Prevalence of dental caries in 3–6-year-old children in Prishtina, Kosovo



V. Rrustemaj[1,2], B. Bahtiri Rrustemaj[3], M. Lapter Varga[4] , L. Ferizi Shabani[3,5], S. Anic Milosevic[4]

[1]*School of Dental Medicine, University of Zagreb, Zagreb, Croatia*
[2]*UBT-College, Dental Faculty, Prishtina, Republic of Kosovo*
[3]*Department of Paediatric and Preventive Dentistry, University Dentistry Clinical Center of Kosovo, Prishtina, Republic of Kosovo*
[4]*School of Dental Medicine, University of Zagreb, Zagreb, Croatia, Department of Orthodontics*
[5]*Department of Dentistry, Alma Mater Europaea Campus College Rezonanca, Prishtina, Republic of Kosovo*

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email: vrrustemaj@sfzg.hr

Abstract

Aim The aim of this study was to evaluate the dental caries status in deciduous dentition and associated risk factors in kindergarten children in Prishtina, the capital of Kosovo.

Material and methods A cross-sectional study was performed among 655 kindergarten children aged 3-6 years from Prishtina. Dental health status was assessed using the World Health Organization (WHO) caries diagnostic criteria for decayed, extracted and filled surfaces of the teeth (defs index) in the deciduous dentition. At the same time, a questionnaire was completed with the children's parents/guardians to identify potential risk factors associated with deciduous dental caries. Statistical analysis was performed using frequencies, means, and chi-square test.

Results The mean number of decayed tooth surfaces was high in all age groups and increased with the age of the children, while the mean value of the defs index in 3-6-year-old kindergarten children was 10.05 ± 15.348. Boys tended to have higher defs scores compared to girls (10.69±15.101 / 9.18±15.665). The questionnaire developed with the children's parents/guardians revealed that 455 (69.5%) out of 655 of their children brushed their teeth without parent/guardian supervision, 51.9% of children brushed their teeth only once a day and visited the dentist once a year (77.6%).

Conclusion The deciduous dental caries status of kindergarten children in Prishtina remains serious problem. Regular dental check-ups, accompanied by oral health education through regular tooth brushing, and dental visits are recommended for all kindergarten children and the children's parents/guardians.

KEYWORDS Oral health, defs index, 3-6 years old, kindergarten children, parents/guardians.

Introduction

Dental caries is considered a serious public health problem because of its negative impact on children's physical and mental health. In fact, dental caries is associated with pain, impaired growth and development, speech disorders, and often premature tooth loss leading to chewing problems and loss of self-confidence [Al-Qatami et al., 2023; Clementino et al., 2015; Su et al., 2018; Tadi et al., 2018; Tortora G et al., 2023].

Deciduous teeth are more affected by dental caries, mainly because the tissues that make up the tooth are thinner than those of permanent teeth and caries progresses rapidly. This can be accompanied by complications such as pulpitis and apical periodontitis, which can also affect the development of permanent teeth. Other factors that cause dental caries include sweetened foods and beverages, lack of regular oral hygiene and dental visits, and failure to use preventive measures [Dukić et al., 2011; Zeng et al., 2018].

According to the World Health Organization (WHO), dental caries is one of the most prevalent diseases worldwide, ranking third among chronic non-infectious diseases after cancer and cardiovascular disease. It is also one of the most prevalent diseases, ranking first in caries of permanent teeth (2.3 billion people) and twelfth in deciduous teeth (560 million children) [Chapain et al., 2023; Su et al., 2018]. According to the data, 60-90% of children and the vast majority of adults are affected by dental caries. Based on the latest data from Global oral health status report, the estimated global average prevalence of caries of deciduous teeth is 43%, and 134 of 194 (69% of countries) WHO Member States have prevalence figures of more than 40%. Prevalence ranges from 46% in upper-middle-income countries to 38% in high-income countries. Case numbers are highest in lower-middle-income countries (244 million cases) and lowest in high-income countries (45 million cases) [World Health Organization, 2022].

