

The relation between oral hygiene skills and the prevalence of dental caries among 4 - 6-year-old children

Jaunė Razmienė, Giedrius Vanagas, Eglė Bendoraitienė, Aurelija Vyšniauskaitė

SUMMARY

Aim of the study. To evaluate the tooth brushing skills and the prevalence of dental caries as well as its intensity in relation to oral hygiene skills among 4 – 6-year-old children.

Material and methods. The cross-sectional study was performed from November 16, 2009 to January 12, 2010. 235 children (4 – 6-year old) were randomly selected from kindergartens in Plungė and Jonava in Lithuania. The results of study were registered in the special forms prepared in accordance with the recommendations of WHO. Parents of the children were asked to fill in the questionnaires.

Results. The results of the study show that 91% (Plungė) and 90% (Jonava) of 4 – 6-year-old children have caries in their primary teeth. The prevalence of caries is different in relation to age: 78.7% of 4-year-old children, 97.3% of 5-year-old children, and 95.3% of 6-year-old children. The intensity of caries is as follows: 4.9 (SN=±4.9), 7.5 (SN=±4.5), and 8.2 (SN=±4.7).

Conclusions. There is the high prevalence of caries, particularly of not treated forms, among 4 – 6-year-old children. The oral hygiene index is just satisfactory.

Key words: dental caries, prevalence, intensity, dmf index, oral hygiene.

INTRODUCTION

Dental caries is a multifactorial disease with a complex of factors which cause its beginning. They are the following: microorganisms, plaque, under-development of enamel structure, social factors, education level of parents, and socioeconomical status [1]. Dental caries is widely spread among children of different age groups in Lithuania. In 2002 one study highlighted, that the prevalence of caries among 3-year-old children was 50.6% and the prevalence of early childhood caries was 6.5% [1]. Older children have higher prevalence of caries which attacks not only primary, but permanent teeth as well [2]. The first permanent molars are damaged frequently [3]. The forms of complicated dental

caries are frequent and their treatment is complex and expensive. The treatment of dental caries often ends up with tooth extraction what results in occlusion anomalies, dysfunctions of chewing system, and esthetical defects. It is caused by psychological problems and widely spread anxiety of dental treatment [4].

The scientists researching aetiology and pathogenesis of dental caries have been concentrating on the local factor (dental plaque) recently [5]. Dental plaque contains various microorganisms, metabolism products of bacteria, salivary proteins, and food particles. The longer plaque stays on teeth, the more organic acids are released. These acids are used by bacteria in their metabolism and they give the beginning for dental caries [5]. The evaluation of the Oral Hygiene Index is very important in the study of dental caries aetiology [5,6,7]. The investigations on the topic show the influence of dental plaque on the occurrence of dental caries [5,6].

The most effective way to fight dental plaque is a regular tooth brushing. The study performed by V. Vaitkevičienė et al. in Kaunas [8] shows that 85.5% of 3 – 7-year-old children brush their teeth regularly (once or twice a day) and 1.6% of them do not brush their teeth at all. However, oral hygiene

¹*Clinic of Oral Health and Pediatric Dentistry, Academy of Medicine, Lithuanian University of Health Sciences*

²*Department of Preventive Medicine, Academy of Medicine, Lithuanian University of Health Sciences*

*Jaunė Razmienė*¹ – PhD student

*Giedrius Vanagas*² – MD, PhD, lect.

*Eglė Bendoraitienė*¹ – D.D.S., PhD, assoc. prof.

*Aurelija Vyšniauskaitė*¹ – D.D.S.

Address correspondence to Dr. Jaunė Razmienė, Department of Oral Health and Paediatric Odontology, Lithuanian University of Health Sciences, Luksos Daumanto Str. 6, LT-50106 Kaunas, Lithuania.

E-mail address: jaune.razmiene@gmail.com

levels of children from smaller towns of Lithuania are not known.

The aim of the study is to evaluate oral hygiene skills among 4 – 6-year-old children. It shows the prevalence of dental caries and its intensity in relation to oral hygiene skills.

METHODS

Study design

A cross-sectional study design was used.

Study participants. 4 – 6-year-old children, living in towns of Plungė and Jonava, attending kindergartens. The kindergartens were selected from the alphabetical list of the educational institutions in the municipalities of Jonava and Plungė. The first and the last ones from the lists were chosen. All 4 – 6-year-old children from those kindergartens were examined.

Ethical considerations

The permission for the examination of the children was received from the Bioethics committee (November 4, 2009 Nr.BE-2-19) as well as from the educational departments in the municipalities of Jonava and Plungė (November 16, 2009 Jonava, December 18, 2009 Plungė). Parents of the children were introduced with the aims and the procedures of the study. They were asked to sign the consent.

