ORAL HEALTH

EVALUATION OF THE ORAL HEALTH STATUS IN GERIATRIC PATIENTS

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Abstract

The geriatric population in R. Macedonia presents a specific group that needs continuous evaluation of their oral health. According to WHO data in 2010, 12 % of the population was aged 65+ years in Macedonia. Aging is the process with different specific changes in all systems and organs, including the orofacial system. The most common conditions associated with age in the geriatric population are teeth loss, parodontopathy, precancerous lesions and oral carcinomas, xerostomia, resorption of the residual alveolar ridge, and overall dysfunction of the orofacial system. There is a great influence of the performed prosthodontic therapy in geriatric patients on the overall and general health. The aim of this study was to evaluate the condition of the soft tissues in geriatric patients, especially in patients with prosthodontic treatments, their oral health, and the influence of oral health on life quality. Material and methods: Observational cross-sectional study was conducted in geriatric patients and Geriatric Oral Health Assessment Index (GOHAI) was used for self-assessment of their oral health and the impact of oral conditions and performed dental treatment on quality of life. Results: Participants witha mean age of 72.88 years reported several general and systemic diseases, and the main risk factors for their oral mucosal changes were smoking and drinking alcohol. Total anodontia was observed in 37.5% of respondents and partial anodontia in 62.5%. The average period of wearing dentures was 7.8 years. The total scoreof the quality of life and oral health of the respondents varied in the interval 1.93 ± 0.65, and the average value in the subjects with prosthetic constructions for p> 0.05 (p = 0.19) was slightly higher in relation to the subjects without any prosthodontic device. Conclusion: GOHAI-12 score in the study had a low value, less than 50 indicated that the respondents were in poor oral health. According to the results of the self-assessment, there was a weak to moderate perception of oral health. An integrated approach is needed to achieve a critical positive level of general and oral health in geriatric patients.

ОРАЛНО ЗДРАВЈЕ

ПРОЦЕНКА НА ОРАЛНОТО ЗДРАВЈЕ КАЈ ГЕРИЈАТРИСКИ ПАЦИЕНТИ

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Извадок

Геријатриската популација во Македонија претставува специфична група која има потреба од континуирана евалуација на нивното орално здравје. Според податоците на СЗО во 2010 година, 12 % од населението во Македонија било на возраст 65+ години. Стареењето е процес со различни специфични промени во сите системи и органи, вклучувајќи го и орофацијалниот систем. Најчестите состојби поврзани со возраста кај геријатриската популација се губење на забите, пародонтопатија, преканцерозни лезии и орални карциноми, ксеростомија, ресорпција на резидуалниот алвеоларен гребен и целокупна дисфункција на орофацијалниот систем. Големо е влијанието на извршената протетичка терапија кај геријатриските пациенти врз нивното целокупно и општо здравје. Целта на оваа студија беше да се процени состојбата на меките ткива кај геријатриските пациенти, особено кај пациентите со протетички третмани, нивното орално здравје и влијанието на оралното здравје врз квалитетот на животот. Материјал и методи: Спроведовме опсервациона студија на пресек кај геријатриските пациенти, а геријатрискиот индекс за проценка на оралното здравје (GOHAI) беше употребен за да се изврши евалуација на нивното орално здравје и влијанието на оралните состојби и извршениот дентален третман врз квалитетот на животот. Резултати: Испитаниците со просечна возраст од 72,88 години пријавиле повеќе општи и системски заболувања, а главните фактори на ризик за промените на оралната мукоза биле пушењето и пиењето алкохол. Вкупна анодонција е забележана кај 37,5% од испитаниците и делумна анодонција кај 62,5%. Просечниот период на носење протези изнесуваше 7,8 години. Вкупната оценка за квалитет на животот и оралното здравје на испитаниците варираше во интервалот 1,93 ± 0,65, а просечната вредност кај субјектите со протетички конструкции за р> 0,05 (р = 0,19) беше нешто повисока во однос на субјектите без било каква протетичка изработка. Заклучок: Резултатот на GOHAI-12 во студијата имаше ниска вредност, помалку од 50 што покажа дека испитаниците беа со слабо орално здравје. Според резултатите од самооценувањето, имаше слаба до умерена перцепција за нивното орално здравје. Потребен е интегриран пристап за да се постигне критично позитивно ниво на општото и оралното здравје кај геријатриските пациенти.

