

# Oral health of 12 and 15 year-old adolescents living in the social care homes in south of Lithuania

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## SUMMARY

**Objectives.** To evaluate oral health conditions and determine risk factors of dental caries of adolescents living in social care homes in the South of Lithuania and to compare the results with adolescents of the same age in general population.

**Materials and methods.** Subjects of study are 12 and 15 year-old adolescents from all social care homes and 3 schools of Alytus county, Marijampole county and Vilnius city. 55 adolescents living in social care homes (study group) and 55 adolescents living outside social risk families (control group) were clinically examined between February and September of 2019. The clinical study assessed: 1) the prevalence and incidence of caries using the decayed-missing-filled teeth (DMFT) index, 2) the oral hygiene status using the Silness and Loe index, 3) the salivary buffer capacity using Ivoclar Vivadent CRT Buffer indicators. The R-package was used for statistical analyses. Threshold for statistical significance set at  $p < 0.05$ .

**Results.** Prevalence and incidence of caries in study group was higher compared with adolescents of the same age in general population – prevalence 81.82 % and 69.1 %, respectively, DMFT medians 3 and 1, respectively. Social living environment, age or gender were not statistically significant determinants for oral hygiene or salivary buffer capacity. The correlation between oral hygiene and DMFT indices was statistically significant. Both – oral hygiene and salivary buffer capacity – fit into linear regression model and were statistically significant.

**Conclusions.** Adolescents, living in social care homes, were found to have poorer oral health with higher prevalence of caries than those living in families. Poor oral hygiene and low salivary buffer capacity have been identified as significant risk factors for the development of caries.

**Key words:** oral health, dental caries, oral hygiene, dental plaque, foster home care.

## INTRODUCTION

Children, residing in social care homes, could be considered as one of the most vulnerable social groups (1). The separation from parents may negatively affect their psychology, emotions and social behavior, these children may lack social and cultural identity which is not apparent in children living with their parents (2). For these reasons children in social care may have more mental health issues, poorer eating habits, weaker immune system and tendency to have health problems, including a higher risk of oral diseases such as dental caries (3).

Although the prevalence of caries in developed countries is decreasing in recent decades, it is still the leading oral disease in the world. The prevalence of dental caries is up to 90% among children and adolescents (4). Based on the results of various studies, children, residing in social care homes, are considered to be at an increased risk group for developing caries (3). During examinations in Mazeikiai, Plunge, Akmene and Telsiai social care homes it was concluded that the accessibility of dental services is sufficient however prevalence of caries among these children is high and the knowledge of oral health and oral care is deficient (5).

Oral health is important for physiological and psychosocial well-being: ability to talk, chew, smile and socialize without psychological discomfort (6). It also impacts daily activities: due to oral diseases, toothache, frequent dental appointments or medicine

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assumption children may skip classes, be inattentive during lessons. All of these factors may have an influence on diminished academic achievements of children and have impact on their behavior (7).

Evaluating existing studies of children's population, we can only make assumptions that adolescents, residing in social care homes, have poorer oral health compared with peers living with their parents in Lithuania. Any clear conclusions cannot be made due to lack of studies and data. It is also important to figure out which risk factors (poor oral health or low salivary buffering capacity) have the biggest impact on oral health.

The main objectives of this study was to evaluate oral health conditions and determine risk factors of dental caries of adolescents living in social care homes in the South of Lithuania and to compare the results with adolescents of the same age in general population.

## MATERIALS AND METHODS

The study protocol (number 158200-17-904-416) was approved by Vilnius Regional Biomedical Research Ethics Committee.

### Study population

Clinical examination of the oral cavity was performed in 21 social care homes in South Lithuania counties: Marijampole, Alytus and Vilnius city between February and September of 2019. Only healthy 12-year and 15-year-old adolescents without any mental and physical disabilities were included into the study (55 in total). The time of examination was planned in advance and confirmed by the head of institution. Consents from adolescents and their supervisors were received. All adolescents residing at care homes at that time were examined.

Control group was selected at random from schools of the same regions. One school from every region (3 in total) was selected by computer and all 12 and 15 year-old adolescents were examined who were present at school at that time. All information was sent to the selected school in advance and consents from adolescents and their parents were received.

### Data collection

An oral examination was performed by the same investigator. Clinical examination of the mouth was carried out using a 22 mm diameter dental mirror, a straight type 9 mm length dental probe "Explorer" and a periodontal probe of Community Periodontal Index for Treatment Needs (CPITN) with 3.5, 5.5,

8.5, 11.5 mm color-coded marking and 0.5 mm round tip. All adolescents were examined in an ordinary chair in room light.

