

HYGIENIC-DIETARY REGIMEN AND OCCURRENCE OF DENTAL CARIES IN 10-YEAR-OLD CHILDREN IN THE AREA OF BITOLA MUNICIPALITY

ХИГИЕНО-ДИЕТЕТСКИ РЕЖИМ И ПОЈАВАТА НА ДЕНТАЛЕН КАРИЕС КАЈ ДЕЦА ОД 10 ГОДИШНА ВОЗРАСТ НА ПОДРАЧЈЕТО НА ОПШТИНА БИТОЛА

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Abstract

Aim: The main goal of this study is to evaluate the hygienic-dietary regimen and the state of oral health of children 10-year-old children from the Municipality of Bitola from urban and rural environments. **Material and methods:** 300 respondents who were examined at PHI „Dr. Haim Abravanel“ - Bitola were included in the study, including 164 males and 136 females, students in the fourth grade of elementary school. In addition to basic personal and general anamnestic data, data related to the hygienic-dietary regimen of the participants were included, i.e. data on the consumption of different types of food and drinks, as well as frequency and duration of tooth brushing. In the study, the structure of the DMFT index was evaluated, and, the condition of the teeth that had undergone a preventive procedure of fissure sealing was recorded. **Results:** The prevalence of carious, extracted and/or filled teeth was only 20%, among the respondents who brushed their teeth 3 or more times a day. There was a 47.98% incidence of decayed, extracted, and/or restored teeth among children who consumed sugar. We observed carious, extracted and/or filled teeth in 71.43% of the subjects with discarded sealants, and in only 35.44% of the subjects with sealed fissures. **Conclusion:** Regular oral hygiene, controlled intake of sugars, fissure sealing, application of fluorides, health education and promotion of regular preventive dental examinations have an important role in the prevention of dental caries and its complications. **Key words:** dental caries, oral hygiene, nutrition, fissure sealing.

Апстракт

Цел на трудот: Основната цел на овој труд е евалуација на хигиено-диететскиот режим и состојбата на оралното здравје кај деца на 10годишна возраст од општина Битола од градска и рурална средина. **Материјал и методи:** Во студијата беа вклучени 300 испитаници кои што биле на преглед во Службата за заштита на деца до 14 години при ЈЗУ Здравствен дом „Д-р Хаим Абраванел“ - Битола. Беа опфатени 164 машки и 136 женски испитаници, ученици од IV одделение. Покрај основните лични и општи анамnestички податоци беа опфатени податоци кои се однесуваат на хигиено-диететскиот режим на испитаниците, односно податоци за консумација на различни видови на храна и пијалоци, фреквенција и времетраење на четкање на забите. Во истражувањето беше направена и евалуацијана структурата на КЕП индексот, а беше евидентирана и состојбата на забите кај кои претходно било извршено превентивно залевање на фисурите. **Резултати:** Кај испитаниците кои што ги четкале забите 3 или повеќе пати на ден, застапеноста на кариозни, екстрахирани и/или пломбирани заби е само 20%. Кај децата кои внесувале шеќери евидентирани се кариозни, екстрахирани и/или реставрирани заби кај 47.98%. Забележуваме присуство на кариозни, екстрахирани и/или пломбирани заби кај дури 71.43% од испитаниците соодпаднати залевачи, а кај само 35.44% од испитаниците со залевачи. **Заклучок:** Правилната и редовна орална хигиена, контролираниот внес на шеќери, залевањето на фисурите и јамичките на забите, употребата на флуориди, здравствена едукација и промовирањето на редовни превентивни стоматолошки прегледи имаат клучички улога во превенцијата на денталниот кариес и неговите компликации. **Клучни зборови:** дентален кариес, орална хигиена, исхрана, залевање на фисури.

Introduction

Researching the etiology of dental caries is one of the most important tasks in dental science for its successful prevention. Caries is a multifactorial disease caused by complex interactions between the host - the tooth, dental plaque, diet, and time. One of the best definitions of caries is provided by Loesch, who defines it as a chron-

ic, complex, bacterial infectious disease that results in milligram mineral losses in dental structures¹.

The goal of preventive dentistry, as an essential segment of dental medicine, is to recommend and ensure the application of appropriate efficient and effective measures and means for the prevention of dental caries and other oral diseases by applying modern scientific and clinical knowledge in the field of etiopathogenesis.

Despite significant scientific achievements and the fact that caries can be prevented, it continues to be a global public health problem that negatively impacts the quality of life. According to the World Health Organization, 60-90% of school-age children around the world have dental caries, with the highest prevalence among Asian and Latin American children².

