

SEASONAL VARIATIONS OF FLUORIDE CONCENTRATION IN DRINKING WATER OF NANDGAON KHANDESHWAR TEHSIL

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ABSTRACT

The availability of potable drinking water is still a major problem in both rural and urban areas of the developing countries. The major problem concerning drinking water is the presence of fluoride. In high doses, fluoride is toxic to human and animals. Therefore it is necessary to study the fluoride content of the drinking water. For this water samples of different villages from Nandgaon Khandeshwar Tehsil from Amravati district are collected. Premonsoon and post monsoon water samples were analyzed by using the sodium-2 parasulphophenylazo -1-8-dihydroxy-3,8 naphthalene disulphonate (SPANDS) spectrophotometric method. In summer high fluoride content was found (>1.5 mg/lit) than winter. To avoid adverse effects of high fluoride content "Defluoridation" technique can be used.

Keywords: fluoride, monsoon, samples, water.

Introduction

Ground water is a dynamic renewable resource. The distribution of ground water is also not uniform and has temporal and spatial variation. Its occurrence and availability are controlled by the structure of the rock formations, geomorphological setup and hydrological and hydromorphological conditions.

The Maharashtra State is occupied 81.24% by basaltic rock. The sources of ground water are bore wells, open wells and hand pumps which are available for drinking water in urban as well as rural areas. Fluoride is one of the physico-chemical constituent of ground water which occurs in traces many times in natural water. Fluoride is an ion of the chemical element fluorine which belongs to halogen family and more electronegative having oxidation state (-1) than other members of halogen.

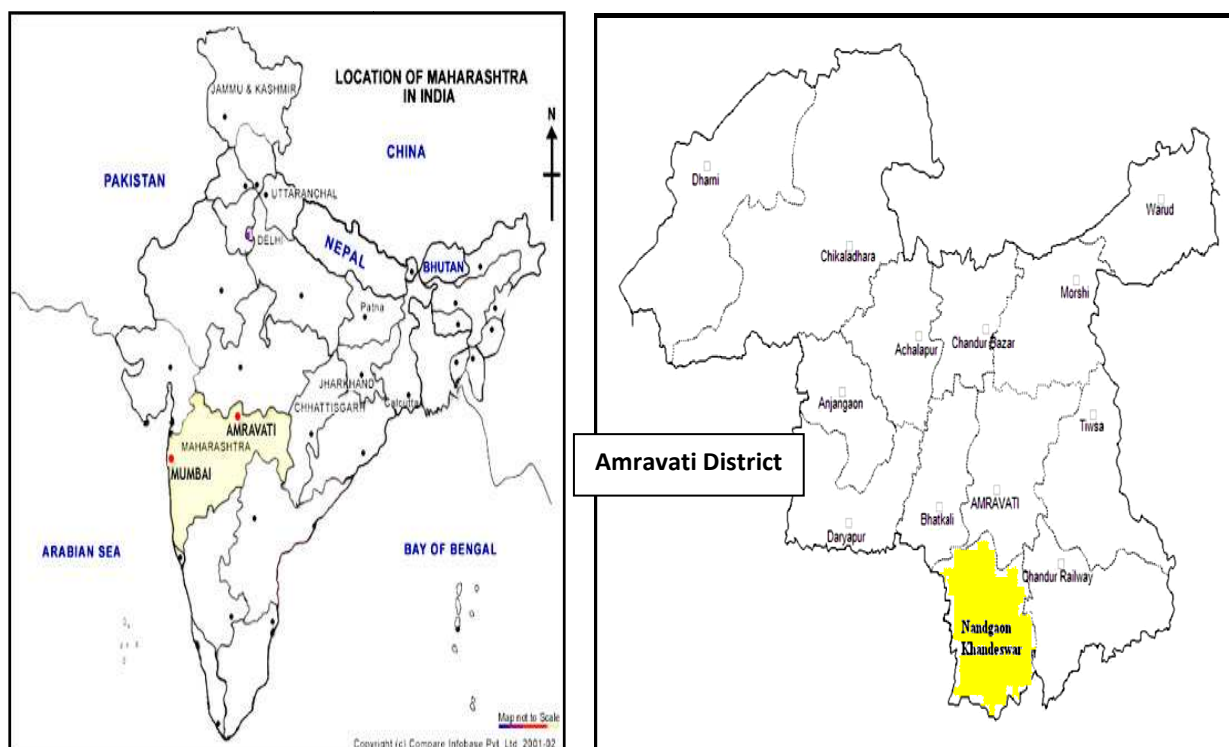
It occurs in the form of chemical compound such as sodium fluoride (white crystalline powder) or hydrogen fluoride (colourless liquid or gas) which present in minerals like fluorospar, fluoropalite, topaz and cryolite. Throughout the study it is found that 65% of India's villages suffer from fluorosis. In Maharashtra State most of the villages in Yavatmal district and Bhandara district also

