

Evaluation of Physical chemical Characteristics of Ground water at Alirajpur, Madhya Pradesh, India

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Abstracts: Ground water is one of the major sources of drinking water in many parts of Alirajpur, Madhya Pradesh, India. Ground water contain of fluoride 0.5 to 1.00 mg/l. our study shows that pH 7.23 to 8.42 Electrical conductivity 946 to 978 mg/l, Total Alkalinity 142 to 178 mg/l, Total Hardness 624 to 699mg/l, Chloride 15.4 to 51.41mg/l. and Fluoride 2.93 to 8.55mg/l. is present which is than permissible limit of APHA (American Public Health Association) high Fluoride in ground water at various selected sampling sites our research shows that high level of the ground water of Alirajpur District of Madhya Pradesh, India. In present study it is found that is the ground water Alirajpur district is affected by high fluoride concentration.

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Key words: Fluoride, Physical chemical Characteristics, Ground water, fluorosis.

Introduction

Fluoride is an essential element for life. The fluorides belong to the halogen group of minerals. Fluorides are mainly found in ground water when derived by the solvent action of water on the rocks and the soil of the earth's crust. Fluoride is the most electronegative of all chemical elements. It is seventeenth in the order of frequency of occurrence of the elements and represents about 0.06 to 0.09% of the earth's crust (Wedepohl, 1974). At low concentrations it is generally believed that fluoride deficiencies can arise but at high fluoride concentrations other deleterious effects can certainly transpire. In relation to drinking water it is generally believed that too little (< 0.5 mg l-1) or too much (> 1.5 mg l-1) can affect bone and teeth structure (Edmunds and Smedley, 1996, 2003). Due to the scarcity of surface water, Madhya Pradesh has to depend on ground water resource to a great extent. Estimation finds that 65% of India's villages are exposed to fluoride risk (UNICEF, 1999). In the present investigation an attempt was made to record the fluoride concentration and other physico-chemical parameters in Alirajpur district, Madhya Pradesh. Fluoride is beneficial to human beings to extent when present in concentration of 0.5 to 1.0 mg/l. Its negatively charged ions that will attract and bound with calcium and magnesium fluoride is the ionic form of fluoride widely distributed in nature much of current concern with regard to environment quality is too caused on water because of its importance in maintaining the human health, plants, agricultural, crops and health of ecosystem. Fresh water is finite resource, essential for agriculture, Industry and even human existence. Without fresh

water of adequate quality and quantity sustainable development will not be possible. Fluoride has been recognized as one of the most significant natural ground water quality problem affecting arid and semiarid region of M.P. Intake of fluoride excessive amount beyond the permissible limits (> 0.05 to 1.00 mg/l.) can be very harmful for humans, plants, crops and animals etc. Fluorosis in general, has been identifies in various countries.

Study Area of Alirajpur

The Alirajpur is a District of M.P. Alirajpur is located at 22.19° N and N 74.22° E at the East central border of Madhya Pradesh about 170 km from Indore. It has total area of 2165.2459 sq. km. As of the census taken in 2011 the district has a total population of 7280,617 people spread in around 551 villages.

Material and Methods

The methodology of proposed work is purely analytical done according to the process mentioned and followed as CPCB, APHA guidelines for ambient water quality. Four sampling stations were selected for Water samples of selected area. Samples were collected in previously washed and dried plastic containers. The temperature of sample was noted at sampling points of Alirajpur District. The physicochemical parameters such as temperature, pH, conductivity, total hardness, alkalinity, chloride and fluoride were analyzed for present study of Alirajpur district following villages Ajanda, Machliya, Badi, Alirajpur, Kharpai, Kund, Bhedwa and Dolkheda (Table.2) has been selected as Kanpur, Bhavaliya, Begdi, Nanpur ,Rajawat, Dolkheda, Mayala ,Isdu Chakalkui. In the study showed wide range of values

under each test and sample were found to have inferior quality, unsafe for drinking purposes at most of the place in Alirajpur district and the water needs to be treated for using in domestic purposes.