In recent decades, there has been a significant decrease in the occurrence of caries in children in highly developed countries^{3,4}. This condition is due to the increased health culture, the application of fluorides and the sealing of fissures and pits, the use of better and more advanced oral hygiene products, improved access to dental health care, as well as preventive campaigns and programs aimed at increasing awareness among the population for the preservation and promotion of oral health. On the other hand, an increased frequency of dental caries has been registered in developing countries, especially in those countries in which preventive dental programs have not yet been established and implemented^{5,6,7}.

Cooperation with the dentist and adherence to his recommendations are the key element for the prevention and early treatment of caries in children. Additional education, motivation, and regular dental check-ups increase the likelihood of interceptive treatment of caries while it is still in a reversible phase. In fact, preventive therapy in dentistry is of exceptional importance and includes lifetime oral health care and maintenance of optimal oral hygiene and a healthy lifestyle^{8,9}.

The primary objective of this paper is to evaluate the hygienic-dietary regimen and the state of oral health in 10-year-old children from the Municipality of Bitola, both in urban and rural settings, in light of current scientific knowledge. Special emphasis was placed on toothbrushing as a basic oral hygiene measure, the types of food that children usually consume and fissure sealing as a key preventive measure in childhood, as well as their impact on the structure of DMFT index and overall oral health.

Materials and methods

300 respondents were included in the study - children aged 10 from urban and rural areas of the Municipality of Bitola, who were examined at the Healthcare Service for children under the age of 14 at PHI Health care Center „Dr. Haim Abravanel“- Bitola. 164 male and 136 female respondents, students in the IV grade from two elementary schools in the city of Bitola, as well as two elementary schools in the rural areas of the municipality of Bitola were used as a representative sample.

The data were collected in a questionnaire for each respondent separately. In addition to the basic personal

and general anamnestic data, data related to the hygienic-dietary regimen of the respondents were included, i.e. data on the consumption of different types of food and drinks which were classified into several categories (milk and dairy products, meat and fish, fruit and vegetables, sweets, cakes and sugary drinks), the degree of oral hygiene expressed through the frequency and duration of tooth brushing, replacement of the toothbrush, etc. The research also included data on the dental status of the respondents through the evaluation of the structure of the DMFT index, regarding the prevalence of permanent teeth with caries, extracted permanent teeth, and permanent teeth with fillings (filled teeth). Also, the condition of the teeth that had previously undergone the preventive procedure of fissure sealing with Fuji TRIAGE[®] glass ionomer, the time of their sealing, the need for their resealing and the time spent since resealing, and that of the first premolars and the first permanent molars were recorded.

All data were collected with the consent of the parents of the respondents, and the examinations were conducted as part of the routine activities carried out by the Department of Pediatrics and Preventive Dentistry in the Municipality of Bitola as part of the action plan for the National Strategy for the Prevention of Oral diseases in children aged 0 to 14 years.

All collected data were processed using appropriate statistical methods. Statistical analysis was performed in the program Statistica 10.0 (Data Analysis Software System).

Results

150 children from the city of Bitola and 150 children from the rural areas of the municipality of Bitola, all at the age of 10, participated in this study and they were classified according to gender and place of residence (city/village). Out of a total of 300 respondents, 164 respondents or 54.66% were male, and 136 or 45.33% were female (Table 1).

Table 1. Distribution of respondents according to gender and place of residence

	male	female	Total
city	86 (57.33)%	64 (42.66)%	150
village	78 (52.00)%	72 (48.00)%	150
Total	164 (54.66)%	136 (45.33)%	150

As the results of the evaluation of the oral hygiene status of the studied groups demonstrate, special emphasis was placed on the use of oral hygiene products, namely the frequency and duration of tooth brushing as the main parameters, as well as their association with the occurrence of dental caries. According to the processed answers, it was determined that only a small percentage of children brush their teeth 3 times a day (10%). Most of the respondents (75%) stated that they brush twice a day, 9% only brush once a day, and 6% of the respondents brush very rarely, which is less than once a day (Table 2 and Graph 1).