Study instruments and organization

The study was conducted from November 16, 2009 to January 12, 2010. The study was performed by: the dental examination of the children's teeth and the questionnaires for the parents about oral hygiene habits of their children. The dental examination was performed according to methodology of oral status evaluation recommendations by WHO, using a dental mirror, a probe and a light source. The results of the dental examination were registered in the forms, prepared according to WHO recommendations, [9] as well as in the questionnaires filled by the parents. The parents were informed about their children dental status and the fact whether the dental treatment is necessary.

The study evaluated the intensity and the prevalence of dental caries, as well as oral hygiene of the children. Healthy, caries affected, filled, extracted, and sealed teeth were recorded. 5 different surfaces of the teeth were evaluated separately.

Dental caries and its intensity were evaluated using dmf (primary teeth) and dmf-s (surfaces of primary teeth) Indexes. Dmf Index stands for d- decayed, f - filled, m- missing teeth per child. The mean

value of dmf is calculated adding individual dmf scores and dividing from the number of examined people. The number of missing teeth is not given because of a physiological teeth shifting.

Complicated dental caries was evaluated separately. There is not a standard methodology for the evaluation of complicated caries. Seeking to know its prevalence in df score, deep and wide enamel and dentine defect reaching the pulp chamber and roots were taken into consideration.

The oral hygiene status was evaluated using Silness-Loe Plaque Index (PLI) [7]. The index evaluates the amount and the location of plaque. The plaque disclosing agent is not used. The probe is scratched along the surface of the tooth and result is given in the following form:

- 0 – no plaque;
- 1 – plaque is located on gums and a tooth neck area;
- 2 – plaque is seen on tooth neck area and interdentially;
- 3 – plaque covers a whole tooth surface.

PLI is calculated adding scores and dividing from the number of teeth. The meanings of the scores are the following: 0 – excellent oral hygiene; 0.1-0.9 – good; 1.0-1.9 – satisfactory; 2.0-3.0 – bad.

Study questionnaire

The questionnaires were filled in by parents. They provide the information for the evaluation of tooth brushing skills as well as parents' attitude towards oral hygiene of their children. Tooth brushing skills were evaluated using the following questions: Does a child brushes his/her teeth twice a day – score 1; once a day – score 2; irregularly (2-4 times a week) – score 3; does not brush his/her teeth at all – score 4.

Statistical data analysis was made using standard data analysis programme packets SPSS 16. The data were analysed using descriptive statistics, the statistical hypotheses about average rate differences. The feature interdependence was analysed. The χ^2 criterion and the Fisher criterion were used to check the hypothesis. The level of significance 0.05 was chosen to assess the statistical hypotheses.

RESULTS

Sociodemographic characteristics of the study participants

The total number of 235 children in 4-6-year-old age group were involved to the study; accordingly: 75 of them were 4-year-old, 75 – were 5-year-old,

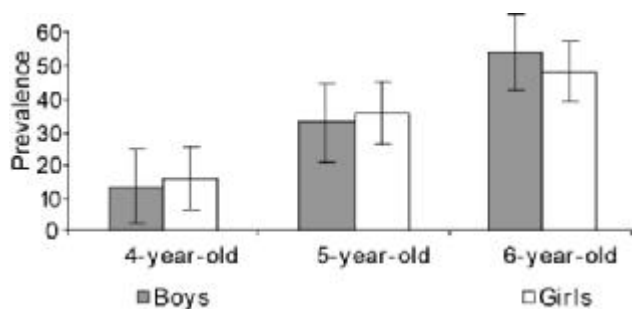


Fig. 1. The Prevalence of Complicated Caries in Primary Teeth Surfaces in Relation to the Age and Gender of Examined Children

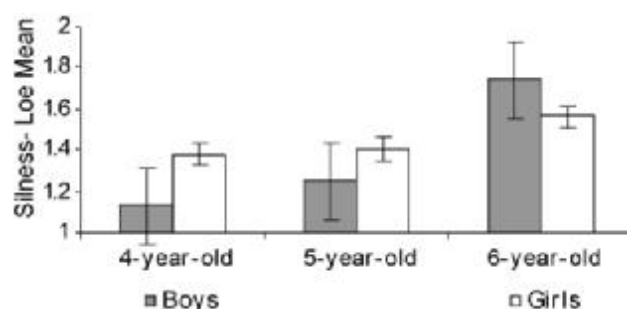


Fig. 2. The Silness- Loe Mean Value in Relation to Age and Gender

and 85 of them were 6-year-old. 117 (49.8%) of the children were boys and 118 (50.2%) of them were girls. Among 6-year-old children status of permanent teeth was the following: the number of healthy teeth was 2.4 (± 1.69); unerupted 1.18 (± 0.69), caries affected 0.25 (± 0.74), sealed 0.18 (± 0.69).