Result and Discussion

Fluoride is beneficial to human beings to extent when it is present in concentration of 0.5 to 1.0 mg /l. (Table-1.) reported that low or high concentration in water as the major cause of dental fluorosis. Analytical results of different water samples taken from 22 villages of Alirajpur Tehsil are given (Table-2 Fig 1-4) It is clearly shows that 90% sample are containing fluoride above the permissible limits (WHO 2003, Sikarwar et.al.

Temperature

The temperature of water is basically important for affecting the chemical and biological reactions of the organism in water. (16°-30°c).

pH

pH is the logarithm of reciprocal of hydrogen ion activity expressed in moles per liter. In the present study most of the Observation of pH was found within the desirable limit (ISI). The pH of ground water has no direct effect on health but all biochemical reactions are sensitive to the variation in pH different samples collected in different seasons shown 7.4 to 8.6 respectively.

Electrical conductivity

Conductance of water may be due to the presence of soluble salt and other ionic species. The conductance value for the samples ranges from 1034 to 3300.mg /l.This is found to be within the permissible limit as prescribed by united state public health standard (USPHS).

Total Hardness

Hardness is the most important properties of water. In ground water hardness is due to the presence of bicarbonate, Sulphates, chloride and Nitrate of calcium. Hardness of all water samples found 205 to 860 mg/l. The maximum permissible limit of total hardness as CaCO₃ is given as 600 mg/l. for drinking water prescribed by ICMR (1975). These it is found beyond the limit at 300 mg/l -500 mg/l.

Total alkalinity

Total alkalinity of all water samples ranged 180 to 789 mg/l. that are Nanpur (school), Kotbu (school)

respectively. Total alkalinity of water is measure its capacity to neutralize and is characterized by presence of hydroxyl ion capable of combining with hydrogen ion in solution. Alkalinity is the measure of buffering capacity of the water.

Chloride

Chloride is one of the common anions present in all natural water and generally commended with calcium, Magnesium and sodium ions. The amount of chloride in all samples of water ranges from 25 to 501 mg/l. actually chloride imparts a salty test to water sample of containing low fluoride are characterized by high chloride sulphate content of water ranging from 1.5 to 4.9 mg/lit. This is within the permissible limit prescribed by ICMR (1975).

Fluoride

Fluoride is one of the main trace elements in ground water, which generally occurs as a natural constituent. All the ground water samples collected from different sampling sites were analyzed for fluoride concentration. Fluoride was found greater ranged from 1.02 to 8.45 mg/l. All the fluoride values are much above the permissible limit prescribed by CPCB, ministry of work and housing (1971). Fluoride is beneficial to certain extent when present in concentration of 0.5 to 1.00 mg/l. because of fluoride causes calcification of dental enamel (calcium fluorapatite crystal) especially between the children below 8 years of age. Sikarwar et.al (2010). Fluoride cause dental fluorosis and if present in excess of 0.5to1.5 mg/l. So it is caused fluoridation and skeletal when present fluorosis beyond the limit of 3.5 mg/l. If such water is consumed for a prolonged period causes fluoride toxicity in the form of dental skeletal and gut fluorosis. The latter is also known as fluoride toxics i.e. osteofluorosis, hydrofluorosis, fluoride osteopathys and endemic fluorosis.

Fluoride toxicity also affects the soft tissues and the enzyme systems but it effects on teeth bones and gut only. Fluoride is known to combine with hydrochloric acid of stomach and is converted in hydro fluoric acid which is highly corrosive. The stomach and intestinal mucosa is destroyed with loss of microbial drying up and cracking of cell surface and tissues production is hampered. Excess Concentration of fluoride causes dental diseases in the calcification stage of children.



Figure -1
Map of India



Figure -2
Map of Study site Alirajpur.

