

## ORIGINAL RESEARCH

# Impact of school for future parents and first preventive examination in the first year of life on oral habits

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(Boris Egić)**Abstract**

Pregnancy is an ideal time to promote the primary prevention of early childhood caries. It is crucial to have a child's first dental examination in the first year of life. The aim of this study was to find out how the School for future parents and the child's first dental examination affect children's oral habits. A specialist pediatric dentist was involved in the implementation of the School for future parents and the courses and on timely care for the good oral health of the child. We examined all one- and two-year-olds whose parents responded positively to a dental examination for their child. During the first examination, we considered attendance at the School, how the parents booked the dental examination, what the child drinks when thirsty, how many times a day they brush their children's teeth and toothpaste use. During the second examination, we considered what the child drinks when thirsty, how many times a day the parents brush their children's teeth and toothpaste use. The results showed that participants in the School were more likely to book their children's first preventive, consultative dental examination ( $p < 0.001$ ), brush their children's teeth, and use toothpaste ( $p < 0.001$ ) than parents who did not attend the school. However, there was no difference between the two groups regarding what parents gave their children to drink when they were thirsty ( $p = 0.69$ ). In the child's second year, all the parents used toothpaste, brushed their children's teeth more often, and their children drank sweet drinks more often than before the first examination ( $p < 0.001$ ). We have succeeded in raising awareness of good oral habits among parents and children (the frequency of brushing children's teeth and the using toothpaste), but not changed the behavior in the type of drinking against thirst.

**Keywords**

Pregnancy; First examination; Oral habit

## 1. Introduction

Altered hormone levels during pregnancy can cause gum problems in expectant mothers [1]. Several systemic diseases and conditions may influence the risks of an expectant mother developing an oral disease. For example, an association has been established between high blood pressure and periodontitis, *i.e.*, patients with previously undetected elevated blood pressure may also suffer from periodontal disease [2]. Certain periodontal microorganisms initiate immune responses [3]; hence apical periodontitis can elevate the inflammatory status of the individual as well as insulin resistance [4]. During pregnancy, the oral cavity is more frequently exposed to gastric acid, which can erode tooth enamel, thus making the teeth more sensitive and more susceptible to dental caries [5]. Poor oral health during pregnancy can cause premature births and low birth weights [6]. Children whose mothers have caries are more than six times more likely to have early childhood caries (ECC) than children with mothers who do not have caries [7]. With pregnancy comes responsibility and concern for the

general health and oral health of both mother and child.

Tooth development begins during the first six weeks of intrauterine life [8], and mineralization of primary teeth begins during embryogenesis [9, 10]. Vitamin D deficiency during pregnancy is associated with more caries in the primary dentition [11]; hence, maternal malnutrition influences the incidence of ECC [12]. Tooth formation during pregnancy is the critical period for tetracycline staining due to tetracycline intake during pregnancy [13]. It has been proposed that exposure to dioxins may lead to an elevated risk of molar incisor hypomineralization (MIH) [14]. Any changes in the mineralization of the teeth have permanent consequences and may lead to a poor tooth structure and an easier occurrence of caries.

Another problem is the high consumption of sweet drinks by children in modern times [15, 16]. High consumption of sweet drinks is a risk factor for obesity and being overweight [17]. Furthermore, it also increases the risk of developing diabetes mellitus type II [18], a cardiovascular risk factor [19] and elevates the risk of caries [20–22]. Therefore, high

consumption of sweet drinks is very harmful to general health and oral health. It is important to educate young parents as early as possible about the dangers of frequently consuming sweet drinks.

Meanwhile, the biggest problem in treating decayed teeth in young children is a lack of cooperation; treating decayed teeth is easier in older children than in younger ones. Therefore, during the first years of life, it is crucial to protract the period without caries. In this regard, it is necessary to perform the first preventive, consultative dental examination during the first year of a child's life [23]. Only in this way can we achieve primary prevention in the truest sense of the word; hence, this is the time when the greatest emphasis should be placed on educating parents to take responsibility for their children's oral health.

The aim of the study was to investigate how the School for future parents and the child's first dental examination affect children's oral habits. The null hypotheses were that there is no difference between parents who attend the School for future parents and those who did not with regard to booking the child's first dental examination and the oral habits developed by children in their first year of the life, and that there is no difference between children's oral habits during their first and second years of life.

