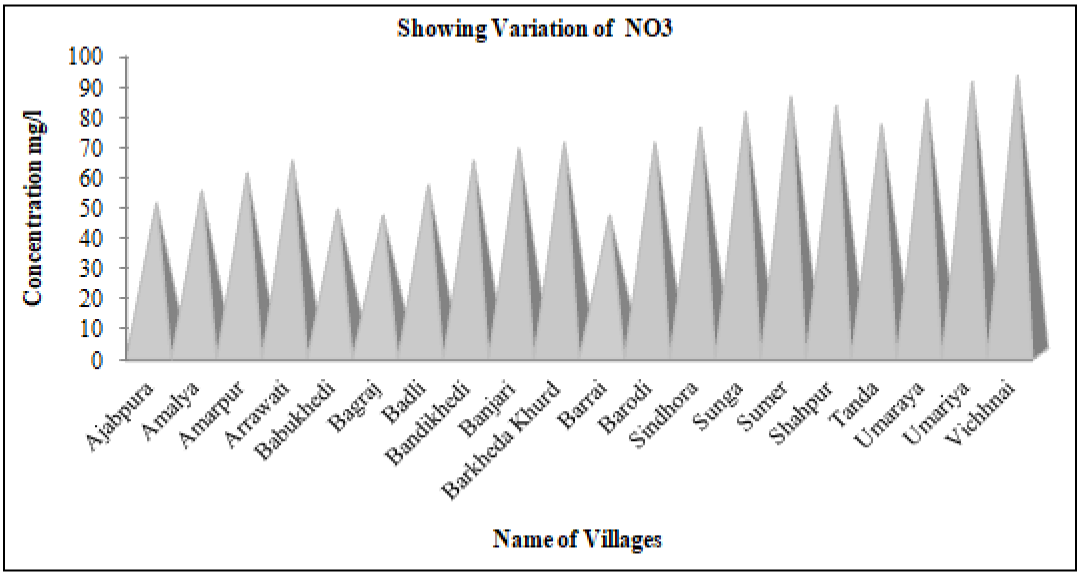
Graph 2



Graph 3



Graph 4



Graph 5

3. Result and Discussion

In the present investigation, analytical parameter is shown in table. The total dissolved solids observed in this area is between 988-1685 mg /l. Leaving two samples all are above 1000mg/l values. Generally, the higher TDS causes gastro intestinal irritation to the human beings, but the prolonged intake of water with the higher TDS can cause kidney stones and heart diseases. High TDS of this area may be the influence of anthropogenic sources such as domestic sewage, industrial waste, septic tanks, agricultural activities and influence of rock-water interaction.

In the present investigation total hardness ranges from 394mg/l to 672mg/l. It is caused primarily by the presence of cations and anions present in water. Water hardness has no known adverse effects; however, some evidence indicates its role in heart diseases and hardness of 150-300 mg/l and above may cause kidney problems and kidney stone formation.

In the present study Iron concentration ranges from 0.56mg/l–1.42mg/l. 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[3, 4]. Since the earth's underground rock formations contain about 5% iron, it is common to find iron in many geographical areas around the globe. Iron in water is typically found in three major forms and is rarely found in concentrations greater than 10 milligrams per litre. ‘Clear water iron’ is a non-visible ferrous (Fe2+) form of dissolved iron is found in water that is not exposed to oxygen. Iron is an essential nutrient for human, 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, which is based on aesthetic concerns.

Analytical parameter of the table shows the Manganese concentration ranges from 0.12mg/l to 0.65mg/l. Manganese inform of mineral naturally occurs in rocks[5] and soil and may also be present due to underground pollution sources. Manganese is seldom found alone in water. It is frequently found in iron-bearing waters but is more rare than iron. Chemically it can be considered a close relative of iron since it occurs in much the same forms as iron. Manganese can be consumed from our diet and in our drinking water. Bathing and showering in manganese containing water does not increase our exposure since manganese does not penetrate the skin and doesn’t get into the air. High exposure to manganese has been associated with toxicity[6] to the nervous system, producing a syndrome that resembles Parkinsonism[7]. Manganese is unlikely to produce other types of toxicity such as cancer or reproductive damage. Mn in drinking water is associated with neurological damage. Manganese is a known mutagen. The accumulation of Mn may cause hepatic encephalopathy[8].