Introduction

Aging of the population is a natural process and reality, both in developed and underdeveloped countries in the world. According to Eurostat in 2008 in Europe over 20% of the population was old. The World Health Organization (WHO) in 2010 for the first time established a database on oral health in 163 of 193 registered countries. The data from the last census in 2002 in the Republic of Macedonia, showed that the geriatric population from 65 to 85 years was 214,915, of which 96,752 were men and 118,163 women.According to the WHO data in 2010, 12% of the population was over 65 years oldin Macedonia[1].The data for the capital city Skopje indicated 72,968 people at this age, of which 50,428 men and 22,540 women[2].

The geriatric population in the Republic of Macedonia is a specific group that needs continuous evaluation of their oral health. There is not much data on the state of oral health in the geriatric population in our country, and the cross-sectional study that covered 8 rural and urban areas (Skopje, Vardar, Eastern, Northeastern, Southeastern, Southwestern, Pelagonia, and Polog region)conducted in 2015/2016on a representative sample of432people (age>65 years) showed a high prevalence of anodontia of 45.1%, poor oral hygiene, and even 60-80% of respondents needed some urgent prosthetic treatment[3].

Aging is a process with different and specific changes in all systems and organs, and it affects the human bodyincluding the orofacial system too. In the elderly population, the number of remaining teeth is reduced, and their condition is changed. The changes of the teeth occur physiologically and gradually over the years, and are manifested at all layers of enamel, dentin, pulp, and cement. Oral soft and hard tissues are also affected by the aging process. These changes in the mouth are not pathological, and they are manifested on a macro and microscopic level[4].

The most common conditions associated with aging are tooth loss, periodontitis, precancerous lesions, and oral cancers, xerostomia, resorption of the residual alveolar ridge, and complete dysfunction of the orofacial system[5]. Oral hygiene habits are also age-dependent, and oral hygiene maintenance is often irregular or not performed, and is a result of impaired vision and reduced manual and cognitive capacity in the elderly[6].In this population, it is very important to discover all those factors that lead to the appearance and development of leukoplakia and other precancerous lesions as early as possible[7]. Precancerous lesions and oral cancers are much more common in the elderly than in the younger population, and screening tests are an important tool for asymptomatic patients in everyday practice[8]. The effectiveness of screening tests is evaluated according to the diagnostic value in terms of their sensitivity, specificity, and the number of cases detected with them[9,10].

Poor and inadequate prosthetic treatment in geriatric patients does not provide good masticatory function, and the masticatory forces in these patients can be reduced by up to 60%[11]. Therefore, careful planning of prosthetic treatment, improve-

ment of oral hygiene, and proper diet are very important factors for proper assessment of the quality of life of the geriatric population related to oral health[12].

The aim of this study was to assess the condition of oral status in geriatric patients with and without prosthetic devices, their general and dental health, and the impact of oral health on quality of life.

Material and methods

The data for the paper was obtained by clinical and epidemiological examination, observational cross-sectional study conducted in the geriatric population - patients over 65 years of PHI UDCC "St. Panteleimon", Skopje (Picture 1). Eighty respondents who were included in the study signed an informed consent form. The examination was approved by the Ethics Committe for examination at the Faculty of Dentistry, UKIM in Skopje.

Figure 1. Epidemiological survey and clinical examination

Respondents were divided into 2 groups according to the presence or absence of prosthetic construction in the mouth: 40 respondents at the

Clinic for dental prosthetics with prosthetic constructions and 40 respondents without prosthetic constructions.

