EPIDEMIOLOGY OF FLUOROSIS IN THE BORAZJAN AREA OF IRAN
I. FLUORIDE CONTENT IN DRINKING WATER

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INTRODUCTION

Fluorides are normal constituents of many water supplies, and low contents of about 1 ppm are regarded as essential for prevention of dental caries. If the content of fluorides in drinking water is less than 0.5 ppm the incidence of dental caries is likely to be high and when present in concentrations greater than 2 ppm they may cause endemic fluorosis (WHO, 1970, 1972). It has therefore been recommended by WHO that the fluoride content of drinking water should be kept within well-defined limits, which variate with water temperature between 0.6 and 1.6 ppm.

In some areas natural fluoride content of water is greater than the maximum recommended and signs of toxic effects on teeth and bones have been observed among people of these areas (WHO., 1969, 1972).

Since in the Borazjan area of Iran the presence of dark brown and yellow flakes on the teeth was observed by one of the authors (Dr. A. Mesghaly) a study on fluoride content in the drinking water resources of that area was carried out.

The aim of this study was to assess the size of the hazard represented by fluoride high concentration in drinking water, both from an immediate public health interest as well as of the potential implications represented by the migration of manpower into areas undergoing at present an industrialization process in Iran.

MATERIALS AND METHODS

The main drinking water resources in the Borazjan area are: 18 public wells, 2,163 private wells, the Boshigan river, and the Borazjan river.

Water samples were taken from five different sources :

(i) Raw water of Borazjan private wells,
(ii) Chlorinated water of the Borazjan public wells,
(iii) Raw water of the Boshigan river,
(iv) Chlorinated water of the Boshigan river,
(v) Chlorinated water in a mixture of Borazjan public wells and Boshigan river.

The chemical analysis was carried out by chromatography combined with distillation and spectrophotometry. Each determination was repeated 3 times and the results reported are the average of these 3 determinations.

RESULTS

Fluoride content in the five studied sources of drinking water is presented in Table 1. The concentration ranged between 0.5 and 2.3 ppm, showing that water from the Boshigan river had the lowest content in fluorides (0.5 and 0.6 ppm) and the highest content in fluorides corresponded to the water of the private wells of the Borazjan area.

DISCUSSION

For the water temperature range observed (22-24°C) fluoride content should not exceed 1 ppm, therefore all drinking water resources containing water from the Borazjan wells, whether private or public, had a fluoride

Table 1

Fluoride content in the five studied sources of drinking water in Borazjan area.

Source	Fluoride content ppm	Temperature °C
Raw water of Borazjan private wells	2.3	23
Chlorinated water of Borazjan public wells	2.1	24
Raw water of the Boshigan river	0.6	22
Chlorinated water of the Boshigan river	0.5	23
Chlorinated water in a mixture of Borazjan public wells and Boshigan river	1.5	23

content greater than the maximum recommended, namely : 2.3, 2.1 and 1.5 ppm. The river water, whether raw or chlorinated, had a fluoride content below the minimum of 0.7 ppm recommended for the observed water temperature range, namely : 0.6 and 0.5 ppm.

The findings suggest that the fluoride content in drinking water from the Borazjan wells may play an important role in the epidemiology of endemic fluorosis in that area.

Furthermore, as fluoride compounds are used in a number of industries, such as : aluminium works, fertilizer factories and brick and ceramics factories, they may lead to pollution of air, water, soil and plants (WHO., 1972).

Cook and Hughes reported in 1975 their observations in the island of Bahrain in the Arabian Gulf, an area of naturally occurring endemic fluorosis, where an aluminium smelting plant was established in 1971. Urinary fluoride among reduction workers was significantly higher, 7.5 ppm, than among other workers, 2.2 ppm, or applicants before beginning to work at the plant (1.8 ppm). Post-shift urinary fluoride (9 ppm) was higher than pre-shift (4.4 ppm) and during shift (7.9 ppm) showing that a significant absorption and excretion of fluoride occurred during working hours.

The fact of occupational exposure to fluorides should not be neglected when considering the introduction of industrial activities into areas with naturally occurring fluorosis. Furthermore, migration of manpower into areas undergoing an industrialization process could expose a great number of workers and their relatives to the fluorosis hazard.

Further studies are required for acquiring knowledge on the relationship between fluoride content in drinking water and prevalence of endemic fluorosis.

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