

## ASSESSMENT OF FLUORIDE CONTENT IN BOREWELL WATER AND ITS ENVIRONMENTAL IMPACTS IN AKOLA CITY

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### ABSTRACT

An investigation was carried out in 30 colonies of Akola city, Maharashtra during June 2010–January 2011; to assess fluoride and to find out the severity of diseases. The concentration of fluoride was found in between 0.10-2.73 mg/lit. which is more than the permissible range of fluoride content (0.5 mg/lit) in borewell drinking water, which is caused yellowing of teeth in children's, skeletal fluorosis, dental fluorosis, joint pains and gastro-intestinal problems in population of different age groups of the study area.

**KEY WORDS:** Fluoride, Borewell water, Environmental impacts, Akola city.

### INTRODUCTION

Water is a soul of nature, it is universal solvent. In India only 20% people get clean drinking water and rest 80% satisfy their thirst from polluted water. The main sources of drinking water are rivers, wells, borewells, reservoirs, etc. They are more or less polluted. Due to the great solvent power of water, number of organic and inorganic compounds found in dissolved condition in various proportions. The unwanted inorganic components are present more in soil which dissolved in surface water and ground water.

According to Teotia and Teotia <sup>1</sup> more than 0.5 mg/lit fluoride in drinking water caused "yellowing of teeth" in infants and children's. Short *et.al* <sup>2</sup> has reported skeletal fluorosis

from India as early as 1937. Teotia *et.al.* <sup>3</sup> reported that skeletal fluorosis is not confined to adult but also afflicts infants and children's in the age range of 6 months to 14 years. Further more than 1 million people in India are affected with skeletal fluorosis<sup>4</sup>. It is also estimated that nearly 25 million peoples are affected with fluoride poisoning due to the environment pollution<sup>5</sup>.

The fluoride is most toxic compound widely distributed in nature and universally present in soil, water and atmosphere. Fluorosis is a major public health problem resulting from long term consumption of water with high fluoride levels. It is characterized by dental mottling and skeletal manifestation such as crippling deformities,

osteoporosis and osteoclerosis. In India, as many as 15 states are affected by endemic fluorosis and an extensive belt of high fluoride in water and soil is reported in South India [3].

In Akola, the area beyond Municipal Corporation limits depends exclusively on well and borewell for drinking water needs. In view of different level of fluoride in different drinking water sources, the concentration of fluoride in borewell drinking water of Akola city varies between 0.10-2.73 mg/lit.

In the present study, the fluoride content in different borewell drinking water of Akola city and their effects on school going children's and different age groups of human are reported.

### MATERIAL AND METHODS

The study area is situated between the longitude N 20° 43.111' and latitude E 77° 00.491' in Akola District (M.S.). The District Akola is the third largest city in Vidarbha region after Nagpur and Amravati. The average maximum temperature is about 38.33°C and minimum 12.08°C with average rainfall is about 75 to 100cm. The soils are characterized by black cotton soil and acidic in nature. Moreover, the level of fluoride in bore well water of this area is not measured earlier. Therefore the present investigation is made.

The water samples were collected from 30 borewells from different colonies for the detail study of fluoride content in Akola city from West, North, East, and South zone.

**Sample Collection:** A total 30 samples were collected in polythene bags which were cleaned and finally washed with acid water, followed by rising twice with distilled water. The water samples collected were chemically analyzed. The analysis of water was done using procedure of standard method [1]. The samples of water for the analysis were collected during the months of June 2010 - January 2011.

### RESULT AND DISCUSSION

The permissible limit of fluoride content in drinking water recommended by ISI and WHO is

1.0 mg/lit. However Teotia and Teotia [7], suggested that maximum permissible limit of fluoride below 0.5 ppm.

In the present work, all nine water samples of west zone were examined. The fluoride percentage was found in between 0.20-2.73 mg/lit. Out of nine samples, six samples were found fluoride percentage more than 0.5 mg/lit. while one sample i.e. Umari (Lahan) was with extremely high concentration i.e. 2.73 mg/lit. (Table1). From the North zone of Akola city, total 5 samples were examined. The ranges of fluoride percentage were 0.2-1.16 mg/lit. Out of five samples, two samples was found more than permissible limit (Table 2)

From the east zone, total eight samples, from eight colonies were examined. Out of these, only three samples were found with fluoride percentage more than permissible limit (Table 3). And from south zone of Akola city eight water samples were estimated. One sample i.e. Malkapur indicated percentage more than permissible limit (Table 4).

