

FLUORIDE CONCENTRATION IN DRINKING WATER IN THREE AREAS IN PENINSULAR MALAYSIA

¹Shaharuddin MS, ¹Mohd Izam Syah I, ¹Irwan J, ¹Muhd Mursyidi M
and ²Dasrilayah Syahrial

¹Department of Community Health, Faculty of Medicine and Health Sciences

²Dental Department, Student Health Centre
Universiti Putra Malaysia, 43400 Serdang, Selangor

Abstract: A study on the concentration of fluoride in drinking water in three areas in Peninsular Malaysia, namely Kajang in Selangor, Kuala Kangsar in Perak and Pasir Mas in Kelantan was performed. The samples were taken from homes of respondents who participated in a dental fluorosis study in the said areas. Water samples were taken in triplicates for three consecutive days and were stored in pre-cleaned HDPE 250 mL bottles at a temperature under 4 C. A total of 2115 bottles of water samples were collected during the study. Analysis of fluoride was carried out using a direct reading spectrophotometer model HACH DR/2010 using the SPADNS method. Results showed that fluoride concentration in drinking water ranged from 0.35 to 0.81 mg/L in Kajang, 0.12 to 0.90 mg/L in Kuala Kangsar and 0.25 to 0.85 mg/L in Pasir Mas. These readings were lower but within the regulation issued by the Ministry of Health, Malaysia, which is between 0.5 to 0.9 mg/L. Issues such as dental caries elimination arise with the inadequate concentration of fluoride in some samples of drinking water studied.

Keywords: Fluoride, Drinking water, Peninsular Malaysia

INTRODUCTION

Fluorine is a basic element which is present in the form of fluorapatite, fluorite and fluoroapatite in the earth's crust. Water is the main source of fluoride, and the highest concentration of fluoride in water can be found in soils rich in fluorapatite [1]. The amount of fluoride which is ingested with water will be dependent on the fluoride content of the water and on the amount of this water which is consumed daily. The fluoride content of the water can be determined fairly readily, but precise determination of the daily water intake of the individual is considerably more difficult [2].

Fluorides have been used as a tool to eradicate caries, but without a suitable and correct concentration, these may lead to the onset of dental fluorosis, which is a form of hypoplasia of the enamel that results from an abnormally high consumption of fluoride during tooth development [3]. In Malaysia, piped water supply is fluoridated before being sent to homes in almost all states in the country, except Sabah.

This study aims to determine the concentration of fluoride in drinking water in the areas studied and whether it is suitable for the prevention of dental caries or fluorosis, especially in children.

MATERIALS AND METHODS

Three areas in Peninsular Malaysia were involved in this study, namely Kajang in Selangor, Kuala Kangsar in Perak and Pasir Mas in Kelantan. A total of 2115 drinking water samples were collected from schoolchildren from three schools in the areas studied. Samples were collected in triplicates for three consecutive days. The HDPE bottles used were pre-cleaned and were stored at a temperature under 4°C. Analysis of fluoride content was done using a HACH brand DR/2010 direct reading spectrophotometer. SPADNS method was used, which is based on the reaction between fluoride and zirconium dye.

RESULTS AND DISCUSSIONS

Results showed that fluoride concentration in drinking water ranged from 0.35 to 0.81 mg/L in Kajang, 0.12 to 0.90 mg/L in Kuala Kangsar and 0.25 to 0.85 mg/L in Pasir Mas. Please refer to Table 1 below.

Table 1: Concentration of fluoride in drinking water in three area studied

<i>Area</i>	<i>Range of concentration of fluoride (mg/L)</i>
Kajang, Selangor	0.35 – 0.81
Kuala Kangsar, Perak	0.12 – 0.90
Pasir Mas, Kelantan	0.25 – 0.85

The Ministry of Health, Malaysia puts the permitted level of fluoride in drinking water at 0.5 to 0.9 mg/L [4]. This shows that the readings obtained in this study was below but within the levels permitted by the ministry. A study by Chuckpaiwong et al. in 48 villages and 48 schools in Thailand found that the concentration of fluoride was in the range of 0.01 to 0.92 mg/L, with the highest concentration coming from underground water sources [5]. Hoque et al, in a study to determine the concentration of 304 water samples collected from rural and urban areas in Bangladesh, found that the range of fluoride in those waters were between 0.02 to 2.32, where only 16% of samples exceeded the MPL of 1.0 mg/L set for drinking water in Bangladesh [6].

Rahimah and Latifah, in a study among schoolchildren aged 12 to 16 years old in Malaysia, concluded that the cause of dental fluorosis among 67 – 88 % of respondents were due to fluoridated water with a concentration of 0.3 to 0.5 mg/L. This study concludes that the concentration of fluoride in drinking water samples was within the levels permitted by the Ministry of Health, Malaysia. The suitability of these concentrations of fluoride in preventing dental caries or fluorosis depend on a few factors, among them intake of water per person per day and ambient temperature.

ACKNOWLEDGEMENT

The author would like to thank those involved in this study, especially Mohd Izam Syah Idris, Irwan Jaapar, Muhd Mursyidi Mukhtar and Dasriyah Syahrial, and also Assoc. Prof. Dr Mohd Yunus Abdullah, Head, Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

REFERENCES

1. World Health Organization (WHO). 1996. Guidelines for Drinking Water Quality, 2nd Edition. WHO, Geneva 2: 231 – 236.
2. Bell M. E. and Ludwig T. G. 1970. Ingestion From Water. Part of Chapter 2: Supply of Fluorine to man. Bell ME, Largent EJ, Ludwig TG, Muhler JC and Stookey GK (reviewers). In: Fluorides and Human Health, World Health Organization, Geneva. pp 30
3. Kementerian Kesihatan Malaysia. 1998. Laporan Teknikal Ketua Pengarah Kementerian Kesihatan Malaysia.
4. Chuckpaiwong S, Nakornchai S, Surarit R, Soo-ampon S and Kasetsuwan R. 2001. Fluoride in water consumed by children in remote areas of Thailand. *Fluoride* 34 (1): 71 – 84
5. Hoque Fazlul A. K. M., Khaliquzzaman M., Hossain M. D. and Khan A. ?H. Fluoride in drinking water of Bangladesh. XXVth ISFR Conference Abstract. *Fluoride* 35(4): 224 – 263
6. Rahimah A. K. and Latifah A. L. 1998. Fluoride levels in Dentrifices. *Annals Dentistry, University of Malaya*, 5: 2 - 5