

## Fluorosis: A Health Perspective Study

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### Abstract

Fluoride concentration of ground water sample from eleven villages in Block Baroli Ahir of district Agra were assessed. The study of fluoride distribution revealed that the concentration of fluoride in these villages are more than 1.5 ppm and ranging upto 18.4 ppm which is much above the permissible limit. Although small concentration of fluoride in drinking water has a beneficial effect on body, the higher concentration causes serious dental fluorosis, skeletal fluorosis and non-skeletal fluorosis in villagers. The fluorosis in human being and livestock is in alarming scale due to the prolonged intake of such higher concentration of fluoride which has tremendous influence on the socioeconomic conditions of the poor villagers. In general, the severeness and prevalence of fluorosis increased with increasing of fluoride concentration, age and by taking low calcium rich diet.

**Key words:** Fluoride, water, fluorosis, osteosclerosis

### INTRODUCTION

Today million of men, women and children are crippled and leading a vegetative life due of fluorosis. It is a clinical condition recognized as early as 1937. Fluorosis is a world wide dental, skeletal and non-skeletal problem. It is caused by high fluoride intake from drinking water, food, air, medicines and cosmetics.<sup>1</sup> It was observed that municipal water can reduce the incidence of dental caries as compared to ground water<sup>2</sup>. Similar water borne public health problem in Turkey, it is concluded that one third of osteosclerosis was due to fluoride content<sup>3</sup>. Thoracic ossification of ligamentum flavum and other ligaments can be caused by fluorosis<sup>4</sup>. In India, fluorosis problem was first detected in Andhra Pradesh<sup>5</sup>. The body parts having high calcium content like teeth and bone are more prone to fluorosis<sup>6</sup>. Many studies of fluoride content of water in India have been carried out and incidence of fluorosis is reported to be associated with high concentration of drinking water<sup>7,8,9,10</sup>. Dental fluorosis was observed<sup>11,12,13,14</sup>. Skeletal fluorosis was reported<sup>2,3,4</sup>. Liver and kidney diseases or non skeletal fluorosis were observed<sup>15</sup>. In India fluoride levels have been observed in water sources in certain districts of Andhra Pradesh, Tamilnadu, Karnataka, Kerala, Rajasthan, Gujarat, U.P., Delhi, Bihar, Haryana, M.P., Punjab, Orissa and Jammu and Kashmir<sup>16</sup>. High fluoride levels were reported in many regions like Saudi Arabia<sup>17</sup>, Brazil<sup>18</sup>, Europe<sup>19</sup>, Euthopia<sup>20</sup>, China<sup>21</sup>, Australia<sup>22</sup>, Tanzania<sup>23</sup>. Although there are several

sources of fluoride intake. It is roughly estimated that the highest amount of total intake of fluoride is through drinking water

In Agra District of U.P., most of the villages depend on ground water for their drinking and other requirements in view of the reported presence of dental skeletal and non-skeletal fluorosis in the rural population of District Agra and on account of lack of data on the fluoride content of their drinking water. Present study was carried out to assess the prevalence of fluorosis among rural population of few villages of Agra District.

Therefore an extensive survey of water quality in 11 villages of Block Baroli Ahir of Agra Distt. Having a population of about 26,700 has been performed. Water sample from almost all the drinking ground water sources (pump, open well, tube well and jet pump) were collected from these villages.

### MATERIAL AND METHODS

**Sampling:-** The ground water samples were collected in duplicated pre-cleaned 500 ml poly ethylene bottles.

**Monitoring period:-** Monitoring Fluoride concentration in drinking water was carried out during the period from November 2009 to August 2010. **Apparatus and Reagents:-** Only highly pure (A.R. grade) chemicals were used. Fluoride concentration was measured by using fluoride meter (C.L. 352).

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**PROFORMA FOR ASSESSING FLUOROSIS IN RURAL POPULATION**

1. Name of Owner
2. Source of water  
(a) Hand pump                      (b) Jet pump                      (c) Open well                      (d) Tube well
3. Depth of Source
4. Family members
5. People is having any type of Fluorosis: Yes/No (Tick any one)
6. Quantum of Fluorosis
7. Types of Fluorosis  
(a) Dental Fluorosis                      (b) Skeletal fluorosis                      (c) Non –skeletal fluorosis                      (d) All or few of the above.
8. Educational Status
9. Duration of operation
10. Water  
(a) Operational                      (b) Non-operational
11. Past occurrence
12. Any other information.