To analyze the caries rate and treatment planning, the World Health Organization (WHO) selected five age groups for the study corresponding to the basic oral health surveys: 5 years, 12 years, 17-18 years, 35-44 years, and 65-74 years [Petersen, 2003; World Health Organization, 2013].

It has been reported that the caries distribution in the primary dentition follows a typical pattern. The caries pattern varies not only according to age, gender, race, dietary habits, oral hygiene practices, geographic location, and so-

cioeconomic status, but also within the oral cavity. Not all tooth surfaces are equally susceptible to caries. Therefore, it is important to know the relative caries susceptibility of teeth in the maxillary and mandibular arches [Saravanan et al., 2005]. It is very important to pay attention to oral health promotion and education in preschool settings to reduce the high rate of dental caries. Learning healthy habits reduces the risk of developing dental diseases such as caries. This is achieved when parents/guardians instruct their children to brush their teeth with fluoride toothpaste at least twice a day, especially in the morning and before bedtime [Chapain et al., 2023]. The studies conducted so far in Kosovo on preschool and school children show high levels of dental caries and poor oral health [Begzati et al., 2010; Begzati et al., 2011; Ferizi et al., 2022; Ferizi et al., 2018; Ferizi et al., 2017; Latifi-Xhemajli et al., 2023]. This is probably due to the lack of dental clinics and paediatric dentists in all kindergartens and schools in the country. The underlying causes of children's dental caries are often complex and related to country-economic, cultural, social or political factors. Additionally, dietary habits, irregular tooth brushing, and infrequent dental visits are considered significant factors in increasing the prevalence of dental caries in children. On the other hand, the lack of fluoridation methods has a substantial impact on the rise in dental caries rates [Ferizi et al., 2017; Han JY et al.,2020].

However, studies on the defs index in the primary dentition have not yet been conducted in kindergarten children in our country. Since there are few studies on this topic in our country, the present study was conducted to obtain information on oral health requirements of 3- to 6-year-old children in the capital of Kosovo, Pristina. This basic data will help in planning and implementation of appropriate preventive measures, restorative care and maintenance of oral health of children.

Materials and Methods

Research design and participants

This present study was carried out between the period of August 2021 and December 2021, whereas data were collected through an epidemiological survey. The study was conducted in the eastern part of the Republic of Kosovo, in the capital Prishtina. The study was conducted in all eleven kindergartens in Prishtina (eight public and three private ownership kindergardens), with a total of 655 children of both sexes. Each kindergarten was previously informed by the Municipal Directorate of Education of Pristina about the study to be conducted.

A systematic random procedure was used to select the study participants. The sample size was proportional to the number of children in each selected kindergarten. The children were randomly selected based on their name lists from the rosters of each class.

Ethical approval was obtained from the Ethics Committee of the School of Dental Medicine, University of Zagreb, Croatia, under reference number 05- PA -30- XXIII -1/2021; Date: 29.01.2021 and the Directorate of Education of the Municipality of Prishtina (Protocol number: 03-610/01-56638/21; Date 26.03.2021. We also obtained written permission for this study from the Dental Chamber of Kosovo with protocol number: 17/2021; Date: 19.07.2021).). Consent was obtained from parents/guardians, who were informed by the kindergarten management prior to data collection.

All procedures performed with human participants in the present study conformed to the ethical standards of the institutional and/or national research committee and the 1975 Declaration of Helsinki, revised in 2000.

Children aged 3 to 6 years who attended a kindergarten in Prishtina and were present on the day of the study and whose parents/guardians had given their full consent were included. Children whose parents/guardians had not permitted to the clinical examination of the child, whose children suffered from serious systemic diseases or syndromes, six-year-old children with erupted first permanent molars and who were not ready for the clinical examination were excluded.

Six dental students were trained to collect data and two dentists (one paediatric dentist and one orthodontist) were trained to perform the examination. The caries diagnosis protocol was taken from the WHO guideline for dental caries diagnosis criteria, 1997, for epidemiological studies [World Health Organization, 2013].

Interexaminer agreement was assessed by re-examining a 10% random sample of children on a different day in the same week. A dental student selected the children for follow-up. After the dental examination, each child received an oral health report.

