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CHEMICAL CHARACTERISTICS OF THE GROUND WATER IN RURAL PARTS OF BILASPUR CITY WITH SPECIAL REFERENCE OF FLUORIDE ION

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ABSTRACT

Although fluoride was once considered an essential nutrient, the U.S. National Research Council has since removed this designation due to the lack of studies showing it is essential for human growth, though still considering fluoride a "beneficial element" due to its positive impact on oral health. The U.S. specifies the optimal level of fluoride to range from 0.7 to 1.2 mg/L (milligrams per liter, equivalent to parts per million), depending on the average maximum daily air temperature; the optimal level is lower in warmer climates, where people drink more water, and is higher in cooler climates. High concentrations of fluoride (F^-) in drinking water are harmful to human health. This communication reports F^- incidence in groundwaterand its relation with the prevalence of dental and skeletal fluorosis in Sarguja, Chhattisgarh,India. In 1994 a World Health Organization expert committee on fluoride use stated that 1.0 mg/L should be an absolute upper bound, even in cold climates, and that 0.5 mg/L may be an appropriate lower limit A 2007 Australian systematic review recommended a range from 0.6 to 1.1 mg/L Assay of fluoride concentration in ground water samples around in some parts of Bilaspur revealed that fluoride content in beyond the permissible limit in a some residential areas. The extent of Fluoride present in different samples was obtained by spectrophotometer. The extent of fluoride was found in village Sendari found to be from minimum 0.39 to 1.72 mg/l. But F^- ion in Deorikhurd was 1.12 to 2.20 mg/l.

Keywords: climate, dosage, fluorosis, permissible limit, consumption.

INTRODUCTION

Safe drinking water is essential to humans and other life forms. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack accesses to adequate sanitation. There is a clear correlation between access to safe water and GDP per capita. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%.Water plays an important role in the world economy, as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation. Approximately 70% of the fresh water used by humans goes to agriculture. Water is the chemical substance with chemical formula H_2O one molecule of water has two hydrogen atoms covalently bonded to a single oxygen atom water appears in nature in all three common states of matter and may take many different forms on Earth water vapor and clouds in the sky; seawater and icebergs in the polar oceans; glaciers and rivers in the mountains; and the liquid in aquifers in the ground. At high temperatures and pressures, such as in the interior of giant planets, it is argued that water exists as ionic water in which the molecules break down into a soup of hydrogen and oxygen ions, and at even higher pressures as super ionic water in which the oxygen crystallizes but the hydrogen ions float around freely within the oxygen lattice. Fluoride's effects depend on the total daily intake of fluoride from all sources. About 70–90% of ingested fluoride is absorbed into the blood, where it distributes throughout the body. In infants 80–90% of absorbed fluoride is retained with the rest excreted, mostly via urine; in adults about 60% is retained. About 99% of retained fluoride is stored in bone, teeth, and other calcium-rich areas, where excess quantities can cause fluorosis. Drinking water is typically the largest

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source of fluoride. In many industrialized countries swallowed toothpaste is the main source of fluoride exposure in unfluoridated communities.

OBJECTIVES

The quality of water is of vital concern for mankind since it is directly linked with human welfare. It is matter of history that pollution of drinking water caused water borne diseases which wiped out entire population of cities. The aim of this study was to determine the amount of fluoride in drinking water of four villages of Bilaspur dist. Polluted water is the culprit in all such cases. The major sources of water pollution are domestic waste from urban and rural areas, and industrial wastes which are discharged in to natural water bodies. For this Physico-chemical analysis of drinking water samples will be taken from different four villages and aware to avoid all problems which come from more fluoride.

Selected area

Today water resources have been the most exploited natural system since man strode the earth. pollution of water bodies is increasing steadily due to rapid population growth. The study was carried out in Bilaspur district with an area of 16034.4 Sq.kms and 34 percent population are backword in Bilaspur . These are the developing districts in Chhattisgarh. About 36% of area encompasses reserved and protected forest land. The net irrigated area is 31968 ha. Out of which 6077ha. is irrigated by ground water. Five samples are from Bilaspur Dist.

METHOD

Samples were collected and analysed as per procedure laid down in the standard methods for examination of water and waste water of American public Health Association (APHA) compsite sampling method was adopted for collection of samples of water from five location of village Sample for chemical analysis were collected in polyethylene container's. Samples collected for metal contents were acidified (1.0 ml HNO_3 per liter samples). Some of the parameter like P^H Temperature, conductivity, dissolves oxygen T.D.S. were analysed on site using portable water analysis kit. The other parameter were analysed at laboratory (Pillai, K. S. and Stanley, V. A).

