

Assessment of Fluoride in Drinking Water in Sri Lanka

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1. Introduction

The relationship between fluoride content in drinking water and human health has been studied extensively world over. Fluoride in drinking water is known for both beneficial and detrimental effects on human and animal health. It is generally believe that small amounts of fluoride in the diet can prevent dental caries and strengthen bones, however excessive amount could adversely affects on human health. Dental and skeletal fluorosis, bone deformities, decreased birth rates, increased rates of urolithiasis (kidney stones), impaired thyroid function and in certain instants kidney damages can be caused by chronic ingestion of fluoride. Not like most other element, fluoride enters the human body through drinking water. The prevalence of fluorosis is mainly due to the intake of large quantities of fluoride through drinking water owing to more than 90% bioavailability. Therefore the distribution of fluoride in the natural environment is very important in health studies, particularly in tropical countries where excessive fluoride is common n drinking water. Although the sources of fluoride are diverse, including drinking water, foodstuffs and tea, the contribution of fluoride from local sources remains high including cooking using water from a local water source.

Endemic fluorosis, especially dental mottling and discoloration has been prevalent for a long time among the population in villages in the dry zone of Sri Lanka. The main aim of this study was

to assess the levels of fluorides in groundwater of the dry zone region of the country.

2. Materials and Methods

In order to assess the levels of fluoride in the dry zone regions of Sri Lanka, all available fluoride values were gathered from all available sources. Most of the early studies were employed spectrophotometric method that use acid zirconyl SPADNS reagent (Zirconyl-iv Chloride, Octahydrate) as it is one of the common and inexpensive method of determination of fluoride. Data from nearly 15000 wells were used for the preparation of the fluoride distribution map.

3. Results and Discussion

The hydrogeochemical distribution of fluoride is of great concern in delineating areas in which dental and skeletal problems cased by deficiency or excess fluoride are prevalent in Sri Lanka. The wet zone of Sri Lanka fortuitously has been spared of the fluoride problem. The very low level of fluoride in the groundwater in the wet zone is due to the extensive leaching of the rocks and minerals that carry fluoride in them with subsequent flushing out due to heavy rain.

In the dry zone, on the other hand, high temperature and extensive evaporation tends to concentrate the substances in the water including fluoride. An important feature to note is that the rocks and minerals in both the wet and dry zones are similar and hence the fluoride variation is

mainly a climatic feature and not a geological one even though the fracture intensity of rocks may play a minor role. A wet zone hilly area of Kandy has for instance a low level of fluoride. Over 90 % from 243 shallow and deep wells studied in Kandy District had fluoride level below 0.40 mg/L and only 2 % of wells had more than 0.80 mg/L of fluoride with the mean of 0.28 mg/L

In contrast to wet zone, the dry zone consisting of fairly high levels of fluoride. From a total of 15000 samples collected from six dry zone provinces, almost 50 % of the studied wells had fluoride levels greater than 1.0 mg/L. In the Galgamuwa region in northcentral province, nearly 15 % of deep wells had more than 2.0 mg/L of fluoride, while more than 40 % of shallow wells in the Giriulla in Anuradhapura region exceeds 2.0 mg/L F. However, 1.6 % of 407 wells surveyed in Thambutthegama had fluoride levels averaging from 4 to 10 mg/L and 31.4 % of wells had 2-4 mg/L of fluoride.

The drinking water wells with fluoride content of less than 1.0 mg/L were found to be in Galnewa (18.5 %), Kahatagadigiliya (27.7 %), Maha Wilachchiya (28.3 %) and Palagala (28.9%). Similarly, wells with fluoride content of more than 2.0 mg/L were found in Nochchiyagama (46.3 %), Galnewa (40.0 %) and Palagala (32.5 %). More than 1000 wells had been analyzed for their fluoride contents in the Kekirawa region in which 18 % of wells had more than 2.0 mg/L of fluoride. In this region, several skeletal fluorosis cases have also been reported.

In the southern dry zone regions of Wellawaya, Thanamalwila and Buttala also recorded higher fluoride levels in which 34.9, 34.0 and 23.8 % wells exceeded 2.0 mg/L fluoride, respectively. During this study a new fluoride distribution map of Sri Lanka has also been prepared.