

## DENTAL CARIES AMONG INSTITUTIONALIZED ELDERLY

**Mihajlo Petrovski**

Faculty of medical sciences, Goce Delcev University-Stip, Republic of N. Macedonia,  
mihajlo.petrovski@ugd.edu.mk

**Kiro Papakoca**

Faculty of medical sciences, Goce Delcev University-Stip, Republic of N. Macedonia,  
kiro.papakoca@ugd.edu.mk

**Sofija Carceva-Salja**

Faculty of medical sciences, Goce Delcev University-Stip, Republic of N. Macedonia,  
sofija.carceva@ugd.edu.mk

**Olivera Terzieva-Petrovska**

Faculty of medical sciences, Goce Delcev University-Stip, Republic of N. Macedonia,  
olivera.petrovska@ugd.edu.mk

**Abstract:** Dental caries is one of the most common oral diseases in human population. The interaction of the highly prevalent xerostomia and the inability to maintain oral hygiene at a satisfactory level among institutionalized elderly leads to an increased incidence of dental plaque. Dental plaque is main etiological factor for dental caries and periodontal diseases. Therefore, the elderly have an increased risk of caries and periodontitis. Recurrent caries around inappropriate or old definitive fillings and cervical or root caries are the most common types of caries among adults. Due to the process of apical migration of epithelial attachment and present gingival recession, primary site of this type of caries occurrence is cervical region. Main aim of this paper was to determine the prevalence of dental caries among institutionalized elderly people over 65 years old. This research was conducted in the "Mother Teresa" department, within the Gerontology Institute "XIII-th of November" Skopje. All of the institutionalized persons (total number - 73 subjects) older than 65 years were examined. Clinical examination was performed and the prevalence of coronary and root caries among subjects was determined. The presence of dental caries during the research is detected only with the usage of a dental mirror and a dental probe without the use of additional or auxiliary instruments and methods. The average number of present (remaining) teeth among these institutionalized elderly was  $5.81 \pm 7.34$  (range from 0-24, with Confidence interval from 4.09 to 5.52). The mean value for the DMFT index found among institutionalized elderly examined in this study was  $28.84 \pm 4.71$  (range 16-32, with Confidence interval from 27.74 to 29.93). The average value of untreated carious teeth among institutionalized elderly in this study was  $2.73 \pm 3.72$  (range 0-14, with Confidence interval from 1.86 to 3.59) per subject. The research indicates that the examined institutionalized people older than 65 years in which there were natural teeth, prevalence of root caries was 54.05%. The average number of root caries defects in one subject was  $1.16 \pm 1.4$ . Among the overall examined population the presence of root caries of teeth was 26.03%. Root caries is more common in the lower jaw (the frontal teeth mostly - 34.14%) than on the upper jaw. According to the processed data in this examination tooth which is usually with root caries is left lower canine. In only one patient (1.74% of the) was observed definitive restoration of the root caries. Based on the obtained data and subsequent analysis of the results, we can notice that the oral health and hygiene are unsatisfactory among institutionalized elderly. Also, presence of a large number of extracted and carious teeth, and a low incidence of teeth with definite fillings are one most important characteristics of the oral health among institutionalized elderly. Institutionalized elderly also have high prevalence of root caries.

**Keywords:** institutionalized elderly, dental caries, root caries, long-term care institutionalized elderly.

### 1. INTRODUCTION

Oral health, as a part from the general health, is conditioned by a numerous factors such as dental caries and its complications, untreated and unextracted tooth roots, oral mucosal lesions and numerous oral infections, precancerous conditions and benign and malignant tumors, pain in the temporomandibular joint, xerostomia and partial or total toothless. Tooth loss affects the masticatory efficiency, and also affects the choice of food and of course the nutritional status of the elderly. (Mason et al, 2006) Dental caries is one of the most common oral diseases in human population.

The interaction of the highly prevalent xerostomia and the inability to maintain oral hygiene at a satisfactory level among institutionalized elderly leads to an increased incidence of dental plaque. Dental plaque is main etiological

factor for dental caries and periodontal diseases. Therefore, the elderly have an increased risk of caries and periodontitis.