The prevalence and the intensity of dental caries

The study results show that 91% (Plungė) and 90% (Jonava) of 4 – 6-year-old children have caries in their primary teeth. The caries prevalence has no statistically significant difference in both towns. The prevalence of caries was different in age groups: 78.7% of 4-year-old children, 97.3% of 5-year-old children, and 95.3% of 6-year-old children. The intensity of caries was as follows: 4.9 (SN= ± 4.9), 7.5 (SN= ± 4.5), and 8.2 (SN= ± 4.7). There was higher prevalence and intensity of caries among the older children (Table 1).

Assessing the number of decayed and filled surfaces of the children’s teeth the score of the caries prevalence in primary teeth surfaces varied from 6.3 (4-year-old girls) to 14.2 (6-year-old girls). The score of the filled teeth surfaces was from 0.2 (4-year-old boys) to 2.0 (6-year-old boys). Older children had more decayed and filled teeth surfaces than younger children.

The prevalence of complicated caries

The evaluation of the prevalence of complicated caries was performed in the study (Figure 1)

The prevalence of complicated dental caries was higher among older children and it ranged from 22.6% to 60.9% ($\chi^2=11.1$; $p=0.004$) and from 16.1% to 48.2% ($\chi^2=21.6$; $p<0.001$) in the group of boys and girls as well. There was the following relation: the older the children the higher the prevalence, accordingly: 4-year-old – 30.0%; 5-year-old – 41.5%, and 6-year-old – 49.7%.

Children oral hygiene

Assessing the prevalence and intensity of dental caries, the children dental status was related to the accumulation of dental plaque. The oral hygiene index was calculated in accordance with Silness-Loe method. (Figure 2)

The study results show that children oral hygiene status could be valued as satisfactory. According to the collected data, older children had worse tooth brushing skills and their plaque level was higher. The boys` mean index values ranged from 1.13 to 1.74 ($p=0.026$) and for the girls - from 1.38 to 1.56 ($p=0.143$).

The evaluation of tooth brushing frequency and regularity highlighted that 161 (68.5 %) of the children brushed their teeth regularly – once or twice

Table 1. The intensity of caries in primary teeth surfaces among 4 – 6-year-old children (n=235) (DF-s and compound parts mean values) and the distribution by age and gender

Age	Gender	Primary teeth surfaces				
		df V (SN)	%	d V (SN)	fV (SN)	%
4	Boys (n=31)	7.7 (± 13.6)	100	7.5 (± 13.6)	0.2 (± 0.6)	2.64.5
	Girls (n=44)	6.6 (± 7.0)	100	6.3 (± 7.0)	0.3 (± 0.7)	
5	Boys (n=40)	14.2 (± 11.8)	100	12.5 (± 12.1)	1.7 (± 2.9)	12.07.0
	Girls(n=35)	12.8 (± 9.8)	100	11.9 (± 10.2)	0.9 (± 2.1)	
6	Boys (n=46)	15.2 (11.4)	100	13.2 (± 11.9)	2.0 (± 3.0)	13.27.8
	Girls (n=39)	15.4 (11.0)	100	14.2(± 10.7)	1.2 (± 2.0)	

a day, and 74 (31.5%) of the children brushed their teeth irregularly or did not brush at all (Table 2).

According to this study, the frequency of regular tooth brushing did not differ significantly between girls and boys ($p=0.401$). The results also showed that regular tooth brushing was lower among older children. It varied from 80% (4-year-old children) to 57.6% (6-year-old children). The oral hygiene status was better in the group of children who brushed their teeth regularly, their Silness-Loe index and the prevalence of caries was statistically significantly lower (Table 2). The score in df-s index of complicated caries was 39.4 % in the group of the children with regular tooth brushing skills and 73.6% in the group of the children with irregular tooth brushing skills.

DISCUSSION

The study data showed that the prevalence of dental caries was very high among 4 – 6-year-old children. The prevalence of dental caries was higher among older children. According to the results of the study there was a high prevalence of untreated forms of dental caries. This could be associated to insufficient oral hygiene skills among children in Lithuania. The analysis of df-s composition showed that most of dental caries cases were affected by untreated teeth of children: the df score of filled teeth was only from 2.6% to 13.2%. Our data analysis indicated that complicated dental caries in primary teeth ranged from 30% to 49.7%.