This proforma includes the information about people to rural area with special reference to fluorosis. A face to face interview of people was carried out and collected information was entered on the questionnaire.

**Figure 1. Performa for Assessing Fluorosis in rural population**

This study was conducted in 11 villages of Block Baroli Ahir of Agra District. A total of 80 samples from various drinking water sources (hand-pumps, open wells, tube wells and jet pumps) were collected from these villages and analysed them by fluoride meter. It has been reported that the fluoride concentration in ground water of studied villages ranged between 0.8-18.3 ppm. During the survey it was found that the people were consuming this water for long time. People were critically examined and particulars were filled in the specific proforma (Figure1).

## RESULTS AND DISCUSSION

Out of 26700 individuals of 11 villages of Block Baroli Ahir of Agra District, 14930 individuals showed fluorosis. According to fluoride concentration, water of these villages is divided in two zones.

Zone 1. Partially problematic water.

Zone 2. Highly problematic water.

### ***Zone1. Partially problematic water.***

The villages falling in this zone fluoride less than 3 ppm. Only Gadi rohta and Devri come under this zone and number of affected individuals given in Table 1.

### ***Zone 2. Highly problematic water.***

Above 3 ppm fluoride is present in 9 villages, fall in this zone. Patti Pachgain, Kheda, Rohta. Hakimpura, Salemabad, Gadi devri, Nagla devri, Astal, Pachgain come in this zone and number of affected individuals are given in table1.

Use of such waters (F > 3 ppm) for drinking cause serious health hazards including dental, skeletal and non-skeletal fluorosis. Defluoridation of water is highly desirable for drinking water supplies in this zone.

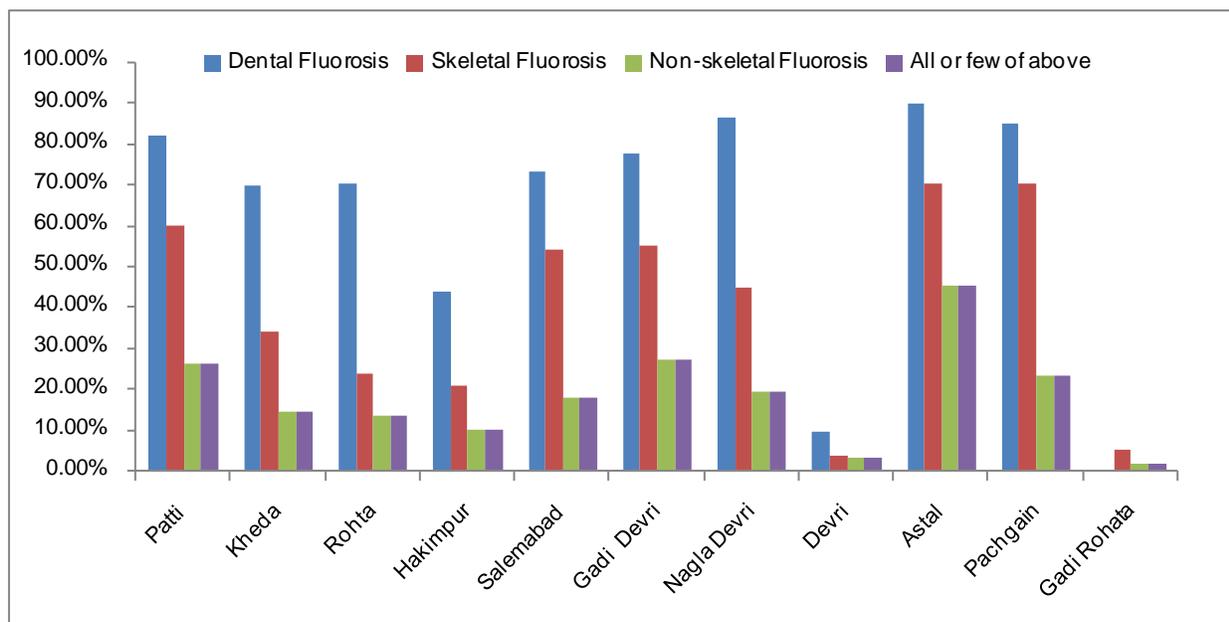
Diseases of individuals of Block Baroli Ahir of Agra District.