All participants completed a questionnaire with anamnestic data on their general health status - medical history and oral health status - dental history, as well as data from the analysis of risk factors and oral hygiene, and completed a GOHAI - questionnaire (Global / General Oral Health Assessment Index).The GOHAI questionnaire for self-assessment of oral health and the impact of oral conditions on quality of life consists of 12 questions such as functional limitation, aesthetic dissatisfaction, discomfort during chewing, avoidance of certain types of food, avoidance of social contacts, and more. The questionnaire covers the problems of the elderly in three dimensions: physical functioning such as eating, speaking, and swallowing; mental functioning such as oral health concerns, dissatisfaction with appearance and avoidance of social contacts; pain and discomfort, use of pain medication or discomfort in the mouth.The questions are written positively or negatively, to stimulate the respondents to give their assessment of their oral health. The answers are evaluated with number 1-5 where 1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always. The overall score on the scale is the sum of all the values for each question, and the low value indicates the presence of an oral health problem. A higher GOHAI score indicates better oral health status. The values also show three levels of subjective perception of respondent's oral health: poor, moderate, and good perception. At the Clinic for prosthodontics, a clinical examination (ex-

tra and intraoral) was performed to evaluate the oral condition, the presence of mucosal changes, dental and prosthetic status[13-16].

Results

The socio-demographic characteristics of respondents are an important indicator with high significance in epidemiological research (Table 1). The mean age of our respondents was 72.88 years, most of them 32.5%, were aged 75-79 years and 1.25% at least were over 85 years. Gender distribution showed a higher presence of female respondents (57.5%) - compared to male respondents (42.5%). According to the place of residence, most of them originate from urban environments 82.5%, 16.25% from the peri-urban environment, and the smallest number live in rural areas (1.25%). Only 20% of our geriatric patients had completed universityeducation, most of them had secondary education (57.5%), while persons without education or completed primary education were 22.5%.

Table 1. Socio-demographic characteristics

RISK FACTORS		PHI UDCC
numberpercent		
GENDER		
male	34	42,5%
female	46	57,5%
AGE/years		
65-69	24	30%
70-74	25	31,25%
75-79	26	32,5%
80-84	4	5%
85-90	1	1,25%
Over 90	/	/
language		
Macedonian	72	90%
Albanian	3	3,75%
other	5	6,25%
education		
without	/	/
4 grade	/	/
primary	18	22,5%
secondary	46	57,5%
university	16	20%

Respondents also had several general and systemic diseases, mostly cardiovascular diseases such as hypertension (47.5%), rheumatic cardiomyopathy and angina pectoris (15%), hypotension (12.5%), and arrhythmias (7.5%). Prevalence of the eye diseases and cataracts was registered in 12.5% and reduced vision in 22.5%of respondents. Diseases of the gastric mucosa and ulcer were present in 20%, 20%had diseases of the bones and joints, and 12.5% of female patients were diagnosed with osteoporosis, for which they received therapy with bis-phosphonates. Of the endocrine diseases, the most common were diabetes mellitus (25%) for which the patients most often used therapy with Glucophage tablets or insulin ampoulec, and 12.5% of patients suffered from thyroid disease.

Risk factors for oral disease are hereditary predisposition and conditions or risks that depend on lifestyle and some behaviors (smoking, excessive alcohol consumption, drug use, tattooing and piercing, and HPV-16 virus infection).

Data were analyzed and the results obtained are displayed in Table 2. Respondents did not provide information that any of them used illegal substances, got a tattoo, or had a piercing. Risk factors were smoking and alcoholconsumption, and there were no data on HPV infection. Forty-five percents smoke or smoked, of which 61.1% werw men and 38.8%women. On average, everyone smoked 1-2 packs a day, and 40% stopped more than three years ago, or about 10 years ago. Regarding alcohol as a risk factor, 47.5% drank alcoholic beverages 6-11/week, and 5% drank 1-5 drinks/week, most of the respondents still drink some beer or brandy when they have the opportunity, and only 20% gave data that they no longer consume alcoholic beverages.

Table 2. Prevalence and distribution of risk factors

SMOKING male female	36(45%) 22(61,1%) 14(38,8%)
HOW MANY CIGARETTES? HOW LONG? WHEN DID YOU QUIT?	1-2 boxes 20 years Quit more than 3 years ago
ALCOHOL / AVERAGE AMOUNT OF ALCOHOL	38(47,5%) 6-11 drinks/week
ABUSE OF PROHIBITED SUBSTANCES	no
TATTOOS / PIERCINGS	no
INFECTION / HPV VIRUS	no

Most of the respondents did not know the exact reasons for the extraction of the largest number of their teeth, so fractures, a large dental caries process, and periodontitis were most often mentioned. Total anodontia or no teeth in the upper and lower jaw were observed in 37.5% of patients, while partial anodontia had 62.5%. More than 53.33% of patients with complete anodontiawere women. Of the patients with partial anodontia, 72% were females and 28% were males. The average age of patients with total anodontiawas 72.63 ranging from 65 to 80 years. The average age of patients with partial anodontiawas 72.66 ranging from 65to 80 years.

