Stomatologija, Baltic Dental and Maxillofacial Journal, 11:42-47, 2009

Evaluation of dental care and the prevalence of tooth decay among middle-aged and elderly population of Kaunas city

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SUMMARY

The aim of the study was to evaluate the prevalence and the intensity of tooth decay among the middle-aged and elderly population of Kaunas, city, and to assess the need for prostheses as well as the possibilities for oral care.

Material and methods. During 2006-2008, we studied 1,141 inhabitants of Kaunas city; the subjects' age was 45-72 years. Oral evaluation technique proposed by the WHO was used in the investigation. We evaluated the prevalence of tooth decay, and its intensity was evaluated using the DMF-T index. We also evaluated dental prostheses, the need for prosthetics, and asked the subjects how they took care of their oral health. Results. The prevalence of tooth decay among middle-aged and elderly population of Kaunas city was 99.9%. The DMF-T index was 21.01±0.3 in the age group of 45-54 years, 23.52±0.4 – in the age group of 55-64 years, and 25.63±0.3 – in the elderly subjects. Full removable dentures were found in 14.0% of the elderly subjects, while 1.0% of the middle-aged subjects and 1.2% of the elderly subjects required full dentures. 57.7% of the subjects aged 45-54 years, 53.1% of the subjects aged 55-64 years, and 43.4% of the elderly subjects brushed their teeth twice daily. Conclusions: The intensity of tooth decay in middle-aged and elderly population of Kaunas city significantly increased with age (21.01-25.63). A relationship was found between oral hygiene status and the DMF-T index. In the middle-aged and elderly population of Kaunas city, the intensity of tooth decay was significantly lower (DMF-T 23.04%) among those who brushed their teeth twice daily than among those who brushed their teeth once daily or less frequently (DMF-T 24.01%). Reduction of the prevalence of tooth decay among middle-aged and elderly population of Kaunas city necessitates alterations in people's attitudes towards dental care, implementation of suitable hygiene habits, and creation and implementation of the dental disease prevention program for adults and the elderly, based on the strategy proposed by the World Health Organization.

Key words: tooth decay, DMF-T index, prostheses, oral care, oral condition.

INTRODUCTION

Tooth decay is a chronic infectious disease of the hard dental tissues, resulting in demineralization of the enamel and dentin. This disease is highly prevalent in all age groups (children and adults alike), and is one of the main causes of tooth loss among adults both globally and in Lithuania [1,2,3]. Studies have shown that in the elderly, tooth decay affects the roots, dental necks frequently manifest signs of abrasion from hard toothbrushes and/or toothpastes containing large amounts of abrasive substances, and this part of the population frequently suffers from periodontal diseases [4-6]. Middle-aged and elderly people also develop other oral diseases, including wearing down of teeth, xerostomia, or precancerous disorders.

It is said that healthy oral cavity means not only healthy teeth and gums, but also healthy organism as a whole. To preserve oral health – and thus to improve the general condition of the body – the application of preventive measures has been proposed, especially including universal education of personal oral hygiene and removal of the accumulated plaque [4,5]. A number of epidemiological studies analyzing and proving the significance of oral hygiene have been performed [5-7]. During the last years, significant changes occurred in the oral care system. These included increased accessibility to modern dental care equipment, materials, and new means of oral hygiene [8].

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Adults also need to develop their oral hygiene habits and to get acquainted with novel means of oral care. Before initiating the education process, attention must be paid to the person's daily activities, usage of medicines, oral condition, and oral hygiene habits. Taking into account the peculiarities of the personality is also of utmost importance in order to avoid insulting the person during the education process [9]. Preservation of oral health requires not only knowledge of the cause of the emergence and development of the disease, but also the ability to implement healthy lifestyle principles in people.

Opposite to the common myth stating that it is too late for adults to change their life-long habits, studies have shown that such change may be a successful process even in the elderly population. Studies of the activity of the elderly in the preventive programs have shown that the main reason for passiveness, inactivity, and failure to alter the habits was a lack of information on the primary healthcare level. This basically means that people did not receive explanations about the possibilities, means, and measures of prevention [9,10].

One of the main directions of the strategy of the WHO is prevention of chronic diseases, which is especially relevant in the elderly population. So far in Lithuania there have been no preventive programs that would help the adult population to preserve healthy teeth and to avoid dental diseases, while dental disease prevention programs for children and adolescents were created and implemented. Adults – especially at older age – have a number of various health problems, as stated in the WHO documents [1,5,10,11].

