ORAL HEALTH STATUS OF 6- AND 12-YEAR-OLD CHILDREN OF ROMA ORIGIN FROM EASTERN SLOVAKIA: A PILOT STUDY

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SUMMARY

Objective: The purpose of this study was to determine the prevalence and clinical effect of untreated dental caries in Roma children from eastern Slovakia using dmft/DMFT index and SiC index, association between dental caries development and oral hygiene, dietary habits and preventive dental care.

Methods: Dental caries were assessed by recording the dmft index (for primary dentition) and the DMFT index (for permanent dentition) that are used to assess the state of teeth, which expresses the current state of teeth or its development in an individual or the entire population. The SiC index was calculated as the mean dmft of one-third of the population with highest caries scores. The normality of data distribution was tested by Shapiro-Wilk test. P-value < 0.05 was considered statistically significant. Chi-square test was used to compare proportions (oral hygiene, dietary habits and preventive dental visit). Data were analysed using ordered logistic regression and t-test. The study includes questionnaire containing 5 questions about dietary habits, oral hygiene and preventive dental visit.

Results: The results of presented study confirmed higher average values of DMFT (3.24) in the population of 12-year-old Roma children and lower average values of dmft (2.5) in the second group (p < 0.05). The value of SiC index represented 6.10 in the group of six-year-old and 7.66 in twelve-year-old children. Logistic regression was performed to test the magnitude of the association between dental caries and related factors. There was statistically significant association between average value dmft/DMFT and dietary habits, oral hygiene, and preventive dental visit in both study groups.

Conclusion: The study revealed insufficient oral hygiene of the Roma children population. Systematic implementation of preventive examinations for oral hygiene and health programmes are needed to promote oral health. The study represents a pilot study of the SiC index values in Roma minority population from eastern Slovakia.

INTRODUCTION

The World Health Organization (WHO) provided the definition of health, according to which health is a state of complete physical, mental and social well-being. Oral health is an integral part of overall health of human organism, and it means healthy teeth and surrounding tissues, i.e., quality state of individual's teeth (1). Dental caries occurrence represents a specific issue of oral health. In general, the majority of oral diseases is of complex nature and results from infectious microbial agents, inborn and environmental factors (2). Dental caries affects a majority of children and adults worldwide, and represents a major public health problem due to the fact that disease burden and associated concomitants (pain, tooth loss, trouble learning, eating, and sleeping, days of missed school/work, emergency room visits) are concentrated in vulnerable populations such as racial and ethnic minorities, and those living in rural areas and in poverty (3).

Excessive intake of free carbohydrates, inadequate exposure to fluorides and without regular removal of microbial biofilm lead to destruction of the tooth structure, resulting in the appearance of pain. Lack of oral hygiene affects the quality of life associated with oral health, and in the advanced stage there is a loss of teeth, loss of dental pulp vitality, systemic infection and other pathological manifestations in the orofacial area (4, 5).

Roma minority population living in eastern Slovakia has certain characteristic features that differ from the Slovak majority population. These differences have a significant impact on their health status, including dental status (6–10). Oral health is influenced by both medical and preventive care. Medical care remedies the consequences of dental diseases, but cannot prevent them, where, on the other hand, preventive measures can handle it.

MATERIALS AND METHODS

In this study a total of 659 children (both genders) were enrolled, including 344 6-year-old probands and 315 12-year-old probands of Roma origin living in socially deprived area in the

East region of Slovakia (Kežmarok-Podhorany, Červenica, Svinia, Šarišské Michaľany, Košice – Lunik IX). Children were divided into two groups with primary (6-year-old) and permanent dentition (12-year-old). The dental examinations were performed in every subject. Caries experience data (DMFT/dmft) was collected according to established protocols. DMFT/dmft scores were evaluated according to the WHO criteria (11). Oral examinations were carried out in classrooms with the help of a plain mirror and the ballpoint probe under daylight or, when necessary, using a portable source of light. The same examiner performed all examinations. No radiographs were taken. The written consent was signed by the children's parents or caregivers. All study protocols for participant recruitment and data collection were approved by the institutional Review Board and by the institutional Ethics Committee.