To determine the incidence of dental caries, the DMFT index were used: D – decayed, M – missing due to caries, F – filling due to caries. The diagnostic threshold was according the WHO plus initial lesion, when active initial lesion were also defined as caries (8). If one tooth has caries and filling, it is considered as 'decayed'.

Dental plaque was evaluated by the Plaque Index (Silness and Loe, 1964). Four surfaces of all teeth were examined. The teeth were assessed visually using ordinary lighting, a dental mirror and a probe. Grading scale from 0 to 3 was used. Plaque Index was grouped into four categories and used as a categorical variable in statistical analysis: excellent 0; good 0.1-0.9; average 1.0-1.9; bad 2.0-3.0.

Salivary buffer properties were assessed using Ivoclar Vivadent CRT Buffer indicators. The saliva was taken with special disposable 3 ml plastic pipettes and transferred on indicator papers by Ivoclar Vivadent. Other steps of the saliva test were performed following the instructions of the manufacturer. To ensure the reliability of the data and to minimize subjective interpretation by the investigator, saliva indicator results were photographed with Apple iPhone X by assigning an identification code to the photograph.

### Statistical analysis

Data were analyzed using R packages. Any  $p$  values of less than 0.05 ( $p < 0.05$ ) was considered statistically significant. Normality of distribution was assessed using Shapiro-Wilk test. To evaluate correlation between DMFT and oral hygiene, DMFT and salivary buffer capacity Spearman's rank correlation coefficient was used. Non-parametric Kruskal-Wallis test and Wilcoxon signed-rank test were performed to find significant differences between categories. Risk factors were identified using a linear regression model.

## RESULTS

The study involved 55 adolescents, residing in social care homes. By age, 42% of subjects were 12 years old and 58% of subjects were 15 years old. By location, 55% of examined adolescents were from Vilnius, 25% from Marijampole and 20% from Alytus counties social care homes. By gender, 58% of subjects were boys and 42% – girls.

The prevalence of caries in a study group was 81.82%. The incidence of caries of boys was

**Table 1.** Distribution of oral hygiene status by gender, age, county of the study group

	0	1	2	3	Total (%)	Total (n)
<b>Distribution of oral hygiene status by gender</b>						
Boy	3.1	53.1	21.9	21.9	100.0	32
Girl	13.0	43.5	26.1	17.4	100.0	23
<b>Distribution of oral hygiene status by age</b>						
12	9.4	53.1	21.9	15.6	100.0	32
15	4.3	43.5	26.1	26.1	100.0	23
<b>Distribution of oral hygiene status by county</b>						
Alytus	9.1	18.2	45.5	27.3	100.1	11
Marijampolė	0.0	78.6	7.1	14.3	100.0	14
Vilnius	10.0	46.7	23.3	20.0	100.0	30

**Table 2.** Distribution of saliva buffer characteristics by gender, age, and county of the study group

	low	average	high	Total (%)	Total (n)
<b>Distribution of saliva buffer characteristics by gender</b>					
Boy	3.1	50.0	46.9	100.0	32
Girl	13.0	47.8	39.1	99.9	23
<b>Distribution of saliva buffer characteristics by age</b>					
12	6.2	50.0	43.8	100.0	32
15	8.7	47.8	43.5	100.0	23
<b>Distribution of salivary buffer characteristics by county</b>					
Alytus	18.2	36.4	45.5	100.1	11
Marijampolė	7.1	35.7	57.1	99.9	14
Vilnius	3.3	60.0	36.7	100.0	30

**Table 3.** Distribution of oral hygiene status by gender, age, county of the control group

	0	1	2	3	Total (%)	Total (n)
<b>Distribution of oral hygiene status by gender</b>						
Boy	15.8	31.6	42.1	10.5	100.0	19
Girl	19.4	55.6	22.2	2.8	100.0	36
<b>Distribution of oral hygiene status by age</b>						
12	15.6	50.0	28.1	6.2	99.9	32
15	21.7	43.5	30.4	4.3	99.9	23
<b>Distribution of oral hygiene status by county</b>						
Alytus	23.1	46.2	23.1	7.7	100.1	13
Marijampolė	21.4	42.9	28.6	7.1	100.1	14
Vilnius	17.9	46.4	25	10.7	100.0	28

**Table 4.** Distribution of saliva buffer characteristics by gender, age, and county of the control group

	low	average	high	Total (%)	Total (n)
<b>Distribution of saliva buffer characteristics by gender</b>					
Boy	10.5	63.2	26.3	100.0	19
Girl	16.7	55.6	27.8	100.1	36
<b>Distribution of saliva buffer characteristics by age</b>					
12	15.6	53.1	31.2	99.9	32
15	13.0	65.2	21.7	99.9	23
<b>Distribution of salivary buffer characteristics by county</b>					
Alytus	7.7	61.6	30.8	100.1	13
Marijampolė	14.3	57.1	28.6	100.0	14
Vilnius	17.9	50.0	32.1	100.0	28

2.5±3.0 and girls 3.0±4.5. No statistically significant difference was found between these two groups ( $p>0.05$ ). The incidence of DMFT was 2.0±3.25 in 12-year-old adolescents and 3.0±3.0 ( $p>0.05$ ) in 15-year-old adolescents. Comparing the incidence of DMFT in different counties, no statistically significant differences were observed ( $p>0.05$ ).

