

# Mouthwash ingestion by preschool children

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*Even though fluoride provides a significant contribution in dental caries prevention, it is known that its random employment may lead to enamel alterations such as dental fluorosis, besides the possibility of severe systemic alterations. The aim of this study was to evaluate the ingestion of mouthwashes administered to preschool children. It was concluded that parents and teachers of young children must be very careful during the accomplishment of educational programs comprising fluoridated mouthwashes, because of the high possibility of ingestion.*

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## INTRODUCTION

Oral diseases are still a major health problem in most developing countries.<sup>1,2</sup> For this reason, Dentistry currently prioritizes the prevention and preservation of the integrity of the dental tissues, encouraging professionals to develop techniques, materials and educational programs for health promotion.

Preventive procedures are mainly based on resources to reduce the dental plaque index and consequently oral diseases. Even though it is known that no other means of oral hygiene are as efficient as the toothbrush and dental floss,<sup>3,4</sup> some chemical substances also act on the tooth surfaces and contribute to the prevention of carious lesions. Among such substances, fluoride has been employed and may be found in the public water supply, foods, salt, mouthwashes, dentifrices and other pharmaceutical and dental products. Among those, fluoridated mouthwashes have been

proven to reduce dental caries in children<sup>5,10</sup> since they diminish the accumulation of the dental biofilm<sup>9</sup> and the number of *Streptococcus mutans*.<sup>11, 12</sup> When employed in regular and constant programs, they may lead to the effective control of dental caries, especially in conjunction with the application of pit and fissure sealants.<sup>6</sup>

According to Levy *et al.* (1995),<sup>13</sup> supplementary fluoridation should be routinely adopted for children living in nonfluoridated areas. However other authors<sup>7,12</sup> stated that fluoride supplementation in fluoridated areas is inappropriate, because it increases the daily dosage of fluoride ingested by children. On the other hand, continuous optimal utilization of these compounds tend to yield a reduction in the DMFT and DMFS indexes, close to the target proposed by the World Health Organization, provided security limits are followed.<sup>4</sup>

Despite of its wide employment, the toxic action of fluoride has already been demonstrated.<sup>14,15</sup> For this reason, caution and care are required; especially taking into account that the optimal level of fluoride in the body has not been clinically determined yet.<sup>13,16</sup> The random employment of the product during the period of dental development is known to lead to enamel alterations such as dental fluorosis.<sup>14,17</sup>

Children are increasingly taking part in preventive programs, mainly at school, where they are informed on the importance of oral health, tooth brushing and regular fluoridated mouthwashes. Therefore, the amount of fluoride intake may be higher than required for some children, especially those living in fluoridated areas. Younger children are at increase risk from disposing properly the rinse without ingesting part of the solution.<sup>18, 19, 20, 21</sup> Acute intoxication may also occur from the ingestion of a high amount of fluoride at once, which may lead to nausea, abdominal pain, vomiting and diarrhea and, in more severe cases, generalized weakness,

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spasms of the extremities, drop in blood pressure, convulsions and death.<sup>3, 14, 15</sup>

Considering the increased number of educational and preventive programs and the possible intake of fluoridated compounds by very young children, the aim of this study was to evaluate the ingestion of mouthwashes when employed by preschool children.

**MATERIALS AND METHODS**

A total of 123 children of both genders, aged 2 to 6 years old, were included in the study. Informed consent term was previously obtained from the parents or caretakers.

During the first stage, professionals informed children about the importance, effects and risks of fluoride and how to employ it in a simple and accessible manner.

On the second stage children initially, brushed,, followed by thorough water rinsing in order to eliminate food debris, plaque and saliva from the oral cavity. Afterwards, each child received a plastic cup containing 5ml of the placebo solution for a one-minute rinse.

After this period, the children discharged the liquid in a tube on which the volume of the solution discharged was measured in milliliters to evaluate the amount of solution swallowed after the mouthwash.

**RESULTS**

Figure 1 shows the amount of solution discharged by the children in milliliters. Data was analyzed by age and gender. A more homogeneous pattern was observed for the females when compared to the males, since the amount of solution discharged ranged just from 3ml to 5ml. The intermediate horizontal line represents the amount of solution ingested and the other two lines represent the limits that comprise most of the values discharged by the children. Ten values not comprised between these lines were regarded as atypical and therefore excluded. From these ten values, three are related to the 2 year old children, who swallowed almost the entire amount of solution. The other values, namely 2, 2 and 3ml were found for children aged 4, 5 and 6 years old, respectively.

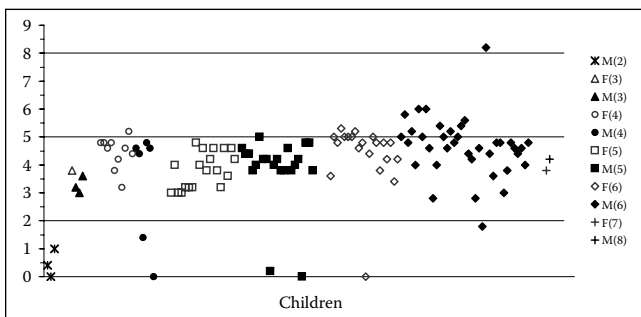


Figure 1. Amount of solution (in ml) discharged after the mouth rinse by gender, according to age (2 to 6 years)

Table 1. Population means of solution discharged by the children in each age group.

