Content of Fluoride in Available Bottled Water from the Republic of Macedonia

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Abstract

Aim of the Paper: To determine the content of fluoride in drinking bottled water available in the country.

Material and Methods: Thirty-five commercial brands of bottled water (12 out of 23 domestic production and imported brands) were procured from bigger markets in the Republic of Macedonia. Determination of the content of fluorine is performed using ion selective electrode (Thermo Orion Ion plus Fluoride Electrode) and Ionometar (pH/ISE meter - Thermo-Orion) of the public health Institute.

Results: The content of fluoride in packaged water from domestic production ranged from 0.035 in Spring to 1.086 in vision with an average 0.368 (± 0.305), while imported bottled water ranged from 0.032 in ordinary water ROSA to 2.220 in bottled water KOM, with an average 0.631 (± 0.497). 12 packaged water from domestic production only in three of them emphasized the concentration of fluoride in their declaration, two of whom she corresponded to the concentration which we have determined. 23 imported packaged water in 15 of them emphasized the content of fluoride in their declaration, while 6 of them featured content of the declaration did not correspond to the concentration of fluorine which we have determined.

Conclusion: This study showed that bottled water contains different concentrations of fluoride. Parents that use bottled water to prepare powdered milk for babies and baby foods should be aware that it may contain higher concentrations of fluoride and put their child at risk the occurrence of dental fluorosis.

Keywords: Bottled water; Mineral water; Fluoride

Introduction

Proper use of fluoride contributes to the improvement of oral health worldwide and in our country [1]. The aqueous drinking a principal means by which fluorine is introduced into the human body and only 6.8% of the population receives optimally fluoridated naturally water main public water systems [2]. The drinking water in the country has a low content of fluorine, which is correlated with high average DMFT score of 6.88 among the 12 year olds of our population. The concentration of fluoride in drinking water from public water utilities in the country moves from 0-0., 4 mg/l [3,4]. Water used for drinking directly or indirectly in addition to juices and food is an important source of intake of fluoride in the body. Lately there is a trend of increased use of natural drinks because developing a passion for exercise, fitness, frequent travel and the trend of consuming food out of home. All these trends along with people's concerns about the taste and quality of water from public water supply systems, contribute to more people use bottled water. The recent floods that occurred in the country and which were followed by a public invitation from the Institute of Public Health to citizens not to consume drinking water from a public water supply in the flooded areas and regions, necessitated by the consumption of bottled drinking water. Besides that our country is rich in water [4], the amount of imported bottled water is continuously increasing in the last six years (Figure 1) [5].

The concentration of some elements, such as calcium, sodium, iron, silver and aluminum in bottled water are regulated in most countries, one of which is ours. The appearance of fluorine in drinking water varies depending on the type/composition of the soil. The content of fluoride in
bottled water can be very variable and if above optimal levels may have a negative impact especially on the oral health of children who drink bottled water as the primary source of drinking water. According to WHO recommendations (Guidelines for drinking-water quality Third Edition, 2004) [6] and also according to our current regulations (Regulations for water safety Official Gazette no.46/08) [7], the content of fluorine in water drinking to 1.5 mg/l. The protective role of fluoride in drinking water from the cavities is most apparent at concentrations of 0.8-1.2 mg/l. Because nowadays people consume more bottled drinking water, the need to determine the content of fluoride in it. Aim of the paper is to determine the content of fluoride in packaged drinking water available in the market in the country. These data will be useful as dentists dealing with clinical practice as well as those working in public health and to use when you need to implement fluoride prophylaxis of individual or mass level.

