THE INFLUENCE OF SOCIO-ECONOMIC FACTORS ON THE NUMBER OF EXTRACTED TEETH AMONG THE POPULATION OF SKOPJE REGION IN THE REPUBLIC OF NORTH MACEDONIA

ВЛИЈАНИЕ НА СОЦИО-ЕКОНОМСКИТЕ ФАКТОРИ ВРЗ БРОЈОТ НА ЕКСТРАХИРАНИ ЗАБИ КАЈ НАСЕЛЕНИЕТО ОД СКОПСКИОТ РЕГИОН ВО РЕПУБЛИКА СЕВЕРНА МАКЕДОНИЈА

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Abstract

There is numerous data about the impact of individual social status on personal health in social epidemiology. Socioeconomic factors with the greatest exogenous impact on individual health are as follows: sociocultural (family, school, workplace, media availability) and socioeconomic (education, material resources, allocation of funds). Also, everyone has their own health potential, which depends on immunity, physical activity, nutritional habits, and stress absorption and health behavior: diet, harmful habits, hygiene. The aim of this research is to trace dental health, as part of general health among the residents of the Skopje region, considering the number of extracted teeth in each individual as well as the current condition of the remaining teeth in correlation with the specified socioeconomic factors, in addition with differences in gender, age, and ethnicity. Based on the mentioned parameters, an epidemiological study was carried out on the territory of the city of Skopje which included 582 subjects from each municipality of Skopje, distributed in percentage terms according to the number of inhabitants in each municipality. The participants completed a questionnaire relating to the abovementioned risk factors and they underwent a clinical examination of the oral cavity. The extracted teeth as well as the number of teeth for extraction were noted in the examination. The obtained data showed that social class and education have a significant influence on the studied parameters. **Key words:** social status, education, extracted teeth, oral hygiene.

Апстракт

Социјалниот статус на една индивидуа влијае врз нејзиното здравје за што постојат бројни податоци во социјалната епидемиологија. Од социо-економските фактори коишто влијаат врз здравјето ќе ги издвоиме: социо-културните (семејство, училиште, работно место, медиумска достапност) и социјално-економски фактори (образование, материјални ресурси, распределба на средства) кои имаат најголемо егзогено влијание врз индивидуа со сопствен здравствен потенцијал (имунитет, физичка активност, нутритивни навики, стрес амортизација) и сопствено здравствено однесување (начин на исхрана, штетни навики, хигиена). Целата на трудот е да се проследи денталното здравје како дел од општото здравје кај жителите во скопскиот регион, преку бројот на екстрахирани заби кај една индивидуа, како и моменталната состојба на преостанатите заби во корелација со наведените социо-економски фактори, надополнето со ралики во пол, возраст и етничка припадност. Врз основа на сите наведени параметри беше спроведена епидемиолошка студија на територијата на град Скопје, која опфати вкупно 582 испитаници од сите скопски општини, процентуално распоредени според бројот на жители во секоја општина. Беше пополнет анонимен прашалник со сите прашања кои соодветствуваат на горенаведените фактори на ризик и клинички преглед на забалото. Во прегледот беа нотирани екстрахираните заби, како и бројот на преостанати заби за екстракција. Добиените податоци покажаа дека социјалната класа и образованието имаат значајно влијание врз испитуваните параметри. **Клучни зборови:** социјален статус, образование, екстрахирани заби, орална хигиена.

Introduction

The whole world population lives in organized societies that may have different characteristics and different levels of development.

According to numerous data in different countries, the individual social status has a great impact on individual health. It is known that biological factors are the ones which determine the occurrence of disease, but they are not the only ones and are complemented by the social

environment of the individual. Poverty is considered one of the most important determinants of health and disease, which is followed by the lifestyle of the individual: nutritional habits, physical activity, oral hygiene and professional dental follow-up. Even most developed societies face health status inequality due to different socioeconomic background.

According to researchers in different countries, there are various divisions of social categories which are determined by different parameters. Still, the basic parameters for determining social class are income, education and place of residence.

Despite the significant decline in the incidence of tooth loss in the last two decades[1], socioeconomic inequalities as factors persist over time, which are particularly emphasized in developing countries[2,3]. The correlation between the socioeconomic status and various health problems in the population is a constant subject of public debates[4].

Similar to general health, oral health follows social moments. Oral health can be affected by the individual's responsibility on the one hand, which includes oral hygiene and dental visits, and by dental availability and socioeconomic factors on the other hand[5].

