

# A Quantitative Study of Fluoride in Ground Water Jodhpur, Rajasthan (India) and its Side Effect

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**Abstract:** All water sources have Fluoride in natural form. Fluoride rich water caused Fluorosis in human being. The quality of Ground water Jodhpur city degradation due to activity of human being such as Urbanization and Industrialization. In few last year's industrial emissions have responsible for fluorosis. Fluoride is useful us but high concentration is very harmful for human life. High concentration of fluoride in ground water causes various diseases such as arthritis, seeking bone, growth of children and infertility disorders etc. Fluoride quality in Ground water is depressed since last years. We would investigate the physico-chemical properties of the fluoride ions concentrations and distributions in Jodhpur City ground water. Ten ground water samples were collected during pre-monsoon 2018 from different hand pumps and open well to study the chemical parameter, such as pH, EC and fluoride by different analytical techniques. It has been observed that values are higher compared to WHO and BIS standards.

**Keywords:** Jodhpur City, ground water, pre-monsoon, fluoride, physico-chemical, parameter, WHO and BIS

## 1. Introduction

Fluoride is very essential ions in the drinking water. Fluoride in drinking water is beneficial to human health, depends on its concentration. Low concentrations of fluoride in drinking water can prevent teeth enamel and facilitate the mineralization of hard tissues but high concentrations of fluoride may be contribute to various physical disorders like a dental and skeletal fluorosis, infertility, brain damage . Average of fluoride in Jodhpur City is 1.383 ppm. Hence it may be concluded that some of the part of city is highly fluoride contaminated. Fluoride contamination is serious worldwide environmental problems in ground water. From few last years Fluoride contamination increase due to breakdown and leaching of fluoride bearing rocks and soils.

According to WHO more than 200 million people in world rely on drinking water with a fluoride concentration that exceeds 1.5 ppm and high fluoride concentrations in groundwater can be found in various parts of the world specially in developing countries. So our prime importance is developing the effective and efficient technology for removal of fluoride.

## 2. Review of Literature

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people in world rely on drinking water with a fluoride concentration that exceeds 1.5 ppm and high fluoride concentrations in groundwater can be found in various parts of the world specially in developing countries. So our prime importance is developing the effective and efficient technology for removal of fluoride.

## 3. Materials and methods

Ground water samples from different Baori, Jhalra, hand pumps of ten sampling points were analyzed during Pre monsoon 2018 .Samples were collected in air- tight good quality plastic bottles.These samples was analysed for parameters like pH, Electrical Conductivity and fluoride (F<sup>-</sup> ). Physical parameters pH and EC were determined by pH meter and electrolytic conductivity meter corresponding. Fluoride (F<sup>-</sup>) determined by colorimetry with help of double beam spectro-photometer. The values for all parameters are reported in table (2). All results are compared with standard limit recommended by WHO & BIS (table 1).

## 4. Results and Discussion

The concentration of Fluoride incorporated in Table 2. Classification of water samples are described on the basis of WHO standards. Other Physico-chemical parameters are shown in Table 3. Physico-chemical properties of ground water of Jodhpur City Compared to Standards are shown in Table 1

**Table 1.** Standards for drinking water quality

S. No	Chemical Consituent	WHO	BIS Range	
			Desirable	Max. Relax. Limit.
1	pH	6.5-8.5	6.50-8.20	8.50
2	Electrical Conductivity	0-1400	-	-
3	Fluoride	1.00	1.00	1.50

Note: All values are in mg/l except EC in  $\mu\text{S}/\text{cm}$  at  $25^\circ\text{C}$  and pH has no unit

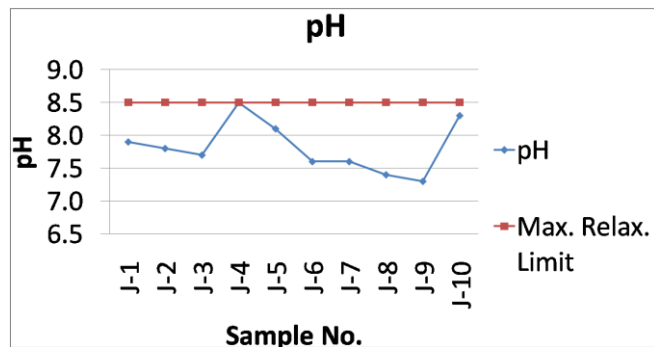
**Groundwater quality for drinking water purposes**