1. Dental Fluorosis
2. Skeletal Fluorosis
3. Non-Skeletal Fluorosis
4. All or few of the above.

**1.Dental Fluorosis:** - Individuals of zone 1 and 2 were affected from dental fluorosis. State of dental fluorosis among these individuals were chalky white,

**Table -1 Number of individuals affected due to fluoride present in ground water.**

Name of villages	Individuals Examined	Fluoride Concentration (ppm)	Individuals affected by Fluoride	Handicapped by Fluoride
Patti Pachgain	2000	1.8-18.3	1650 (82.5%)	135 (6.75%)
Kheda	5000	1.4-7.40	3500 (70%)	82 (1.6%)
Rohta	1700	1.2-4	1200 (70.58%)	50 (2.94%)
Hakimpura	1250	1.5-5	550 (44 %)	30 (2.4%)
Salemabad	3000	1.2-7.3	2200 (73.33%)	20 (.6%)
Gadi Devri	1800	0.8-4	1400 (77.77%)	470 (26%)
Nagla Devri	2000	0.9-3.41	1730 (86.5%)	30 (1.5%)
Devri	6000	1-3	550 (9.16%)	10 (.16%)
Astal	250	1.2-5.6	240 (90%)	25 (10%)
Pachgain	2000	0.8-8.4	1700 (85%)	57 (2.85%)
Gadi Rohta	1700	1.6-2.5	200 (11.76%)	30 (1.7%)
Total	26700	-	14930 (55.9%)	939 (3.5%)

**Figure 2. Number of individuals affected by different types of fluorosis.**

brownish yellow and brownish black. The yellow discoloration near the gums was due to dirty teeth. In some individuals whole teeth became black and pitted or perforated. Some villagers lost their teeth due to consuming high concentration of fluoride from long time. Number of affected individuals are mentioned in Figure 2.

**2.Skeletal Fluorosis:** The individuals of Block Baroli Ahir were unable to bend and touch the toes without bending the knees, touch the chest with the chin and stretch the arms sideways. They were affected from pain or stiffness in the backbone, hip, joints, neck and

backbone. Number of affected individuals are indicated in Figure 1.

**3. Non-skeletal Fluorosis:** Individuals were affected from following non-skeletal manifestations.

- Gastro intestinal problems:- individuals were affected by acute abdominal pain, diarrhea, constipation, blood in stools, bloated feeling (gas, tenderness in stomach, feeling of nausea (flue like symptoms), mouth sores and loss of appetite. These were considered as early warning signs of fluoride toxicity.

- Neurological manifestations: nervousness, depression, tingling sensation in fingers and toes, excessive thirst and tendency to urinate frequently (polydypsia and polyurea)
- Muscular manifestations: - muscle weakness, stiffness, pain in the muscle and loss of muscle power.
- Allergic manifestations :- very painful skin rashes, which are perivascular inflammation, prevalent in women and children, pinkish red or bluish red round or oval shaped spots on the skin that fade and clear up in 7 to 10 days.
- Urinary tract manifestations: - urine became much less in volume, yellow red in colour and itching in the region.
- Headache