## 2. Materials and methods

The prospective study was conducted in Slovenia, at the department of dentistry of the Murska Sobota Public health center, from 2021 to 2022. In keeping with the law, we examined all children in our local area (the Municipality of Murska Sobota, Lendava, Ljutomer and Gornja Radgona), whose parents responded positively to an invitation to book a first (newborns in the year 2021) and second (children born in 2021) preventive, consultative dental examinations. The children's parents made independent decisions to respond positively to the invitation to book dental examinations for their children, and with such voluntary responses, neither written nor verbal consent was required. The legal basis of our study (conducting preventive, consultative dental examinations) was compliance with the regulations on delivering preventive health care at the primary level [24]. Additional approval by an ethics committee was not required. Parents' interest preventive examinations, performed by a specialist pediatric dentist, is highest during the child's first two years; from the third year onwards, parents do not respond as often to invitations to book preventive, consultative dental examinations by a specialist pediatric dentist. Most children from the age of three upwards have a personal dentist who provides all the dental services they need, which would make that population unresponsive and unrepresentative.

A specialist pediatric dentist was involved in the implementing the School for future parents in consultation with the gynecology department of the Murska Sobota Public health center. There were two courses: the first focused on the inseparability of general health and oral health and the emergence of new risk factors for the development of oral diseases during pregnancy, while the second focused on timely dental care for the good oral health of the child. Finally, the specialist pediatric dentist encouraged the expectant parents to book their child's first

preventive, consultative dental examination in the child's first year of life.

In the first year of the study (2021), we examined all children whose parents responded positively to the invitation to book a preventive, consultative dental examination for their child. The specialist pediatric dentist obtained the list of newborns for the year 2021 from the Ministry of Internal Affairs, the Directorate of Internal Administrative Affairs, the Population Registration Sector (the legal basis was reference no. 24). Based on this list, there were 785 newborns in our region (Municipality Murska Sobota, Ljutomer, Lendava and Gornja Radgona).

We examined all children who responded through:

- Invitation from the list of newborns (from the specialist pediatric dentist).
- Referral (from pediatricians); in addition, in collaboration with pediatricians, six-month-old and nine-month-old babies were referred to a specialist in pediatric dentistry for their first preventive, consultative dental examination.
- Their own order.

In the second year of the study (2022), we examined all children scheduled for a preventive, consultative dental examination by their parents, either through an invitation from the specialist pediatric dentist or by taking the initiative to book the examination independently.

For this study, we created two special forms for each year of the study. In the forms we entered the following data:

(a) At the first examination (in the first year of life), parents provided information about:

- School attendance for future parents.
- How they ordered the examination (themselves, pediatricians or by invitation).
- What the child drinks when thirsty (water or sweet drinks).
- How many times a day they brush their children's teeth (no brushing, once or twice a day).
- The use of toothpaste (yes/no).

(b) At the second examination (in the second year of life), the parents provided information about:

- What the child drinks when thirsty (water or sweet drinks).
- How many times a day they brush their children's teeth (no, once, twice a day).
- The use of toothpaste (yes/no).

We analysed the following:

(a) At the first examination (first year of life):

- The number of children ordered for examination by the parents themselves, ordered by pediatricians, or ordered by us with invitations based on the list of newborns received from the Ministry of Internal Affairs, Directorate for Internal Administrative Affairs, Population Registration Sector.
- Attendance of the school for future parents.
- Type of order (themselves, pediatricians or by invitation).
- Frequency of brushing children's teeth.
- Use of toothpaste when brushing children's teeth.
- What the child drinks when thirsty.
- Impact of attending the school for future parents and type of order on the first examination.
- Impact of attending the school for future parents on oral hygiene (frequency of tooth brushing, use of toothpaste).

– Impact of attending the school for future parents and what the child drinks when thirsty.

(b) At the second examination (second year of life):

– Frequency of tooth brushing and use of toothpaste.

– What the child drinks when thirsty.

(c) Comparing between the first and second year of life:

– Frequency of tooth brushing and use of toothpaste.

– What the child drinks when thirsty.

Statistical analysis:

The statistical analysis was conducted using the software IBM SPSS 26.0 (IBM Inc., Chicago, IL, USA). We used the chi-square test (level of significance  $p \leq 0.05$ ) to compare:

– Attendance at the school for future parents and type of order for the first examination.

– Attendance at the school for future parents and frequency of tooth brushing.

– Attendance at the school for future parents and use of toothpaste.

– Attendance at the school for future parents and what the child drinks when thirsty.

– Frequency of tooth brushing in the first and second years of life.

– Use of toothpaste in the first and second years of life.

– What the child drinks when thirsty in the first and second years of life.

### 3. Results

In this study, 1384 examinations were performed. In the first year of the study (2021), 711 children were examined. Of the 785 one-year-olds born in our region (Municipality Murska Sobota, Ljutomer, Lendava and Gornja Radgona) (based on the list of the newborns), we examined 711 one-year-olds (90.6% of the entire population of newborns in our region). In the second year of the study (2022), 673 children were examined, 38 children less than in the first year.