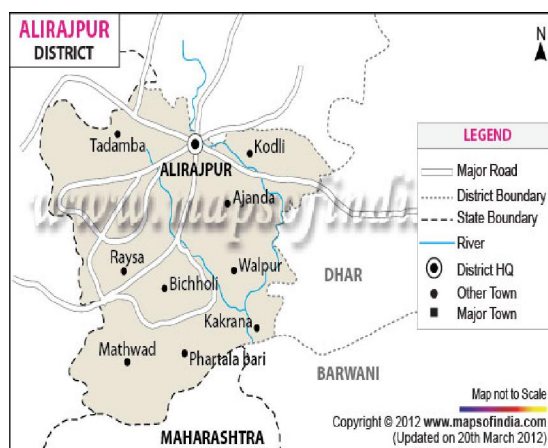


Figure -3 Map of Madhya Pradesh

Table 1- Limits of Fluoride Concentration

International Standard (APHA 1993)		Indian Standard (1993)		Ministry of Urban Development		WHO 2003	
Maxi. Acceptable Conc. of Fluoride in mg/l.	Maxi. Available Conc. of Fluoride in mg/l.	Maxi. Acceptable Conc. of Fluoride in mg/l.	Maxi. Available Conc. of Fluoride in mg/l.	Maxi. Acceptable Conc. of Fluoride in mg/l.	Maxi. Available Conc. of Fluoride In mg/l.	Maxi. Acceptable Conc. of Fluoride in mg/l.	Maxi. Available Conc. of Fluoride in mg/l.
0.7	0.5	1.7	1.5	1.0	1.5	1.0	1.5

Table 2. Fluoride concentration recorded at sampling stations.

S.NO.	Sampling sites	Sources	Fluoride Concentration in mg/l.
1	Alirajpur	Hand Pump	1.14 mg/l.
2	Ajanda	Hand Pump	6.40 mg/l.
3	Begdi	Hand Pump	1.73 mg/l.
4	Behdwa	ETP Plant	3.4 mg/l.
5	Dolkheda	Hand Pump	2.5 mg/l.
6	Mayala	Hand Pump	2.1 mg/l.
7	Isdu	PHED	4.51 mg/l.
8	Rajawat	Open Well	2.71 mg/l.

9	Kharkua	Hand Pump	3.45mg/l.
10	Kanpur	Hand Pump	8.46 mg/l.
11	Machliya	Hand Pump	2.18 mg/l.
12	Laxamani	Open well	1.18mg/l.
13	Laxamani	Tube well	1.33 mg/l.
14	Phata	Hand pump	2.34mg/l.
15	Kotbu	PHED Water supply	1.45mg/l.
16	Kund	Hand pump	4.42mg/l.
17	Rajawat	Open Well	2.38mg/l.
18	Nanpur	Hand Pump	2.11 mg/l.
19	Nanpur	PHED Water supply	0.64mg/l.
20	Kanpur	Open well	1.89mg/l.