It is evident from the above observations data (Table 1 to 4), it is obvious that the fluoride concentration is more than the limits for drinking purpose. Fluoride content of 1 mg/lit in drinking water has no biological side effects [4]. Studies in these areas revealed that, fluoride level is more than the permissible level in drinking water and consumed for a period of 5-10 years caused dental fluorosis. Between 4-8 mg/lit for a period of 15-20 years caused severe form of dental and mild form of skeletal fluorosis and if it exceeded 8 mg/lit and consumed for a 5-10 years or more caused severe form of dental and skeletal fluorosis. Similar type of observation reported by Galagon et. al. [2] in drinking water to produce severe form of dental and mild form of skeletal fluorosis consumed for a period of 15-20 years.

Health status of the people is varied in different colonies of Akola city because of severity of fluorosis, which is direct reflection of fluoride content of drinking water.

## CONCLUSION

From the above result and discussion it is concluded that, the important role of drinking water in the incidence of fluorosis is obvious. It is therefore essential that, the villages affected by fluorosis be supplied with safe drinking water less than 1 mg/lit fluoride either by changing the water source to safer once or by adopting suitable treatment technique to remove fluoride in the existing sources. Since, grains, vegetables and milk are also source of fluoride to man, their fluoride content could be taken into account while, fixing the safe level of fluoride in drinking water.

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**Table 1:** Fluoride content in drinking water from the borewell from West zone of Akola city and their respective colonies

| S.N. | Name of the sampling site | Month of sampling | Percentage (%) of fluoride (mg/lit.) |
|------|---------------------------|-------------------|--------------------------------------|
| 1    | Jatharpeth                | June 2010         | 0.20                                 |
| 2    | Rautwadi                  | June 2010         | 0.30                                 |
| 3    | Vitthalnagar              | June 2010         | 0.72*                                |
| 4    | Umari (Lahan)             | June 2010         | 2.73***                              |
| 5    | Umari (Mothi)             | July 2010         | 1.42**                               |
| 6    | Sudhir Colony             | July 2010         | 0.84*                                |
| 7    | Shankar Nagar             | July 2010         | 0.68*                                |
| 8    | Ravi Nagar                | July 2010         | 0.72*                                |
| 9    | P.K.V. Area               | July 2010         | 0.20                                 |

| S. N. | Name of Zone | No. of Samples |
|-------|--------------|----------------|
| 1     | West Zone    | 9              |
| 2     | North Zone   | 5              |
| 3     | East Zone    | 8              |
| 4     | South Zone   | 8              |

**Table 2:** Fluoride content in drinking water from the borewell from North zone of Akola city and their respective colonies

| S.N. | Name of the | Month of sampling | Percentage (%) of |
|------|-------------|-------------------|-------------------|
| 1    | Akot File   | Aug.              | 1.16**            |
| 2    | Birla       | Aug.              | 0.30              |
| 3    | New         | Aug.              | 0.20              |
| 4    | Ramdaspath  | Aug.              | 0.20              |
| 5    | Gaddam      | Aug.              | 0.74*             |

**Table 3:** Fluoride content in drinking water from the borewell from East Zone of Akola city and their respective colonies

| S.N. | Name of the | Month of | Percentage (%) of |
|------|-------------|----------|-------------------|
| 1    | Deshmukh    | Sept.    | 1.87**            |
| 2    | Tar File    | Sept.    | 1.80**            |
| 3    | Ladis File  | Sept.    | 0.82*             |
| 4    | Gawalipura  | Oct.     | 0.34              |
| 5    | Shivaji     | Oct.     | 0.39              |
| 6    | Malipura    | Oct.     | 0.38              |
| 7    | Dabki       | Oct.     | 0.40              |
| 8    | Mohata      | Oct.     | 0.42              |

**Table 4:** Fluoride content in drinking water from the borewell from South zone of Akola city and their respective colonies

| S.N. | Name of the | Month of  | Percentage (%) of |
|------|-------------|-----------|-------------------|
| 1    | Durga       | Dec.      | 0.30              |
| 2    | Shastri     | Dec.      | 0.10              |
| 3    | Sindhi      | Dec.      | 0.24              |
| 4    | Civil Line  | Jan. 2011 | 0.20              |
| 5    | Gaurakshan  | Jan. 2011 | 0.30              |
| 6    | Malkapur    | Jan. 2011 | 0.51*             |
| 7    | Adarsha     | Jan. 2011 | 0.25              |
| 8    | Congress    | Jan. 2011 | 0.20              |