Recurrent caries around inappropriate or old definitive restorations and cervical or root caries are the most common types of caries among adults. (Rihs et al, 2009; Du et al, 2009) Root caries is a special type of caries characterized by presence of a carious lesion on one or more teeth in the area of the tooth root (the part of the tooth that is protected with cement). Due to the process of apical migration of the epithelial attachment and the present of gingival recession, the primary location of demineralization is the cervical region, and thus the caries affects the dental cementum. In cement, the carious process destroys large area and develops rapidly, due to its histological and mineralogical structure. The process occurs in two ways: by direct decomposition of the cement at the site of the carious lesion and by pilling of the cemental substance between the dentin and the cement due to the penetration of bacteria. (Матовска, 2011)

According to Alian et al. (2006), a high prevalence of coronary dental caries and root caries is seen among elderly population worldwide, and advanced dental caries and periodontal disease are considered to be the most important causes for tooth loss. Factors that have been considered as causes of increased risk of caries among the elderly population include (1) invasive factors (originally: "attack factors") such as: dental plaque, the presence of specific microorganisms and nutritional factors and (2) defense factors (source: "defense factors") such as the protective role of saliva and the use of fluoride. (Petrovski & Terzieva-Petrovska, 2018)

The prevalence of carious lesions of the root surfaces, according to Du et al. (2009) among the middle-aged persons is 13.1 %, and it increases in the elderly where the prevalence is 43.9 %. The authors found a similar condition in the presence of coronary caries. Namely, the average number of teeth affected by caries in middle-aged people is 0.21, while in the elderly the average number of carious teeth is 1.21.

According to Wyatt (2002), about 80 percent of institutionalized elderly have at least one carious lesion, about half of them have coronary caries, and about 70 percent of them have root caries. On average, there are 3.8 carious teeth per examined subject, despite the large number of extracted teeth. Significantly more carious lesions located on the dental crowns were present in the residents with extended long-term care in these institutions.

In an article published by Gati and Vieira (2011) was found that almost all ( 97 %) from the people older than 75 years (mean age 85 years) had caries, while two-thirds of the individuals who participated in the study had root caries, of which about 20 % was untreated. According to this research, active coronary or root caries is more common in the male population and in people who consume tobacco in the form of cigarettes or cigars.

The elderly individuals, especially those who are institutionalized, in most cases do not seek any dental health care. If any of the remaining teeth are affected by caries it is usually ignored by the patient and they finally come to the dentist when severe pain occurs. (Gil-Montoya et al, 2006).

Taking into consideration the previously mentioned facts about oral health, the presence of numerous dental problems, as well as the increased oral health needs and impaired health among institutionalized elderly, **the main aim of this paper was to determine the prevalence of dental caries among institutionalized elderly people over 65 years old.**

## 2. MATERIAL AND METHOD

For the realization of the main aim, an adequate research was conducted in the period from April to July 2018, in the department "Mother Teresa", within the Public Health Institution- Gerontological Institute "Thirteenth November" - Skopje, an institution for long-term care of elderly population.

The research included a total number of 73 subjects older than 65 years. In this long-term care institution, most of the institutionalized persons are functionally-dependent individuals, dominated caused by chronic diseases.

During the examination, all persons who are in the terminal stage of the disease, who have dementia and all individuals who have cognitive disorders, patients who have a nasogastric tube and patients who are placed on artificial ventilation were excluded. Also, all individuals who do not cooperate due to various behavioral disorders, aggression or do not allow them to undergo a clinical examination are not included in the study group. Persons who do not understand the Macedonian language were also excluded from the examination group.

Prior to the interview, the vocabulary was adapted to the required level and the details of the study and the main aim of the research were explained to those individuals who are participating in the examination using appropriate terminology. The interviews were conducted after obtaining verbal consent of the patient to participate in the examination. Interviews were conducted in patients' rooms or in a doctor's office, always respecting the basic postulates for preserving the privacy and dignity of the patient.

The presence of dental caries during the research is detected only with the usage of a dental mirror and a dental probe without the use of additional or auxiliary instruments and methods.

The dental clinical examination was performed in the institution, in an office or in the rooms of the institutionalized elderly or in a room adequate for that purpose. The examination was performed on a patient sitting on a chair, lying in bed or placed in a wheelchair.

For the examination we have used a dental probe and a dental mirror for one use only, disposable gloves, and a portable lamp for artificial illumination. After the examination, the used instruments and disposable medical gloves were stored in appropriate places for storage of medical waste.

The data obtained from the dental and medical history and clinical examination after being collected were statistically processed. The results are presented by using of graphicons and tables.

### 3. RESULTS

The mean age of the study participants was  $73,79 \pm 6,92$  years (range 65-93 years with Confidence interval from 73.18 to 75.41 years). The female subjects in the examined group are more numerous than the male subjects (61.64% vs. 38.36%).

