

ORAL HEALTH

NUTRITIONAL HABITS AS RISK FACTORS FOR DENTAL CARIES IN CHILDREN FROM RURAL AND URBAN AREAS IN SKOPJE

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Abstract

Proper nutrition is a long-term investment in one's own health. Oral health as an integral part of general health is in bidirectional relationship with diet and nutrition. Globalization and urbanization have led to nutrition transition from a traditional agriculturally-based diet to consumption of processed foods that are high in sugar. Children have been particularly affected by this change. The aim of this study was to investigate the association between specific nutritional and hygiene habits and the development of caries in children from urban and rural areas. The study was conducted in December 2019 and comprised children aged 6 years. A survey was made and children's dental status was tested. The results obtained showed a higher percentage of healthy deciduous (50%) and permanent (35%) teeth in children from rural areas than in children from urban area. Both groups had similar habits in terms of cariogenic and cariostatic food intake, but there were differences in children's hygiene habits.

ОРАЛНО ЗДРАВЈЕ

НУТРИТИВНИТЕ НАВИКИ КАКО РИЗИК ФАКТОР ЗА ПОЈАВА НА ДЕНТАЛЕН КАРИЕС КАЈ ДЕЦА ОД РУРАЛНА И УРБАНА СРЕДИНА ВО СКОПЈЕ

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Извадок

Правилната исхрана е долготрајна инвестиција во сопственото здравје. Оралното здравје како нераскинлив дел од целокупното здравје е во директна двострана корелација со исхраната. Глобализацијата и урбанизацијата доведоа до една нутритивна транзиција, кога од традиционална исхрана со свежи земјоделски производи се премина на процесирани исхрана богата со шеќери, промена од која посебно се засегнати децата. Целта на оваа студија беше да се испита поврзаноста помеѓу специфични нутритивни и хигиенски навики и појавата на кариес кај деца од урбана и рурална средина. Истражувањето беше направено во декември 2019 година кај деца на возраст од 6 години, на кои им беше направено анкетирање и утврдување на денталниот статус. Според нашата студија, поголем беше процентот на здрави млечни (50%) и трајни (35%) заби кај децата од селска средина отколку кај градските деца. И кај двете групи имаше слични навики во однос на внес на кариогена и кариостатска храна, но постојат разлики во хигиенските навики.

Introduction

Proper nutrition is a long-term investment in one's own health. Oral health as an integral part of general health is in bidirectional correlation with diet and nutrition. Sufficient intake and availability to relevant nutrients are of key significance for the growth, development, and repair of oral tissues and healthy dentition¹ hence, a lack of certain nutrients might result in developmental anomalies of the craniofacial system, and on the other hand, increased intake of other nutrients can lead to onset of dental caries as the most common oral disease. In case of poor oral health, teeth absence or a feeling of pain and discomfort due to dental or oral diseases, there is a reduced masticatory ability. This can lead to consumption of inadequate food, that in the long term might cause certain diseases and conditions in the body such as obesity, hypertension, diabetes or cardiovascular diseases. Oral diseases are still the most common non-communicable diseases globally^{2,3} and pose an important public health problem because of their prevalence, their impact on individuals and society, and they also result in high treatment costs.⁴ In spite of the enormous improvements in prevention and treatment of oral diseases in the last decades, problems still persist causing pain, fear, anxiety, functional limitations (with poor attendance and performance of children in school) as well as social handicap due to tooth loss.⁵ In addition to negative influences on quality of life, treatment of den-

