

A Socio-Medical Approach applied to Determine Dental Caries Risk Factors among Bulgarian Dental Medicine Students

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Abstract: *In the dental daily practice, the socio-medical approach finds a concrete expression in the social history of the disease. The aim of the research was to determine the social and behavioral risk factors in dental caries etiopathogenesis in healthy young Bulgarians without general and chronic diseases and without periodontal and mucosal diseases. The participants were dental medicine students (i.e. from the same social age group and ethnicity) (n = 110) aged 18-25 with a preserved dentition of 28 teeth. The participants completed questionnaire about their dietary habits, snacks between meals and other behavioral and social factors associated with the development of the dental caries. Based on their DMFT scores the students were classified into two groups: caries-active and caries-resistant. The results were processed by using IBM SPSS Statistics v19. The differences between caries-active and caries-resistant students regarding: their parents' education and profession; food, hygiene and harmful habits; fluoride prophylaxis; orthodontic treatment, are small and not significantly different in terms of statistics, except for the visits to the dentist. This confirms once again the great homogeneity of the selected participants in the study.*

Keywords: social medicine, dental caries, caries risk factors, students

1. Introduction

Dental caries is a socially significant disease and one of the problems in the public health sector because of its wide distribution in all regions of the world. Its severity is the greatest among the less privileged and the socially marginalized population groups. The pain, suffering and impairment of function and aesthetics caused by dental caries affect peoples' quality of life. At the same time, dental treatment is extremely expensive in the developed countries and is practically unaffordable in the low and middle income countries such as Bulgaria.

In the dental daily practice, the socio-medical approach finds a concrete expression in the so-called *social history of the disease*. The human personality with its specific and unique social environment, social relations, and risk factors is the focus of the social history of any disease. The social history of the disease assists the formation of the general history of the disease and thus helps the dentist to make substantiated conclusions and decisions regarding the etiology, pathogenesis, treatment, prevention and rehabilitation of a particular disease [6].

A number of studies and analyses of the impact of *the social factors* on public health reveal the decisive influence of gender, age, social class, racial origin, and stress [14, 30, 31].

The **aim** of the present study was to clarify and to determine social and behavioral risk factors (*food, hygiene habits, harmful habits*) in dental caries etiopathogenesis in healthy young Bulgarians without general and chronic diseases and without periodontal and mucosal diseases.

2. Materials and Methods

The participants in this survey were dental medicine students (i.e. from the same social age group and ethnicity) (n = 110) aged 18-25 with a preserved dentition of 28 teeth. There were performed:

Clinical examinations of 110 persons, Klein's index calculation and separation of participants into 2 groups according to the DMFT index value:

- Caries-active with $DMFT \geq 9$ (23 in total: 13 women and 10 men)
- Caries-resistant with $DMFT \geq 9$ (21 in total: 11 women and 10 men)
- 44 people in total.

A survey, conducted by interview, with 20 questions on behavioral and social factors associated with the development of the dental caries.

3. Results

Caries-active and caries-resistant individuals were compared in groups. The recorded results of the questionnaire forms are shown in Table 1.

Table 1 demonstrates that there are no significant differences between the caries-active and caries-resistant students by reference to their parents' education and professions. There were no parents with basic education in both studied groups and the majority is university graduates. The group of caries-resistant students features the greatest number of parents who are dentists. The percentage distribution by professions is uneven and is in favor of other, non-medical professions. There were no statistically significant differences in the percentage distribution of the parents by reference to the indicators of education and profession between the two groups (Table 1, $p > 0.05$).

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Table 1: Comparative analysis of the data by reference to the indicator of the surveyed groups of students' parents' education and profession (n=44)

Indicator		DMFT group				p-value
		Resistant		Active		
		No	%	No	%	
Parents' education	Basic	0	0.0	0	0.0	1.000
	Secondary	3	14.3	3	13.0	
	Higher	18	85.7	20	87.0	
	Total	21	100.0	23	100.0	
Parents' profession	Doctors	1	4.8	3	13.0	0.586
	Dentists	7	33.3	6	26.1	
	Others	13	61.9	14	60.9	
	Total	21	100.0	23	100.0	

Table 2-a demonstrates the participants' daily dietary habits. There were no significant differences in the dietary habits between the two groups – the caries-active and caries-resistant ones – according to the comparative analysis of the results (Table 2-a, $p > 0.05$).

