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**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**Available online at: <http://www.iajps.com>**Research Article****ASSESSMENT OF FLUORIDE CONTENT IN THE GROUND  
WATER OF DIFFERENT VILLAGES OF WASHIM DISTRICT  
REGION IN MAHARASHTRA****Dr. R.F.Pagariya**Department of Chemistry, R.A.Arts, M.K. Commerce and Shri. S.R. Rathi Science College,  
Washim-444505 (India).**Abstract:**

*Most of the people in rural areas depend on bore wells, open wells and hand pumps for drinking water. The present investigation was undertaken to study the level of fluoride ions in the groundwater of Washim region by collecting 10 samples of the groundwater from 7 different villages and 3 from city during February 2017 to March 2017. The fluoride concentration in the underground water of these villages varied from 0.00 mg/l to 1.20 mg/l. Majority of the water samples were within permissible limits according to Indian as well as WHO standards of Washim region hence no dental and skeletal fluorosis was noticed*

**Keywords:** Fluoride ion, Groundwater, Washim Region, WHO standards, Permissible limit.

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**INTRODUCTION:**

Ground water forms a major source of drinking water in urban as well as in rural areas. More than 90% of the rural population uses ground water for domestic purposes. Fluoride is a common constituent of groundwater. It is the most electronegative of all chemical elements and is never encountered in nature in the element form [1]. Fluoride is an anion of the chemical element fluorine which belongs to the halogen group of minerals and is natural constituents of the environment. Fluorine is the 13<sup>th</sup> most abundant element of the earth crust. It represents about 0.3 g/kg of earth's crust [2]. It occurs mainly in the form of chemical compounds such as sodium fluoride or hydrogen fluoride which are present in minerals fluorospar, fluorapatite, topaz and cryolite. High concentrations of fluoride in water are generally found in ground waters. In India the states of Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and Delhi are affected by fluoride contamination in water. This involves about 9000 villages affecting 30 million people [3].

Estimation finds that 65% of India's villages are exposed to fluoride risk [4]. Use of phosphatic fertilizers in agriculture and industrial activities like clays used in ceramic industries or burning of coals also contribute to high fluoride concentrations in groundwater. India is among the 23 nations around the globe where health problems occur due to the consumption of fluoride contaminant water. Fluoride at lower concentration (0.6-1.5) is essential element for the development of teeth and bones in growth, fertility, prevention of anemia in pregnancy and infancy [5]. Higher intake of fluoride taken over a long period of time exerts negative effects on the course of metabolic processes and an individual may suffer from skeletal fluorosis, dental fluorosis, non skeletal manifestation or a combination of the above [6-7]. This can cause joint pain, restriction of mobility, bending of vertebral column, deformation of knee joints, bone fracture and even paralysis. In India, 20 million people are severely affected by fluorosis and 40 million people are exposed to risk of endemic fluorosis.

Washim District in Maharashtra is a relatively newly formed district that was created on 1st July 1998. The city of Washim houses the district headquarters. The district is located in the Vidarbha Region of Maharashtra, India. The entire district occupies an area of about 5150 sq kilometer. The geographical coordinates of Washim District are 76 degree 7 East Longitude and 19 degree 61 North Latitude. The Washim city is bounded by villages like Saykheda, Rajgaon, Hiwra (Rohila), Tondgaon, Chincholi, Borala, Wadi (Raytala) and local area. The climate of this region is characterized by hot summer and general dryness throughout the year except during the south west monsoon season (i.e. June to September). The present study was carried out to assess the fluoride content of underground water in and around Washim city.

**MATERIALS AND METHOD:**

The study was carried out in 7 villages of Washim region because the people of this region use ground water for drinking and also for irrigation fields. Total 10 ground water samples from different sources like open well, bore well and hand pump were taken from rural areas of different Gram Panchayats and analyzed for fluoride content. The groundwater samples were collected during the February 2016 to March 2017 between 8 am to 10 am in clean polyethylene plastic bottles of 100 ml capacity and before filling, bottles were rinsed with water under study. They were labeled, coded and brought to the laboratory for fluoride determination on the same day. Fluoride analysis was done at the Department of Chemistry, R.A.Arts, M.K. Commerce and Shri. S.R. Rathi Science College, Washim using SPADNS method. The SPADNS reagent, distilled water and Borosil glassware's were used throughout the work. All the experimental were carried out in triplicate and the results were found reproducible with a  $\pm 3\%$  error limit.