The results for the first year of the study (Table 1) show that the predominant impetus to book a preventive, consultative dental examination, was an invitation from a specialist pediatric dentist (50.2%), and the least common channel was referrals by pediatricians (13.4%). Furthermore, 36.4% of the parents booked the dental examinations themselves. Of these, 28.7% had attended the School for future parents. There was a statistically significant difference ( $p < 0.001$ ) between the two parent groups: the parents who attended the School for future parents were more likely to book the examination themselves than the parents who did not attend the school.

In the first year of the children's lives, most of the parents brushed their children's teeth at most often once a day, one-third of the parents brushed their children's teeth twice a day, and 14.9% did not practice brushing their children's teeth. The research results regarding the impact of the School for future parents show that almost two-thirds of the parents who attended the School for future parents brushed their children's teeth twice a day, one-thirds brushed once a day, and only 4.9% did not brush their children's teeth. Furthermore, there was a statistically significant difference ( $p < 0.001$ ) between the two parent groups: the parents who attended the school brushed their children's teeth twice as often as those who did not.

Toothpaste use in the first year of the children's life was rare, only one-third of the parents used toothpaste to brush their children's teeth. However, 84.3% of the parents who attended the School for future parents used toothpaste-and they used it more often than with the parents who did not attend the school. There was a statistically significant difference ( $p < 0.001$ ) between the two parent groups: the parents who attended the school used toothpaste significantly more often than the parents who did not attend the school.

In the first year of life, the children surveyed drank water when they were thirsty more than any other beverage. The results were similar for the children whose parents attended the School for future parents (86.3% of whom gave their children water when they were thirsty) and for the children whose parents did not attend the school. There was not statistically significant difference ( $p = 0.69$ ) between the two groups.

Regarding the results from the second examination (in the second year of life), (Table 1) all parents brushed their children's teeth and used toothpaste, and 80.4% brushed twice a day. There was a statistically significant difference ( $p < 0.001$ ) between periods: in the second year of the children's life the parents brushed their children's teeth more often (twice a day) and used toothpaste more often than in the first year of the children's life. Furthermore, the parents gave their children water when they were thirsty rare in the second year of the child's life than in the first. However, there was a statistically significant difference ( $p < 0.001$ ) between periods for sweet drink intake: children in the second year of life drank sweet drinks more often than in their first year.

### 4. Discussion

In this study, we rejected the null hypothesis regarding booking the child's first dental examination, frequency of brushing children's teeth, and toothpaste use in the first year of a child's life. The results show that the parents who attended the School for future parents booked the first preventive, consultative dental examination themselves, brushed their children's teeth more often, and used toothpaste more often than the parents who did not attend the school. Furthermore, the null hypothesis of this study was rejected regarding the frequency of brushing children's teeth, toothpaste use and what children drink when thirsty between the first year and the second year of the children's lives. The results show that the parents brushed their children's teeth and used toothpaste more often in the second year of the children's lives. The parents gave their children sweet drinks to drink more often in the second year of life. However, the null hypothesis of this was not rejected, that is regarding preferred beverage for quenching thirst in the first year of the children's lives. There was no difference between the two groups of parents, as both groups gave their children water to quench thirst more frequently than any other beverage.

Expectant parents are typically confused, as they are bombarded with new information (about care, breastfeeding, diet and hygiene of the child), from professionals (gynecologists, pediatricians, midwives, patronage service) on the one hand, and with incorrect information on the other hand, for example, on the internet. It is not surprising that they forget many critical things and must be reminded several times.

**TABLE 1. Impact of school for future parents and the first preventive-consultative examination on oral habits.**

	1st year	Impact of school for future parents	$p^*$	2nd year	Comparing between years $p^*$
Number	711			673	
Attended school	28.7%				
Type of order					
Themselves	36.4%	77.5%			
Pediatricians	13.4%	2.5%	<0.001 <sup>a</sup>		
Invitation	50.2%	20.1%			
Frequency of brushing teeth per day					
No brushing	14.9%	4.9%		0.0%	
Once	54.0%	34.3%	<0.001 <sup>a</sup>	19.6%	<0.001 <sup>b</sup>
Twice	31.1%	60.8%		80.4%	
Toothpaste use					
No	66.3%	15.7%	<0.001 <sup>a</sup>	0.0%	<0.001 <sup>b</sup>
Yes	33.7%	84.3%		100.0%	
What children drink when thirsty					
Water	87.1%	86.3%	=0.69 <sup>a</sup>	80.8%	<0.001 <sup>b</sup>
Sweet drinks	12.9%	13.7%		19.2%	

\* $p$  value Pearson's coefficient; <sup>a</sup>:  $p$  value of Pearson's coefficient, compare between parents who attended the school of future parents and who not attended; <sup>b</sup>:  $p$  value of Pearson's coefficient, compare between first and second year;  $p \leq 0.05$ : level of significance.