Regarding the number of remaining teeth as an important indicator of the oral healthstate, the average number of remaining teeth in the upper and lower jaw in patients was 14.5 ranging between 4and 23 teeth. The most common cause of tooth extraction was loosening or periodontitis, followed by large carious lesions and fractures of the teeth. The periodontal status of the patinets with partial edentulousness was noted by recording the presence/absence of gingival bleeding, the presence/absence of periodontal pocket, and the lost attachment from 0-3mm to 12mm. Inflammation and gingival bleeding, at least one periodontal pocket 4-5 mm deep and a lost 0-3mm attachment to at least one tooth were observed in all patients with residual teeth.

Prosthodontic constructions present in the mouth are total prosthesis, partial prosthesis, skeletal prosthesis, crowns, bridge, and combined prosthetic rehabilitation (bridge/prosthesis). Of all respondents 93.33% hadtwo total prostheses, 6.66% had one total prosthesis in the upper jaw and partial edentulousness with lower partial acrylic prosthesis and in 3.33% prosthetic rehabilitation was performed in combination with a lower total prosthesis, and partial edentulousness in the upper jaw with a visceral skeletal prosthesis (Table 3).

Table 3. Prosthetic rehabilitation

PROSTHETIC REHABILITATION	number	%
2 total dentures	28	35%
1 total denture	/	/
Total/partial denture	2	2,5%
Partial/partial denture	10	12,5%
Skeletal denture	6	7,5%
Bridges	4	5%
Bridge/Partial denture	18	22,5%
Bridge/Total denture	2	2,5%
Upper total denture/bridge/lower partial denture	4	5%
Bridge/partial skeletal denture/silicone denture	5+1	7,5%
Total	**80**	**100%**

Patients had a total of 60 total acrylic prostheses and 26 partial acrylic prostheses. The average wearing dentures time was 7.8 years ranging in an interval of 3-20 years (Figure No. 2).

Figure 2. Total prostheses

Calculation and results of the questionnaire for the GOHAI index

The GOHAI Questionnaire consists of 12 items/questions: T1(How often do you limit the amount of food you eat because of problems with your teeth or dentures?); T2(How often do you have problems with biting or chewing any kind of food (solid meat or apples)?); T3(Do you have difficulty swallowing?); T4 (How often have your teeth or dentures prevented you to speakthe way you wanted?); T5 (How often you were able to eat without feeling discomfort?); T6(How often have you avoided contact with people because of the condition of your teeth or dentures?); T7(How satisfied are you with the look of your teeth, gums or dentures?); T8(How often have you used medication to relieve pain or discomfort from around your mouth?); T9(How often have you been concerned about the condition of your teeth, gums or dentures?); T10(How often do you feel nervous or aware of problems with your teeth, gums or dentures?); T11(How often did you feel uncomfortable eating in front of people because of problems with your teeth or dentures?); T12(How often were your teeth or gums sensitive to heat, cold or sweets?).

Responses to the questions are scored according to the Likert scale and a GOHAI score is obtained, according to which the oral health is divided into three categories: high - good oral health 57-60; moderate - secondary oral health 51-56; low - poor oral health less than 50.

The obtained score can be categorized for easier and faster determination of the level of psychometric characteristics according to the oral health self-perception: less than 50 as "low perception, 51-56 as" moderate perception "for oral health, 57-60 as" high perception ". Table 4 and Figure 3 show descriptive statistics of the total score and the average score for the quality of life and oral health of respondents.