PROCEDURE

Method: SPADNS SPECTROPHOTOMETRIC

RESULT

Village I –Koni

A Total number of six samples were collected and tested for their fluoride concentration. Three samples represent surface water collected from river/nallah and represented as s1-sw_1, s1-sw_2,s1-sw_3 while the remaining samples were collected from under-ground water / tube wells s4-sw_4, s1-sw_5,s1-sw_6 .All the six samples were colourless . Odourless, and free from solid suspension. The result of absorbance has been compiled below for the s-1 samples:-

Village II Sendari

A Total number of six samples were collected and tested for their fluoride concentration. Three samples represent surface water collected from river/nallah and represented as s2-sw_1, s2-sw_2,s3-sw_3 while the remaining samples were collected from under-ground water / tube wells s4-sw_4, s5-sw_5,s2-sw_6 .All the six samples were colourless . Odourless, and free from solid suspension. The result of absorbance has been compiled below for these samples:-

Village III- Mopka

A Total number of six samples were collected and tested for their fluoride concentration. Three samples represent surface water collected rom river/nallah and represented as s3-sw_1, s3-sw_2,s3-sw_3 while the remaining samples were collected from under-ground water / tube wells s3-sw_4, s3-sw_5,s3-sw_6 .All the six samples were colourless . Odourless, and free from solid suspension. The result of absorbance has been compiled below for these samples:-

Village IV- Torwa

A Total number of six samples were collected and tested for their fluoride concentration . Three samples represent surface water collected from river/nallah and represented as S4-sw_1, s4-sw_2,s4-sw_3 while the remaining samples were collected from under-ground water / tube wells s4-sw_4, s4-sw_5,s4-sw_6 .All the six samples were colourless . odourless, and free from solid suspension. The result of absorbance have been compiled below for these samples:-

Village V- Deorikhurd

A Total number of six samples were collected and tested for their fluoride concentration . Three samples represent surface water collected from river/nallah and represented as S5-sw_1, S5-sw_2,S5-sw_3 while the remaining samples were collected from under-ground water / tube wells S5-sw_4, S5-sw_5,S5-sw_6 .All the six samples were colourless . odourless, and free from solid suspension. The result of absorbance have been compiled below for these samples:-

Table I- Fluoride Concentration of water samples in village Koni.

samples	Fluoride in mg/l
S1-sw1	1.12
S1-sw2	1.34
S1-sw3	0.86
S1-sw4	0.85
S1-sw5	0.73
S1-sw6	0.81

Mg/l ↑ Water samples→

Table II- Fluoride Concentration of water samples in village Sendari.

Samples	Fluoride in mg/l
S2-sw1	1.72
S2-sw2	0.74
S2-sw3	0.40
S2-sw4	0.39
S2-sw5	1.61
S2-sw6	.53

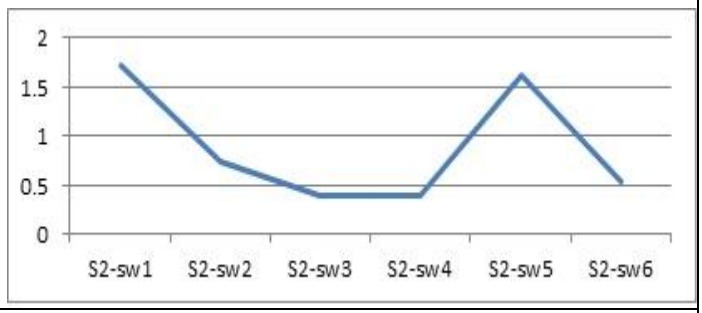


Table III- Fluoride Concentration of water samples in village Mopka.

samples	Fluoride in mg/l
S3-sw1	0.58
S3-sw2	0.64
S3-sw3	1.52
S3-sw4	1.50
S3-sw5	0.45
S3-sw6	0.48

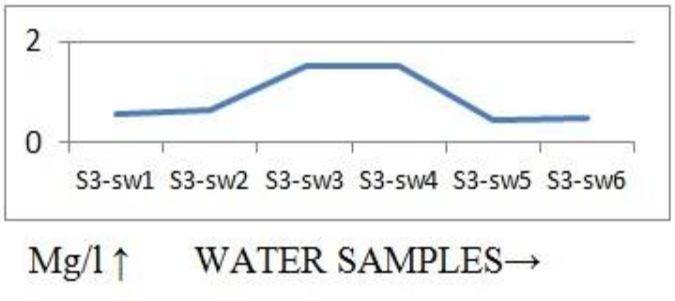


Table IV- Fluoride Concentration of water samples in village Torwa

Samples	Fluoride in mg/l
S4-sw1	1.09
S4-sw2	0.92
S4-sw3	0.94
S4-sw4	1.62
S4-sw5	1.70
S4-sw6	1.65

