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DOI: 10.23804/ejpd.2018.19.02.12

Prevalence and progression of early childhood caries in Niš, Serbia

ABSTRACT

Aim Early childhood caries (ECC) entails the presence of one or more decayed, missing, or filled teeth in children aged up to 71 months. Our aim is to present the prevalence and progression of ECC in Niš, Serbia.

Methods The study was performed at the Clinic of Dentistry in Niš, involving 250 children aged 3 to 6 years. The prevalence of caries was presented using the dmf index. Depending on the progression, tooth decay was reported as dI (superficial decay), dII (deep decay), dp (pulpitis), dg (dental gangrene), and dx (chronic apical periodontitis).

Results Our results show that in Niš the dmf index was 2.38 in the studied children. Of all the decayed teeth, dI was found in 73.18%, and dII in 22.38% of the children. The complications of tooth decay (pulpitis, gangrene, periodontitis) were not highly prevalent: dp=1.41%; dg=1.01%; and dx=2.02%.

Conclusion Based on the obtained results, it can be concluded that the prevalence of early childhood caries is relatively high. Therefore, health education for parents has to be intensified, focusing on the significance of preservation of health of the primary teeth all the way to their physiological replacement with the permanent teeth.

Keywords Early childhood caries; Prevalence; Progression.

Introduction

Primary teeth are important in the preservation of oral and general health in the first decade of life [Livny and Sgan-Cohen, 2007; Mazhari et al., 2007]. Early childhood caries (ECC) is the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. ECC occurs very early, rapidly progresses, with delayed symptomatology and numerous complications. It has a prominent role in the homeostasis of both oral and general health of children from the earliest age. The presence of ECC leads to nutrition disorders due to pain and/or missing teeth, onset of dentoalveolar infections, impact on the buds of permanent teeth, periodontal and gastrointestinal diseases, common occurrence of respiratory infections, and disturbed overall physical development of the children.

ECC occurs early, sometimes immediately following the primary tooth eruption, as the consequence of bad habits and inadequate nutrition. It is the result of interaction of microorganisms that colonise the oral cavity (belonging predominantly to the *Streptococcus mutans* group) with sugary foods on the enamel surface [Colak et al., 2013; Paglia et al., 2016]. In fact, ECC develops via the interaction of three principal factors: presence of cariogenic microorganisms, fermentable carbohydrates, and teeth themselves, during a period of time. Specific, early-age related factors have to be taken into account as well, such as an immature defence system, primary teeth in the phase of post-eruptive mineralisation, hypoplastic changes, special nutrition (predominantly liquid, based on breast-feeding or formula milk). In addition to these, there are various other risk factors which indirectly contribute to the diseases affecting the primary teeth, and many of them are still being investigated.

The onset of caries in that period of life is increased by certain difficulties in the maintenance of oral hygiene and lack of parents' knowledge on the importance of primary teeth and options for the preservation of their health. Caries often affects a number of teeth and their surfaces. It is thought that ECC occurs in 4-90% of pre-school children [Livny and Sgan-Cohen, 2007].

In different countries, as well as in different regions of one country, the percentage of ECC varies depending on the habits, customs, culture, health education level, socioeconomic conditions, and similar. The consequences of ECC are numerous and diverse. An early loss of a number of primary teeth can adversely impact nutrition, speech, development of the face and jaws, eruption of permanent teeth, appearance of the affected child, which further disturbs normal psychological development, and unpleasant experiences in dental offices may grow into dentophobia.

The aim of this paper was to analyze the prevalence rates and progression of ECC in the city of Niš, Serbia.

Materials and methods

The study took place at the Clinic of Dentistry of Niš, involving 250 children aged 3 to 6 years, with similar numbers of boys and girls enrolled. A systematic dental examination was performed at the beginning of the study using a dental probe and mirror under artificial lighting in order to get an insight into the dental health of the examinees. The health of the primary teeth was reported using the Klein-Palmer dmf system. The prevalence of caries was presented using the dmf index and its components: d (number of decayed teeth); m (number of missing teeth), and f (number of filled teeth). Depending on the progression, tooth decay was reported as dl (superficial decay), dll (deep decay), dp (pulpitis), dg (dental gangrene), and dx (chronic apical periodontitis).

The study was approved by the Ethical Committee of the Medical Faculty, University of Niš (in accordance with the World Medical Association Declaration of Helsinki).

Results

The study revealed a high prevalence of ECC. There were 132 (52.8%) children with ECC, while 118 (47.2%) children were not affected. The obtained results showed that in the studied children dmf index was 2.38 (Table 1).

In the structure of dmf index, the difference between decayed (83.36%), filled (16%) and missing teeth (0.3%) was noticed (Fig. 1).

Of all the studied teeth with caries, dl was present in 73.18%, and dll in 22.38%. The complications of tooth decay (pulpitis, gangrene, periodontitis) were not highly prevalent: dp 1.41%; dg 1.01%; and dx 2.02% (Fig. 2).

Of the examined 1500 upper incisors and canines, 1418 were healthy teeth, 82 teeth had caries, while there were no filled or missing teeth. As for lower incisors and canines, all the 1500 examined teeth were healthy (Table 2).