affected by serious fluorosis. Fluoride at lower concentration is essential element for the development of teeth and bones in growth, fertility, prevention and anemia in pregnancy. In high doses, fluoride is acutely toxic to human and animals. Long term consumption of water containing 0.5 mg of fluoride per litre may cause dental fluorosis and more than 1.5 mg/lit causes skeletal fluorosis, this can causes joint pain, restriction of mobility, bending of vertebral coloum, deformation of knee joints, bone fracture and even paralysis. Chronic effect on kidneys have also been observed. The fluoride from the ground water can be removed by defloridation technique and Activated Alumina (Adsorption) Technique.

Material and Method

Study Area

Nandgaon Khandeshwar is a tehsil place in Amravati district of Amravati revenue division in Vidarbha region of Maharashtra state (India). It is located 32 km towards south from Amravati District surrounded by three talukas namely Chandur Railway of Amravati District, Ner and Dhamangaon Railway of Yavatmal District. Total population of Nandgaon Khandeshwar is 1,27,068 and area acquired is 338 m elevation (altitude). Total number of villages in this taluka is 314.



Experimental

Necessity to study fluoride concentration in Nandgaon Khandeshwar Taluka is because source for drinking water is ground water. The ground water sample collected from hand pump and dug well. The period of sample collection is premonsoon (summer) April 2012 to May 2012 and post monsoon (winter) Nov 2012 to dec 2012. Samples collected from seven different villages from different locations. The water samples were collected in clean polyethylene plastic can of 250 ml capacity. Before filling, bottles were rinsed with water under study. They were labelled, coded and brought to the laboratory for analysis on the same day.

Water samples were analysed by using the sodium-2 parasulphophenylazo-1-8 dihydroxy 3, 8- naphthalene disulphonate (SPANDS). Spectrophotometric method is based on the reaction between fluoride and zirconium dye. Fluoride reacts with the dye, dissociating a portion of it in to a colourless complex anion ($Zr.F_6$) and the dye. As the amount of fluoride increases the colour produced becomes

progressively lighter. The AR-grade reagent and chemicals, distilled water and Borosil glasswares were used throughout the analysis.

The water samples from fifteen different sampling spots were analyzed for fluoride content. The period of investigation was pre monsoon and post monsoon.

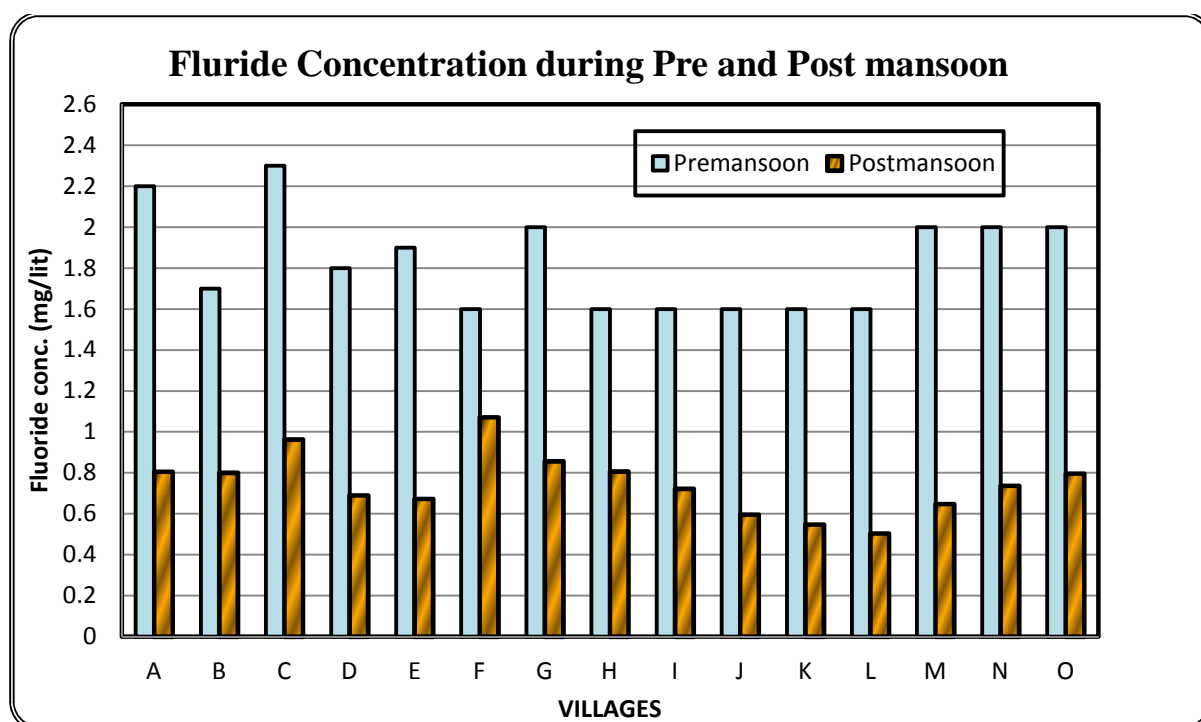
During the period of investigation fluoride concentration values varied seasonally. The higher concentration was found in the ground water of Nandgaon Khandeshwar tehsil. The Fluoride concentration during pre monsoon (April to May) 2012 ranged from 1.6 to 2.3 mg/lit. Fluoride concentration of all sampling spot is beyond permissible limit (1.5 mg/lit). During summer Dhanora (K), Nandgaon Khandeshwar, Kodori, Mangarul, Chawala were under serious Fluoride contamination.

