

# Assessment of Seasonal Effect of Fluoride in Ground Water of Osian Region of Jodhpur District

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## ABSTRACT

Fluoride is a highly toxic substance, ingestion of excess fluoride, most commonly in drinking-water, can cause fluorosis which affects the teeth and bones. Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems. Paradoxically, low levels of fluoride intake help to prevent dental caries. The control of drinking-water quality is therefore critical in preventing fluorosis. To examine the suitability of water for drinking and irrigation purposes in context to fluoride concentration, a physico-chemical study of the ground water of Osian region of Jodhpur district of Rajasthan state has been carried out. For this, Fluoride concentration of forty water samples were collected from the region, during pre-monsoon and post-monsoon seasons in the month of June and November 2013 respectively, to assess the quality of water in the study area. Concentration of fluoride was recorded 0.3 mg/L to 8.3 mg/L in pre-monsoon and 0.2 mg/L to 8.1 mg/L in post-monsoon season. The results were compared with standards prescribed by Indian government IS: 10500 and the relative distribution of fluoride in the region is shown through a pie chart. This analysis can be useful for carrying out remedial measures for high fluoride concentration, region.

## Key words

Fluoride, Osian region, physico-chemical analysis, water quality.

## 1. INTRODUCTION

Water is an essential compound present on earth to sustain life; it plays an important role in transmission of a number of infectious diseases. According to World Health Organization more than 3.4 million people die as a result of water related diseases every year, making it the leading Cause of disease and death around the world [3]. Fluoride is considered to be an important substance, ingestion of excess fluoride, most commonly in drinking-water, can cause thyroid, fluorosis which affects the teeth and bones. Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems. Paradoxically, low levels of fluoride intake help to prevent dental caries. The control of drinking-water quality is therefore critical in preventing fluorosis. The safe drinking water is defined as water with microbial, chemical and physical characteristics that meet guidelines of national standards, e.g. IS 10500. The quality of water is reflected through various physical, chemical and biological conditions, which are eventually influenced by natural and anthropogenic sources.

In this paper a chemical study seasonal variation of Fluoride compound of the ground water of Osian region of Jodhpur district has been carried out for analyzing fluoride concentration in water. To analyze, 40 water samples were collected during pre- monsoon and post-monsoon seasons in the month of June and November 2013 respectively and Fluoride concentration of the samples was determined to assess the quality of water in the

area, so that remedial measures could be work out for high Fluoride concentration.

## 2. EXPERIMENTAL SETUP

To analyze the distribution of Fluoride 40 water samples were collected in sterilized plastic bottles from the different pockets of Osian region; the locality of samples collected is shown in table 1. The concentrations of Fluoride in collected samples were examined through Ion Selective Electrode Method. The Principle of this method is -- the fluoride sensitive electrode is of the solid state type, consisting of a lanthanum fluoride

Crystal; in use it forms a cell in combination with a reference electrode, normally the calomel electrode. The crystal contacts the sample solution at one face and an internal reference solution at the other. A potential is established by the presence of fluoride ions across the crystal which is measured by a device called ion meter or by any modern pH meter having an expanded millivolt scale. Concentration of fluoride present in the sample is calculated using standard curve.

## 3. RESULTS & DISCUSSION

Different standards have been developed by different agencies for various usage for water. All these standards take in to account the effect on human health, vegetation as well as on quality of life consideration etc. The standard differs in terms of maximum allowable concentration and accepted level. Hence it was realized that, there is need of a common classification scheme to know water quality status in terms of various important indicator parameters, in this paper fluoride is considered. Giving due consideration to all classification schemes, a general classification, as Excellent, Acceptable, Slightly Polluted and Heavily Polluted water as per fluoride concentration and the action required is also proposed.

Excellent – Water quality is pristine.

Acceptable -- Needs only disinfections.

Slightly polluted -- It requires filtration and disinfections.

Polluted -- It requires special / auxiliary treatment and disinfections.

Heavily polluted --Water cannot be used for any purpose directly i.e. drastic treatment is required.

Fluoride level is found 0.3 mg/L to 8.3 mg/L. From the Table -2 it is observed that 17 samples in pre and 19 in post monsoon out of 40 falls under the *Excellent* category, 10 samples in pre and 14 samples in post monsoon fall in the in the acceptable category, 7 samples in pre and 2 samples in post monsoon fall in the in slightly polluted category. 4 samples in pre and 3 samples in post monsoon fall in the in polluted category and 2 samples in pre and 2 samples in post monsoon fall in the in highly polluted category.