Figure 3 illustrates the prevalence of ECC in the intercanine space related to the type of tooth. Most commonly involved were the upper right central incisors (40.24%) and upper left central incisors (39.02%), and then left and right lateral incisors, affected by ECC in 9.76%. In 1.22% of cases ECC involved the upper left canines, while the upper right canines were unaffected by caries.

ECC progression in the upper incisors and canines is shown in Figure 4. Superficial decay was detected in 57 teeth (69.51%), and deep decay in 19 teeth (23%). The percentages of caries complications were not high (gangrene in 2 teeth, or 2.44%; chronic apical periodontitis in 4 teeth, or 4.88%; there were no teeth with pulpitis).

Children with ECC		Children without ECC		dmf
N	%	N	%	
132	52.8	118	47.2	2.38

TABLE 1 Prevalence of ECC.

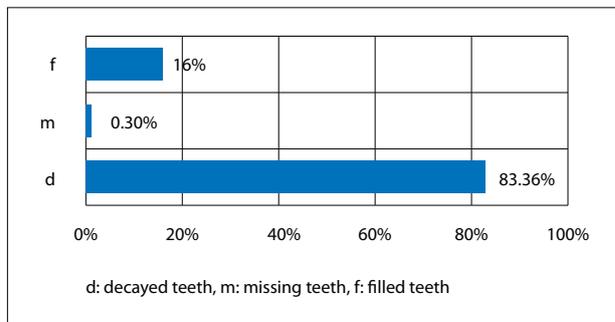


FIG. 1 dmf structure.

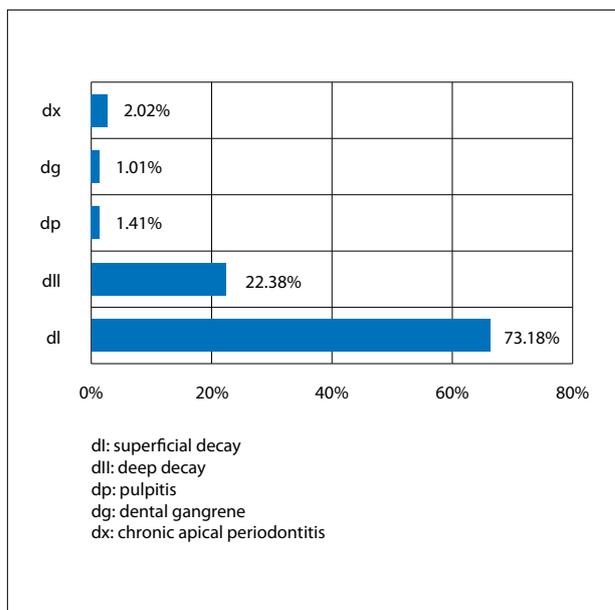


FIG. 2 Progression of ECC in the maxilla.

Teeth in the intercanine space							
Upper jaw				Lower jaw			
d	m	f	h	d	m	f	h
82	/	/	1418	/	/	/	1500

d- decayed teeth
m- missing teeth
f- filled teeth
h- healthy teeth

TABLE 2 Number of decayed, missing, filled and healthy teeth in the intercanine space in children.

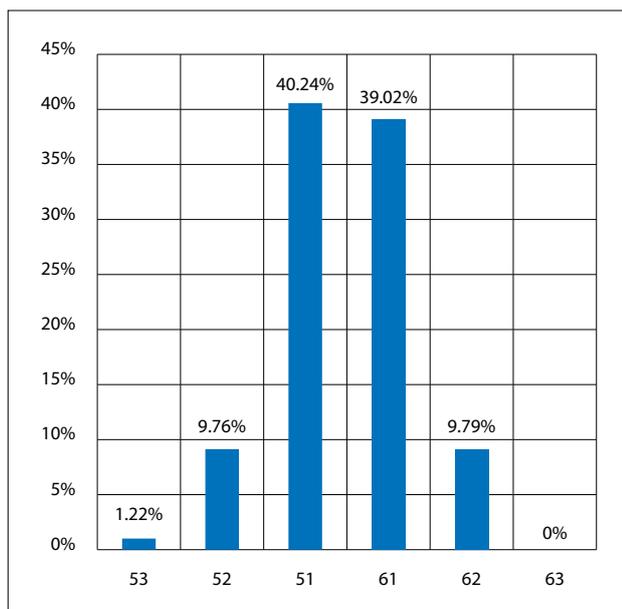


FIG. 3 Frequency of ECC on the teeth within the intercanine space.