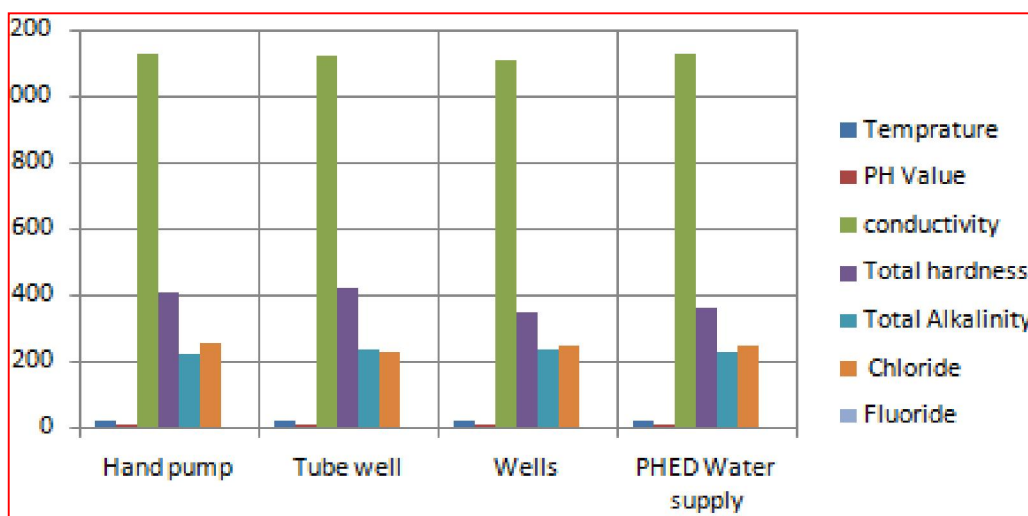


Figure 4. Bar diagram Physicochemical of characteristics of concentration of different parameters in seasonal study area of Alirajpur, (M.P.)

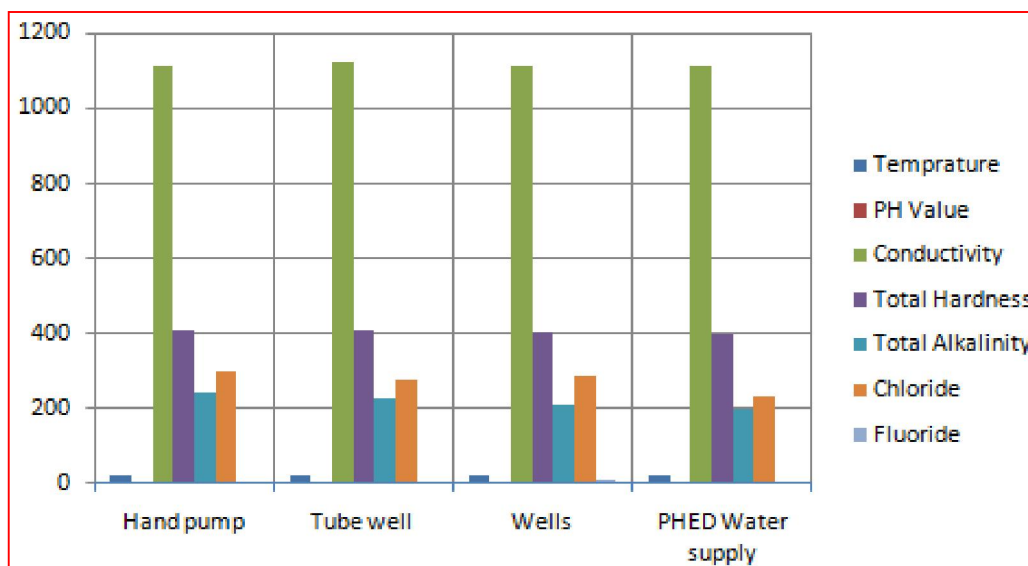


Figure 5. Bar diagram Physicochemical of characteristics of concentration of different parameters in seasonal study area of Alirajpur, (M.P.)