Table 4. Quality of life and oral health/total, average score / Descriptive statistics

GOHAI	No	Average	Confidence -95,00%	Confidence +95,00%	Median	Sum	Min.	Max.	Std.Dev.
Sum Total	80	15,48	14,32	16,63	14,50	1238	6	32	5,19
Average	80	1,93	1,79	2,08	1,81	154,75	0,75	4,00	0,65

The total score that refers to the quality of life and oral health in respondents from group 1 varied in the interval 15.48 ± 5.19; ± 95.00% CI: 14.32-16.63; the median was 14.50; the sum of the total score was 1238; the minimum value was 6 and the maximum value was 32. The average score referring to the quality of life and oral health of the respondents from group 1 varied in the interval 1.93 ± 0.65; ± 95.00% CI: 1.79-2.08; the median was 1.81; the sum of average score was 154.75; the minimum score was 0.75 and the maximum score was 4.00.
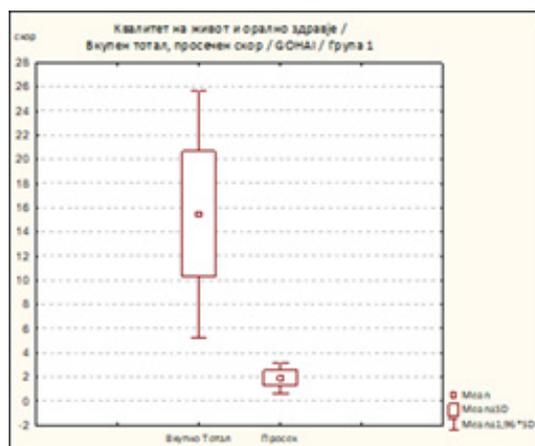
Figure 3.

Table 5 presents the difference in the quality of life and oral health of respondents in relation to gender. The average value of quality of life and oral health in male respondents (x = 2.05) for t = 1.40 and p> 0.05 (p = 0.17) was slightly higher thanin female respondents (x = 1 , 85).

Table 5. Quality of life and oral health / Gender

Variable	Mean Male	Mean Female	t-value	df	p	Valid N Male	Valid N Female	Std.Dev. Male	Std.Dev. Female
Average*	2,05	1,85	1,40	78	0,17	34	46	0,63	0,66

There was an insignificant correlation between the average value of quality of life and oral health and their age (72.48-5.25). For r = -0.21 (p> 0.05) a moderately weak negative insignificant correlation was found. Namely, with a single increase in the age of the respondents by one year, the quality of life and oral health decreases insignificantly by 0.03 units. The average value of quality of life and oral health in the respondents in peri-urban environment (x = 2.27) for t = - 2.17 and p <0.05 (p = 0.03) is significantly higher than in respondents in urban environment (x = 1.86).

Table 6. Quality of life and oral health / Environment

Variable	Mean Urban	Mean Periurban	t-value	df	p	Valid N Urban	Valid N Female	Std.Dev. Urban	Std.Dev. Periurban
Average*	1,86	2,27	-2,17	78	**0,03**	66	14	0,58	0,84

For F = 0.57 and p> 0.05 (p = 0.57), there was no significant difference in the quality of life and oral health when it comes to the education of respondents. Table 7 shows the difference in the quality of life and oral health of respondents in relation to smoking. The average value of quality of life and oral health in smokers (x = 2.15) for t = 2.74 and p <0.01 (p = 0.008) was significantly higher than in non-smokers (x = 1.76).

Table 7. Quality of life and oral health / Smoking

Variable	Mean Smokers	Mean Nosmokers	t-value	df	p	Valid N Smokers	Valid N No smokers	Std.Dev. Smokers	Std.Dev. No smokers
Average*	2,15	1,76	2,74	78	**0,008**	36	44	0,72	0,53

The average value of quality of life and oral health in respondents who drank alcohol (x = 2.03) for t = 1.30 and p> 0.05 (p = 0.20) was slightly higher than in the respondents who did not drink alcohol (x = 1.85). The average value of quality of life and oral health in respondents with prosthetic constructions (x = 2.03) for t = - 1.32 and p> 0.05 (p = 0.19) was slightly higher in relation to respondents without prosthetic structures (x = 1.84).