This study results also showed that the prevalence of caries among 4-year-old children was 78.7%, in 5-year-old children group was 97.3%, and in 6-year-old children group was 95.3%. The

intensity of caries was 4.9 (4.9), 7.5 (4.5), and 8.2 (4.7) respectively. The data of 2003 study in Kaunas city showed, that the prevalence of dental caries among 4-6-year-old children was [2]: for 4-year-old children - 62.2%, 5-year-old children - 76.1%, 6-year-old children - 93.3%. Comparing the results of this study with the other countries, the prevalence of caries among 4-year-old children ranged from 39% (USA, 1999) to 46% (Sweden, 2002) [10,11,12], among 5-year-old children - from 34% (Norway, 2007) to 60% (Spain, 1998) [13,14,15], and among 6-year-old children - from 76.8% (Turkey, 2002) to 91.5% (Hungary, 2000) [16,17]. Dmf mean value in the group of 4 – 6-year-old children ranged from 0.12 (Iceland, 2005) to 5.07 (Israel, 2005) [18,19]. Taking into consideration the differences in the prevalence of dental caries among studies it is possible to state that the prevalence of caries in our examined population is much higher than the average. It could be related to the availability of dental treatment, and worse oral hygiene skills as well as to parents' attitudes towards oral hygiene of their children [20]. The significant differences in dental caries prevalence in different countries can be also related to different caries examination criteria used, such as counting all lesions and cavities or only cavities, also to the ethnical, cultural, behavioural, nutrition and oral hygiene differences [1].

This study highlighted only satisfactory level of children oral hygiene, Silness-Loe index was 1.4. Only 22% of the examined children brush their teeth twice a day, 46.5% of them brush their teeth once a day and 31.5% of the children brush their teeth irregularly (more than one third of the examined children). The research made in 2002 and 2005

Table 2. The Comparison of the Prevalence of Caries and Oral Hygiene Index in Relation to Children Tooth Brushing Skills

Index	Tooth brushing		χ^2	P value
	Regular (n=161)	Irregular (n=74)		
Age				
4 (n=75)	80.0%	20.0%	9.2	p=0.01
5 (n=75)	69.3%	30.7%		
6 (n=85)	57.6%	42.4%		
Gender				
Boys (n=117)	65.8%	34.2%	2.9	p=0.401
Girls (n=118)	71.2%	28.8%		
The prevalence of caries	86.9%	97.3%	13.7	p=0.003
The prevalence of complicated caries	34.2%	71.6%	37.9	p<0.001
Silness-Loe index	0.93	2.19	81.5	p<0.001

among the population of Kaunas city showed that 43.2% of children had moderate or bad oral hygiene, while 56.8% of children had good oral hygiene [2,8]. According to this study, the oral hygiene skills get worse among older age group children. They brush their teeth more irregularly and it can be related to the attitude changes in their families: parents, probably, pay more attention to younger children tooth brushing and older ones are more self-dependent. The frequency of tooth brushing statistically is significantly related to the intensity of caries. The research shows that training children for good oral hygiene skills, it is possible to get lower the dmf score in certain period of time [21]. However, there are not any preventive training programs for tooth brushing in Lithuania.

The main disadvantage of this study can be regarded in the way of the dental caries examination. The compressed air and saliva suction as well as modern methods (such as X-rays) were not used. These factors could influence the evaluation of the study results. This study is important, because it combined both: examination and parents' questionnaires data on oral hygiene skills of their children. All the data were collected by one paediatric dentist, so there are no assessment biases for evaluation criteria used and in their interpretation. The study deals with three age groups of children, thus there is a possibility to compare differences in oral health status in different age

groups. Seeking to make this type of study more clinically objective, it would be advantage to use the methodology of longitudinal studies and to evaluate the efficacy and the influence of different prophylactic agents on the caries prevalence. Also, it would be advantage to evaluate the relation between parental oral hygiene skills, their attitudes towards oral hygiene skills in their children and the prevalence and intensity of dental caries.

CONCLUSIONS

1. The prevalence of caries among 4 – 6-year-old children in Plungė and Jonava was 91% and 90% respectively. The prevalence of caries was different in age groups (the older the children the higher prevalence) and it ranged from 78.7% to 95.3%. The intensity DF score was from 4.9 to 8.2.

2. The prevalence of complicated dental caries in primary teeth was higher among older children and it ranged from 30% to 49.7%. The prevalence of complicated dental caries in primary teeth was significantly different in relation to oral hygiene skills among children: regularly tooth brushing - 39.4% and for irregular tooth brushing - 73.6%.

3. The regular tooth brushing was less prevalent in older age groups. Children with regular tooth brushing had, statistically significant lower prevalence of dental caries and twice lower Silness-Loe index Score.

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