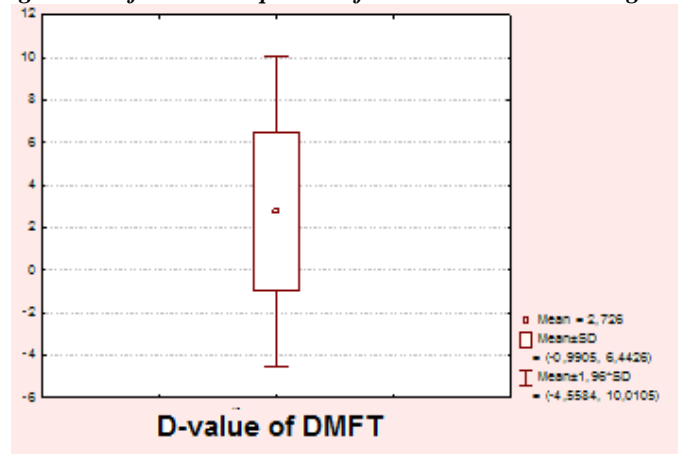
After adequate analysis of the data, it was found that the average duration of institutionalization in the long- term institution for the examined elderly is approximately 5 and a half years ( $5.64 \pm 6.92$  years, range from 0.06 to 24.00 years with Confidence interval from 4.19 to 7.10 years)

The average number of present (remaining) teeth among these institutionalized elderly was  $5.81 \pm 7.34$  (range from 0-24, with Confidence interval from 4.09 to 5.52). The average number of remaining teeth in males was higher and it was  $9.07 \pm 7.34$  (range 0-24, with Confidence interval from 6.01 to 12.13), while for female subjects it was  $3.78 \pm 7.89$  (range 0-23, with Confidence interval from 1.90 to 5.65). During the statistical analysis of the data, it was found that the number of remaining teeth in males is significantly higher than the number of remaining teeth in females (for  $p < 0.001$ ).

The mean value for the DMFT index found among institutionalized elderly examined in this study was  $28.84 \pm 4.71$  (range 16-32, with Confidence interval from 27.74 to 29.93).

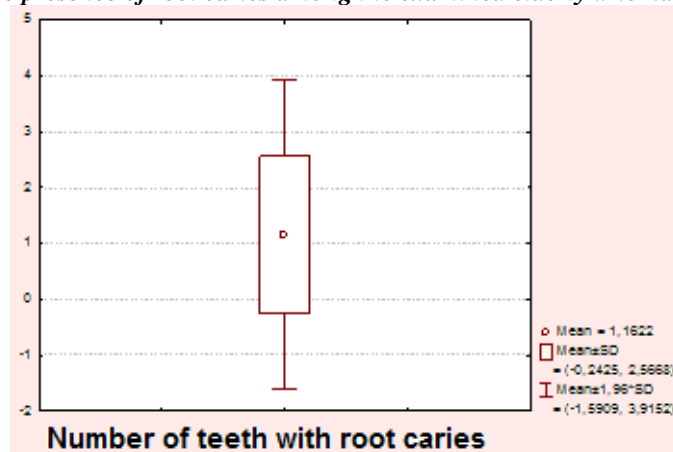
The average value of untreated carious teeth (or D-component of the DMFT-index) among institutionalized elderly in this study was  $2.73 \pm 3.72$  (range 0-14, with Confidence interval from 1.86 to 3.59) per subject. (Fig. No. 1). This number is showing the carious destroyed teeth.

**Fig. No. 1. Average value of the D-component of the DMFT index among the examined elderly**



The research indicates that in the examined institutionalized persons over 65 years of age who have natural teeth, the prevalence of carious destruction of the tooth root is 54.05%. The average number of root carious defects is  $1.16 \pm 1.4$ . (Fig. No. 2.) At the level of the entire examined population, the average presence of caries at the root or cervical caries of the teeth is 26.03%.

**Fig. No. 2. The presence of root caries among the examined elderly who have natural teeth**



Number of root carious lesions present	N	Percentage of the entire examined population	Percentage of subjects with teeth
One	6	16,22 %	8,22 %
Two	10	27,04 %	13,70 %
Three	1	2,70 %	1,37 %
Four	1	2,70 %	1,37 %
Five and more	2	5,41%	2,74 %

**Table no. 1. Number of carious root lesions among institutionalized elderly**

Root caries was most common in the lower jaw (at the level of the front teeth - in 34.14% of the cases with root caries) than in the upper jaw. According to the analyzed data in this examination, root caries was most common observed on the lower left canine.

Definite restoration of root caries was observed in only one patient (1.74% of the subjects).