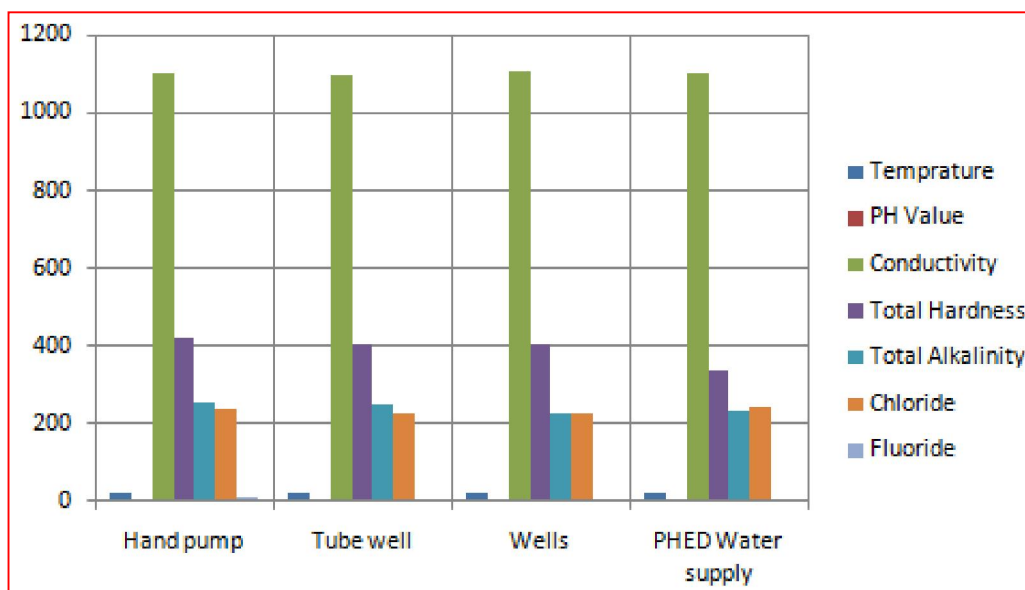


Figure 6. Bar diagram Physicochemical of characteristics of concentration of different parameters in seasonal study area of Alirajpur, (M.P.)

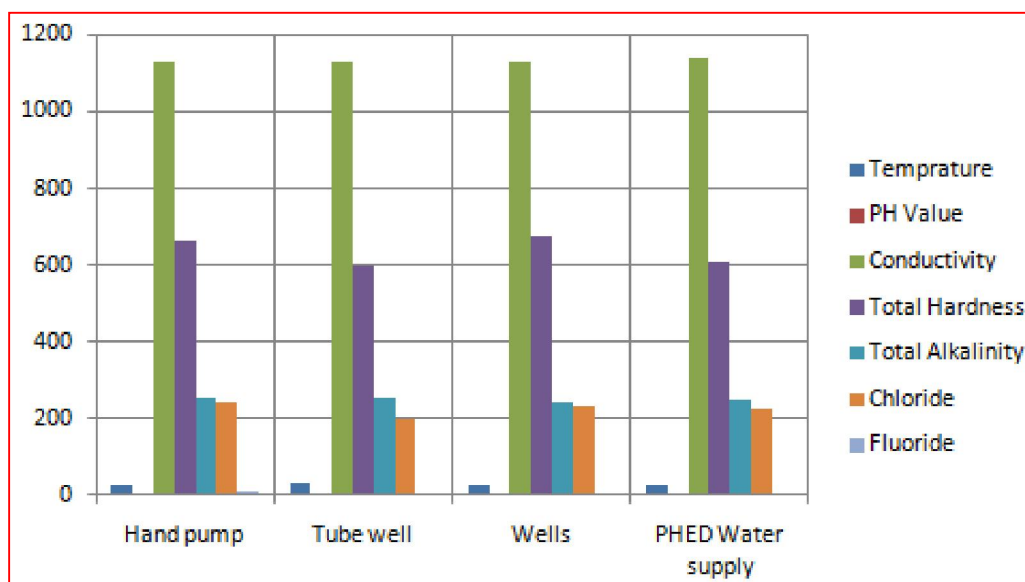


Figure 7. Bar diagram Physicochemical of characteristics of concentration of different parameters in seasonal study area of Alirajpur, (M.P.)



Dental fluorosis



Dental fluorosis

Figure 8. Photographs showing Dental fluorosis and collected from H.S.School Laxamani and Pachyat Bhavan Nanpur.

Conclusion

Physical chemical parameters of fluoride Alirajpur ground water are within desirable limit prescribed by WHO accept few samples. the results of present study shows we conclude that some of the Alirajpur water samples though fit for drinking purposes yet it need treatment to minimize the contamination especially hardness and TDS in few water sources. To create increasing awareness among the people to maintain the of Alirajpur water at its highest quality and purity levels n the Alirajpur district.

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