There were no significant differences in the relative shares of the students subjected to fluoride prevention between the caries-resistant and the caries-active group (Table 2-b, $p > 0.05$). There were no significant differences in the frequency of orthodontic treatment between the two groups of patients (the caries-active and caries-resistant ones) (Table 2-c, $p > 0.05$).

Table 2 (a): Daily dietary habits of caries-resistant and caries-active patients (n=44)

Indicator		DMFT group				p-value
		Resistant		Active		
		No	%	No	%	
Breakfast	No breakfast	4	19.0	5	21.7	0.860
	Irregularly	9	42.9	8	34.8	
	Regularly	8	38.1	10	43.5	
	Total	21	100.0	23	100.0	
Lunch	No lunch	0	0.0	0	0.0	1.000
	Irregularly	10	47.6	11	47.8	
	Regularly	11	52.4	12	52.2	
	Total	21	100.0	23	100.0	
Supper	No supper	0	0.0	0	0.0	0.176
	Irregularly	4	19.0	1	4.30	
	Regularly	17	81.0	22	95.7	
	Total	21	100.0	23	100.0	
Snacking between main meals	No	5	23.8	6	26.1	0.570
	Yes	16	76.2	17	73.9	
	Total	21	100.0	23	100.0	
Frequency of snacks between meals	No snacks	3	14.3	1	4.3	0.619
	Rarely, during holidays	2	9.5	5	21.7	
	< 4 times a week	5	23.8	4	17.4	
	1 time a day	7	33.3	9	39.1	
	2 times a day	4	19.0	4	17.4	
	Total	21	100.0	23	100.0	

Table 2 (b): Fluoride prophylaxis of caries-resistant and caries-active patients (n=44)

Fluoride prophylaxis	DMFT group				p-value
	Resistant		Active		
	No	%	No	%	
Yes	11	52.4	11	47.8	1.000
No	10	47.6	12	52.2	
Total	21	100.0	23	100.0	

Table 2 (c): Frequency of orthodontic treatment (n=44)

Indicator	DMFT group				p-value	
	Resistant		Active			
	No	%	No	%		
Orthodontic treatment	Yes	7	33.3	5	21.7	0.728
	No	14	66.7	18	78.3	
	Total	21	100.0	23	100.0	

Hygiene habits are studied in all participants (Table 3). A high level of personal plaque control was recorded – after using color tablets to visualize the plaque and record prevailing plaque-free surfaces (Table 3). Low percentages were recorded for places that bleed during probing – criteria that can categorize a patient to the group with a healthy periodontium.

Table 3: Hygiene habits of the two researched groups (n=44)

Indicator		DMFT group				p-value
		Resistant		Active		
		No	%	No	%	
Frequency of brushing the teeth/daily	1 time	2	9.5	2	8.7	0.620
	2 times	18	85.7	18	78.3	
	3 times	1	4.8	3	13.0	
	Total	21	100.0	23	100.0	
Use of plaque inhibitory solutions	Yes	13	61.9	14	60.9	1.000
	No	8	38.1	9	39.1	
	Total	21	100.0	23	100.0	
Use of dental floss	Yes	9	42.9	15	65.2	0.225
	No	12	57.1	8	34.8	
	Total	21	100.0	23	100.0	
Use of dental floss	Yes	11	52.4	8	34.8	0.361
	No	10	47.6	15	65.2	
	Total	21	100.0	23	100.0	

Table 4: Comparative analysis in relation to the frequency of the preventive check-ups

Indicator		DMFT group				p-value
		Resistant		Active		
		No	%	No	%	
Frequency of preventive check-ups, as students	Every 3 months	4	20.0	5	21.7	0.129
	Every 6 months	11	50.0	16	69.6	
	Every 12 months	3	15.0	2	8.7	
	Every 24 months	3	15.0	0	0.0	
	Total	21	100.0	23	100.0	
Frequency of preventive check-ups before university	Every 3 months	2	10.0	1	4.3	0.388
	Every 6 months	8	35.0	14	60.9	
	Every 12 months	5	25.0	4	17.4	
	Every 24 months	6	30.0	4	17.4	
	Total	21	100.0	23	100.0	
p-value		0.008		0.006		

There were no significant differences in relation to the harmful habits between the two groups of studied

participants ($p > 0.05$). The lack of a significant difference in these results in the medical history indicators showed a relative homogeneity of the two groups in terms of not only gender and age.