Clinical examination

A dental examination was performed on all randomly selected children to determine the presence of caries. The dental examination was performed in a kindergarten classroom under natural light using a dental mirror and probe. A more detailed index was calculated for each tooth surface, namely the defs index (decayed, extracted due to caries, and filled surfaces of deciduous teeth). For molar teeth, 5 surfaces were considered, and for anterior teeth, 4 surfaces were considered. A tooth surface was classified as carious (ds) if a lesion had a visible cavity, undermined enamel, or a soft dentin floor or wall. A tooth was classified as extracted (es) if it was missing due to caries. A tooth was recorded as filled surface (fs) if it was permanently filled without caries.

Oral health questionnaire

The questionnaires and parental consent forms were distributed and collected during scheduled parent-teacher meetings in kindergarten facilities. All teachers in each kindergarten received unified training before the study began. The children's parents/guardians were asked to complete a questionnaire related demographic background: gender and age, and children's oral hygiene behaviors (daily frequency of tooth brushing, parental supervision of tooth brushing, and use of toothpaste with fluoride) and the frequency of dental visits during the year (never, once a year, once within 6 months, or several times a year).

Statistical Analysis

Data processing was performed using the Statistica 64 version 10 software package for Windows and the PASW Statistical 18 software package. Analysis included frequencies and means. The chi-square test was used to analyze the distribution of children by age and gender. A p value of ≤ 0.05 was considered statistically significant.

Results

A total of 655 children participated in the study. Three hundred seventy-eight (57.7%) of them were boys, and the remaining 42.3% were girls. By age, most study participants were 5 years old (224 children), followed by 4-year-olds (190 children), 6-year-olds, and 3-year-olds (162 and 79 children, respectively) (Table 1). The defs index was higher in the 3- to 6-year-old children, with a mean value of 10.05±15.348, partly due to the higher

Age		Gender		Total
		Boys	Girls	
3	N	40	39	79
	% within age	50.6%	49.4%	100.0%
	% within gender	10.6%	14.0%	12.1%
4	N	105	85	190
	% within age	55.3%	44.7%	100.0%
	% within gender	27.8%	30.7%	29.0%
5	N	137	87	224
	% within age	61.2%	38.8%	100.0%
	% within gender	36.2%	31.4%	34.2%
6	N	96	66	162
	% within age	59.3%	40.7%	100.0%
	% within gender	25.4%	23.8%	24.7%
Total	N	378	277	655
	% within age	57.7%	42.3%	100.0%
	% within gender	100.0%	100.0%	100.0%
Chi-square test		χ2 = 3.340	df = 3	p= 0.342

TABLE 1 Distribution of kindergarten children by gender and age

Tooth surface	Age (years)	n	Mean±SD	95% CI*		Min.	Max.
				h1	h2		
decayed (ds)	3	79	7.71±13.947	4.58	10.83	0	78
	4	190	8.55±15.112	6.39	10.72	0	88
	5	224	8.76±14.144	6.90	10.63	0	65
	6	162	9.91±14.040	7.73	12.09	0	65
	Total	655	8.86±14.367	7.76	9.96	0	88
extracted (es)	3	79	0.80±2.339	0.27	1.32	0	10
	4	190	0.77±3.547	0.27	1.28	0	32
	5	224	0.93±2.980	0.54	1.32	0	22
	6	162	1.64±3.237	1.14	2.14	0	16
	Total	655	1.04±3.165	0.80	1.29	0	32
filled (fs)	3	79	0.22±0.983	0.00	0.44	0	8
	4	190	0.14±0.811	0.02	0.25	0	8
	5	224	0.12±0.500	0.05	0.19	0	3
	6	162	0.19±0.560	0.10	0.27	0	3
	Total	655	0.15±0.685	0.10	0.21	0	8
decayed + extracted+ filled surfaces (defs)	3	79	8.72±14.857	5.39	12.05	0	88
	4	190	9.46±16.132	7.15	11.77	0	88
	5	224	9.80±14.954	7.83	11.77	0	73
	6	162	11.73±15.182	9.38	14.09	0	66
	Total	655	10.05±15.348	8.87	11.23	0	88

TABLE 2 Mean and standard deviation for defs index based on age

mean value of decay tooth surfaces in all age groups (ds=8.86±14.367). The mean number of es values were slightly higher in 6-year-old children, with an overall average of 1.04±3.165. On the other hand, the fs index had lower values in all children aged 3 to 6 years (fs= 0.15±0.685). It should be noted that defs increases with the age of children, so that the average values from 3 to 6 years were 8.72, 9.46, 9.80, and 11.73, respectively (Table 2).