Table 2. Tooth brushing frequency

	number of respondents
less than once a day	18 (6 %)
once a day	27 (9 %)
twice a day	225 (75 %)
3 or more times a day	30 (10 %)

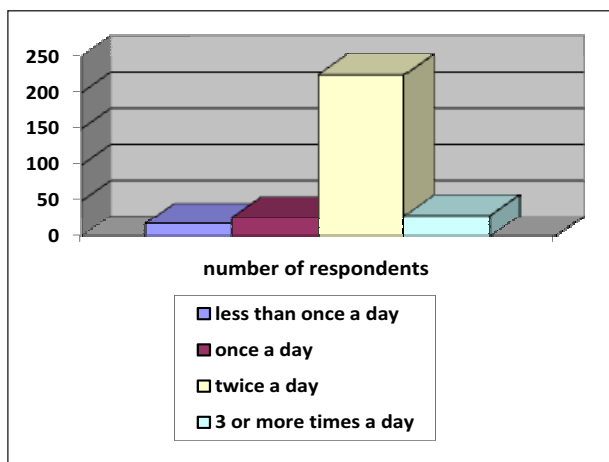


Chart 1. Tooth brushing frequency

A great percentage of the respondents (65%) answered that they brush their teeth for 1-2 minutes, 20% brush their teeth for less than 1 minute, and only 15% brush for 3 or more minutes (Table 3 and Graph 2). 70% of the respondents (210 children) replace their toothbrush twice a year, 20% (60 children) every 3 months, and 10% (30 children) once a year.

The studied population has an age-appropriate diet that abounds in sugars and products from the modern confectionery industry. An evaluation of the dietary regime included the different types of food and drinks that are most often preferred, as well as their connection with the

Table 3. Duration of tooth brushing

	number of respondents
less than a minute	60 (20 %)
1-2 minutes	195 (65 %)
3 or more minutes	45 (15 %)

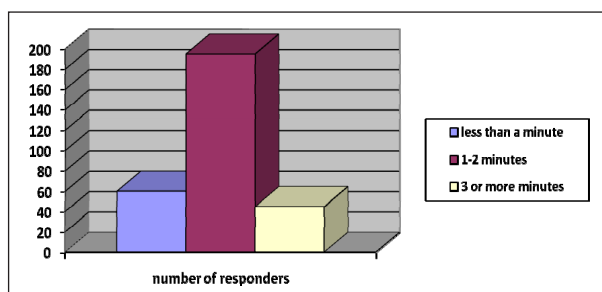


Chart 2. Tooth brushing frequency

occurrence and prevalence of caries. A huge percentage of the respondents answered that they consume a variety of nutritious products that include milk and dairy products, meat and fish, and, fruits and vegetables. However, a significantly higher number consumed foods and drinks rich in sugars, in contrast to those who consumed healthy foods such as fruits and vegetables (Chart 3).

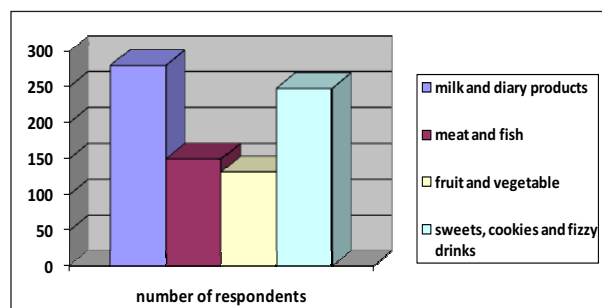


Chart 3. Consumption of types of food and drinks

Concerning the sealing of the fissures and pits of the teeth as an extremely important preventive measure, the condition of the sealing of the teeth which was performed on the first premolars and the first permanent molars, as well as the need for their possible resealing, as well as the connection of this preventive measure with the prevalence of caries, was monitored. In 237 out of 300 children, the teeth had sealed fissures, and in 63 children, the sealants were completely or partially discarded, necessitating resealing.

The oral status was evaluated by noting the structure of the DMFT index among children aged 10 from urban and rural areas in the area of the municipality of Bitola.

Table 4 and Table 5 showcase the results obtained from the structure of the DMFT index, expressed through the number of respondents without or with carious, extracted, and/or filled (restored) permanent teeth in relation to gender and place of residence.

The following tables show the results obtained from the statistical analysis regarding the correlation of the number of respondents with and without carious, extract-

ed and/or filled (restored) permanent teeth and several previously considered parameters, namely: the frequency of tooth brushing (Table 6), the duration of tooth brushing (Table 7), the consumption of food and drinks rich in sugar (Table 8) and the condition of the fissure sealants (Table 9).