Table 5 Comparative analysis of data by reference to harmful habits

Indicator		DMFT group				p-value
		Resistant		Active		
		No	%	No	%	
Teeth clenching	Yes	7	33.3	4	17.4	0.303
	No	14	66.7	19	82.6	
	Total	21	100.0	23	100.0	
Breathing through mouth	Yes	1	4.8	3	13.0	0.609
	No	20	95.2	20	87.0	
	Total	21	100.0	23	100.0	
Smoking	Non-smoker	11	52.4	15	65.3	0.238
	Ex-smoker	3	14.3	1	4.3	
	< 5 cigarettes a day	5	23.8	2	8.7	
	< 5 cigarettes a day	2	9.5	5	21.7	
	Total	21	100.0	23	100.0	
Alcohol consumption	Non-drinker	1	4.8	2	8.7	0.624
	Rarely, during holidays	14	66.7	17	73.9	
	1-2 times a week	6	28.5	4	17.4	
	Total	21	100.0	23	100.0	

4. Discussion

The level of teeth loss is an accurate indicator of the population's status of dental health. The main reasons for the problem can not only be carious process and its complications, but various other reasons, mainly periodontal diseases. To plan a treatment, however, it is necessary to be able to identify the risk factors that will lead to carious process activation. No appropriate limits and criteria for dental caries incidence in both children and adults have been defined in Bulgaria.

The Republic of Bulgaria has not provided any data at a national level in the recent years and so far (notwithstanding the studies on dental caries prevalence in both the population as a whole and in specific population groups) there have not been set up clearly defined, appropriate limits and criteria for caries-active and caries-resistant healthy people over 18 years with a permanent dentition. The problems of dental health of people over age of 18-20 years and their quality of life have been considered, but they need further exploration.

The object of this study is young people, students at the Faculty of Dental Medicine, Medical university of Sofia. The participants are a specific group of selected individuals aged 18-25 years old, without chronic periodontal and mucosal diseases, including without prosthetic restorations and constructions – inlays, onlays, crowns, bridges and implants. The participants' age is an important factor to be controlled in the studies on caries, because there are significant differences in caries prevalence depending on age. It is advisable to carry the research in limited age groups, which will allow for the establishment of appropriate criteria for determining the high risk category for the particular age group. This information would be

useful for selecting the most effective therapeutic approach for these individuals.

It is also necessary to eliminate the effect of the following factors: hormones – during pregnancy and lactation; menopause; age-related changes associated with salivation and metabolism decrease (weight gain and different degrees of obesity); osteoporosis. It should be taken into consideration that in this case the respondents were people with an alleged level of general and health culture above the average, which affects their oral status.

The participants were separated into caries-resistant (DMFT up to 5.0) and caries-active (DMFT above 9.0) groups according to the WHO's requirements, but in our modification and similar to Ahumada et al. (2003)[2], who expanded the DMFT/S values for caries-free patients to 6.0. The separation was also done according to the results of the clinical examinations on dental caries incidence among the studied persons and the conditions of the country in which there are no prevention programs at a national level.

The long-lasting systemic and serious disturbances of the eating habits, dynamics, preferred food selection and metabolic equilibrium justify a significantly higher DMFT index and dental caries epidemiology by reference to persons (Ep), resulting from increased acid formation [9].

Dental caries prevalence and incidence in the world is different. Even within a single country, the geographical and social factors strongly influence the development of dental caries [3, 24, 25, 26, 27]. The financial factor in particular is considered as a risk factor for caries occurrence [5, 13, 23].

According to various studies, caries epidemicity in Bulgaria is within 76-97% and increases with age [28]. This necessitates the need for effective prevention of the population, general health culture improvement, timely and accurate dental caries diagnostics and treatment.

The survey results show that there are improbably small differences between the studied caries-active and caries-resistant individuals regarding: their parents' education and profession; food, hygiene and bad habits; fluoride prevention; orthodontic treatment; frequency of visits to the dentist; all of which is confirmed by the statistical analysis of the results. The analysis of data on the participants' eating habits and preferences shows serious errors in their nutrition and long-lasting disturbances. The volunteers eat irregularly, mostly in the evening, and a high percentage of the participants in both groups (the caries-active and caries-resistant ones) eat dough based and sugary foods between meals. The cariogenic action of starch in combination with sucrose, when taken between meals in particular, is well-known in literature [8, 15, 17]. The fact that all volunteers are dental medicine students and have free access to specialized information and dental care is not without importance.