### Material and Methods

During 2008 35 commercial brands of bottled water were

<table>
<thead>
<tr>
<th>Brand of bottled water</th>
<th>Source of water</th>
<th>Type of water</th>
<th>Concentration of fluoride</th>
<th>Concentration of fluoride marked on the declaration</th>
<th>pH value</th>
<th>pH value marked on the declaration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vizijana</td>
<td>Klechovce village</td>
<td>Natural</td>
<td>1,086</td>
<td>1.00</td>
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<tr>
<td>Kozuvankna</td>
<td>Mrezicko village</td>
<td>Spring</td>
<td>1,046</td>
<td>not indicated</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>Dobravoda</td>
<td>Topolovic</td>
<td>Natural</td>
<td>0,81</td>
<td>not indicated</td>
<td>not indicated</td>
<td></td>
</tr>
<tr>
<td>Akva Kokino</td>
<td>Nagoricane village</td>
<td>Natural</td>
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<td>not indicated</td>
<td>not indicated</td>
<td></td>
</tr>
<tr>
<td>Pela Rosa</td>
<td>Kremenica</td>
<td>Natural</td>
<td>0,32</td>
<td>0.14</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Germina</td>
<td>Germijan village</td>
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<td>not indicated</td>
<td></td>
</tr>
<tr>
<td>Pelisterka</td>
<td>Medjiltija village</td>
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<td>not indicated</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Davina</td>
<td>Skopje</td>
<td>Natural</td>
<td>0,105</td>
<td>0.4</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Gorskia</td>
<td>Trnkot</td>
<td>Spring</td>
<td>0,084</td>
<td>not indicated</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Ladna</td>
<td>Breza-Lisec</td>
<td>Spring</td>
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<td>not indicated</td>
<td>not indicated</td>
<td></td>
</tr>
<tr>
<td>Aqua Kiss</td>
<td>Kochani</td>
<td>natural</td>
<td>0,071</td>
<td>not indicated</td>
<td>not indicated</td>
<td></td>
</tr>
<tr>
<td>Izvorska</td>
<td>Vasov Grad</td>
<td>Spring</td>
<td>0,035</td>
<td>not indicated</td>
<td>not indicated</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Content of fluoride in 23 imported packaged water.
and those imported from domestic production. The concentration of fluorine in all 35 samples was determined using the ion selective electrode (Thermo Orion Ion Plus Fluoride Electrode) and Ionometar (pH/ISE meter - Thermo-Orion) of the Public Health Institute. Chemical analysis was used 10% TISAB Aluminon. Fluorine solutions standards with a concentration of 0.01 to 1.00 mg/l were used to calibrate measurements.

Results

From 35 packaged water, 12 (34%) was produced in Macedonia respectively Table 1 presents the most widely used brands of bottled water in our country, the established concentration of fluorid, and tagged values for fluoride and pH of the declaration. The concentration of fluoride in bottled water from domestic production is within the lowest value of 0.035 for spring to the highest value of 1,086 for Vizijana. From 12 branded packaged water (domestic production), only three had pointed the content of fluoride on its declaration, from which two did not correspond to the content that we have determined. Table 2 presents imported packaged water with the concentration of fluorine which we have determined and it ranged from the lowest value of 0,032 mg/l in bottled water Rosa originating from Serbia to 2,220 in water Kom originating from Bulgaria. As for the quality of labeling of packaged water, 17 (48.5%) packaged water not emphasized fluoride content on their label, while 18 packaged waters emphasized contents of fluorine, in 8 that does not correspond to the content we have determined. Table 3 presents the average, maximum and minimum values that we received for mineral waters in all studies, differences between measured concentrations of fluoride in different studies may be explained as a variation of the content of fluoride over time, depending on the source of bottled water, as well as seasonal fluctuations. Healthcare professionals should be aware that the value of the tags cannot be credible as this study demonstrated in 44.4% of the branded packaged water no alignment between the determined value of fluorine and that pointed on labels. The large number of domestic manufacturers of packaged water does not emphasize the content of fluoride on their declaration because they are legally required to highlight the content of fluoride on the label if it is greater than 1 mg/l. According to the Rulebook on the special requirements for natural mineral water (Official Gazette of RM no.32/06) [13-16]. Article 14 states that if the natural mineral water contains more than 1 mg/l should be appointed to the product or another prominent position "contains fluoride". If natural mineral water contains more than 1.5 mg/l fluoride should be indicated that the product is not suitable for regular/repeated use of infants and children under 7 years old. According to our analyzes we conducted on natural mineral water from home production only Kozuvanka (1,046 mg/l), vision (1,086 mg/l) and Good Water (0,810 mg/l) contain higher values of fluorid that are within the recommended values of WHO and our legislation. It is also very important water consumers to have accurate information on the concentration of fluoride in the water, which they consume. Having in mind this situation, we recommend packaged water be analyzed at least twice a year at the Institute of Public Health of the Republic of Macedonia or in other accredited independent laboratory. The natural mineral waters with low or very low content of fluorid, like type of Gorska, Aqua Kokino, Ladna could be used by the general population including child population. It is worth noting that the first Cold bottled water is recommended for the youngest by the Association of Psychiatrists of Macedonia.

When we evaluate the effect of the consumption of bottled water on total intake of fluoride in one individual, three factors should be considered:

1. The amount of bottled water consumed daily.
2. The intake of fluoride from other sources, such as swallowing toothpaste with tooth brushing and food with high content of fluorine.
3. The use of bottled water for preparing milk feeds and dissolution of the pulp food for newborns.

Conclusion

1. Manufacturers of bottled water did not emphasize the content of fluorine labels or hoist that is incorrect.
2. Dentists should be aware of the concentration of fluorine in the water we drink his patients from childhood, whether it is packaged or tap water.
3. Parents who use bottled water to prepare the milk meal for your baby, you should be aware that it contains high concentrations of fluoride to expose their children to risk of dental fluorosis.

References

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7. Guidelines for water safety Official Gazette no.46 / 08.


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