Substantiation of the necessity for preventive measures aimed at the preservation of oral health in middle-aged and elderly population requires data about the population's oral condition. In order to determine the prevalence of dental diseases in the adult population, studies were performed in Vilnius city and Vilnius region, in five cites of Lithuania, and in five district centers, yet no dental disease prevention measures were applied in the adult population. In the second-largest city of Lithuania – Kaunas – so far there have been no detailed scientific studies on the prevalence and intensity of tooth decay in the middle-aged and elderly population or on this population's oral hygiene habits and oral hygiene status.

The aim of this study was to evaluate the prevalence and the intensity of tooth decay among middle-aged and elderly population of Kaunas, city, and to assess the need for prostheses as well as the possibilities for oral care.

CONTINGENT AND METHODS

This cross-sectional study was performed with the permission of Kaunas Regional Biomedical Research Ethics Committee. The study was performed within the framework of the international program "Health disparities and aging in societies in transition" of the Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) study. 1141 participants underwent a detailed analysis of the oral condition; of these, 336 were 45-54 years of age (141 males and 195 females), 388 – 55-64 years of age (164 males and 224 females), and 417 – 65-72 years of age (199 males and 218 females). This article presents the results of the evaluation of the oral condition in the middle-aged and elderly population (45-72 years of age). The study was performed in the Hospital of Kaunas University of Medicine (HKUM) using odontological equipment, a mirror, and a probe. The results were recorded in a questionnaire designed according to the recommendations of the WHO. The questionnaire also contained each subject's number, age, sex, nationality, and place of residence, as well as the date of the study.

Dental condition was evaluated using the clinical examination criteria proposed by the WHO (WHO Basic methods, 1997) [12]. The examination of the teeth was performed using a flat mirror and a blunt probe.

A tooth was recorded as healthy if it demonstrated no clinical signs of tooth decay. The prevalence and intensity of tooth decay were evaluated as well. The prevalence of tooth decay was determined by calculating the percentage ratio between the number of subjects with detected teeth affected by tooth decay, and the total population. The prevalence of the disease was calculated separately for each of the investigated age groups of subjects. For each subject, individual DMF-T was calculated along with the tooth decay intensity index calculated for all subjects, for each age group, and for both sexes. All dental surfaces were evaluated. The findings were recorded using the numeral recording system. In addition, we evaluated dental prostheses and the need for prosthetic dentistry services.

In addition to objective examination, the subjects were asked about how they cared for their oral health, i.e. how many times per day they brushed their teeth, how frequently they visited the odontologist, and how they evaluated their oral condition.

The accumulated findings were stored in databases. Statistical analysis was performed using the SPSS 13.1 software package. When applying statistical hypotheses, the selected significance level was 0.05. The comparison of mean values between groups was performed using dispersion analysis (ANOVA). The evaluation of the relationship between qualitative determinants was performed using the χ^2 criterion.

RESULTS

Statistical data analysis showed that the prevalence of tooth decay in middle-aged and elderly population of

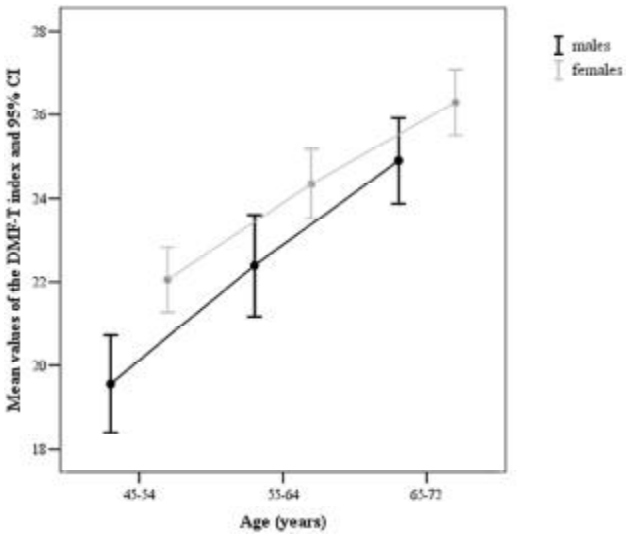

Figure. Distribution of the mean values of the DMF-T index among middle-aged and elderly male and female population of Kaunas city

Kaunas city amounted to 99.9%. Only one subject (an elderly male) was found to have all healthy teeth during this study.

We calculated the intensity of tooth decay among middle-aged and elderly population of Kaunas city. The DMF-T index was 21.01±0.3 in subjects aged 45-54 years, 23.52±0.4 – in subjects aged 55-64 years, and 25.63±0.3 – in elderly subjects. The intensity of tooth decay in males of the studied age groups was significantly ($p<0.05$) lower than that in females (Figure).