In the present study the Table shows the concentration of chromium ranges from 0.02mg/l – 0.08 mg/l. Chromium is essential to animals and human. Chromium in excess amounts can be toxic especially the hexavalent form. Chromium is used to metal alloys and pigments for paints, cement, paper, rubber, and other materials. In dissolved form chromium is present as either trivalent $Cr(OH)_3$ or as hexavalent CrO_4^{2-}. The amount of dissolved Cr^{3+} ions is relatively low, because these form stable complexes. Oxidation ranks from Cr(III) to Cr(VI). In natural waters trivalent chromium is most abundant. Many chromium compounds are relatively water insoluble. Chromium (III) compounds are water insoluble, because these are largely bound to floating particles in water. Chromium (III) oxide and chromium (III) hydroxide are the only water soluble compounds. The main chromium mineral is chromite. Chromium compounds can be found in waters only in trace amounts. Chromium (Cr) is an essential micronutrient for animals and plants. It is considered as a relative biological and pollution significance element. Chromium is an essential nutrient in man because it helps the body in the use of sugar, protein and fats but at low concentration. However, intake excess causes various health effects such as skin rashes, stomach upset, ulcer[9], respiratory problems, alteration of genetic materials, weakness of immune system, kidney and liver damage, and can even lead to death.

Lead (Pb) is an undesirable trace metal less abundantly found in earth crust. In the present study its concentration ranges from 0.01mg/l – 0.08 mg/l.. Lead is used principally in the production of lead-acid batteries, solders and alloys. Lead is also found in soil, vegetation, animals and food. It is a serious cumulative body poison. Lead inhibits several key enzymes involved in the overall process of haemosynthesis, whereby metabolic intermediate accumulates. Lead in the environment may derive from either natural or anthropogenic sources.

One of the main trace elements in groundwater is fluoride (F) which generally occurs as a natural constituent. In the present study its concentration ranges from 1.24mg/l – 2.28mg/l. 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[10]. 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[11]. The higher intake of fluoride[12] may change the metabolic activities of soft tissues[13] (brain, liver, kidney, thyroid and reproductive organs). The permissible limit of fluoride in drinking water is 1.5 mg/l[14]. water containing more than 1.5 mg/l of fluoride cause mottled tooth enamel in children and are not suitable for drinking purpose. Excess fluoride may also lead to fluorosis that can result in skeletal damage. Clinical report indicate that adequate calcium intake is directly associated with reduced a risk of dental fluorosis. Vitamin C also safeguards against the risk.

Nitrate (NO3) generally occur in trace quantities in surface water but may attain high levels in some groundwater[15]. In the present study its concentration ranges from 46mg/l – 92mg/l. It is well known that the nitrogenous fertilizers are one of the important sources for groundwater[16] nitrate for the past two decades[17]. Further, nitrogenous materials are rare in geological system. In excessive limits, it contributes to the illness known as methenglobinemia in infants. The permissible limit of nitrate is 45 mg/l.

4. Conclusion

Water analysis after a certain period of interval let the residential people know about the quality of potable water[18]. The people may take preventionary steps to reduce the water pollution. There is no easy way to solve water pollution; if there were, it wouldn't be so much of a problem. There are three different things that can help to tackle the problem—education, laws, and economics. Making people aware of the problem is the first step to solving it. Greater public awareness can make a positive difference. Life is ultimately about choices—and so is pollution. We can live with sewage-strewn beaches, dead rivers, and fish that are too poisonous to eat. Or we can work together to keep the environment clean so the plants, animals, and people who depend on it remain healthy. We can take individual action to help reduce water pollution, for example, by using environmentally friendly detergents, not pouring oil down drains, reducing pesticides, insecticides and so on. We can take community action too, by helping out on beach cleans or litter picks to keep our rivers and seas that little bit cleaner. And we can take action as countries and continents to pass laws that will make pollution harder and the world less polluted. Working together, we can make pollution less of a problem—and the world a better place.

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