tal caries is a health system burden consuming about 10% of health-care budgets in industrialized countries; dental caries is the fourth most expensive disease to be treated in the world.^{2,3,6} It has been estimated that in 2010 a total of 442 billion dollars were spent globally for dental caries treatment.⁷ Dental caries is a lifelong progressive and cumulative disease, hence, low levels of caries in childhood is something we should pay attention to⁸ in order to reduce caries rate and associated costs. The causal relationship between fermentable carbohydrates and caries was for the first time reported in the scientific literature in the 50s of the last century.⁹ The relationship between caries and carbohydrates is well known: dental hard tissues are demineralized under the influence of acidic by-products produced by bacteria in biofilm (dental plaque) during the fermentation process of carbohydrates¹⁰, with a rapid reduction of pH in the saliva below 5.5 in tooth biofilm. This low pH has impact on the balance of microbes in the biofilm by increasing the proportion of acidogenic types of bacteria, thus intensifying tooth demineralization.¹¹ Over the last decades, globalization and urbanization, especially in the countries with low and middle income, have brought to a kind of nutrition transition from a traditional agriculturally-based diet to consumption of processed foods that are high in sugar. This change has particularly affected children.^{12,13,14} According to the information note about sugar and dental carries released by WHO in

2017, economic growth is characterized by nutrition transition to a diet with a high proportion of free sugars and fats in the total daily energy intake.⁷

The aim of this study was to examine socio-behavioral risk factors for onset of caries, i.e., to analyze the relationship between specific nutritional and hygiene habits and prevalence of caries in children from urban and rural areas in Skopje.

Materials and methods

The study was conducted in December 2019, in primary preventive and dental care center within the public health institution Health Center Skopje. It included 60 children, born in 2013, at the age of 6 years, of both sexes and of any nationality, who were divided into two groups according to the place of residence – 30 children from urban and 30 children from rural areas. A detailed dental examination was made by a licensed dentist, and Gnatus dental chair, dental reflector, dental mirror, probe, buster and personal protective equipment were used. Data were obtained and retrieved in line with the WHO 2017 form. After the

examination, a survey among children's parents was made by distributing a questionnaire containing demographic data, data on the type of diet/nutrition and on oral cavity hygiene. For the purposes of this study, a simple statistical analysis of data was made.

Results

The study included 16 boys and 14 girls who lived and attended school in rural areas, and 16 girls and 14 boys from urban area. The percentage was the same (79.3%, i.e., 23 children) in both groups of children who preferred white bread over black or corn bread. Regarding the answer to the question *Do you eat sweets often, rarely or never*, fourteen of children (46%) from rural areas chose *often*, and a larger percentage (53.3%, i.e., 16 children) opted for *rarely*. Contrary to this, 18 city children (60%) answered they often ate sweets and cakes. However, 12 children (40%) from rural areas more often drank sugar-sweetened beverages than those from urban area (26.7%, i.e., 8 children). Four of the city children said they never drank sugar-sweetened beverages (13.3%) (Figure 1).

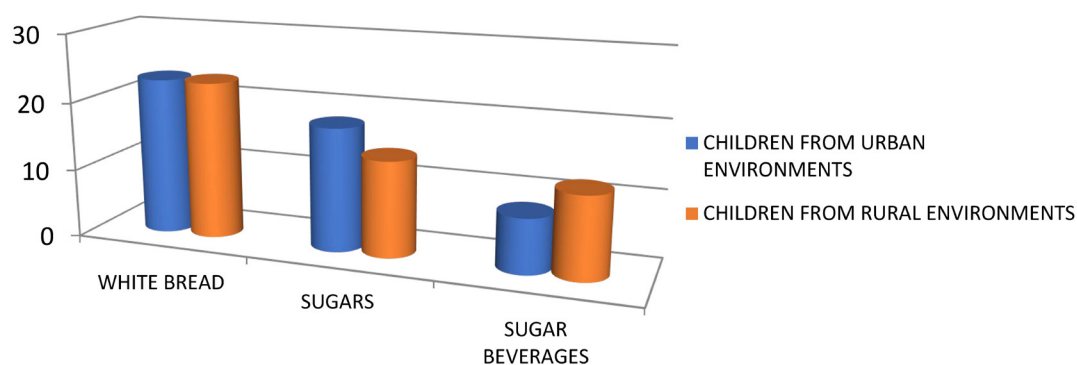


Figure. 1 Consumption of food with a cariogenic effect

Children from urban area in our study consumed more often milk as a food with cariostatic effect (19 children, i.e., 63.3%) than children from rural areas: 15 children (50%) from rural area often consumed milk; 40% (12 children) answered they drank milk rare and three of

them (10%) never drank milk. Both children from rural and urban areas often ate fruit and vegetables, whereas children from rural areas more often ate meat, fish and eggs, but there was no significant percentage difference (Figure 2).