However, there are studies from countries with higher standard, which have been investigating the correlation between socioeconomic factors, individual behavioral factors, and oral health. For example, insufficient access to dental services explains poor oral health and periodontal disease symptoms among poor Swedish adults[6]. Dental programs partly contribute to the increase in the number of healthy teeth in the lower social class in the United Kingdom (Donaldson). In contrast, lack of dental visits and oral hygiene were not associated with more extracted teeth in low-income areas of Australia[7].

Latin American countries still have a high prevalence of tooth loss[8]. But there is a significant difference between them. Tooth loss is an important dental health problem that affects physical and psychosocial health, as well as quality of life, due to reduced chewing ability and limitation of social interaction[9,10].

The socioeconomic status of an individual is defined on the basis of several factors which are grouped into two groups: sociocultural (family, school, workplace, media availability) and socioeconomic factors (education, material resources, allocation of funds). These factors have the greatest exogenous influence on an individual with their own health behavior (physical activity, nutritional habits, harmful habits, oral hygiene).

According to the study by Bayat, there are bigger possibilities for more tooth extractions rehabilitated by dental prosthesis in poorer populations with lower levels of education. Tooth extraction is the method of choice among the poor population because this service is cheaper than dental treatment and is covered by mandatory social Insurance. A study in Iran describes dental care system which is mostly private, and health insurance does not provide adequate coverage for dental services[11].

Similarly, other comparative studies indicate more extracted teeth[12]. not compensated by prosthetic fabrications[13] in low social classes in different countries.

Dental caries, as the most common reason for tooth extraction, is a worldwide problem, which is significantly greater in families with a low socioeconomic level, single parents or a low level of education. Low health levels are not simply a failure of the health services, but are associated with inadequate income, education and housing[14]. High income increase opportunities to utilize health services and prevent diseases. In contrast, low income influence the underutilization of health services due to reduced purchasing power for drugs and transportation costs. Families with lower economic capacity have a hard time fulfilling their basic needs. Because of that, they have a hard time providing health services[15,16]. Many studies show that the prevalence of caries is higher in children who come from families with low socioeconomic status. This is because children from these type of families consume a lot of cariogenic foods. Also, there is a lack of knowledge about dental and oral health, and they rarely make dental visits[17]. This is usually due to various factors such as family isolation, inadequate finances, parental indifference, lack of appreciation for the value of oral health, and even lack of understanding of the importance of oral health by the parents. Health education can be one of the solutions for reducing the lack of information as a factor of health problems. Health education may change an individual's habits (from harmful to beneficial) which will positively affect their dental health[18]. The level of education is a very influential factor on the individual's attitude towards healthy life. A person with higher level of education will have better knowledge about health, which will affect their habits for healthy life. In his research, Afrimelda states that a person with a higher level of education, pays more attention to their own dental health and vice versa, if someone has low or no education, then oral health care is also at a low level. The same opinion is conveyed by Silvia et al.[20] in 2014, according to whom, the higher level of education - the more the value of health is recognized, the individual is more easily employed and earns to meet their health needs. On the other hand, lack of education will hinder the development of one's attitude towards newly recognized values.

Tooth loss can have a negative impact on an individual's quality of life regardless of age. The prevalence of tooth loss has increased in the aging population. For this

reason, researchers are more focused on studies that include older individuals[21]. They analyze the quality of nutrition, phonetic and aesthetic function, as well as the psychological and social well-being of the individual[22]. Tooth loss indicates an individual's concern for dental disease treatment, which is considered one of the most useful indicators of oral health status[23]. The available data from the field of dental social epidemiology is very limited, therefore, the idea for conducting such studies in our country becomes significant. In addition, frequent changes in the healthcare system also affect health, even more so, as an increasing number of dental services are paid for[24].

The State Statistics Office of RNM determines the income indicator by quintiles according

to the total income in the family on an annual level[25]. The calculation of the poverty parameter is based on the income data for the family per member on a monthly level, using the data from Laeken Household Indicators (LHI). According to the poverty indicator, the population is divided in 5 social classes (from 5.000 to 30.000 Macedonian denars per family member monthly). Numerous studies point out problems with oral health in the population in rural areas, which leads to the extraction of teeth without the possibility of their conservative restoration. Insufficient health information, access to state dental services, fear of dentists, diet rich with sugars and poor oral hygiene are cited as reasons[26].

