FLUORINE CONTENT IN WATER AND PREVALENCE OF FLUOROSIS IN KANPUR CITY

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ABSTRACT

Fluorides are the 13th commonest element in the earth’s crust. Water is the major source which contains fluoride in varying quantities. Recommended optimum level of fluoride for drinking water is 0.7 to 1.2 ppm. Fluorosis is a disease caused by deposition of fluorides in the hard and soft tissues of the body. The present study was conducted in rural and urban areas of district Kanpur. School children aged 10-12 years were observed clinically to assess the prevalence of fluorosis. The mean fluoride level in water was 1.59 ppm in rural area and 1.21 ppm in urban area of Kanpur. The prevalence of fluorosis was more in rural area (14.2%) as compared to urban area (6.2%). Majority of the respondents were having very mild form of fluorosis. Community Fluorosis Index (CFI) calculated was 0.27. No association was found between problem of dental fluorosis and dental caries.

Key words: Flourine, Fluorosis, Oral health, School Children, Water.

INTRODUCTION

Fluorosis is a disease caused by deposition of fluorides in the hard and soft tissues of the body. Fluorosis is of two types – dental fluorosis and skeletal fluorosis. Water is the major source which contains fluoride in varying quantities. Recommended optimum level of fluoride for drinking water is 0.7 to 1.2 ppm (WHO, 1963). India is one among the 25 nations around the globe where health problem have been reported due to excessive fluoride in drinking water. UNICEF, (1995) reported that in India, the number of people affected by fluorosis which causes dental problem, gastroenteritis and crippling estimated at an appalling 25 million. About 62 million people of India in 160 districts and 17 out of 35 states drink water contaminated by excess fluoride (over 1.5 ppm). Out of 17 states in the country Uttar Pradesh ranks first in this regard. In Uttar Pradesh high level of fluorine which till few years ago was found in Firozabad, Mathura, Agra, Unnao, Rae Bareilly and a few villages in Lucknow has spread to new areas such as Sonbhadra village where a large number of villagers are suffering from fluorosis due to the excessive fluoride content in the ground water. (Times of India, 2004) Kanpur is an industrial hub with nearly 800 industries causing severe environmental and water pollution.

Fluorosis in humans and animals is a bane, which lead to social and economic burden. This disease is not curable but preventable by appropriate and timely action. Provision of water with safe level of fluoride (about 1 ppm) to population at risk is the chief preventive measure.

The present study was planned with the objective to assess the prevalence of fluorosis in rural and urban school children and fluoride content estimation in water samples from different sources of water.

MATERIALS AND METHODS

The present study was conducted in 10 rural and 10 urban localities of Kanpur which were selected through simple random sampling. The urban area of Kanpur is divided into 6 zones and 110 wards come under these zones from which 10 urban localities were selected purposively. The rural area of Kanpur is divided into 3 tehsils and 10 blocks come under these 3 tehsils from which 10 rural localities were purposively selected. School children of 10-12 years were selected from 20 schools of urban localities and 10 schools of rural localities.

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Permission was obtained from the principal of school for conducting the survey. Water samples from different sources like tap water, hand pump and draw well were collected and the level of fluorine in water was estimated by the Alizarin visual method (Taras et al., 1967). To estimate fluorine content 10 ml of water from different sources viz, tap, hand pump and draw well was collected in sterilized bottle and estimation was carried out on the same day. A Dean’s Index criterion developed by Dean (WHO, 1997) was used for the clinical examination of dental fluorosis. The teeth were scored as Normal (0), Questionable (1), Very mild (2), Mild (3), Moderate (4), Severe (5). Community Fluorosis Index (CFI) was calculated. A CFI of greater than 0.4 was used to identify if the condition was a major public health problem.

RESULTS AND DISCUSSION

Clinical examination of nine hundred sixty four school children (568 girls, 396 boys) revealed that 9.75 percent of children were suffering from different degree of dental fluorosis. In rural area 14.2 percent of the respondents were having problem of dental fluorosis, while in urban areas 6.92 percent of the respondents were suffering from dental fluorosis and remaining 93.07 percent of respondents were having normal teeth. Study conducted in Kanyakumari district of Tamilnadu reported that there was a significant difference in the level of dental fluorosis between rural and urban residents. (Baskaradoss et al., 2008). Dental fluorosis was scored according to Dean’s Index and value of F (0.97 and 0.32 for rural and urban areas, respectively) was found to be non significant at 5% level of significance.