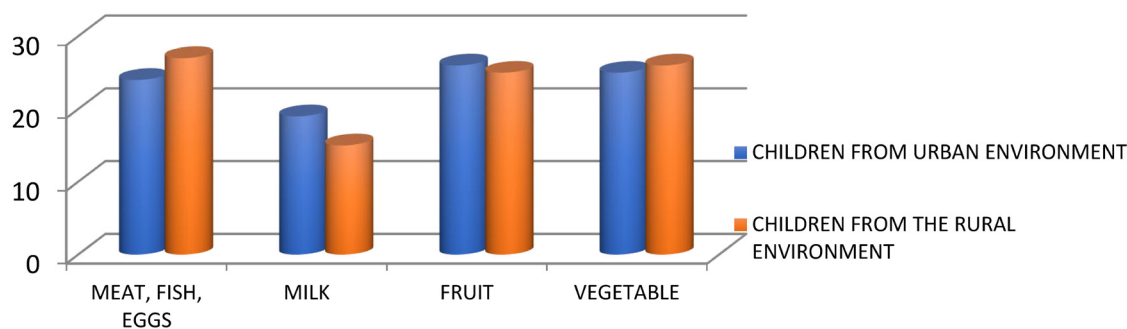


Figure. 2 Consumption of food with a cariostatic effect

In both groups, all 60 children (100%) had toothbrush, but 26 of city children (86.7%) used it on a regular basis. The percentage of children from rural areas that were regularly brushing their teeth was smaller (76.7%, i.e., 23 children). A higher percentage of rural children (40%, i.e., 12 children) were brushing their teeth for 2-3 minutes compared to majority of city children (17 children or 56.7%) who were brushing their

teeth for less than 1 minute. All 30 children (100%) from urban area used fluoride toothpaste, but there was four of them who used dental floss and water for mouthwash as basic tools for maintaining oral hygiene. In the group of children from urban area there was no child who ever used dental floss or water for mouthwash for routine oral hygiene (Table 1).

Table 1. Hygienic habits

	Toothbrush		Washes the teeth			Duration			Uses		
	Yes	No	Regu- larly	Occa- sionally	Never	<1min	1 min	2-3 min	Fluo- ride tooth- paste	Dental floss	Water for mouth- wash
Urban area	30 100%	/	26 (86.7%)	4 (13.3%)	/	5 (16.7%)	17 56.7%	8 26.7%	30 100%		
Rural area	30 (100%)	/	23 (76.7%)	7 (23.3%)	/	5 (16.7%)	13 (43.3%)	12 (40%)	26 (86.7%)	2 (6.7%)	2 (6.7%)

In the end, an analysis of the dental status was performed and it comprised 120 first permanent molars and 60 first deciduous teeth from each group of children. The following results were obtained: in city children, 95 of the first permanent molars were unerupted (77.5%), only 3.3% (4 permanent first molars) had caries, 7.5%, i.e., nine were healthy, twelve (10%) were teeth with resin composites and sealants, and only 3(2.5%) were molars with filled tooth surfaces but no caries. In the group of rural children, 64 of the first permanent molars were unerupted (53.3%), 35% (42 permanent first molars) were healthy, 5% (6 molars) had caries, 5.83%, i.e., seven were with resin composites and sealants, and only one (0.83%) had filled tooth surfaces. The analysis of the first deciduous teeth showed that in city children 24 of deciduous teeth (40%) were with dental caries, 35% (21) were healthy teeth, 21.6% or 13 of