The analysis of the DMF-T components showed that filled (F) teeth were most numerous (10.41±0.3) in 45-54 year-old subjects, while the highest numbers of missing (M) teeth (16.96±0.5) were found in the elderly (65-72 year-old) population of Kaunas city (Table 1).

One of the aims of the study was the evaluation of the condition of prostheses and the need for prosthetic procedures for the restoration of the masticatory function. The study showed that the percentage of subjects wearing full removable dentures increased with age – full removable dentures were found in 14.0% of the elderly subjects.

A very important task of the study was the evaluation of the need for full dentures. During the study we found that 1.0% of the middle-aged inhabitants and 1.2% of elderly inhabitants of Kaunas city were toothless, and in all age groups the need for full dentures was greater among males (Table 2).

Personal hygiene has significant influence on dental condition. For this reason we inquired the subjects about the frequency of their tooth brushing. A little over one-half (57.7%) of the subjects aged 45-54 years brushed their teeth twice daily. Younger subjects took better care of their teeth, compared to the older ones. One half (50.0%) of the elderly subjects brushed their teeth only once a day. In all age groups, females cared

Table 1. Mean values of the components of tooth decay intensity in the middle-aged and elderly population of Kaunas city

Age groups	DMF-T	D	F	M
45-54 years	21.01±0.3	1.13±0.1	10.41±0.3	9.27±0.4
55-64 years	23.52±0.4	1.27±0.1	8.82±0.3	13.43±0.4
65-72 years	25.63±0.3	0.84±0.07	7.83±0.3	16.96±0.5
Total	23.55±0.2	1.13±0.06	8.9±0.2	13.49±0.3
	F=44.6;df=2;p<0.001	F=7.1;df=2;p=0.001	F=14.8;df=2;p<0.001	F=76.6;df=2;p<0.001

Table 2. Condition of dental prostheses in the middle-aged and elderly population of Kaunas city

	Age groups								
	45-54 years			55-64 years			65-72 years		
Type of prosthesis	Total %	Males %	Females %	Total %	Males %	Females %	Total %	Males %	Females %
Full dentures	0	0	0	4.6	4.9	4.5	14.0	13.6	14.4
Full dentures needed	0.6	0.7	0.5	1.0	2.4	0	1.2	2.0	0.5

Table 3. Distribution of the frequency of toothbrushing in the middle-aged and elderly population of Kaunas city

Frequency of toothbrushing	Age groups								
	45-54 years			55-64 years			65-72 years		
	Total %	Males %	Females %	Total %	Males %	Females %	Total %	Males %	Females %
Twice daily	57.7	36.9	72.8	53.1	37.2	64.7	43.4	28.1	57.4
Once daily	38.7	56.7	25.6	39.9	49.4	33.0	50.0	59.7	41.2
3-4 times per week or less frequently	3.6	6.4	1.6	7.0	13.4	2.3	6.6	12.2	1.4
With respect to sex in age groups		χ^2=44.1;df=2;p<0.001			χ^2=36.9;df=2;p<0.001			χ^2=45.9;df=2;p<0.001	
With respect to age groups					χ^2=19.0; df=4; p<0.001				

for their teeth better than males did (Table 3).

The intensity of tooth decay (DMF-T 23.04%) among middle-aged and elderly inhabitants of Kaunas city who brushed their teeth twice daily was significantly lower than that of the subjects who brushed their teeth once daily or less frequently (DMF-T 24.01%) ($p<0.02$).

During the study, we tried to determine whether the inhabitants of Kaunas city cared for their oral health and visited their odontologists twice a year for prevention of dental diseases. The analysis of the results showed that 43.2% of the respondents visited their odontologists less frequently than once yearly, and over one-fifth (22.6%) of elderly men did not remember when they last visited their odontologists (Table 4).

Data analysis showed that the subjects needed odontological assistance, but over one-third (37.6%) of the subjects aged 45-54 years, and over one-fourth (28.9%) of the elderly inhabitants of Kaunas city indicated that they did not visit their odontologists for economic reasons, or simply pointed out their low income and high costs of odontological services. In addition to that, as much as 15.8% of the subjects aged 45-54 years, and 8.9% of the elderly subjects indicated that fear was the reason for not visiting their odontologist; females mentioned fear as the reason for not visiting the odontologist nearly as two times more frequently as males did (Table 5).