Among the respondents who brushed their teeth 3 or more times a day, the prevalence of carious, extracted

Table 4. Distribution of carious, extracted and/or restored permanent teeth among respondents in relation to gender

	number of respondents	
	Male (%)	Female (%)
D-decayed(carious) permanent teeth		
don't have	140 (85.37)%	120 (88.24)%
have	24 (14.63)%	16 (11.76)%
M-missing (extracted) permanent teeth		
don't have	162 (98.78)%	136 (100)%
have	2 (1.22)%	0
F-filled (restored) permanent teeth		
don't have	125 (76.22)%	88 (64.71)%
have	39 (23.78)%	48 (35.29)%

Table 5. Distribution of carious, extracted and/or restored permanent teeth among respondents in relation to the place of residence (urban/rural environment)

	number of respondents by place of residence	
	City (%)	Village (%)
D- decayed (carious) permanent teeth		
don't have	132 (88.00)%	128 (85.33)%
have	18 (12.00)%	22 (14.67)%
M- missing (extracted) permanent teeth		
don't have	148 (98.67)%	155 (100)%
have	2 (1.33)%	0
F- filled (restored) permanent teeth		
don't have	109 (72.67)%	104 (69.33)%
have	41 (27.33)%	46 (30.67)%

Table 6. Correlation between the brushing frequency and the prevalence of carious, extracted and/or filled teeth

	number of respondents N	number of respondents without/with carious, extracted and/or filled teeth	
		don't have	have
Less than once a day	18	6	12
Once a day	27	14	13
Twice a day	225	127	80
Three times a day	30	24	6
Total	300	171	129

and/or filled teeth was only 20%. In contrast, among respondents who brushed less than once a day, the presence of caries, extracted, or filled teeth was 66.67%. This leads to the conclusion that there is a statistically significant difference in the prevalence of carious, extracted and/or filled teeth between the four groups regarding the frequency of brushing (Pearson Chi-square= 12.48, df=3, p=0.05).

Concerning the duration of tooth brushing, we can conclude that there is also a statistically significant difference regarding the prevalence of carious, extracted and/or

filled teeth between the three groups (Pearson Chi-square=20.08, df=2, p= 0.05).

Among the children who consumed sugar, the presence of carious, extracted, and/or filled teeth was observed in 47.98%. On the other hand, among the children who did not consume such food, the prevalence of carious, extracted and/or filled teeth is only 19.23%.

It can be stated that there is a statistically significant relationship between the condition of fissure sealants and the prevalence of carious, extracted and/or filled teeth (Pearson Chi-square=26.30, df=1, p=0.05). Thus, we

Table 7. Correlation between the brushing frequency and the prevalence of carious, extracted and/or filled teeth

	number of respondents N	number of respondents without/with carious, extracted and/or filled teeth	
		don't have	have
Less than a minute	60	21	39
1-2 minutes	195	115	80
3 or more minutes	45	35	10
Total	300	171	129

Table 8. Correlation between the consumption of sugary foods and the incidence of carious, extracted and/or filled teeth

	number of respondents N	number of respondents with carious, extracted and/or filled teeth
consume sugary foods	248	119 (47.98%)
don't consume foods rich in sugars	52	10 (19.23%)
Total	300	129

Table 9. Correlation between the condition of fissure sealants and the prevalence of carious, extracted and/or filled teeth

	number of respondents N	number of respondents without/with carious, extracted, and/or filled teeth	
		don't have	have
respondents with fused fissures	237	153	84
respondents with fallen waterers	63	18	45
Total	300	171	129

observe the presence of carious, extracted and/or filled teeth in as many as 71.43% of the subjects with discarded sealants, but in only 35.44% of the subjects with sealed fissures, indicating the significant preventive role of fissure sealing when performed correctly and promptly.

Discussion

The recent research results from several epidemiological studies in pediatric population indicate that the prevalence of caries has decreased significantly in developed countries such as the countries of Western Europe and the USA¹⁰. This is due to the implementation of systematic school preventive programs, health education programs, intensive and continuous application of fluorides, improved oral hygiene, and changes in lifestyle and living conditions^{11,12}.

The main task of oral hygiene is to reduce the amount of dental plaque, and consequently, to reduce the total number of bacteria in the oral cavity and indirectly, the number of acidic products created and their demineralization potential. Inadequate and irregular oral hygiene is not a direct cause of caries, but it significantly promotes the growth and reproduction of microorganisms in dental plaque, which increases the acidity in the oral cavity, thereby creating suitable conditions for the manifestation of the conditionally pathogenic properties of some cariogenic microorganisms¹³.

According to our study, the majority of children brush their teeth twice a day, in the morning and the evening. However, a large part of the respondents still uses only the basic means for oral hygiene, a toothbrush and a toothpaste, and 6% of them brush their teeth less than once a day, which is obviously insufficient to prevent the accumulation of dental plaque and occurrence of caries. The use of dental floss and rinsing liquids is still relatively uncommon, despite the increasing awareness of children and their parents about their benefits. The duration of toothbrushing in most children in our study is 1 to 2 min-

utes, which is significantly less than the recommended time.