**TABLE- 1: WATER SAMPLES WERE COLLECTED FROM DIFFERENT POCKETS OF OSIAN REGION**

S. No.	Source	Type	Fluoride concentration (mg/L)		S. No.	Source	Type	Fluoride concentration (mg/L)	
			Pre-monsoon	Post-monsoon				Pre-monsoon	Post-monsoon
1	Ujaliya, Osian	Ow	1.0	0.9	21	Mathaniya, Mathaina	Ow	1.3	1.2
2	Oochiyara panchatat samiti,Osian	Ow	7.7	7.3	22	Nirmal bera, Mathaina	Ow	1.6	1.4
3	Ghatinav,Osian	Tw	1.1	0.9	23	Navoda bera, Mathaina	Ow	2.7	2.5
4	Devka bera,Osian	Ow	1.0	0.7	24	Premasukh ji Daga ka bera, Mathaina	Ow	1.0	0.9
5	Sirmandi (Birjaram singada),Osian	Tw	1.6	1.4	25	Water supply, Mathaina	Ow	4.2	4.0
6	Simardha baba ki samadhi,Osian	Tw	0.9	0.6	26	Padla bera, Mathaina	Ow	1.4	1.3
7	Vidhyalaya,Osian	Ow	0.7	0.6	27	Rathoron ka bera Mathaina	Ow	1.1	0.9
8	Pashu mela maidan,Osian	Tw	1.1	0.9	28	Kotchala bera, Mathaina	Ow	1.1	1.0
9	Shri sachiyaya mat athiti grah,Osian	Tw	1.5	1.3	29	Kotchala bera nanakram, Mathaina	Ow	1.2	0.9
10	Mataji mandir road, Osian	Hp	1.7	1.3	30	Nawada bera, Mathaina	Ow	1.4	1.3
11	Simardha baba ki samadhi, forest dept, Osian	Tw	0.8	0.6	31	Padla bera, Mathaina	Ow	1.6	1.4
12	Ashok kumar mali Geeta dham road, Tiwari	Ow	1.5	1.3	32	Gopji gahlot, Mathaina	Ow	1.5	1.4
13	Jagdish mali ,Geeta dham road Tiwari	Ow	5.1	4.9	33	Bhurji solanki, Mathaina	Ow	1.4	1.3
14	Sohan sankhla Tiwari	Ow	1.7	1.5	34	Manaram ji Tak, Mathaina	Ow	1.1	0.9
15	Sanwar ram ji mali Tiwari	Ow	2.2	2.0	35	Sumrapal tak, Mathaina	Ow	1.0	0.8
16	Pepa ram ji mali,geeta dham road Tiwari	Ow	0.4	0.3	36	Chandraram ji parihar, Mathaina	Ow	1.5	0.9
17	Pukhraj cOwdhry Tiwari	Ow	1.0	0.9	37	Kanwal ji gahlot, Mathaina	Ow	5.8	5.3
18	Sunil kumar siyol, Geeta dham road Tiwari	Ow	1.4	1.3	38	Jagraj tak, Mathaina	Ow	1.1	0.8
19	Phed ,Bijariya bawari road Tiwari	Tw	8.3	8.1	39	Kailash ji daga, Mathaina	Ow	1.6	1.5
20	Handpump Tiwari	Hp	0.3	0.2	40	Daga ka bera, Mathaina	Ow	1.5	1.3