Aim

Guided by the available knowledge from social epidemiology, we determined the objectives of this research: to determine a correlation between socioeconomic and sociocultural factors as exogenous factors (income, education, place of residence, proximity to a dental facility) and health behavior (visiting a dentist, maintaining oral hygiene, diet, BMI) as an endogenous factor regarding the number of extracted teeth and teeth for extraction in the population, supplemented by differences in sex, age, ethnicity.

Material and method

For this research, we created an epidemiological study in which socioeconomic indicators (income, education, place of residence, proximity to a dental facility), hygiene and health habits, which are of interest to the study, (brushing teeth and regular visits to the dentist, nutritional habits, BMI) were observed, as well as their influence on the number of extracted teeth and the number of remaining teeth indicated for extraction.

The research sample consisted of a total of 582 respondents, proportionally distributed in each of the 17

municipalities in Skopje, according to the number of residents in the municipality. The research was conducted over a period of 2 years in various dental facilities (Health Center, Polyclinic, Dental office) on the territory of the respective municipality. The research team conducted a random survey of the respondents, which allowed us to obtain data for the survey questionnaire, which was completed with their consent. The questionnaire contained all the data necessary for the research:

1. Socioeconomic indicators (place of residence, education, income)
2. Sociocultural factors (infrastructural and media connection, proximity to a dental office)
3. Health potential (physical activity, nutritional habits, BMI)
4. Health behavior (harmful habits, maintenance of oral hygiene, regular visits to the dentist)

The clinical examination was performed by members of the research team with a single-use instruments in the Clinical Center, Health Center or dental office in the municipality that accepted cooperation with the team. Data on the number of missing teeth in the oral cavity, as well as remaining teeth diagnosed for extraction, were recorded in the questionnaire.

All patients with serious general health disorders (unregulated diabetes, unregulated blood pressure and serious cardiovascular disorders, liver diseases, hematological diseases, malignant processes in the body), that may affect the quality of life and teeth condition of the individual, were excluded from the research.

The obtained data was appropriately statistically processed, and the results are presented in a table.

Results

From 582 surveyed respondents, aged 18-86 years, 268 were male and 314 were female, which indicates the homogeneity of the sample in terms of gender. The average number of extracted teeth was 7.08 ± 7.1 and 7.06 ± 7.8, respectively in the group of male and female subjects, which indicates statistical insignificance in relation to the gender parameter. The average number of teeth for extraction was 1.17 ± 2.1 in the group of male subjects, 1.16 ± 2.5 in the group of female subjects which is also statistically insignificant.

The structure of the research sample in terms of nationality was Macedonians - 71.65%, Albanians - 18.045%, Turks - 2.23%, Gypsies - 4.98%, Serbs - 1.89% and Bosniaks - 1.2%. The average value of the number of extracted teeth is the highest among

The members of Turkish nationality (12), followed by Gypsies and Bosniaks with 8, Albanians with 6, Serbs with 5, and Macedonians with 4 extracted teeth on aver-

Table 1. Extracted teeth and teeth for extraction according to place of residence

Skopje region					
place of residence	Statistical parameters				p-level
	n	mean ± SD	min- max	median (IQR)	
extracted teeth					
urban	472	6.57 ± 7.3	0 – 32	4 (1.5 – 8.5)	Z=3.8 ***p=0.00015
rural	112	9.19 ± 7.9	0 – 32	7 (4 – 12)	
teeth for extraction					
urban	472	0.98 ± 2.02	0 – 14	0 (0 – 1)	Z=3.6 ***p=0.00035
rural	112	1.96 ± 3.2	0 – 20	1 (0 – 3)	

Z(Mann-Whitney test)   ***p<0.0001

age. The comparison of the number of extracted teeth between different nationalities, made with post-hoc analysis, showed a significant difference in relation to the number of extracted teeth in the group of people of Turkish nationality with p=0.003. Regarding the remaining number of teeth for extraction, the difference is statistically significant between members of Turkish nationality and the other nationalities with p=0.0006, where the remaining number of teeth for extraction is 2 on average.

According to the place of residence, 470 (80.76%) were from urban areas, and 112 (19.24%) from rural areas. The place of residence had a significant effect on the number of extracted teeth and teeth to be extracted (p=0.00015, p=0.00035, respectively). A significantly higher number of extracted teeth and a significantly lower number of teeth for extraction was detected in the subjects from urban areas (table 1).