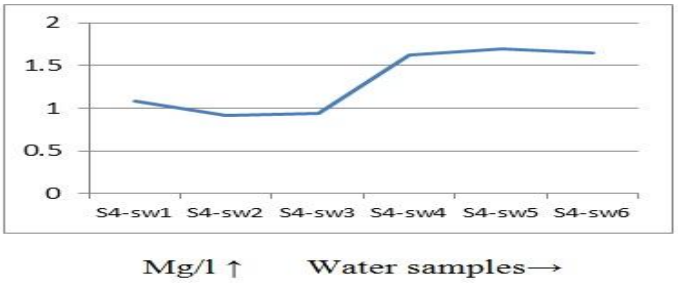
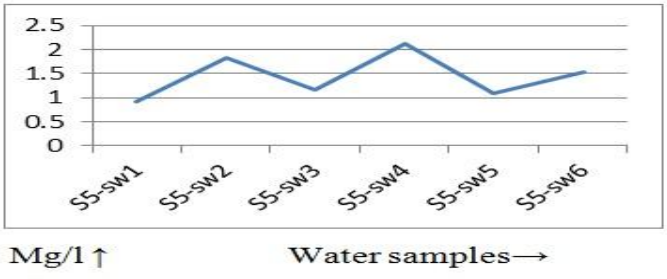


Table V- Fluoride Concentration of water samples in village Deorikhurd

samples	Fluoride in mg/l
S5-sw1	0.91
S5-sw2	1.83
S5-sw3	1.16
S5-sw4	2.12
S5-sw5	1.08
S5-sw6	1.53



DISSCUSSION

Result of analysis of Water from Five villages of the Dist. are recorded in table 1,2,3,4,5 and 6. In all the five villages each have six sampling station (three were collected from the surface and three samples were collected from the tube well) .In Koni village of dist. fluoride was recorded in the range of, .073 to 1.34 mg/l . Maximum permissible limit for fluoride as world Health

organization (WHO) is 1.5 mg/l, all six samples fluoride found under of their permissible limit.

Water sample analyses of Sendari village of Balarampur district are recorded in table 2. From this sampling station three samples were collected from the surface and three samples were collected from the tube well. Fluoride was recorded in the range of 0.39 to 1.74 mg/l. The Maximum permissible limit for fluoride as Indian standard is 0.6 to 1.2 mg/l. all six samples fluoride in few found excess of their permissible limit.

Mximum permissible limit for fluoride as NEERI manual (1991) is 1.0 mg/l. Water from village Mopka are recorded in table 3. From this sampling station three were collected from the surface and three samples were collected from the tube well. Fluoride concentration was recorded in the range of 0.45 to 1.52 mg/l. In few of All six samples fluoride found excess of their permissible limit.

The concentration of fluoride from village Torwa are recorded in table 4 .Fluoride was recorded in the range of 0.92 to 1.72 mg/l. in few of all six samples fluoride found excess of their permissible limit. The concentration of fluoride in Deorikhurd village of Bilaspur was recorded as 0.91 to 2.12 mg/l. .

It was also noted that the fluoride concentration in water is also dependent on climatic condition. In a same sampling station it was found that the concentration of fluoride is higher in summer then the winter and rainy season. The high evaporation during the summer is responsible for the high content of F^- in water. As in summer the drinking water problem is self serious. So when there is the question of purity of water, it's a very difficult job for the tribal people to find the drinking water which is of drinking water quality.

CONCLUSION

The preset study has been made to evaluate the Fluoride concentration of water samples collected from the villages of Bilaspur Dist, Chhattisgarh. Each village has made six sampling station .These samples were analysed for study of fluoride and their effect in surrounding area. Fluoride in naturally occurring in water can be above or below from recommended levels. Both the excess and deficiency of fluoride in water produces adverse effects on the health. Maximum acceptable limit for fluoride as world Health organization is 1.5 mg/l. In present study the fluoride concentration of water samples of all five villages were found over the permissible Limit. Sodium Fluoride used in bauxite mines may be the major source of these fluoride contraptions. So to prevent Fluoride pollution in water and its consequences proper steps are to be taken regarding the use and effects of Sodium Fluoride.

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