In Slovakia, the dmft index (for primary dentition) and the DMFT index (for permanent dentition) are used to assess the state of teeth, which expresses the current state of teeth or its development in an individual or the entire population. The cariosity of the primary and permanent teeth was evaluated using the dmft/DMFT index, i.e., mean value per 1 individual, sum of decayed (d), missing (m) and filled (f) teeth. The SiC index was calculated as the mean dmft of one-third of the population with highest caries scores. Finally, the obtained value constituted the SiC Index. The normality of data distribution was tested by Shapiro-Wilk test. The Chi-square test was used for comparison of categorical variables and the t-test was used for the comparison of continuous variables between the two groups. P-value < 0.05 was considered statistically significant. The study includes questionnaire containing 5 questions about dietary habits, oral hygiene and preventive dental visit. The interviewer asked the participants to answer each question (Table 1). The questionnaire was designed to be computer readable and all answers from the respondents were collected using this digital system. Ordered logistic regression estimates relationships between an ordinal dependent variable and one or more categorical or continuous explanatory variables. In addition, the odds ratio of the relationships was calculated (Table 2). The statistical software STATISTICA 13.5 was used for data processing.

RESULTS

The study revealed that 46.5% of six-year-old Roma children brush their teeth without toothpaste, with 172 probands in the group of twelve-year-old having the most common response to the frequency of dental brushing once a day (54.6%) ($\chi^2 = 23.09$; $p < 0.001$). A specific issue for children at school age is an excessive intake of sweetened drinks and consumption of sweets leading to a caries process. For this reason, we focused on drinking sweetened drinks as well as eating sweets. As many as 296 (86%) children from the 6-year-old Roma group drink sweetened drinks one to three times a day, but respondents from the 12-year-old Roma group responded up to 13 times more often ($\chi^2 = 31.73$; $p < 0.001$). In this respect, tooth decay is a rapid process, particularly in individuals who are neglecting dental hygiene and consuming fermentable sugars. In the six-year-old group, up to 318 (92.4%) consume sweets daily, while in the twelve-year-old group, 292 individuals (92.6%) consume sweets each day ($\chi^2 = 0.02$; $p = 0.900$). The lack of knowledge of dental care also causes failure in annual preventive check-ups at the dentist. Only 5.3% of children in the twelve-year-old group underwent a preventive check-up, while 53 probands in the

Table 1. *Dental care in 6- and 12-year-old Roma children (N = 659)*

Variable	6-year-old children (n = 344)		12-year-old children (n = 315)		p-value
	n	%	n	%	
Brushing teeth					
Brushing without toothpaste	160	46.5	143	45.3	<0.001
Once a day (with toothpaste)	161	46.8	172	54.6	
Twice a day (with toothpaste)	23	6.6	–	–	
Drinking sweetened drinks					
One to three times a day	296	86.0	309	98.0	<0.001
More than three times a day	48	13.9	6	1.9	
Drinking unsweetened drinks					
One to three times a day	310	90.1	240	76.1	<0.001
More than three times a day	34	9.8	75	23.8	
Consumption of sweets					
Once a week	26	7.5	23	7.3	0.900
Daily	318	92.4	292	92.6	
Exceptionally	–	–	–	–	
Preventive dental visit					
Yes	53	15.4	17	5.3	<0.001
No	291	84.5	298	94.6	

six-year-old group underwent a preventive check-up ($\chi^2 = 17.35$; p < 0.001) (Table 1).

Higher DMFT values may be due to the lifestyle and nutritional regimes, as Roma children involved in our study have a low economic and social status. Another prerequisite for higher caries index is an excessive intake of fermentable sugars and consequent tooth decay (Table 1).

In Table 2 the risk assessment takes into account caries status and oral hygiene, dietary habits, and preventive dental visits with present or absent dental caries in 6- and 12-year-old children. As for the oral hygiene practices and dental caries of 6-year-old children there was a statistically significant difference between the mode of cleaning and the prevalence of caries (p < 0.001). It was inferred that 6-year-old Roma children who brush teeth with toothpaste once a day were at 1.2 times higher risk of developing dental caries as compared to children who brush teeth with toothpaste twice a day and without toothpaste (OR = 1.20, 95% CI: 0.20–1.45). We observed very similar results in the second study group – 12-year-old Roma children (p < 0.001). The odds ratio of getting caries was 4.09 times higher in children who brush teeth with toothpaste once a day (OR = 4.09, 95% CI: 3.63–4.55).

When comparing another factor that is involved in the development of dental caries, 6-year-old children who drink sweetened drinks one to three times a day were found to be at 1.65 times higher risk of developing caries (p < 0.001). In the second study group, there was a statistically significant difference (p < 0.001) between children who drink sweetened drinks and the development of tooth decay (OR = 11.75, 95% CI: 9.46–14.57).