## REFERENCES

1. Gupta, M.K.; Singh, V; Rajvanshi, P. & Srivastava, S. (1994), Fluoride in water at Agra. I.J. E.H.; 361 (1) P. 43-46 (1994).
2. Chachra, D.; Limeback, H.; Willett, T.L. & Grynpas, M.D. (2010), The Long-term Effects of Water Fluoridation on the Human Skeleton., J Dent Res. 71, 1228-1237.
3. Tamer, M.N.; Körolu, B.K.; Arslan, C.; Akdoan, M.; Körolu, M.; Cam, H. & Yildiz, M. (2007), Osteosclerosis due to endemic fluorosis., Sci Total Environ 373(1), 43--48.
4. Wang, W.; Kong, L.; Zhao, H.; Dong, R.; Li, J.; Jia, Z.; Ji, N.; Deng, S.; Sun, Z. & Zhou, J. (2007), Thoracic ossification of ligamentum flavum caused by skeletal fluorosis., Eur Spine J 16(8), 1119--1128.
5. Shortt, H.E.; Pandit, C.H.; Ragavachari, T.N.S. (1937), Endemic fluorosis in the Nellore district of South India. Indian Medical Bazzette. 72, P 392-398.
6. Eanes, E.D. & Posner, A.S. (1970), Structural and chemistry of bone mineral. In Biological classification of cellular and molecular aspects. Ed. Schriber H. Appleton-century crafts, P. 1-16.
7. Desai, V.K.; Saxena. D.K.; Bhavsar. B.S. & Katharia. S.L. , (1988), Epideminological Study of dental fluorosis in tribals residing nearfluorspar mines. Fluoride 21 (3): 142-148.
8. Dwarkanath, M & Subburam. V. (1991), Incidence of dental fluorosis. In a small villages population. I.J. E.H. 33 (2): 182-186.
9. Samal, U.N. & Naik. B.N. (1988), Dental fluorosis in school children in the vicinity of an aluminium factory in India. Fluoride 21 (3): 137-141.
10. Sarala kumari, D. & Rao. P.R., (1993), Endemic fluorosis in the village Ralla Anant puram in Andhra Pradesh: An epidemiological study, Fluoride 26 (3): 177-180.
11. Celeste, R.K.; Nadanovsky, P. & Leon, A.P.D. (2007), Association between preventive care provided in public dental services and caries prevalence, Rev Saude Publica 41(5), 830--838.
12. Dar, M.A.; Sankar, K. & Dar, I.A. (2010), Fluorine contamination in groundwater: a major challenge., Environ Monit Assess 173 (1-4), 955-918.
13. Igi, M.; Apostolovi, M.; Kostadinovi, L.; Janji, O.T. & Surdilovi, D. (2009), [The quantity of information which parents and their seven-year-old children have on the affects of nutrition, oral hygiene and fluoride prophylaxis on dental health], Med Pregl 62(9-10), 421--426.
14. Parnell, C.; Whelton, H. & OMullane, D. (2009), Water fluoridation., Eur Arch Paediatr Dent 10(3), 141--148.
15. Chattopadhyay, A.; Podder, S.; Agarwal, S. & Bhattacharya, S. (2010), Fluoride-induced histopathology and synthesis of stress protein in liver and kidney of mice., Arch Toxicol 85(4) 327-335.
16. Sushila, A.K.; Kumar, A; Bhatnagar, M and Bahadur, R. (1993), Prevalence of endecid fluorosis with gastrointestinal manifestations in people living in some North Indian Villages. Fluoride, 26 (2), 97-104.
17. Aldosari, A.M.; Akpata, E.S.; Khan, N.; Wyne, A.H. & Meheithif, A.A. (2003), Fluoride levels in drinking water in the Central Province of Saudi Arabia., Ann Saudi Med 23(1-2), 20--23.
18. Bastos, J.L.D.; Nomura, L.H. & Peres, M.A. (2007), Dental caries and associated factors among young male adults between 1999 and 2003 in Southern Brazil., Community Dent Health 24(2), 122--127.
19. Griffin, M.; Shickle, D. & Moran, N. (2008), European citizens opinions on water fluoridation., Community Dent Oral Epidemiol 36(2), 95--102.
20. Haimanot, R.T.; Melaku, Z.; Kloos, H.; Reimann, C.; ground Fantaye, W.; Zerihun, L. & Bjorvatn, K. (2006), The geographic distribution of fluoride in surface and groundwater in Ethiopia with an emphasis on the Rift Valley., Sci Total Environ 367(1), 182--190.
21. Ba, Y.; Zhang, H.; Wang, G.; Wen, S.; Yang, Y.; Zhu, J.; Ren, L.; Yang, R.; Zhu, C.; Li, H.; Cheng, X. & Cui, L. (2010), Association of Dental Fluorosis with Polymorphisms of Estrogen Receptor Gene in Chinese Children., Biol Trace Elem Res 143(1) 87-96.
22. Do, L.G. & Spencer, A.J. (2007), Decline in the prevalence of dental fluorosis among South Australian children., Community Dent Oral Epidemiol 35(4), 282--291.

23. Mashoto, K.O.; Astrøm, A.N.; David, J. & Masalu, J.R. (2009), Dental pain, oral impacts and perceived need for dental treatment in Tanzanian school students: a cross-sectional study., Health Qual Life Outcomes 7, 73.