The clarification for the mechanism of caries occurrence given by Miller (1889) a long time ago, presents caries as a pathological process caused by the action of oral bacteria on a substrate (fermentable food), with the decomposition of which organic acids are created that cause enamel demineralization and the appearance of the initial carious lesion¹⁴. Even though the respondents stated that they consume a variety of foods, the representation of sweets, cakes, and fizzy drinks in the daily base of nutrition, was present in 82.67%. The frequent intake of carbohydrates, especially between meals, significantly prolongs the harmful demineralizing effect, which means it shortens the time required for remineralization of the demineralized enamel. At the same time, the pH value in the plaque decreases, and the ionic reserves found in the plaque are depleted, preventing the restoration of the demineralized surface of the enamel.

It is well known that the occlusal surfaces of the teeth have the highest incidence of dental caries in children and young people, and pits and fissures represent caries susceptible parts because the occlusal surfaces of the teeth have a rather complex morphology¹⁵. Namely, fissures can penetrate deeply into the occlusal surface, exhibit localized narrowing, and have different depths. Fissures are classified according to their depth (shallow, deep and intermediate fissures), as well as based on their morphological characteristics, whereby we distinguish two main fissure types:

- a) extensive and shallow U- and V-shaped fissures from which dental deposits and food residues are easily removed and are caries-resistant and
- b) narrow and deep Y-shaped fissures, from which it is much more difficult to remove deposits, they are more susceptible to caries and with cracks towards the enamel-dentine connection¹⁶.

The rate at which dental caries develops in fissures is directly related to the depth of the fissure, that is, the deep-

er it is and the closer it is to the enamel-dentine junction, the more susceptible it is to the development of dental caries¹⁷. The sealing of fissures and pits is one of the most common and effective modern prophylactic measures and is aimed at protecting the occlusal surfaces of teeth from the influence of cariogenic factors¹⁸.

As per our analysis, it was determined that the sealing of the first permanent molars and first premolars is carried out continuously every year based on the action plan for the National strategy for the prevention of oral diseases of children aged 0-14 years. According to the records, it was established that the percentage of durability of sealants in teeth with a fissure system is satisfactory, that is, a high percentage (79%) of the respondents, while in 21%, full or partial resealing of the fissures was performed. The reason for the long clinical success after sealing treatment lies in the ability of the sealant to form a micromechanical bond with the inorganic enamel substrate. On the other hand, the marginal micropermeability, that can be observed following the application of fissure sealant, facilitates the penetration of bacteria under the sealant, initiating the process of caries formation^{19,20,21}.

From the obtained data on the structure of the DMFT index, it can be noted that the number of carious, extracted and/or filled teeth is somewhat higher among children from the male population compared to children from the female population. It can be concluded that the results presented in this research coincide with the results given by Kumar et al.⁸, Gauba et al.²², and Jose et al.²³, which indicate that children from the male population have poorer oral hygiene compared to the children from the female population and are in contradiction with the results presented by Saha and Sarkar²⁴, and Retnakumari²⁵ who stated that there is no difference between the DMFT index in children from the male and female populations. The values of the structure of the DMFT index of the children from the rural environment of the municipality of Bitola are greater than the values from the city of Bitola.

Oral health is largely conditioned by the habits, attitudes and behavior of the population. Thus, decades ago, priority was given to oral health care in the Scandinavian countries, with prevention organized at the state level, available to all children, and financed by state funds, which led to a significant reduction in the prevalence of caries. Children were invited at certain terms, those who did not come regularly were also monitored, and all levels of oral health care were included^{26,27,28}.

However, regardless of the good knowledge of its nature and measures for its prevention, dental caries remains one of the most common diseases in the world, affecting 90% of the total population, according to the report of the World Health Organization^{29,30}. It can be concluded that dental caries is the most prevalent chronic dis-

ease in the oral medium, especially among children and adolescents³¹.

Conclusion

Based on the obtained results of the research conducted for this paper, it can be concluded that the oral hygiene habits and dietary regimen of 10-year-old children from the area of the Municipality of Bitola have a significant impact on the state of oral health, especially the prevalence of dental caries and its complications. The practice of correct and regular oral hygiene, controlled intake of sugars, sealing fissures and pits of the teeth, application of fluorides, health education and promotion of regular preventive dental examinations play a vital role in the prevention of dental caries, as well as the maintenance and promotion of overall oral health.

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