The control group involved 55 adolescents of general population. The prevalence of caries was 69.1%. Dental health of adolescents of general population was statistically significantly better than the study group ( $p<0.01$ ), DMFT medians 1 and 3, respectively.

Distribution of oral hygiene and salivary buffer capacity by gender, age and county of the study group could be found in Table 1 and Table 2. Distribution of oral hygiene and salivary buffer capacity by gender, age and county of the control group could be found in Table 3 and Table 4. No statistically significant differences in both groups were found ( $p>0.05$ ) but it can be noted that adolescents, residing in social care homes, were more likely to have bad oral hygiene (20%) than adolescents, living with their parents (5.45%). Meanwhile, excellent oral hygiene was found more frequently in the control group (18.18%) than in the study group (7.27%).

The study excluded subjects with values of all variables greater than  $Q3+3\times IQR$ . The data of these subjects were excluded and not used in statistical analysis (one subject of the study and four subjects of the control groups).

There were no significant differences in dispersion of DMFT indices between different salivary buffer capacity categories. There were also no significant differences in dispersion of DMFT indices between different hygiene indices. The hypothesis of a normal distribution of DMFT indices data was rejected ( $p<0.0001$ ) therefore a nonparametric Kruskal-Wallis test was applied. Significant differences in DMFT indices values between oral hygiene indices categories were found ( $p<0.05$ ). No significant differences were found between DMFT indices and salivary buffer capacity categories ( $p>0.05$ ). Post-hoc Mann Whitney Wilcoxon test was applied to identify significant pairs. A significant differ-

ence was found between the hygiene indices groups "0" and "3" ( $p < 0.01$ ) (Tables 5 and 6).

The Spearman's rank correlation was used to verify the correlation. The correlation between oral hygiene indices and DMFT indices was statistically significant ( $p < 0.01$ ). The inverse correlation between DMFT indices and salivary buffer capacity categories was identified but it was not statistically significant ( $p > 0.05$ ).

Linear regression model between the DMFT indices (dependent variable) and independent variables 'hygiene index' and 'salivary buffer capacity' showed that both independent variables were risk factors for caries ( $r^2 = 0.24$ ,  $p < 0.001$ ).

## DISCUSSION

The present study showed that there are differences in oral health between adolescents in institutional care and those in families. Out of 55 adolescents, living in social care homes, even 45 adolescents (81.82%) had at least one tooth with caries. Meanwhile, among adolescents living with their parents of the same age, at least one tooth with caries was found in 38 adolescents (69.1%) of the 55 examined. The difference of medians of DMFT index was statistically significant, 3 and 1, respectively ( $p < 0.01$ ). Such differences in oral health may be attributed to the role of parents or social workers in the life of the child. Parents usually have the main role in prevention of oral diseases for children. The oral hygiene habits of their children depends on knowledge about health, nutrition, hygiene and even higher education of parents (9). In foster care, the child is supervised by a social worker assigned to him or her, who has to take care of several or even more other children at the same time. It may be difficult to give enough time for everybody both physically and due to limited resources in social facilities. The problem arises that not enough attention may be given to oral health and instructions

of proper hygiene habits. Meanwhile, better oral health among adolescents in families, as found in the study, may be a consequence of parents paying more attention to the oral hygiene of their children.

Almost half of the subjects in both the study and control groups had good oral hygiene: 27 (49.09%) out of 55 in foster care and 26 (47.27%) out of 55 in families. It should be noticed that girls in both groups had excellent oral hygiene more often as compared to boys, also adolescents living in families (18.8%) than living in social care homes (7.27%). Bad oral hygiene was more common among boys than girls and for adolescents living in foster care (20%), compared to adolescents of the same age living with their parents (5.45%). Gender differences in oral hygiene are also highlighted by Markeviciute G. and Narbutaite J. in a 2015 study which showed that the oral hygiene of girls was statistically better than boys,  $0.86 \pm 0.36$  and  $1.28 \pm 0.45$ , respectively (10). Statistically better oral hygiene among girls was also found in a 2018 study by Paradnikaite, where the mean values of the Silness and Loe index for boys were  $1.71 \pm 0.13$  and for girls  $1.34 \pm 0.12$  (5). This can be attributed to the fact that girls are more inclined to care about their appearance, aesthetics and their body hygiene (11). Differences in oral hygiene depending on the social environment may also be attributed to the lack of knowledge and practical oral care skills among adolescents in social care. Over 80% of children and adolescents living in foster homes in 2019 Lithuanian study had average or bad oral hygiene and 79.1% surveyed social workers agreed that children should be better informed about oral health and care (5). Similar situation was found in another study: the majority of the examined children in foster care had average or bad oral hygiene and only about half of the subjects stated that they brushed their teeth twice a day (10). Other studies also confirm that Oral Hygiene Index (OHI) values of children in families are better than those in foster care (12, 13). Gaur et al. estimated OHI scores of