Age	Children	Mean	Standard deviation	Confidence interval of 95%	
				Low limit	Upper limit
3	4	3.4	0.37	2.8	4.0
4	14	4.5	0.49	4.2	4.8
5	39	4.0	0.56	3.9	4.2
6	54	4.6	0.71	4.4	4.8

Table 1 presents the number of children in each age group regardless of gender. Since the intervals do not contain the value of 5ml, which is the amount of solution indicated for the mouthwash, it can be stated that there was a significant ingestion of solution in all age groups. There is evidence that children aged 2 and 3 years old swallowed more solution than the others.

**DISCUSSION**

It is currently known that fluoride plays an important role in oral health when properly employed, and the professionals should be aware that the risk of overexposure is real and may yield acute intoxication.<sup>14, 17</sup> The security parameters currently accepted are 5.0mg F/kg (probable toxic dose), and 0.07mg F/kg/day for the chronic intoxication.<sup>4</sup>

Dental and bone fluorosis are caused by a long-lasting higher dose employment of fluoride.<sup>13, 17</sup> Fluorosis is believed to be the result of the total intake of fluoride not only from the fluoride supplementation, but also from the public water supply, foods, dentifrices and dental treatments.<sup>21</sup> However, the maximal or ideal fluoride dose to allow benefits for prevention of carious lesions with minimal adverse effects has not been determined so far.<sup>16</sup>

Even though the increased number of schools based educational and preventive programs on the employment of fluoridated mouthwashes have been associated with a reduction in the occurrence of dental caries.<sup>4, 8, 22, 23, 24</sup> However, they have been a matter of concern due to the higher frequency of fluorosis in the permanent dentition, in addition to problems associated with acute intoxication from an excessive ingestion of the product.

The present study revealed that there was ingestion of solution in all age groups, and the results presented in Figure 1 suggest that younger children, aged 2 and 3 years old, swallowed larger amounts. This data is in agreement with the findings of Levy et al. (1995),<sup>13</sup> who demonstrated a larger ingestion of fluoridated dentifrices by younger children. This is probably due to the fact that younger children have difficulty understanding the instructions for employment of mouthwashes and the lack of a proper motor control.

The employment of fluoridated gels or mousses is effective for the reduction in the incidence of dental caries, in addition to further advantages such as the easier and more controlled application with or without uti-

lization of trays. The reduced chair time, good acceptance by younger children and supervision of the professional are also mentioned.<sup>8</sup>

Several studies have been accomplished to determine the daily dose ingested by children, as well as the ideal dose.<sup>19,20,21,25</sup> One study conducted in children aged 3 to 6 years old observed a mean daily intake of fluoride of 930.7mg F/day or 53mg/Kg of body weight, being that 51.5% of the fluoride ingested was excreted through the urine.<sup>25</sup> However, studies with larger samples are required to reach a consensus, since only 11 children were evaluated.

Individual variations within different ages have been observed as to the fluoride intake,<sup>20</sup> in agreement with the present study, on which the female gender demonstrated a more homogeneous pattern than the male. This is probably due to the fact that, at this age, the girls tend to be more responsive to the instructions provided by the teachers. The mean amount of solution ingested by the children after the mouthwash at 3, 4, 5 and 6 years old were 1.6, 0.5, 1.0 and 0.4 ml, respectively.

Figure 1 further demonstrates that some children discharged a larger amount than that employed for the mouthwash (5ml), suggesting an increase in salivation during the mouthwash, associated or not to ingestion of the solution.

Due to the excessive intake of fluoride by children, more studies should be conducted in order to determine the fluoride levels existing in foods and dentifrices, as well as the ideal dose for the different ages, so that this product may provide an effective contribution to oral health with no harmful effects.

The employment of fluoridated mouthwashes should be restricted to older children, above 4 years of age, in order to reduce the risk of excessive ingestion of such solutions.

Other means of utilization of fluoride may be indicated for children below 3 years of age, such as professional topical application of fluoridated gels, mousses and varnishes in the dental office and the employment of a small amount of fluoridated dentifrice for tooth-brushing.

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## **Varicella-Zoster Virus (VZV) Reactivation and Facial Paralysis in Children.**

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Reactivation of Herpes Simplex virus type 1 ( HSV-1) is thought to be a major cause of adult idiopathic peripheral facial paralysis ( Bell's palsy). A study from Japan enrolled 30 children younger than 15 years who presented acute peripheral facial paralysis. Serologic assays and polymerase chain reactions analysis were used to investigate the infectious causes. The authors concluded that VZV reactivation is an important cause of acute peripheral facial paralysis especially in children between 6 and 15 years of age.