Discussion

Oral health is important for general health and well-being and has a major impact on quality of life. It is defined as a state of absence of pain in the mouth and face, oral diseases, and disorders that limit individual capacities for chewing, biting, laughing, talking, and psychosocial well-being. About 30% of the European population aged 65-74 do not have natural

teeth and have reduced function and quality of life[13]. The average life expectancy of people is constantly increasing due to better living conditions, education, and better health care. Life expectancy in 1900 was 45 years, and in 2000 it was twice higher(85 years). Aging, on the other hand, is associated with higher rates of morbidity, disability, and lower quality of life. Oral diseases and the reduced number of teeth affect the orofacial system and its functions in elderly patients[14]. They have problems with chewing, decreased sense of taste, bad breath (fluoride), dry mouth (hyposalivation and xerostomia), burning syndrome, speech and communication problems, pain in TMJ, etc.[15]. Age is not always directly related to tooth loss and is most likely the result of periodontitis, caries, poor general health, and socioeconomic factors[16]. However, the number of elderlywith anodontia in different countries is quite high (6-78%), and this has a negative impact on the quality of life related to oral health (OHRQoL)[17]. According to the WHO, anodontia is a severe physical disability that causes several clinical, functional, and psychological difficulties. In this study, partial anodontia was recorded in all patients missing more than one tooth. Studies in some Western European countries show a higher number of remaining teeth than data obtained from our geriatric respondents (37.5% partial and 62.5% total edentulousness). A study conducted in Germany gives data on an average of 14 remaining teeth in subjects from the age group 60-65, and only 3 remaining teeth on average in the group 75-79 years[18]. A study conducted in Sweden after the continuous implementation of measures to improve oral health showed a reduc-

tion in the rate of toothlessness from 14% in 1973, to 8% in 1993 and only 1% in 2003[19]. This confirms that the attitude towards age and the number of remaining teeth have changed, and today it is known that regular maintenance of oral hygiene, proper diet, and visit to the dentist give positive results in preserving natural teeth. Prosthetic constructions (total and partial dentures) successfully restore mastication, phonetics, and aesthetic function, but also contribute a lot to the improvement of social life. Proper chewing function is of great importance because it also affects the effect of digestion. During aging, the secretion of gastric juice decreases, and proper preparation of the bolus is especially important, because the masticatory efficiency of dentures is 16-50% compared to chewing with natural teeth[20].

Health-related quality of life (HRQoL) and oral health-related quality of life represent the condition of the teeth and mouth and general health of patients, and their assessment is performed using several indices. The GOHAI General Oral Health Assessment Index measures people's perceptions of the social impact of oral disorders on their general well-being[21]. The index specializes in the evaluation of oral functional problems in elderly patients and the effects of dental treatment[22]. It consists of 12 questions related to the ability to do social activities and lack of pain and infection. If the patient does not answer more than 3 questions, his data are invalid and are not used for statistical analysis. The total points are 0-60, and the validity of the index was checked in a study conducted on a sample of 1775 patients, which showed great

reliability and accuracy[23]. The total Cronbach's Alpha = 0.65 in our study was high and indicated a very strong internal consistency between responces to 9 questions regarding functional limitations of patients. The total score that refers to the quality of life and oral health of the respondents varied in the interval 15.48 ± 5.19 (22.84 with all values included) the minimum value was 6 and the maximum 32. GOHAI-12 score in this study was very low value, less than 50, and indicated that respondents from group 1 were with poor oral health and according to the results of the self-assessment, there was a weak to moderate perception of oral health.

Conclusion

Evaluating problems in geriatric dentistry alone is certainly not always enough. It is necessary to find appropriate solutions to the problems that exist today not only in terms of dental practice but also in terms of education and social care. As the population ages and part of it become institutionalized, the incidence of caries and periodontal disease will increase, with an increase in the degree of partial or total anodontia. An integrated approach is needed to achieve a critical positive level of general and oral health, especially for patients placed in homes and institutions for their care. Coordinated medical care is as vital as support from different dental specialties. An adequate number of professionally trained medical personnel and adequate education of the dental staff is of great importance.

References

1. Статистички преглед: население и социјални статистики. Социјална заштита на деца, млади и воздрасни лица во Република Македонија, 2008-2009. Државен завод за сатистика на Р. Македонија, октомври 2009.