**General procedure for determination of fluoride in ground water by SPADNS method:**

Fluoride concentration was analyzed by Sodium-2-parasulphophenylazo-1-8-dihydroxy-3, 8 naphthalene disulphonate (SPADNS) colorimetric method using HANNA Instrument HI-93729-1 (APHA 1995) [8]

**Table1: Fluoride in ground water from different villages of Washim Region in February-March 2017**

S.N.	Name of Village/ Grampanchayat	Side of sample	Sample Number	Source of Water	Fluoride in mg/l (ppm)
1.	Washim City	R.A.College	RFP-1	Bore Well	0.91
2.	Washim City	Civil Lines	RFP-2	MNC Water	0.11
3.	Washim City	Mannasing Chauk	RFP-3	Well Water	0.21
4.	Saykheda	South of Washim	RFP-4	Well Water	0.98
5.	Rajgaon	South of Washim	RFP-5	Well Water	0.28
6.	Hiwra (Rhila)	West of Washim	RFP-6	Well Water	0.39
7.	Tondgaon	South of Washim	RFP-7	Tap Water	0.27
8.	Chincholi	East of Washim	RFP-8	Well Water	0.69
9.	Borala	West of Washim	RFP-9	Well Water	1.18
10.	Wadi (Raytala)	West of Washim	RFP-10	Well Water	1.20

The two dry cuvetts (Sample cell) were filled to 1.5 cm below the rim with 10 ml of distilled water and sample water respectively. Accurately measured 2 ml of SPADNS reagent was added to each cuvet and invert several times to mix.

When the bright red solution of SPADNS is mixed with colorless zirconyl acid solution, a dark red complex of Zirconyl acid – SPADNS is formed. When Zirconyl acid–SPADNS solution is added to water containing fluoride, the fluoride ions reacts with the complex and forms bonds with zirconium. The concentration of the complex decreases in approximate proportion to the concentration of fluoride in the water and the colour of the reagent-mixture becomes brighter.

The temperature of the distilled water and sample water in both the cuvetts was maintained at the same temperature. After a one minute, insert the cuvet with reacted distilled water into the holder and zeroed the instrument which becomes ready for measurement. Insert the other cuvet with reacted sample into the same holder and press the read button. The fluoride concentration was directly displayed on Liquid Crystal Display in mg/l F<sup>-</sup>.

### RESULT AND DISCUSSION:

The results of fluoride concentrations in ground water from different villages of Washim Region are depicted in the Table 1.

The study of 7 villages and 3 city samples of Washim region was done for fluoride content because in this region probable source of fluoride in ground water is due to weathering and circulation of water in rocks and soils. Fluoride is leached out and dissolved in

ground water. The fluoride concentration in these zones ranged from 0.00 to 1.20 mg/l with highest fluoride level at Wadi (Raytala) (1.20 mg/l) and lowest at Washim Civil lines (0.11 mg/l) City. Out of total 10 samples, 100% of water samples were found within permissible limit & within desirable limit of fluoride concentration. It was found that among these different villages there is negligible fluoride contamination where fluoride concentration ranged between 0.11 to 1.20 mg/l. This paper investigates the health risks involved with higher concentrations of fluoride in drinking water. Peoples were randomly selected from various homes of this area and taken through a questionnaire. Deformations of bones in children as well as adults were not observed in the study area indicating the consequences of permissible and desirable fluoride concentration. Prominently skeletal deformation, weakening of joints and knees in adults and teeth molting in inhabitants were not observed. It is also interesting to know that dental and skeletal fluorosis was very little prevalent in males and females.

### CONCLUSION:

According to World Health Organization WHO 1994 [9] and Indian Standard Drinking Water specification ISI 1991[10] the maximum permissible limit of fluoride in drinking water is 1.5 ppm and highest desirable limit is 1.0 ppm. Fluoride concentrations above 1.5 ppm in drinking water cause dental fluorosis and much higher concentration skeletal fluorosis. It was found that in all 10 different zones of washim region there was no serious fluoride contamination. Removal of fluoride from drinking water of Washim region and bounded villages to supply of clean fluoride free water is not necessity. Also the ground water management is not suggested.

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