Dental caries today is a greater problem for people of a low socioeconomic status and low health culture resulting from the lack of educational opportunities and/or lack of discipline in that area. Hence, the prepared questionnaire

form contains questions concerning the volunteers' parents' education and profession. Their responses provide valuable information on level of culture of their family environment and the health education they have been subjected to [16]. Approximately the same is the percentage of the participants who have parents that have completed a higher education course. The highest percentage of parents working as dentists is among the caries-resistant men – 50%.

Diet plays a key role in dental caries development and a great number of studies have established the correlation between the frequent consumption of fermentable carbohydrates and the susceptibility to caries. The patients' eating habits and attitudes are important to them [10, 18, 20, 22]. The caries caused by poor dietary habits usually results in a rapid and efficient enamel demineralization [10, 19]. Both the frequency of sugar consumption and the amount of sucrose intake are of significance [1].

Over the last two decades, the decrease in caries prevalence among the population of highly industrialized countries shows that the relationship between sugar consumption and caries is much weaker in the modern era of exposure to fluorides than in the past. Sugar consumption control, especially in high-risk groups of patients beyond childhood age, is of great importance in: patients with metabolic and endocrine disorders (diabetes), pregnant women and women in menopause. This remains a well justified part of caries prevention, no matter that it is not always the most important aspect [12,21].

Practicing dentists should know if their patients have been subjected to fluoride prophylaxis and by what means. Although the majority of the population uses fluoride-containing toothpastes, this should always be checked [18].

The early detection of the dental caries risk factors by using *painless diagnostic methods* in general is part of an evidence-based approach of treatment.

5. Conclusions

The conclusions from the conducted research are as follows:

- 1) The differences between caries-active and caries-resistant students regarding: their parents' education and profession; food, hygiene and harmful habits; fluoride prophylaxis; orthodontic treatment are small and not significantly different in terms of statistics, except for the visits to the dentist. This confirms once again the great homogeneity of the selected participants in the study.
- 2) Everything points to the fact that the acquired oral and hygiene habits and health culture are not sufficient to compensate the nutritional and genetic factors in relation to caries incidence and hard dental tissues resistance.
- 3) Dental caries prevalence in the early years of up to 30 depends on: a person's parents' education, eating dynamics, eating and hygiene habits. It does not depend on the person's parents' profession and the endogenous intake of fluorine tablets in childhood against the background of a very good oral hygiene in all studied persons.
- 4) There are significant differences in the frequency of the preventive check-ups with a dentist in both studied

groups before and after entry into a university, which is probably associated with the greater awareness and motivation during the course of dental medicine studying.

The analysis of the survey shows that young people with a high level of health culture, but also with a high DMFT-index are expected to undergo chronic changes at a subclinical level that will lead to a permanent imbalance of their oral homeostasis. These will very likely lead to changes in the salivary pH, changes in the buffer and enzyme systems of the oral environment, changes in the salivary flow, the microbial numbers and the electrolytes of the whole saliva. One possible explanation is that this is a consequence of permanently persistent bad eating habits since childhood and is related to the educational level of the parents and partly to the family culture and the established dietary habits. Genetic predisposition is also possible. The acquired oral and hygiene habits and health culture are insufficient to compensate the nutritional and genetic factors in relation to caries incidence and hard dental tissues resistance.

Our country's healthcare system is changing, and there are two serious *social requirements* underlying modern health and political problems. One of them is to provide fairer and sufficient medical (and in this case dental) help for the economically poor and vulnerable groups of the population. The other requirement is to find a way to control the growing cost of health care services, including the dental ones [29]. An uncontrollable rise in healthcare costs is observed in every country of the world. This is related to the demographic trend towards population aging, increase of chronic non-communicable diseases, increased expectations and demands of the population to healthcare services and last but not least the access to increasingly expensive medical technologies [7].

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References

- [1] Aires, C.P., C.P.M. Tabchoury, A.A. Del Bel Cury, H. Koo, J.A. Cury. Effect of sucrose concentration on dental biofilm formed in situ and on enamel demineralization, *Car Res*; 2006; 40: 28–32.
- [2] Ahumada, M., E. Bru, M. E. Colloca, M. E. Lopez, M. E. Nader-Macias. Evaluation and comparison of lactobacilli characteristics in the mouths of patients with or without cavities, *J Oral Science*, 2003; vol. 45, 1, 1–9.
- [3] Atanassov, N. Prevention of dental caries with fluorides. *S.*, 2004, 13.
- [4] Badet, M. C., B. Richard, G. Dorignac. An in vitro study of the pH-lowering potential of salivary lactobacilli associated with dental caries, *Journal of Applied Microbiology*, 2001; vol. 90, 6, 1015.