the deciduous teeth had fillings, one tooth was extracted (1.66%) and the same percentage was found regarding resin composites. In rural children, there was a higher percentage of carious first deciduous molars (45%, i.e., 27 deciduous teeth), but also there was a higher percentage of healthy first deciduous molars (50%, i.e., 30 deciduous teeth); there were no teeth with resin composites and adhesives, only 1 deciduous tooth (1.66%) was extracted and only two (3.22%) had filled tooth surfaces (Table 2). When comparing the percentage of healthy and carious teeth in rural and urban children, the percentage of healthy teeth in the primary dentition was higher in children from rural areas (50% in rural children versus 35% in children from urban area). The difference in the percentage of carious deciduous teeth existed (45% in rural children versus 40% in urban children) but it was smaller and insignificant.

Table 2. Dental status of first permanent molars and first deciduous molars

	State of first permanent molars - total 120					State of first deciduous molars (54.74) -total 60				
	caries	healthy	unerupted	resin composites	fillings	caries	healthy	extracted	resin composites	fillings
Urban area	4 (3.3%)	9 (7.5%)	93 (77.5%)	12 (10%)	3 (2.5%)	24 (40%)	21 (35%)	1 (1.66%)	1 (1.66%)	13 (21.66%)
Rural area	6 (5%)	42 (35%)	64 (53.3%)	7 (5.83%)	1 (0.83%)	27 (45%)	30 (50%)	1 (1.66%)	/	2 (3.33%)

Discussion

Donald L. Chi in 2019 has stated that nowadays knowledge about the role of excess intake of sugars (defined

as free sugars or added sugars to the food, other than those found in the structure of grains, vegetables, fruits and milk) has been widely accepted as a factor for occurrence of

dental caries, but also of other systemic health problems such as obesity, diabetes and cardiovascular diseases.^{5,9,15,16,17} The most cariogenic sugar is sucrose, a disaccharide consisting of its monosaccharides glucose and fructose, and which presence causes dental plaque with smaller amount of calcium, inorganic phosphates and fluorides, ions necessary for enamel remineralization. In 2015, WHO released a new guideline on sugars intake in adults and children with a strong recommendation for reduced intake of free sugars that has to be less than 10% of total energy intake, and with an additional recommendation for further reduction of the carbohydrates intake to less than 5% of total energy intake.⁵ Education conducted by dental teams regarding consumption of 100% fruit juices should be consistent with the manual of the American Academy of Pediatricians.¹⁸ According to this manual, children under the age of one year, should not be given juices unless medically indicated.

Foods such as milk and dairy products, apples, cranberries, tea and high-fiber foods have been considered to have cariostatic effects, i.e., they inhibit the development of caries, but further investigations are necessary in order to confirm this statement (Moynihan P.)^{19,20} This effect is due to their composition rich in fibers, water, protective factors such as polyphenolic compounds, calcium, but also due to mechanical stimulation of secretion of greater amount of saliva.^{21,22,23} Lactose is considered to have a smaller cario-

genic effect because its fermentation produces a smaller reduction in Ph in the saliva.²⁴ The caries disease process is a multifactorial and dynamic process conducted in the biofilm with active participation of free sugars via the phases of demineralization and remineralization of dental hard tissues.¹³ The process of demineralization happens during prolonged presence of carbohydrates in the mouth resulting from a poor oral hygiene. Therefore, we have also examined hygienic habits as a risk factor that would influence on the presence or absence of caries in the oral cavity in 6-year-old children.

Conclusion

The results obtained in this study showed that the percentage of healthy deciduous (50% or 30 teeth) and permanent (35% or 42 teeth) teeth was higher in children from rural areas in comparison with 9 of healthy permanent first molars (7%) and twenty-one (35%) healthy first deciduous molars in children from urban area. Both groups presented with similar habits in terms of intake of cariogenic and cariostatic food, but there were differences in the hygiene habits. Hygiene habits had a larger impact on onset of caries than nutritional habits, however, further investigations are necessary that would comprise a larger group of examinees along with a more detailed analysis regarding frequency and total daily intake of carbohydrates.

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