The results on the structure of the defs index by gender, presented in Table 3, also show that the ds component was higher in boys than in girls (9.52±14.233/7.95±14.524). This difference between the sexes was also observed in the average defs index, which was 10.69±15.101 in boys, whereas the average defs index in girls was 9.18±15.665.

From the data presented in Table 4, 649 (99.1%) of the parents/guardians reported that their child brushed their teeth, but 455 (69.5%) of them confirmed that their child brushed their teeth without the supervision of the parents/guardians. In addition, most parents/caregivers (85.6%) reported that children's toothpaste contains fluoride. Regarding the frequency of tooth brushing and visits to the dentist, 51.9% of children brushed their teeth once a day and visited the dentist mostly once a year (77.6%).

Tooth surface	Gender	n	Mean	95% CI*		Min.	Max.
				h1	h2		
decayed (ds)	Boys	378	9.52±14.233	8.08	10.96	0	88
	Girls	277	7.95±14.524	6.23	9.67	0	66
	Total	655	8.86±14.367	7.76	9.96	0	88
extracted (es)	Boys	378	1.04±3.253	0.71	1.37	0	32
	Girls	277	1.05±3.046	0.69	1.41	0	28
	Total	655	1.04±3.165	0.80	1.29	0	32
filled (fs)	Boys	378	0.13±0.496	0.08	0.18	0	4
	Girls	277	0.18±0.880	0.08	0.29	0	8
	Total	655	0.15±0.685	0.10	0.21	0	8
decayed + extracted+ filled surfaces (defs)	Boys	378	10.69±15.101	9.16	12.22	0	88
	Girls	277	9.18±15.665	7.32	11.03	0	73
	Total	655	10.05±15.348	8.87	11.23	0	88

