Status of drinking water in the mega city Delhi

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**Drinking Water Contamination** with Fluoride and prevalence of Fluorosis and associated issues are dealt with. The Mega City of Delhi is referred to as the National Capital Territory of Delhi. It has 1485 sq. km. area with a population of 9 million. The density of population is 6319 per sq. km. The temperature varies as follows. January 3°C - 15°C; April - May 27.5°C - 46°C; July 30 - 32.5°C; October below 25°C. The annual rainfall ranges from 40 cm - 200 cm. The Mega City has dry winter, hot summer, followed by heavy rains. The only major river flows through is Yamuna, which is the main source of drinking water for the population.

The drinking water supply up to now is through Municipal Corporation/New Delhi Water Supply & Sewage Disposal Undertaking. The City can be arbitrarily classified into a few zones, depending upon the type/nature of water supply. Zone 1: water is available in the tap 24 hrs. of the day and is treated water. Zone 2: water is rationed and is available approximately for a total 6 hrs/day during morning, noon and evening. Zone 3: as water supplied by the Municipality is grossly inadequate for the population living in an area, tube well water is mixed with the Municipal supply in overhead tanks and this water is supplied through pipelines for a few hours in the day. Mixed water invariably is not tested for quality. Zone 4: in peri-urban areas, tube well water stored in overhead tanks are supplied through pipelines, invariably not tested for quality, besides individual households dig their own tube well, hand pumps as Municipal supply is inadequate. Zone 5: In the urban slums, there is no organized water supply as the water tankers provide water during certain hours of the day and the community has to collect and store water for the day’s requirement. The slum dwellers dig shallow wells fitted with hand pumps and draw subsoil water where animals and human beings live together under extremely unhygienic conditions. The concept of water quality testing does not prevail.

**Material and methods**

Drinking water samples have been collected from 45 sources in the Mega City and tested for Fluoride at the Fluorosis Control Cell.

The fluoride content of drinking water, collected in plastic bottles, was quantitated on an ION 85 Ion analyzer (Radiometer, Copenhagen). 36 individuals, young and old, men and women living in the Mega City and afflicted with Fluorosis, and who are patients of the All India Institute of Medical Sciences, have been investigated for the circulating levels of fluoride by testing fluoride in blood and excreting levels of fluoride by testing urinary fluoride levels. Fluoride levels of 24-hours urine samples collected in plastic containers and of sera were estimated using an ION 85 Ion Analyzer according to the method of Hall et al. (1972).

**Results**

**Fluoride contamination of drinking water and prevalence of fluorosis**

The Mega City of Delhi is endemic for Fluorosis, where the people are drinking water naturally contaminated with fluoride up to 32.46 ppm. Unlike certain other Nations, in India drinking water is not fluoridated; but fluoride is being removed from drinking water to a permissible limit of 1 ppm (1 mg/litre of water).

This approach of defluoridation of water applies to the community who are living in rural areas of a State where Fluorosis is an endemic disease.

The Mega City of Delhi, as it does not fall under the “Rural” category, the community who are dependent on Municipal water, which is mixed with tube well water samples/shallow hand pumps/owning their own tube wells, are the victims of Fluorosis. The information provided in Table 1 reveals the status of drinking water sources in Palam Village in the Mega City of Delhi.

**Discussion**

The 36 patients investigated at the Hospital of the All India Institute of Medical Sciences are those who came through the Out-patient Department with complaints viz. (1) Aches & pain in the neck; backbone, hip region and other joints; and/or (2) Non-ulcer dyspeptic complaints (i.e. pain in the stomach, bloated stomach, nausea, loss of appetite, constipation with intermittent diarrhoea (Susheela et al. 1993, 1994) and/or (3) unable to walk due to pain below the hip and paralysis. There may be large number of patients, who may be switching over from one hospital to another for getting the disease diagnosed in the Mega City and equally large number may be resorting to some home remedies and may not seek hospital intervention. Therefore, the number of patients reported through this presentation is only a fraction of the total number of individuals who are actually the victims of Fluorosis in the Mega City of Delhi (Table 2). The data reveals an important message and that is in Central Delhi,
Table 1. Revealing the status of drinking water sources in Palam Village (near Indira Gandhi International Airport)

<table>
<thead>
<tr>
<th>Total source</th>
<th>Hand pumps</th>
<th>Open well</th>
<th>Range of Safe water content in water (ppm)</th>
<th>No. of contaminated sources with Fluoride upto 1.0 ppm</th>
<th>No. of Fluoride investigated sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Tube wells</td>
<td></td>
<td>Fluoride</td>
<td>0.24 - 32.46</td>
<td>19</td>
<td>26</td>
</tr>
</tbody>
</table>

Table 2. The prevalence of fluorosis in the Mega City of Delhi

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of patients investigated</th>
<th>Age range</th>
<th>No. of Female patients</th>
<th>No. of Male patients</th>
<th>Drinking* Water</th>
<th>Range of Fluoride in ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 - 32.5</td>
<td>2.00 - 85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34 - 246</td>
<td>0.05 - 0.33</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17 - 13.6</td>
<td>0.06 - 0.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13 - 14.0</td>
<td>0.06 - 0.29</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15 - 19.3</td>
<td>0.06 - 0.60</td>
</tr>
</tbody>
</table>

* Sources are: Tube well, Hand pump, Open well.
** Normal upper limit = 0.1 ppm.
*** Normal upper limit = 0.02 ppm.
References:
1 Application: Fluoride in water. Users handbook for ION 85 Ion Analyzer, Radiometer Copenhagen.