**Table 5.** The influence of oral hygiene on dental health

OHI	$\bar{X}$	SD	IQR	0%	Md (50%)	75%	100%	Total (n)
0	0.750000	0.9574271	1.25	0	0.5	1.25	2	4
1	3.074074	2.7585660	3.50	0	3.0	4.50	11	27
2	4.230769	4.1863637	4.00	0	3.0	6.00	14	13
3	4.727273	2.6111648	2.50	1	4.0	6.00	10	11

**Table 6.** Influence of salivary buffer capacity on dental health

Saliva buffer capacity	$\bar{X}$	SD	IQR	0%	Md (50%)	75%	100%	Total (n)
low	5.250000	2.217356	2.75	3	5.0	6.50	8	4
average	3.481481	2.806180	3.50	0	3.0	5.50	10	27
high	3.250000	3.638562	4.00	0	3.0	4.00	14	24

children in foster care were significantly lower in comparison with children living with parents (13). Similar results can be found in another study by Al-Jobair et al. where OHI scores were higher among children of social care homes compared to the control group ( $p < 0.001$ ) (12).

Bad oral hygiene is highlighted as one of the risk factors for caries in various studies. The study conducted in Poland revealed that poor oral health ( $DMFT \geq 7$ ) among 15-year-old adolescents was associated with toothbrushing less than twice a day, use of fluoride-free toothpaste, frequent snacking and absence of pit and fissures sealants (14). Christian and colleagues discovered that among 12-year-old adolescents living in social care homes, children who answered positively to the question 'Has anyone taught you how to brush your teeth correctly?' had lower incidence of caries by 40%. Other questions about tooth brushing frequency, cariogenic drink intake, dental appointments did not show significant results for caries incidence (3).

The results of this study showed that about half of participants had average salivary buffer capacity: 49.09% adolescents in the study group and 58.18% adolescents in the control group. No statistically significant differences were found between these groups nor gender, age or county ( $p > 0.05$ ). There are a lot of different studies that prove the importance of salivary buffer capacity in neutralizing bacterial acid and importance of salivary flow rate in rinsing dental plaque (15, 16). The study in 2015 investigated the influence of various saliva physiological properties on the development of dental caries (16). The results showed that salivary buffer capacity values in group with active caries were statistically significantly lower than in the caries-free group. Among subjects with active caries, the salivary buffer capacity of boys was higher than girls and no significant differences were found between different age groups.

In the current study, oral hygiene and buffering capacity of saliva were selected as possible risk factors for dental caries. The goal was to determine if the latter factors were significant for caries incidence. The study found a statistically significant correlation between oral hygiene and DMFT index. It was observed that as oral hygiene deteriorated, DMFT index

score increased and statistical significance was found between hygiene index groups "excellent" and "bad" ( $p < 0.001$ ). Both factors: oral hygiene and salivary buffer capacity, were identified as risk factors for caries using a linear regression model  $r^2 = 0.24$  ( $p < 0.001$ ).

Examining the possible caries risk factors, no statistically significant differences were found between adolescents living in the social care homes and general population, however, caries prevalence in children in care was found to be statistically significantly higher. The study also found that poor oral hygiene and low salivary buffer capacity were risk factors for the development of caries in both the study and control groups. As mentioned earlier, oral health may also be influenced by the social or emotional well-being of the individual, which may be adversely affected by the social isolation and inadequate sugar-rich diet of teenagers in institutional care. Further research is needed to investigate the effects of social exclusion and nutrition on oral health.

## CONCLUSIONS

Most teens have good oral hygiene and average salivary buffer capacity. There are no statistically significant differences considering gender or age. Adolescents, living in social care homes, are more likely to have poorer oral health with higher prevalence of caries than general population. Poor oral hygiene and low salivary buffer capacity are risk factors for caries. Poor oral hygiene is a more significant risk factor than low salivary buffer capacity.

After this study, it may be noted that it is important to raise awareness on oral diseases and to educate social workers and residents in social care homes.

## CONFLICT OF INTEREST

The authors state no conflict of interest.

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