

Fluoride concentration of well water in Kelantan: A cross-sectional study

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ABSTRACT

Introduction: Water supply in Kelantan comes from two main sources: the public water supply and the alternative source from the groundwater which is drained through wells. The treatment plants for public water supply were equipped with fluoride feeders but the fluoride concentration was far below the optimum level. The natural fluoride concentration of the domestic water supply should be assessed to ascertain whether the Kelantan population is genuinely experiencing fluoridated water shortage. This study aimed to determine the fluoride concentration of well water gathered from all districts in Kelantan. **Materials and Methods:** In this cross-sectional study, water from dug wells and tube wells were sampled from 137 mukims selected via random sampling. From these selected mukims, two houses with tube wells and two houses with dug wells were selected through convenience sampling technique. Water samples were collected from June to July 2023. For each sample, a volume of 250 ml was collected in clean and dry bottles and stored at room temperature in tightly sealed bottles until analysis. A total of 553 water samples were analysed using a HACH spectro-photometer model DR 1900 with SPADNS 2 Fluoride Reagent AccuVac. The fluoride concentration of each sample was obtained from the average of triplicate determination. The fluoride concentration across all districts were analysed by Kruskal-Wallis test, while the fluoride concentration between types of well were analysed by Mann-Whitney test. All significance levels were set at $p < 0.05$. **Results:** Findings showed that the fluoride concentration ranged between 0.00 – 0.75 ppm and a total of 488 wells had 0.00 ppm fluoride concentration readings. The fluoride level of well water in Kuala Krai was the highest (Median = 0.1 ppm). Kruskal-Wallis indicates that the fluoride level of well water in Kuala Krai was the highest (Mean Rank = 447.89), followed by Pasir Puteh (Mean Rank = 341.45), Jeli (Mean Rank = 351.17), and Kota Bharu (Mean Rank = 275.14), H (corrected for ties) = 174.19, $df = 9$, $N = 553$, $p = 0.00$. The fluoride concentration in water from tube wells and dug wells were 0.00 – 0.75 ppm and 0.00 – 0.30 ppm respectively. However, Mann-Whitney indicates no significant difference between fluoride level of tube well water (Mean Rank = 277.62, $n = 277$) and dug well water (Mean Rank = 276.38, $n = 276$), $U = 38055.5$, $z = -0.16$ (corrected for ties), $p = 0.87$. **Conclusion:** The present study demonstrated that fluoride concentration in well water in Kelantan is below the cut-offs established by the Ministry of Health Malaysia (0.4 – 0.6 ppm) for optimum level of fluoride in drinking water. It is advised that in addition to resuming fluoridation of the public water supply, stakeholders consider other fluoride delivery strategies that are effective for caries prevention in Kelantan.