TABLE 3 Mean and standard deviation for defs index based on gender

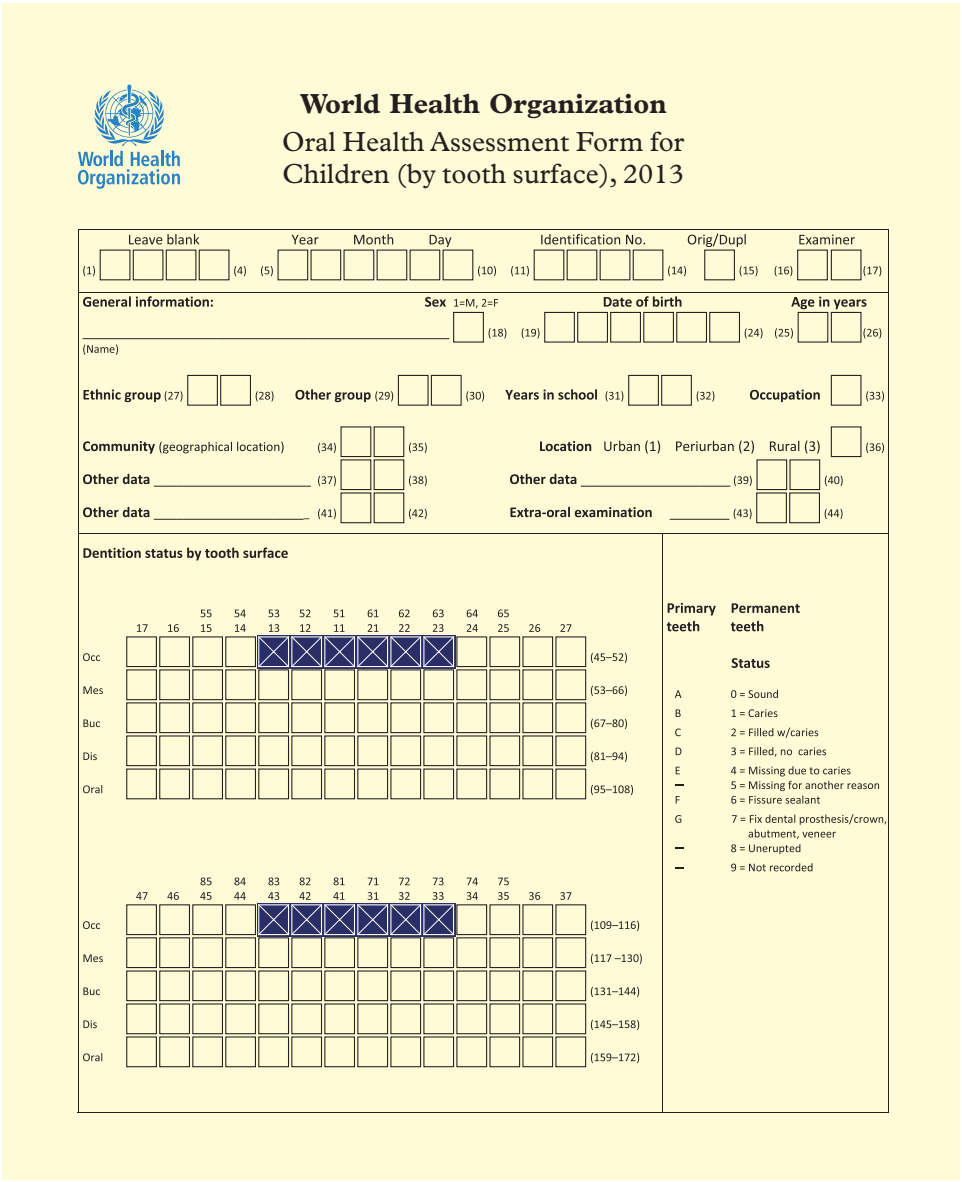
Variables	Frequency (N)	Percentage (%)
Does your child brush his/her teeth?		
Yes	649	99.1
No	6	0.9
Does he/she brush their teeth alone?		
Yes	455	69.5
No	200	30.5
Does your child's toothpaste contain fluor?		
Yes	561	85.6
No	94	14.4
How many times a day does your child brush his/her teeth?		
Once a day	340	51.9
Twice a day	305	46.6
More than twice a day	10	1.5
How often do you send your child for a dental visit?		
Never	17	2.6
One a year	508	77.6
Once within 6 months	77	11.8
Several times a year	53	8.1

TABLE 4 Parents/guardians' knowledge, attitudes and practices regarding their children's oral hygiene and dental visits

Discussion

Oral health is very important for young children because it affects not only their general health but also their normal physiological and psychological development [Nomura et al., 2019]. Many studies provide information on caries in permanent teeth, but there is little information on caries in deciduous teeth. The results of our study are significant because they highlight the extent of the caries problem in this specific population. According to the results of this study, a significantly high level of dental caries was observed in the estimated paediatric population, which gradually increased with age and was higher in boys than in girls. These findings are consistent with some previous studies [Al-Meedani and Al-Dlaigan, 2016; Jain et al., 2015].

In addition, the current study showed high scores of the ds component of the defs index in the children studied, indicating an increased risk of caries. In 1981, WHO and the World Dental Federation FDI jointly formulated oral health targets to be achieved by the year 2000, aiming for 50% of 5-to 6-year-olds to be free of dental caries [Petersen PE., 2003; World Health Organization, 2013]. The same results regarding high caries rates were also found in a previous study in Kosovo on early childhood caries and the dmft index of children aged 1-6 years, with the average dmft index also increasing with the age of the children [Begzati et al., 2010]. These results were higher than in other studies [Elidrissi and Naidoo, 2016; Jamshidi et al., 2022; Nobile et al., 2014], and these high values can be explained by the lack of dentists in kindergartens, but also by the lack of oral health