- [5] Bonev, B. Dental health and quality of life of people over the age of 20 in Republic of Bulgaria., Thesis, Sofia, 2013.
- [6] Borissov, V. et al. Социална медицина. (Social Medicine), S., 1994, 18–19.
- [7] Borissov, V. Здравен мениджмънт. Синтетична презентация за обучаващите се във ФОЗ (Healthcare Management. Synthetic presentation for the students at the Faculty of Public Health), S., 2013, 30–31.
- [8] Boteva E. Impact of different nutritional regimes in the ethiopathogenesis of dental caries, 1988, Medical University, Sofia, 103–104.
- [9] Boteva, E. Investigation of pH and DMF in patients with metabolic diseases, Problems of Dentistry, V. XIX/1991, 90–94.
- [10] Boteva, E., P. Nenov. Changes in the levels of some salivary enzymes in patients with metabolic diseases., Problems of Dentistry, V. XXIII/1995, 36.
- [11] Boteva, E., R. Vassileva, E. Karova. Comparative study of the dental status among adults in Bulgaria, Problems of Dentistry, V. XXIX/2003, 7–9.
- [12] Burt, B. A., S. Pai. Sugar consumption and caries risk: A systematic review. J. Dent. Educ., 2001, 10, 1017–1023.
- [13] Gati, D., A. R. Vieira. Elderly at greater risk for root caries: A look at the multifactorial risks with emphasis on genetic susceptibility. Int J Dent, 2011.
- [14] Grancharova, G., A. Velkova. S. Alexandrova. Social Medicine, 2002.
- [15] Firestone, A. Cariogenicity of foods. J. Amer. Dent. Ass., 101, 1980, 5, 443.
- [16] Imfeld, T. N. Identification of low caries risk dietary components. Monogr. Oral Science, 1983, 11, 1–198.
- [17] Jenkins, G. N. The Physiology and Biochemistry of the Mouth. Fourth Edition, Blackwell Scientific Publications, Oxford, 1978, 284–303.
- [18] Kidd, E. A. M., S. Joyston-Bechal. Essentials of Dental Caries. The Disease and Its Management, Oxford University Press, second edition, 2003, 11–18.
- [19] Kristofferson, K., H. G. Grondahl, D. Bratthall: The more Streptococcus mutans the more caries on approximal surfaces. J. Dent. Res., 1985, 64, 58–61.
- [20] Minah, G. E., E. . Solomon, K. Chu. The association between dietary sucrose consumption and microbial population shifts at six oral sites in man. Archives of Oral Biology, 1985, 30, 397–401.
- [21] Moss, S. J. Children's dental health: the past is the present and the gateway to the future. Alpha Omegan, 2000, vol. 93, 36–37.
- [22] Reich, E., A. Lussi, E. Newbrun. Caries-risk assessment. Int Dent J, 1999, 49, 15–26.
- [23] Ritter, A. V., D. A. Shugars, J. D. Bader. Root caries indicators: A systematic review of risk models. Community Dent Oral Epidemiol., 2010, 38, 5, 383–397.
- [24] Rugg-Gunn, A. J., A. F. Hackett. Nutrition and Dental Health. Oxford University Press, 1993, 1–13.
- [25] Topalova-Pirinska, S. Caries indices – relation to personal oral hygiene., Stomatology, Vol. 82, 2000, 23–25.
- [26] Topalova-Pirinska, S. Personal oral hygiene influence or dental plaque accumulation, Stomatology, Vol. 82, 2000, 26–29.
- [27] Topalova-Pirinska, S. The hygiene – caries correlation among 20-29 years old Bulgarians, Modern Dentistry, Vol. XXXI, 2000, 4, 3–7.
- [28] Topalova-Pirinska, S, E. Karova. Клинично поведение при лечение на зъбния кариес и неговите усложнения. (Clinical behavior in the treatment of dental caries and its complications), S., 2013,
- [29] Vodenicharov, Tz. The ten principles of the physician and the manager., S., 2010, 68–69.
- [30] Vodenicharov, Tz., S. Popova. Medical Ethics, S., 2010.
- [31] Vodenicharov, Tz. et al. Social Medicine, S., 2013, 101–183.