However, generalized evaluation of the subjects' responses about how they evaluated their oral condition showed that over one-half (54.5-65.0%) of the subjects evaluated their oral condition as average, and every fifth (20.0%) elderly subject evaluated their oral condition as poor (Table 6).

Table 4. The frequency of visits to the odontologist in the middle-aged and elderly population of Kaunas city

Frequency of visits to the odontologist	Age groups								
	45-54 years			55-64 years			65-72 years		
	Total %	Males %	Females %	Total %	Males %	Females %	Total %	Males %	Females %
Several times per year	22.4	18.4	28.7	19.3	22.0	17.4	18.0	15.1	20.6
Once a year	31.8	22.0	39.0	29.4	18.9	37.1	23.7	19.1	28.0
Less frequently than once a year	33.3	41.8	27.2	36.3	38.4	34.8	37.6	43.2	32.6
Do not remember the last visit	10.4	17.7	5.1	14.9	20.7	10.7	20.6	22.6	18.8
With respect to sex in age groups		χ^2=28.7;df=3;p<0.001			χ^2=18.3;df=2;p<0.001			χ^2=9.1;df=2;p<0.05	
With respect to age groups					χ^2=22.3; df=6; p<0.001				

Table 5. Reasons for not visiting the odontologist in the middle-aged and elderly population of Kaunas city

Reasons for not visiting the odontologist	Age groups								
	45-54 years			55-64 years			65-72 years		
	Total %	Males %	Females %	Total %	Males %	Females %	Total %	Males %	Females %
No dental problems	46.5	51.1	42.9	53.6	50.0	56.4	62.2	66.1	58.3
Economical reasons	37.6	29.6	44.0	30.8	29.5	31.9	28.9	27.9	29.9
Fear of procedures	15.8	19.3	13.1	15.6	20.5	11.8	8.9	6.0	11.8
With respect to sex in age groups		χ^2=7.0;df=2;p<0.05			χ^2=5.2; df=2;p=0.075			χ^2=4.5;df=2;p=0.1	
With respect to age groups					χ^2=20.0; df=4; p=0.001				

Table 6. Self- evaluation of the oral condition in the middle-aged and elderly male and female population of Kaunas city

Evaluation of the oral condition	Age groups								
	45-54 years			55-64 years			65-72 years		
	Total %	Males %	Females %	Total %	Males %	Females %	Total %	Males %	Females %
Very poor or poor	24.7	28.3	22.2	29.8	26.1	32.6	20.0	19.1	20.8
average	54.5	51.4	56.7	53.3	56.5	50.9	65.0	67.0	63.2
Very good or excellent	20.8	20.3	21.1	16.9	17.4	16.5	15.0	13.9	16.0
With respect to sex in age groups		χ^2=1.6;df=2;p=0.4			χ^2=1.9;df=2;p=0.04			χ^2=0.7;df=2;p=0.7	
With respect to age groups					χ^2=16.9; df=4; p<0.002				

DISCUSSION

The evaluation of the oral condition in the middle-aged and elderly population of Kaunas city showed that the prevalence of tooth decay was very high (99.9%). Only one subject (an elderly man) in the study was found to have all healthy teeth. Similar results were published in other studies performed in different parts of the world [5,13,14,15,16].

The evaluation of the intensity of tooth decay in the middle-aged and elderly population of Kaunas city showed that the results worsened with increasing age – over 20 teeth affected by tooth decay were detected (21.01 – 23.52). The study showed that the intensity of tooth decay in the age groups was significantly lower among males than among females, although it is commonly thought (and confirmed by the findings of our study) that females take more care of their health. Analogous findings were presented by Swiss researchers. According to Bertea et al., hormone fluctuations in the female organism could affect oral health [17].

The analysis of the DMF-T components showed that among subjects aged 45-54 years, the highest number of teeth were filled (F) (10.41±0.3), while the elderly subjects (65-72 years of age) had the highest number of missing (M) teeth (16.96±0.5). The mean value of the missing (M) teeth showed that the elderly subjects had, on the average, fewer than 20 teeth. Similar figures were found in a previous study by Siudikienė et al. in Lithuania [3] and in the study of the Hungarian population of similar age [18,21]. This is despite the fact that the WHO objectives for 2010 include the presence of 20 functional teeth in 75% of the elderly population [1].

Similarly to a previous study performed in 1997/98, we determined the presence of prostheses and the need for prosthetic services for the restoration of the masticatory function. The study showed that the percentage of patients wearing full removable dentures increased with age, and 14.0% of the elderly subjects were found to wear full dentures, i.e. were completely toothless. The same results were also found during the previous study [2]. However, compared to the results published by the WHO (2005), the percentage of toothless elderly population in Poland was twofold (25%), while Austria (15%) and Italy (13%) demonstrated similar results [6,11,24].