The level of education has a significant influence on the number of extracted teeth and teeth for extraction (p<0.0001). Respondents with lack of education and with primary education have a significantly higher number of extracted teeth and teeth for extraction than respondents with higher education (p<0.0001, p=0.0026, respectively).

The mean value of the number of extracted teeth in the group without education is 10, in the group with pri-

Table 2. Extracted teeth and teeth for extraction according to level of education

Skopje region					
Education	Statistical parameters				p-level
	n	mean ± SD	min - max	median (IQR)	
extracted teeth					
Without education	7	8.67 ± 4.9	0 – 14	10 (4 – 12)	H=37.6 ***p=0.0000 1vs4 *p=0.031 2vs 4 ***p=0.00000
primary	57	9.17 ± 9.7	0 – 32	8 (0 – 14)	
High school	295	8.29 ± 7.6	0 – 32	6 (2 – 11)	
faculty	225	4.88 ± 6.1	0 – 32	4 (1 – 6)	
teeth for extraction					
Without education	7	5.14 ± 4.1	0 – 10	4 (2 – 10)	H=39.8 ***p=0.00000 1vs4 **p=0.0026
primary	57	1.93 ± 3.7	0 – 20	0 (0 – 3)	
High school	259	1.42 ± 2.4	0 – 14	0 (0 – 2)	
faculty	225	0.52 ± 1.2	0 – 7	0 (0 – 0)	

H(Kruskal-Wallis test)   *p<0.05, **p<0.1, ***p<0.0001

Table 1. Extracted teeth and teeth for extraction according to health education

Skopje region					
visit a dentist	Statistical parameters				p-level
	n	mean ± SD	min- max	median (IQR)	
extracted teeth					
no	113	13.69 ± 8.9	0 – 32	12 (7 – 20)	Z=9.4 ***p=0.000000
yes	471	5.48 ± 6.1	0 – 32	4 (1 – 8)	
teeth for extraction					
no	113	3.26 ± 3.8	0 – 20	2 (0 – 5)	Z=7.2 ***p=0.000000
yes	471	0.67 ± 1.3	0 – 10	0 (0 – 1)	

mary education - 8, in the group with high school education – 6, and in the group with higher education - 4.

Regarding the number of teeth for extraction, half of the group without education have more than 4 teeth for extraction, while half of the subjects in the other groups do not have teeth for extraction (table 2).

The income indicator determines the individual's connection to one of the social classes that differ from each other in terms of hygiene habits and the attitude towards taking care of their oral health. (table 4).

The State Statistics Office determines the social economic status by quintiles according to the total income

Table 4. Extracted teeth and teeth for extraction (correlations with different variables)

Skopje region		
correlations		
variable	Spearman R	p-level
extracted teeth		
age	0.742	***0.00000
Social class	-0.046	0.27
BMI	0.233	***0.00000
oral hygiene	-0.465	***0.00000
proximity of dental office	0.065	0.11
teeth for extraction		
age	0.208	***0.00000
Social class	-0.176	***0.00002
BMI	0.211	***0.00000
oral hygiene	-0.3315	***0.00000
proximity of dental office	0.222	***0.00000

in the family on an annual level. The calculation of the poverty parameter is based on the income data for the family per member on a monthly level, using the data from Laeken Household Indicators (LHI). According to the poverty indicator, the population is divided in 5 social classes (class 1 - 0-5000; class 2 - 5001-10 000; class 3 - 10001-15 000; class 4 – 15.001-20.000; class 5 over 20 000 Macedonian denars per family member)

The highest percentage of respondents who do not visit a dentist (due to lack of habit or financial means) is observed among the members of social class 1, and according to that, they have, on average, the highest number of extracted teeth and present teeth indicated for extraction. On the other hand, lack of funds leads to worry and loss of motivation to maintain oral hygiene.

Subjects who regularly visit a dentist compared to subjects who do not visit a dentist had a significantly lower number of extracted teeth (p<0.0001), and a significantly higher number of respondents who visit a dentist have an average of 5.48 ± 6.1 extracted teeth, with a median of 4 teeth; respondents who do not visit a dentist have an average of 13.69 ± 8.9 extracted teeth, with a median of 12 teeth. Respondents who visit a dentist have an average of 0.67 ± 1.3 teeth for extraction, while respondents who do not practice visiting a dentist have an average of 3.26 ± 3.8 teeth for extraction (table 3).