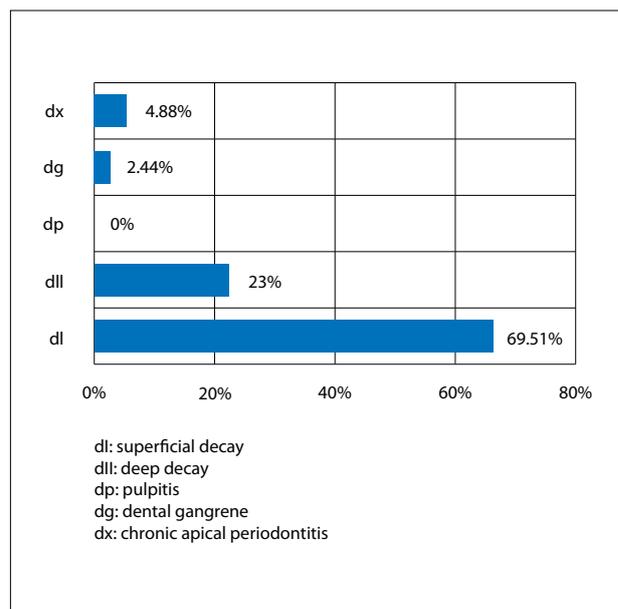


FIG. 4 Progression of ECC on the teeth in the intercanine space.

Discussion

Early childhood is essential for the development and improvement of oral health. ECC is an important and rather big public health problem worldwide [Kumarihamy et al., 2011; Al-Jewair and Leake, 2010; Finlayson et al., 2017]. According to the reports, it is one of the most common chronic infectious diseases in childhood, resisting control due to its multifactorial aetiology [Leong, 2013].

Evaluating the data obtained during dental examination of the enrolled children, we can see that the prevalence of ECC in the studied sample is 52.8%, which suggests that this disease is among the most prevalent diseases affecting pre-school children, as indicated by the studies performed throughout the world [Anil and Anand, 2013; Bankel et al., 2006; Petti et al., 2000].

The prevalence of ECC is different in different world regions. In England, the reported prevalence is 6.8-12%; in the USA, 11-53.1%; in Asia, 36-85%; in India, 44%, in Sweden, 11.4%; and in Italy, 7-19% [Stromberg et al., 2012; Nobile et al., 2014; Ripa, 1988; Drury et al., 1999; Schroth et al., 2007; Berkowitz, 2003]. Recent studies have shown that ECC is more prevalent in undeveloped and less developed countries, as well as among the minorities living in well-developed countries [Congiu et al., 2014]. In Serbia, a growing trend of ECC has been observed, which is presumably associated with a rapid decline in living standards, a therapeutic approach in the disease resolution, and some specific demographic, psychosocial, and behavioural characteristics of the region, that could possibly change the biological

basis of the disease and are still insufficiently studied. A special concern in that regard is also the fact that a higher incidence and prevalence of ECC can later translate into a greater number of decayed teeth in the mixed and permanent dentition, which brings the problem to another, higher level and additionally burdens the health care system. One of the reasons for such a high prevalence of ECC is the fact that we do not pay enough attention to prevention.

In our sample, the value of dmf was 2.38. Similar results have been obtained in Iran and Chile, where the average number of affected teeth has been in the range from 2.1 to 3.8 [Mazhari et al., 2007; Kaste et al., 1996]. However, in well-developed countries, the average number of primary teeth affected by ECC is markedly lower, ranging from 0.6 to 0.87 [Willems et al., 2005].

In the structure of dmf in our study, tooth decay predominated in relation to missing or filled teeth, suggesting, together with the general risk factors, late diagnosis of the disease. Most children visit a dentist for the first time because of pain. A low number of filled teeth (16%) can be observed in association with that. The study performed in Banja Luka from 2008 to 2010 enrolling children aged 2-6 years who attended the Center for Pre-School Education, showed a high prevalence of caries, 35.35% (with caries diagnosed in the form of already created dental cavity). Most of the affected teeth were not treated (as high as 92.69%) [Obradović et al., 2016].

Compared to the teeth in the maxillary intercanine space, in our study we observed that ECC most commonly affected upper central incisors, followed

by lateral incisors and canines, which could possibly be related with the order of appearance of teeth and, consequently, longer exposure to the factors predisposing to ECC. Lower front teeth are not usually affected by caries because of an adequate salivary flow in that region (presence of sublingual and submandibular salivary glands), and the protective effect of tongue in the process of self-cleaning. The studies worldwide reporting on the involvement of individual front teeth by caries are scarce, but most of the authors agree that the vestibular surfaces of upper incisors are the ones most commonly affected [Willems et al, 2005]. The prevalence of caries affecting the upper front teeth in pre-school children in Europe, Africa, Asia, Middle East, and North America ranges from 1-12%, while the percentage of ECC in undeveloped and developing countries is as high as 70% in pre-school children [Njoroge et al., 2010; Milnes, 1996; Senesombath et al., 2010].

Conclusion

The following conclusions may be drawn based on the set aims, used methodology and analysis of the obtained results.

- ECC was present in 52.8% of the studied children from Niš.
- Superficial decay was the most common form.
- In the structure of dmft, tooth decay predominated related to missing or filled teeth.
- Maxillary central incisors were the teeth most commonly affected by caries.

Our own study and numerous studies worldwide show that ECC is a common disease. A high prevalence of ECC in Niš requires intense preventive-prophylactic and health education work with both the children and their parents. Moreover, early diagnosis of the risk factors for ECC is mandatory, as well as the diagnosis of caries itself and timely and sophisticated treatment of ECC in order to preserve the primary teeth in the mouth to the time of their physiological replacement by permanent teeth.

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