A previous study revealed knowledge gaps among pregnant women regarding of personal oral hygiene practices [25]. Most pregnant women do not have sufficient knowledge, and are unaware of the importance of oral health during pregnancy and infant oral health [26]. Pregnant women supported the inclusion of oral health education and preventive measures during pregnancy, as well as the inclusion of oral examinations on the prenatal checklist and the establishment of a referral system as strategies for integrated prenatal oral health care [27]. Selvarajan *et al.* [28] demonstrated that dental health education significantly improves both the knowledge and attitude of expectant mothers.

This study shows that participants in the School for future parents are more likely to book their children's first preventive, consultative dental examination, brush their children's teeth and use toothpaste than parents who do not attend the school. We can conclude that pregnancy is a good time to promote the primary prevention of ECC [29], and the results of the study confirm a that there was a reduced incidence of ECC in children whose mothers received prenatal oral health care [30]. Furthermore, in this study, participation in the School for future parents demonstrates that parents can acquire new knowledge and use it to improve their children's oral habits. Parents who participated in the school were aware of the importance of their child's first dental examination and often booked the first examination themselves. However, there was no difference between the two parent groups regarding what parents gave their children to drink when they were thirsty (water *vs.* sweet drinks). In both parent groups, the proportion of children who drank water was high (approximately 86%).

This study shows that there is a much stronger positive

impact on oral habits from the child's first preventive, consultative dental examination from the second examination. In the second year, there was a difference in the frequency of brushing teeth and toothpaste use: parents brushed their children's teeth more frequently and used toothpaste more often. The study findings demonstrate the importance of a child's first dental examination. We succeeded in breaking down preconceptions, about the importance of timeliness, the frequency of brushing teeth and toothpaste use. However, one of the best milestones of this study is that we managed to conduct both the first and second dental examinations for approximately 90% the population of our area, which is far more successful than the Bulut's study [31]. We could not find any other studies that compared the first and second dental examinations.

In the second year of life, parents give their children sweet drinks more often than in the first year of life. Approximately 80% of children in their second year of life drank water when thirsty more than any other beverage. The results of this study are superior to those of the study conducted by Davison *et al.* [32]; however, both studies report an increased consumption of sweet drinks in children's second year of life. Although health guidelines advise against children under 12 months of age drinking sweet drinks [33, 34], we do not yet know the cause of this global phenomenon (giving infants and toddlers sweet drinks). Experts caring for children must continue to increase parents' awareness of the harmfulness of sweet drink consumption for infants and toddlers.

The strength of the study is that it combines two critical factors for preventive interventions: the school for future parents and the child's first preventive, consultative dental

examination and compares their impact. To the best of our knowledge, no similar study has been conducted. The weakness of this study is that we did not extend it to cover the third year of life and did not examine the oral health habits of the participating parents; it may be worthwhile to capture this information in future studies. Conceivably, a repeat of consultation on good oral habits will yield different results on drinking sweet drinks if we extend the study to cover the third year of children's lives. If we included information on the oral habits of the parents, we will obtain new information about how the oral habits of parents impact the oral habits of their children. This study highlights the need to begin conducting preventive activities concerning children's oral health early in life. It would be good to extend the time span of the research by at least one year. We would then obtain a more complete picture of oral habits in children and the consequences that follow the adoption of weak habits.

This study is an example of good collaborative practice between several experts involved in health care delivery for pregnant women (gynecologists) and children (pediatricians and specialist pediatric dentist), and how each of them contributes to improving oral health and, thus the general health of patients through their collaboration. Therefore, we strive to regularly update the information provided to parents. Preventive measures or consultations are conducted in the first, second, third years and onward; preventive, consultative dental examinations are also performed in the first, second, third years and onward of children's lives.

## 5. Conclusions

Pediatric dentists should be an integral part of the team that cares for pregnant women and the school for future parents, as they contribute benefits for both mother and child. The problem of the increasing consumption of sugary drinks requires more attention. Future studies should focus more on the problem of growing consumption of sugar drinks.

## AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## AUTHOR CONTRIBUTIONS

BE—designed the research study, wrote the manuscript, performed the research and analyzed the data.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study has a legal basis (reference No. 24) and does not require other ethical approvals. Inform consent was obtained from the patients' parents.

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## CONFLICT OF INTEREST

The author declares no conflict of interest.

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