The number of extracted teeth significantly correlates with age, body mass index and oral hygiene (p<0.0001). According to the value of Spearman's coefficient, the correlation between the number of extracted teeth with age and BMI was positive, direct (R=0.742, R=0.233), while the correlation between the number of extracted teeth and oral hygiene was negative, indirect (R = -0.486). It shows that the number of extracted teeth increases with increasing age and body mass index and decreases with increasing frequency of daily oral

hygiene. The number of teeth for extraction significantly correlates with age, social class, body mass index, oral hygiene, and proximity to dental office (p<0.0001). According to the value of Spearman's coefficient, the correlation between the number of extracted teeth and age, BMI and the distance to dental office was positive, direct (R=0.208, R=0.211 and R=0.222, respectively), while the correlation between the number of teeth for extraction and social status and oral hygiene was negative, indirect (R= -0.176 and R= -0.3315). It shows that the number of teeth for extraction increases with increasing age, body mass index and distance to dental office and decreases with higher degree of social status and with increasing frequency of daily oral hygiene.

Discussion

Social epidemiology is a relatively new branch of epidemiology whose task is to evaluate the manner in which the social status of an individual affects their own health[27].

Numerous factors affect oral health, as part of an individual's overall health. If we note that the most common reason for tooth extraction is caries and its complications, then the promotion of health habits and daily oral hygiene should be an imperative in every society. Our research was carried out for each social economic indicator individually and, on the other hand, extracted teeth and the presence of teeth for extraction were tracked as leading parameters for the state of oral health, analogous to the study by Gilbert GH, Duncan RP, Shelton BJ[28].

The income indicator determines the individual's connection to one of the social classes which differ from each other in terms of hygiene habits and the attitude towards taking care of their oral health (table 3 and 4).

Highest percentage of respondents who do not visit a dentist (due to lack of habit or financial means) is observed among the members of social class 1, and according to that, they have, on average, the highest number of extracted teeth and present teeth with an indication for extraction. On the other hand, lack of funds leads to loss of motivation to maintain oral hygiene. We will compare our results with the research of Neto JM, Nadanovsky P.[29] who conducted a research in one company which provided dental care for its employees where, for a period of 2 years, most teeth were extracted among the lowest social classes. These findings are consistent with the findings obtained in our research. The inequality of social classes causes health inequalities, which of course affects the oral health of an individual (respondents with the lowest education have the worst oral health) and, on average, the highest number of extracted teeth.

From all socioeconomic indicators, education is one of the most stable because it is acquired in early life and has a long-term effect on the individual's way of life[30].

Higher education is associated with regular teeth brushing and regular visits to the dentist, which, in turn, leads to a decrease in the number of extracted teeth and the number of teeth for extraction among respondents with higher education (table 2). When we talk about education, we should also mention the data from the research by Teodora T. 31   where it is emphasized that among younger respondents, the key is educating their parents who impose the health culture in the family.

The place of residence also affects our two examined parameters. The population from urban areas has a larger number of extracted teeth, and fewer teeth for extraction, which indicates that they do not visit the dental office for the purpose of treatment and prevention, but for tooth extraction. The population from rural areas has a significantly higher number of teeth for extraction, which indicates that all therapeutic possibilities have already been exhausted, that all past stages of the tooth have been missed in relation to the possibility of a wider therapeutic approach. In that regard, regardless of the place of residence, the number of lost teeth is the same for both groups[32].

The number of extracted teeth and the number of teeth for extraction significantly correlate with age, body mass index, oral hygiene, and proximity to a dental office. The older the patients - the more teeth they have extracted. What is worrying is the excess body weight that correlates with our parameters, which can be interpreted with inattentiveness to health in general and insecurity in social contacts according to the findings of Kabat W[33].

Lack of oral hygiene is the most significant factor for tooth loss, and it is associated with low education, insufficient health awareness or lack of funds for health care.

Conclusion

From the presented data it can be concluded that:

- The level of education is a direct participant in the formation of habits for regular dental check-ups and regular dental hygiene, which indirectly leads to a negative correlation with the number of extracted teeth and teeth indicated for extraction

- The lowest social categories have the highest number of extracted teeth and teeth indicated for extraction

These conclusions should be used in order to act on the risk factors, while seeking corrections in the health policy for dental protection of the population and raising

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Macedonian Dental Review. ISSN 2545-4757, 2023; 46 (2): 33-39.

the awareness of dental health for all relevant factors which are responsible for this problem on the entire territory of the Republic of North Macedonia.

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