2. WorldHealthOrganization. Active Ageing: a Policy Framework. Geneva, Switzerland: WHO; 2002.

3. Nikolovska J, Korunoska-Stevkovska V, Mijoska A, Popovska L. Prosthodontics status and treatment needs among the elderly in the Republic of Macedonia. Open Access Maced J Med Sci 2018;15;6(5):874-878.

4. Guiglia R, Musciotto A, Compilato D, Procaccini M, Lo Russo L, Ciavarella D, et l. Aging and oral health: effects in hard and soft tissues. Curr Pharm Des. 2010;16(6):619-30.

5. Sapurikj M, Tozija F. Oral health strategy for elderly people over 65 years – public health priority in the Republic of Macedonia. Archives of public health. 2011; 3, (1): 54-61.

6. Diz P, Meleti M, Diniz-Freitas M, Vescovi P, Warnakulasuriy S, Johnson NW, Kerr AR. Oral and pharyngeal cancer in Europe: Incidence mortality and trends as presented to the Global Oral Cancer Forum. Translational Research in Oral Oncology. 2017; (2): 1-13.

7. FerlayJ, Steliarova-FoucherE, Lortet-TieulentJ, Rosso S, Coebergh JWW, Comber H, et al. Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012. European Journal of Cancer 2013; 49: 1374–1403.

8. Boyle P, Ferlay J. Cancer incidence and mortality in Europe, 2004. Ann Oncol 2005; 16(3):481–488

9. Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. J Dent Res. 2011; 90(11):1264-70.

10. Inukai M, John MT, Igarashi Y, Baba K. Association between perceived chewing ability and oral health-related quality of life in partially dentate patients. Health Qual Life Outcomes.2010; 8:118.

11. Cohen-Carneiro F, Souza Santos R, Rebelo MA. Quality of life-related to oral health: contribution from social factor. Cien Saude Colet. 2011; 16 (1): 1007-1015.

12. Astrom AN, Ekback G, Ordell S, Unell L. Social inequality in oral health-related quality of life OHRQoL at early older age: Evidence from a prospective cohort study. Acta Odontol Scand. 2011; 69(6):334-42.

13. Razak PA, Richard KM, Thankachan RP, Hafiz KA, Kumar KN, Sameer KM. Geriatric Oral Health: A Review Article. J Int Oral Health 2014; 6(6):110-116.

14. Steele JG, Sanders AE, Slade GD, Allen PF, Lahti S, Nuttall N, Spencer AJ. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples. Community Dent Oral Epidemiol. 2004;32:107–114.

15. McKenna G, Burke FM. Age-Related Oral Changes. Dental update-gerontology. 2010; 37: 519-523.

16. Kiefer JM, Verrips GH, Hoogstraten J. The complexity of the concept oral health related quality of life. Ned Tijdschr Tandheelkd. 2011; 118: 142-144.

17. Farias Neto A, Mestriner JW, da Fonte Porto Carreiro A. Masticatory efficiency in denture wearers with bilateral balanced occlusion and canine guidance. Braz Dent J (2010) 21(2): 165-169.

18. Mack F,Mojon P, Budtz-Jørgensen Eetal.Caries and periodontal disease of the elderly in Pomerania,Germany: results of the Study of Health in Pomerania.Gerodontology. 2004; 21:27–36.

19. Soderpalm-Anderson E, So derfeldt, B,Kro-nstro ̈mM. Oral health and treatment need among older individuals living in nursing homes in Skara-borg, Vastra Gotaland, Sweden.Swed Dent J2006;30:109–115

20. Kenig N, Nikolovska J. Assessing the psychometric characteristics of the Macedonian version of the Oral Health Impact Profile questionnaire (OHIP-MAC49). Oral health and dental management. 2012; 11(1):29-38.

21. Zenthöfer A, Rammelsberg P, Cabrera T, Schröder J, Hassel AJ. Determinants of oral health-related quality of life of the institutionalized elderly. Psychogeriatrics. 2014; 14:247–54.

22. Dolan TA. The sensitivity of the Geriatric Oral Health Assessment Index to dental care. J Dent Educ. 1997; 61(1):37-46.

23. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ. 1990; 54:680–7.