Ow: Open Well; Tw: Tube well; Hp: Hand Pump

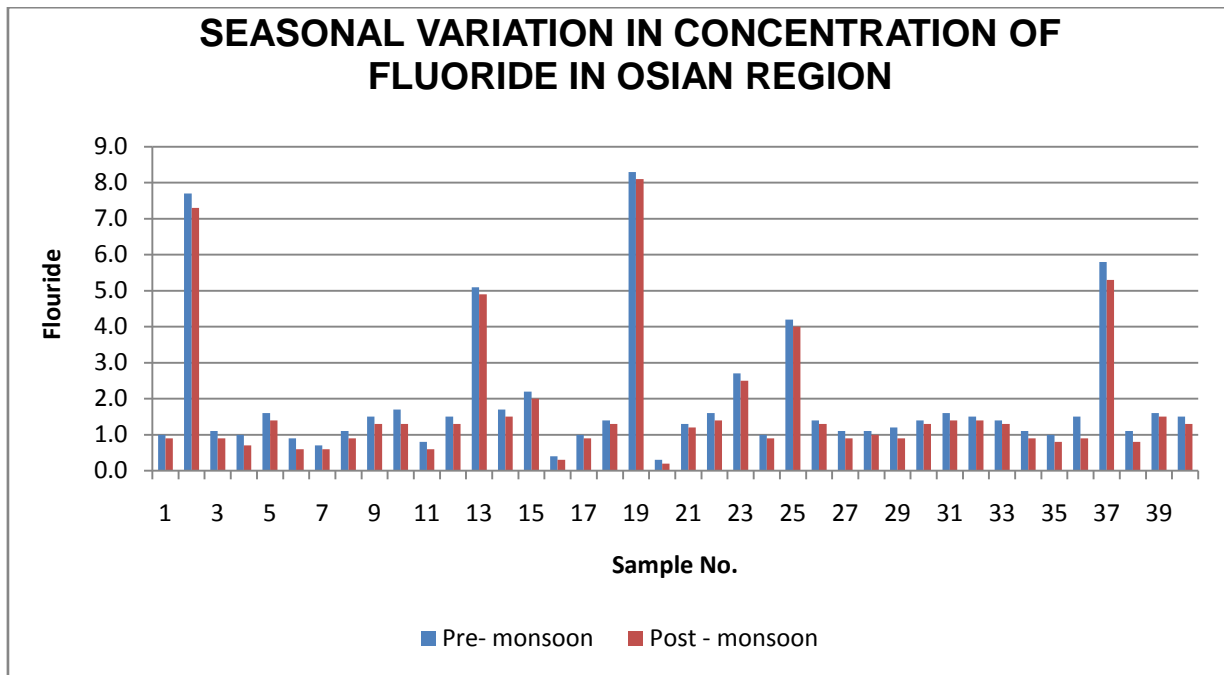


Fig 1: Seasonal Variation in Concentration of Fluoride Different samples of Osian

Table-2  
 Class Of Water On The Basis Of Distribution Of Fluoride

Class of Water	F (mg/L)	Pre- Monsoon	Post- Monsoon
Excellent	0.6-1.2	17	19
Acceptable	1.2-1.5	10	14
Slightly polluted	1.5-2.5	7	2
Polluted	2.5-6.0	4	3
Highly polluted	6.0-10.0	2	2

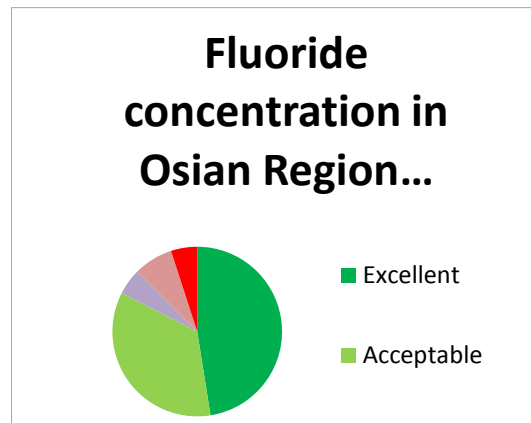


Figure 3 Flouride Concentration Distribution in Post- Monsoon

In most of the samples the water of the region was found suitable, whereas the presence of high Fluoride contents was found in a few samples of the ground water of Osian Region. From the visual representation of the relative number of samples under various categories it is can be observed that most of the region in Osian district is free from the unacceptable fluoride contents in the water and hence this can be used for all purposes, though some of the areas are slightly polluted but after filtration and disinfection, the water can be used. Where as some of the areas are found containing high fluoride, Here this is important to mention that the analysis presented is on the basis of fluoride content in the water and other parameters are not considered.

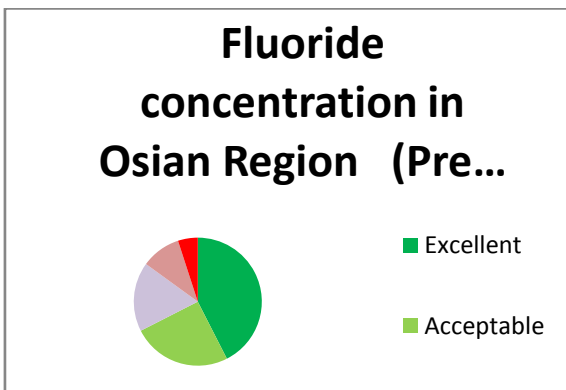


Figure 2: Fluoride Concentration Distribution in Pre- Monsoon

#### **4. CONCLUSION AND RECOMMENDATION**

Through the analysis of results obtained by conduction experiment on forty samples, it can be concluded that Fluoride contents in most of the pockets of Osian region is low and hence *suitable for drinking*. Whereas some of the areas are found containing high fluoride they should be marked as “not suitable for drinking. However, water from some of the regions requires minor treatment like filtering and disinfection, and can be used after the treatment. This is important to mention here that in the present study, the analysis of water, usability and classification of water is carried out by keeping only the fluoride contents in the consideration and for analyzing the total water quality other parameters shall be included.

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