World Health Organization

Oral Health Assessment Form for Children (by tooth surface), 2013

Leave blank (1) (4) Year (5) Month Day (10) Identification No. (11) (14) Orig/Dupl (15) Examiner (16) (17)

General information: Sex 1=M, 2=F (18) Date of birth (19) (24) Age in years (25) (26)

(Name)

Ethnic group (27) (28) Other group (29) (30) Years in school (31) (32) Occupation (33)

Community (geographical location) (34) (35) Location Urban (1) Periurban (2) Rural (3) (36)

Other data (37) (38) Other data (39) (40)

Other data (41) (42) Extra-oral examination (43) (44)

Dentition status by tooth surface

Primary teeth Permanent teeth

Status

A 0 = Sound
B 1 = Caries
C 2 = Filled w/caries
D 3 = Filled, no caries
E 4 = Missing due to caries
– 5 = Missing for another reason
F 6 = Fissure sealant
G 7 = Fix dental prosthesis/crown, abutment, veneer
– 8 = Unerupted
– 9 = Not recorded

promotion and education programs in Kosovo.

Brushing teeth as soon as the first deciduous tooth erupts is very important for maintaining oral health [Zeng et al., 2018]. However, young children have not yet developed the manual skills to brush their teeth, so help or supervision from parents or guardians is very important. In contrast, the results of our study show the opposite, with most children brushing their teeth alone, without the presence of a parent or guardian.

Furthermore, our study found a strong positive correlation between caries development and toothbrushing practices. It is known that the more frequently children brush their teeth, the less caries they develop. According to the results of our study, most children brush their teeth only once a day, which is not enough to prevent dental caries, even if the toothpaste contains fluoride. Although some studies have shown that the use of fluoride toothpaste can effectively prevent dental caries [Zeng et al., 2018]. Our results are comparable to those of other studies in which children of the same age brush their teeth only once a day [Jaggi et al., 2019; Zeng et al., 2018]. It is very important to educate not only children, but also parents, caregivers, and educators in kindergartens about oral health and toothbrushing habits, as this is the only approach to improve children's oral health. In our country, all children up to the age of fifteen are eligible for free dental services in public clinics and hospitals. In contrast, most parents/guardians of the children in the current study reported that their children visit the dentist only once a year, which is significantly related to the high rate of dental caries and low tooth brushing habits. According to dentists, parents' motivation is the most important factor in children's dental care. This is also evident from the study by Aljafari et al. [2022] in which parents reported that only 16% of their children (942 children) attended regular dental checkups. In the future, it is very important that parents/guardians, as well as kindergarten teachers, are encouraged to send their children for dental checkups every three to six months, as recommended for children in this age group, in order to prevent the early onset of dental caries and to apply preventive measures such as fluoridation and dental sealants

The strengths of this study were that all public kindergartens were included and that we completed all questionnaires with parents/guardians. In addition, this was the first time we applied the defs index to kindergarten children, so the results of the current study can be compared with other future studies.

However, this study also has some limitations. Firstly, the study participants included kindergarten children in the capital of Kosovo, Prishtina; therefore, those who did not attend kindergarten (although this population was very small) were not included. Second, in a questionnaire, the information obtained from the memory of the parents/guardians may not be entirely accurate, mainly due to the long period of time used in the study, which may have led to recall bias. Finally, this is a cross-sectional study, so causal conclusions are limited.

Conclusions

The kindergarten children in Prishtina are severely affected by caries. Most of them have a high number of teeth with untreated caries. Moreover, parents/guardians don't have enough knowledge about brushing children's teeth and visiting the dentist. Therefore, oral health education programs should be conducted not only in kindergartens but also in the various institutions where parents/guardians work to improve the information about taking care of their children's oral health.

It is also necessary to employ paediatric dentists in each kindergarten, as this increases the possibility of not only treating caries in children, but also the implementation of oral health prevention and education programs.

Data Availability

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

Author's Contribution

VS, BB and LFSH designed and coordinated the study. VS and LFSH performed dental examinations. MLV and SAM contributed to the data analysis and results interpretation. VS, BB and LFSH wrote the manuscript. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest related to the publication of this work.

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