On the other hand fluoride concentration showed contrast result during post monsoon (November to December) 2012 ranged from 0.5 to 1.07 mg/lit. All villages' shows result under permissible limit.

The seasonal variation in fluoride concentration are given in table

| Sr. No. | Gram panchayat Name | Village Name | Source | Location | Fluoride conc ⁿ (mg/lit) | |
|---------|---------------------|------------------|--------|----------------------------|-------------------------------------|--------|
| | | | | | Pre | Post |
| A | Dhanora (K) | Gharphal | HP | N/H of Panjab Alaspure | 2.2 | 0.8057 |
| B | Sarsi | Sarsi | HP | N/H of Ganesh Bhalekar | 1.7 | 0.8000 |
| C | Nand. Kandh | Nand. Kandh | DW | Near Hanuman Temple | 2.3 | 0.9630 |
| D | Khandala | Jawara | HP | N/H of Divakar Devore | 1.8 | 0.6900 |
| E | Khandala | Jawara | HP | N/H of Mahadev Daseshkar | 1.9 | 0.6730 |
| F. | Kodori | Shingholi | DW | N/H Rajesh Hirode | 1.6 | 1.0715 |
| G. | Kodori | Shingholi | DW | N/H of Tambulkar Vilas | 2.0 | 0.8560 |
| H. | Kodori | Shingholi | DW | N/H of Anant Hirode | 1.6 | 0.8060 |
| I. | Kodori | Shingholi | DW | N/H of Subhash Hirode | 1.6 | 0.7220 |
| J. | Nandsawangi | Nandsawangi | DW | N/H of Babalu Bhilavekar | 1.6 | 0.5960 |
| K. | Nandsawangi | Nandsawangi | DW | N/H of Sanjay Mankar | 1.6 | 0.5480 |
| L. | Nandsawangi | Nandsawangi | DW | N/H of Raghunath Mahure | 1.6 | 0.5040 |
| M | Mangarul Chawala | Mangarul Chawala | DW | N/H of Madan Salokar | 2.0 | 0.6480 |
| N | Mangarul Chawala | Mangarul Chawala | DW | N/H of Kishorrao Lute | 2.0 | 0.7370 |
| O | Mangarul Chawala | Mangarul Chawala | DW | N/H of Dhyneshwar Pardikar | 2.0 | 0.7960 |

Discussion



The Fluoride concentration is lower during post monsoon because of dilution of ground water at the time of monsoon season. Shingoli village shows fluoride concentration more than permissible limit 1.07 mg/lit even during post monsoon.

Fluoride levels more than 0.5 mg/lit over period 5-10 years result in fluorosis terminating in crippling or paralysis.

Conclusion

To avoid adverse effect on the health of human being estimation of fluoride content of drinking water is very essential.

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