**pH:**

The pH of a solution is the negative common logarithm of the hydrogen ion activity

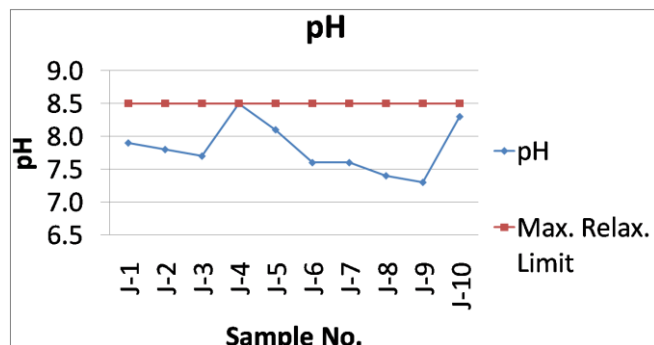
$$\text{pH} = -\log(\text{H}^+)$$

The value of pH in the groundwater varying from 7.30-8.50 these values are within the limits prescribed by WHO and BIS (Table 2)



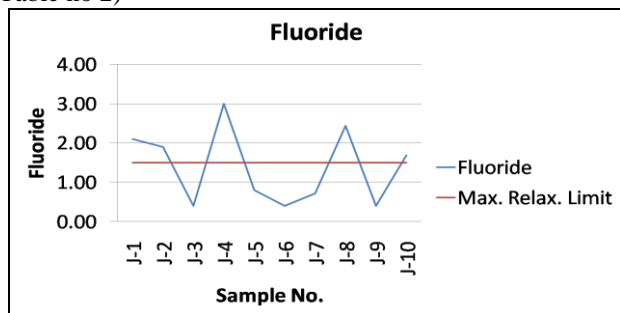
**Electrical Conductivity (EC)**

Electrical Conductivity of the groundwater varying from 600 to 13750 microsiemens/cm at 300K. The maximum limit of EC in drinking water is 1400 microsiemens/cm (WHO) (Table No 1). Samples (J-2, J-4,J-6,J-7,J-8,J-9 and J-10) exceed the permissible limit.



**Fluoride:**

WHO recommends 1.00 mg/l fluoride in drinking water is essential and relaxed up to 1.50 mg/l. The value of fluoride is observed that 0.40 to 3.00 mg/l. Sample no.(J-1, J-2, J-4, J-8 and J-10) show high value of fluoride according to (Table no 2)



**Table 2:** EC, pH and Fluoride variation in ground water of Jodhpur City (Pre Monsoon 2018)

Sample No.	E.C. $\mu\text{S}/\text{cm}$	pH	F <sup>-1</sup> mg/L
J-1	600	7.9	2.10
J-2	7100	7.8	1.90
J-3	610	7.7	0.40
J-4	2000	8.5	3.00
J-5	850	8.1	0.80
J-6	3610	7.6	0.40
J-7	1780	7.6	0.72
J-8	3920	7.4	2.44
J-9	7680	7.3	0.40
J-10	13750	8.3	1.69

**5. Conclusion**

It is observed that half of sample have a good value of ground water exceeds the in permissible limit of EC, pH and fluoride prescribed by WHO and BIS. some sample belong to the doubtful category. It is observed that about 50% of ground water exceeds the permissible limit of EC, pH and fluoride(F<sup>-</sup>) prescribed by (WHO:2003)[7]. Almost all the parameters like EC, pH and fluoride(F<sup>-</sup>) on published scientific data, it is evident that drinking groundwater sources such bore-wells and hand-pumps in jodhpur city of Rajasthan are contaminated with fluoride(F<sup>-</sup>) beyond the permissible limits of 1–1.5 ppm. Fluoride examination of perennial surface water sources is also essential in Rajasthan, as some instances of high F content have been recognized. In this study we have important information for to Jodhpur city fluoride(F<sup>-</sup>) distribution in drinking groundwater. 50% of the ground water belong to doubtful category.

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