Oral hygiene practices are important to keep human beings away from the threat of dental caries. In urban area 93.0 percent of school children were using toothpaste and 97.0 percent school children were using toothbrush to clean their teeth, whereas in rural areas only 43.0 percent of the school children were using toothpowder and 22.0 percent of the school children were using their finger to clean their teeth. In rural area 16.6 percent of the school children were having dental caries, while in urban area only 4.56 percent of the school children were having dental caries. A study conducted in Italy reported that dental caries is more prevalent in school children living in rural areas compared with those living in urban areas. (Perinetti et al., 2006). A study carried out in Brazilian city also reported that the children affected by dental caries living in the rural zone were 45.45 percent compared to 25.49 percent for those living in urban zone (Uedo et al., 2004). The problem of dental caries is more prevalent in rural areas than urban areas and more prevalence of dental caries was found to be in rural areas due to poor oral hygiene practices. Association between dental fluorosis and dental caries was calculated and the value of $\chi^2$ represent the association between dental fluorosis and dental caries. The value of $\chi^2$ is 3.452 which is not significant at 5% level of significance so it shows that there is no association between dental fluorosis and dental caries. Rahmatulla and Wyne (1993) carried out a study in Tamilnadu and reported that the difference between dental caries experienced from low fluoridated and high fluoridated area was not statistically significant.

Results of fluorine estimation in water revealed that the mean fluoride level found to be was 1.21ppm and 1.59ppm respectively in urban and rural areas. In urban localities fluoride level ranged from 0.20 to 2.88 ppm and in rural localities fluoride level ranged from 0.37 to 2.76 ppm (Table 1). In urban areas more than 60.0 percent of the families

<table>
<thead>
<tr>
<th>Rural areas</th>
<th>Hand pump</th>
<th>Draw well</th>
<th>Urban areas</th>
<th>Hand pump</th>
<th>Tap</th>
<th>Draw well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singhpur</td>
<td>0.37</td>
<td>0.25</td>
<td>Ashok nagar</td>
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<td>0.0</td>
<td>-</td>
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<tr>
<td>Hirdaypur</td>
<td>1.06</td>
<td>0.82</td>
<td>Arya nagar</td>
<td>0.20</td>
<td>0.0</td>
<td>-</td>
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<tr>
<td>Gambhirpur</td>
<td>1.03</td>
<td>0.76</td>
<td>Lal Bangla</td>
<td>0.37</td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td>Ludhori</td>
<td>1.96</td>
<td>1.8</td>
<td>Jawaharnagar</td>
<td>1.12</td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td>Ramnagar</td>
<td>1.3</td>
<td>1.54</td>
<td>Gandhi nagar</td>
<td>0.88</td>
<td>0.0</td>
<td>0.76</td>
</tr>
<tr>
<td>Rajepur</td>
<td>1.53</td>
<td>1.64</td>
<td>Shyamnagar</td>
<td>1.0</td>
<td>0.0</td>
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<tr>
<td>Shuklapur</td>
<td>2.76</td>
<td>2.14</td>
<td>Kakadev</td>
<td>2.88</td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td>Taripathakpur</td>
<td>3.1</td>
<td>2.8</td>
<td>Jaimau</td>
<td>2.3</td>
<td>0.0</td>
<td>-</td>
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<tr>
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<td>1.29</td>
<td>Govindnagar</td>
<td>1.68</td>
<td>0.0</td>
<td>-</td>
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<tr>
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<td>2.1</td>
<td>Gumti</td>
<td>1.5</td>
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</tr>
</tbody>
</table>
were using hand pump as source of water for drinking purpose while 34.0 percent were using supply water in which fluoride level was found to be nil. In rural areas 90.0 percent of the families were using hand pump water and remaining 10.0 percent were using draw well as a source for drinking purpose.

When CFI is more than 0.4, it indicates that excess fluorine is posing major public health problem. In the present study CFI calculated was found to be 0.27 which indicates that fluorosis is not a major health problem in the localities of urban and rural areas of Kanpur included in the study.

**CONCLUSION**

The result of the present study concludes that there is need to identify the areas where fluorine level in water is more than permissible level and educate the population about the household treatment processes such as Nalgonda technique or activated alumina process to reduce the fluorine content of water. In addition to this nutritional status of children and adolescents should be improved and education should be given to the communities against indiscriminate use of fluoride rich pesticides and fertilizers.

**REFERENCES**

Rahmatulla, M.; and Wyne, A.N. (1993): Indian Journal of Dental Research, **4**(1) 17-20