Consumptions of sweets and dental caries – the odds of getting caries was 0.13 times lower in 6- year-old Roma children who consumed it once a week compared to 6-year-old Roma children who consumed sweets daily (OR = 0.13, 95% CI: 0.06–0.28, p < 0.001). Comparing the consumption of sweets and caries prevalence in the second study group it was inferred that children who consumed sweets daily were at 3.19 times higher risk of caries process (OR = 3.19, 95% CI: 1.80–4.58, p < 0.001).

Preventive dental visit and dental caries of 6-year-old children – there was a statistically significant difference between passing a preventive dental visit and developing tooth decay (p < 0.001) in both study groups of Roma children. The severity of dental caries was also found to be high in children who did not get preventive dental care (dmft = 2.82, OR = 0.94, 95% CI: 0.52–1.71). In the

Table 2. Risk assessment caries status and oral hygiene, dietary habits, and preventive dental visits in 6- and 12-year-old children (N = 659)

Factors	6-year-old children (n = 344)							12-year-old children (n = 315)						
	Total	Dental Caries				dmft		Total	Dental Caries				DMFT	
		Present		Absent		Mean	SD		Present		Absent		Mean	SD
		n	%	n	%				n	%	n	%		
Brushing teeth														
Brushing without toothpaste	160	116	72.5	43	26.8	1.7	1.3	143	80	56	63	44	1	1.1
Once a day (with toothpaste)	161	78	48.4	84	51.6	3.4	3.9	172	122	70	50	30	5.8	4.2
Twice a day (with toothpaste)	23	3	13	20	87	0.52	1.3						–	–
	OR = 1.20, 95% CI: 0.20–1.45					p < 0.001		OR = 4.09, 95% CI: 3.63–4.55					p < 0.001	
Drinking sweetened drinks														
One to three times a day	296	188	63.5	108	36.5	2.54	2.7	309	196	63	113	37	2.9	3.2
More than three times a day	48	9	18.7	39	81.3	2.25	4.7	6	6	100	–	–	17.7	3.9
	OR = 1.65, 95% CI: 0.40–2.20					p < 0.001		OR = 11.75, 95% CI: 9.46–14.57					p < 0.001	
Consumption of sweets														
Once a week	26	15	57.6	11	42.4	6.42	5.7	23	–	–	23	100	0	0
Daily	318	182	57.2	136	42.7	2.18	2.5	292	202	69	90	31	3.5	3.8
Exceptionally	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	OR = 0.13, 95% CI: 0.06–0.28					p < 0.001		OR = 3.19, 95% CI: 1.80–4.58					p < 0.001	
Preventive dental visit														
Yes	53	31	58.4	22	41.5	0.74	0.7	17	9	52	8	48	0.5	0.5
No	291	166	57	125	43	2.82	3.2	298	193	65	105	35	3.4	3.8
	OR = 0.94, 95% CI: 0.52–1.71					p < 0.001		OR = 2.62, 95% CI: 0.97–4.27					p = 0.002	

n – number of subjects; SD – standard deviation; dependent variable: dmft/DMFT – decayed/missing/filled teeth in primary/permanent dentitions; independent variable: brushing teeth, drinking sweetened drinks, consumption of sweets, preventive dental visit; OR – odds ratio; CI – confidence interval

second study group the results were the opposite, the odds of developing dental caries was 2.62 times higher in children with preventive dental care (dmft = 0.5, OR = 2.62, 95% CI: 0.97–4.27).

We then compared the values of the dmft/DMFT index and the Significant Caries Index (SiC) between the group of six- and twelve-year-old Roma children. The average cariosity index in the group of six-year-old Roma children was 2.5 ± 3.071, the SiC index was 6.10; the average cariosity index in the group of 12-year-old children was 3.2 ± 3.832 and the SiC index was 7.6 ± 3.902 (Table 3, 4). The results show that 6-year-old Roma children had a statistically significantly higher incidence of dental caries ($p < 0.05$), but when evaluating the SiC index, children from the 12-year-old group had statistically significantly worse dentition (7.66, $p < 0.05$).

DISCUSSION

Tooth decay is a localized, pathological, destructive process of hard tooth tissues that occurs surficially beneath the surface of the enamel (12). Consumption of sweets, together with a microbial agent and a decrease in pH, helps to create dental caries, which in the early stages appear on the enamel surface as a chalk spot (12). Temporary dentition is particularly susceptible to dental caries and, at the same time, there is a lower degree of mineralization, with a thick dentine layer and short dentine tubules leading to rapid dental caries spread (5).

Aetiology of dental caries has been related to a combination of environmental risk factors (oral hygiene, diet, fluoride exposure, etc.) and genetic predisposition (13). The earlier molecular genetic studies in humans focused on proline rich peptides in saliva and enamel formation genes (2).