The analysis of the findings of the study showed that 1.0% of the middle-aged and 1.2% of the elderly population of Kaunas city were toothless and needed dentures. More males needed dentures in all the studied age groups. These people did not have dental prostheses at the time of the study, which suggests that their nutrition was inadequate and thus negatively affected the condition of the whole organism [5]. Davis et al. stated that toothless people lack self-confidence, they have difficulty accepting changes in their faces resulting from tooth loss, and even report negative changes in performing daily routine and the quality of life in general [23].

Many researchers state that oral hygiene has major influence on the dental condition [15,16,18]. For this reason the subjects were asked how often they brushed their teeth. A little over one-half (57.7%) of the subjects aged 45-54 years brushed their teeth twice daily. Younger subjects took better care of their teeth, compared to the older ones. One-half (50.0%) of the elderly subjects brushed their teeth only once daily. Females in all age groups took better care of their teeth than males did. Data analysis showed that the intensity of tooth decay was significantly lower among middle-aged and elderly inhabitants of Kaunas city who brushed their teeth twice per day, compared to those who brushed their teeth once daily or less frequently ($p<0.02$). This was noticed in other studies as well [2,3,20,22,25].

During the study we tried to determine if the inhabitants of Kaunas city sufficiently cared for their oral health and visited their odontologists twice yearly for preventive purposes. The analysis of the data showed that the results were not satisfactory – 43.2% of the subjects visited their odontologists less frequently than once a year, and over one-fifth (22.6%) of the elderly males did not remember when they last visited their odontologist.

The findings of this study showed that there was a need for dental treatment and prosthetics, yet over one-third (37.6%) of the subjects aged 45-54 years, and over one-fourth (28.9%) of the elderly subjects stated that they did not visit their odontologists for economic reasons or simply indicated low income and high costs of odontological services. In addition to that, a part of the subjects (15.8% of those aged 45-54 years and 8.9% of the elderly subjects) named fear as the reason for not visiting their odontologists, and this reason was nearly twice as common in females as in males.

We also analyzed how the subjects evaluated their own oral condition. Generalization of the findings showed that over one-half (54.5-65.0%) of the subjects evaluated their oral condition as average, while one-fourth (24.7%) of the subjects aged 45-54 years, and every fifth (20.0%) elderly subject evaluated their oral condition as poor. Thus, this indicates that the subjects understood and critically evaluated the situation.

The obtained findings indicate that if our population learned to value the importance of oral health and improved their oral hygiene habits, this would reduce the prevalence of dental diseases [5,10,15,21] and the number of toothless people – which happened in Holland [19] and Sweden [20]. Undoubtedly, the development of appropriate oral hygiene habits since childhood is more effective. However the attitude of adults and the elderly to dental care needs changing as well. The WHO

health program pays significant attention to the preservation of oral health and emphasizes the need for oral health preservation programs for the elderly [5]. Oral health-improving programs are inexpensive and have no adverse effects. The findings of our study highlighted the need for a program aimed at the prevention of dental diseases in the middle-aged and elderly population.

CONCLUSIONS

1. The intensity of tooth decay in the middle-aged and elderly population of Kaunas city significantly increased with age (21.01-25.63).

2. The number of middle-aged and elderly inhabitants of Kaunas city wearing full removable dentures increased with age (4.6-14.0%), and as much as 1.2% of the elderly subjects needed full dentures.

3. Oral hygiene habits in the middle-aged and elderly population of Kaunas city are inadequate. A little over one-half of the middle-aged subjects brushed their teeth twice daily. In all age groups, females took better care of their teeth than males did. A relationship was detected between oral hygiene and DMF-T. The intensity of tooth decay in middle-aged and elderly inhabitants of Kaunas city who brushed their teeth twice daily (DMF-T 23.04%) was significantly lower than that in subjects who brushed their teeth once daily or less frequently (DMF-T 24.01%) ($p<0.02$).

4. Reduction of the prevalence of tooth decay in the middle-aged and elderly population of Kaunas city requires changing people's attitudes towards dental care, the implementation of appropriate hygiene skills, and creation and implementation of a program aimed at the prevention of dental diseases in the middle-aged and elderly population, based on the strategy proposed by the World Health Organization.

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Received: 06 03 2009
Accepted for publishing: 19 06 2009