In our study the results show that 6-year-old Roma children had a statistically significantly higher incidence of dental caries ($p < 0.05$). For Slovakia, the average value of the carious index for 2017 is dmft = 1.71 (15). Biroš and Beluš in their study (7) report a cariosity index for six-year-old children dmft = 0.7 and

for twelve-year-old children DMFT = 1.9. When comparing our study with the study of Biroš and Beluš (7), we noticed that the dmft index in six-year-old children was higher by 1.8 in our study and in the 12-year-old DMFT group by 1.3, respectively.

Socioeconomic opportunities and stereotypes in the Roma populations are manifested mainly in the consumption of unhealthy foods. 95% of Roma menus are fatty cheap meat, animal and vegetable fats, excessive consumption of sweets and sweet drinks with a high content of simple carbohydrates, low consumption of fruits and vegetables, milk, and dairy products. From the point of view of a healthy diet, especially for children, the low consumption of fish, eggs, legumes, and vegetables is a significant unfavourable indicator. These important nutrition components are being replaced by bread and sweets (15). By examining the dentist's attendance in 2009, it was found that out of the total number of individuals in the survey, 38.7% of Roma children did not visit the dentist at all. In the age group 10–15 years, 10.6% did not participate in the preventive dental examination. In the age group 0–9 years it was 59% (15). Compared to our study, 58.4% of 6-year-old children with dental caries and 52% of 12-year-old children with DMFT higher than 1 underwent a preventive dental examination.

A specific issue for children in school age is excessive intake of sweetened drinks and consumption of sweets. This leads to the creation of incorrect eating habits and the development of dental caries (14). Tooth decay and periodontal disease are the most common chronic infections in the body. Oral diseases are highly prevalent, and their consequences are not only physical but also economic, social and psychological. Very important is the consistent prevention of tooth decay. The main objective in Europe is to develop full-value dental care, where the quality of prevention should be the most important factor in this regard (7, 15). Genetic factors and nutritional aspects are likely to play an important role in their oral health. Studies are currently underway to identify the needs of the Roma ethnic group. The obtained data serve as a basis for the implementation of preventive dental programmes, especially for Roma children (7, 15).

According to the National Health Information Centre (16) in Slovakia, the value of the DMFT index for 12-year-old children dropped from 2.2 in 2008 to 1.71 in 2017 onwards. The best states for dentition of 12-year-old children in this period are Austria, Denmark, Switzerland, and the United Kingdom (DMFT < 1). In Romania, Moldova and Bulgaria, the index of caries was higher than 3 (17). The WHO has declared oral health objectives to reduce caries and its consequences. The aim of the WHO is that children aged twelve should not have a DMFT index higher than 3 (18). According to WHO data, SiC values were 5.6 DMFT in Austria, 4.7 in Australia, 7.3–7.7 in the Czech Republic, 8.1 in Trinidad, and 5.3–6.8 in Germany (19–22). To our knowledge there are no data available about the SiC values for primary and permanent teeth in children of Slovak majority or Roma minority population. Our study presents the results of the SiC values index in Roma minority population, which were set at 6.10 in six-year-old children and 7.66 in twelve-year-old children ($p < 0.05$).

Table 3. *Comparison of mean values of dmft/DMFT index in 6- and 12-year-old Roma children (N = 659)*

Study group	n	dmft/DMFT average value (SD)	p-value
6-year-old children	344	2.5 (3.071)	0.006
12-year-old children	315	3.2 (3.832)	
Whole study group	659	2.85 (3.473)	

n – number of subjects; dmft/DMFT decayed/missing/filled teeth in primary/permanent dentitions; SD – standard deviation

Table 4. *Comparison of mean values of SiC index in 6- and 12-year-old Roma children (N = 659)*

Study group	n	SiC index average value (SD)	p-value
6-year-old children	344	6.10 (2.930)	< 0.001
12-year-old children	315	7.66 (3.902)	
Whole study group	659	6.89 (3.754)	

n – number of subjects; SiC index – significant caries index in primary/permanent dentitions; SD – standard deviation

CONCLUSION

This study represents a pilot study in Roma population highlighting dental caries in school children from eastern Slovakia.

The study revealed insufficient oral hygiene of the Roma children. Systematic implementation of preventive examinations for oral hygiene and health programmes are needed to promote oral health.

Conflict of Interests

None declared

Adherence to Ethical Standards

The study was approved by the Ethics Committee of Presov University, Faculty of Humanities and Natural sciences. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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