#### 4. DISCUSSION

Available data indicate the widespread prevalence of caries and the consequences of its presence around the world, which highlights the enormous socio-medical and socio-dental significance of this problem among institutionalized elderly. The D-component of DMFT indeks, which is used in this examination includes: carious teeth, teeth with definite filling on one surface and with caries on the other side, teeth with definite fillings on which there is recurrent or secondary carious process, teeth with temporary fillings or teeth of which we have only remaining root(s). That is why this component of DMFT index is used to meke an assesment of the carious teeth among the exameenes.

But it must be noted that this index refers only to the prevalence of the disease, its consequences and the need for treatment, so it can present high values especially in populations like ours where the presence of caries and extracted teeth is really high.

The mean mean value for the D-component in this study (Fig. No. 1. ) is simmular with the data presented by Lo et al. (2004), Carter et al.(2004), Zusman et al.(2010) and Corneo et al. (2013), and in contrast to those presented by Ambjørnsen(1986), King and Kapadia (2003), Rihs et al. (2009) and Esmeriz et al.(2012) who reported a lower incidence of carious lesions of the remaining teeth. Higher prevalence of carious teeth (D-component of the DMFT index) among institutionalized elderly was observed by Rao et al.(1999) and Piuvezam and de Lima (2013).

Due to the excessive advanced gingival recession and the high prevalence of periodontal disease, the elderly have a higher prevalence of root caries. The prevalence of root caries in people over the age of 60 is double in contrast to the prevalence of root caries among people over the age of 30.(Gökalp & Doğan, 2012) The high prevalence of root caries among institutionalized elderly people is due to the lack of appropriate prevention programs in the past, while the prevalence of root caries can be reduced with proper dental care, proper oral hygiene, use of fluoride gels and solutions. Vehkalahti et al.(1997) published that root caries was found in 42% of Slavic adults. Gökalp and Doğan (2012) and Marino et al.(2015) found a lower prevalence of carious teeth per subject compared to the results presented in our study - 26.03% (Table No. 2.).

According to Philip et al.(2012) the number of teeth with active caries is related to oral hygiene and the need for assistance in performing it in institutionalized seniors.

Poor oral health in institutionalized elderly is often associated with irregular dental check-ups, irregular oral hygiene, high carbohydrate usage, and cigarette smoking. Such elderly people are much more likely to suffer from coronary and root caries, as well as periodontal disease. As a final effect of these common oral infections, there is an increased loss of teeth. Most often, institutionalized elderly people visit the dentist only for prosthetic or oral-surgical interventions, unlike the preventive and reconstructive procedures, which are rarely solved.

Analyzing the descriptive epidemiological characteristics of the respondents included in our study, an unsatisfactory level of oral health and oral hygiene was found in the examined population group. However, most therapeutic modalities and diagnostic and therapeutic protocols for the geriatric population are still experimental.

The limiting effect of this study is the small number of people participating in this study. However, during the research, all institutionalized persons accommodated in the institution were examined, the entire examined sample respond to the questionnaire and were subjected to a clinical examination. Thus the small number of participants in this study does not adversely affect the validity of the results.

The comparison of the data of this study with other epidemiological studies is complex due to the existence of numerous variations in terms of diagnostic methodology and criteria between different studies. A special problem is the lack of numerous published data regarding the oral health of the institutionalized elderly in our country. This influence on the possibility of comparison with our literary data.

## 5. CONCLUSION

Based on the obtained data and subsequent analysis of the results, we can notice that the oral health and hygiene are unsatisfactory among institutionalized elderly. Also, presence of a large number of extracted and carious teeth, and a low incidence of teeth with definite fillings are one most important characteristics of the oral health among institutionalized elderly. Institutionalized elderly also have high prevalence of root caries.

## REFERENCIES

- Alian, A. Y., McNally, M. E., Fure, S., & Birkhed, D. (2006). Assessment of caries risk in elderly patients using the Cariogram model. *Journal (Canadian Dental Association)*, 72(5), 459–463.
- Ambjørnsen E. (1986). Decayed, missing, and filled teeth among elderly people in a Norwegian municipality. *Acta odontologica Scandinavica*, 44(2), 123–130. <https://doi.org/10.3109/00016358609041317>
- Carter, G., Lee, M., McKelvey, V., Sourial, A., Halliwell, R., & Livingston, M. (2004). Oral health status and oral treatment needs of dependent elderly people in Christchurch. *The New Zealand medical journal*, 117(1194), U892.
- Cornejo, M., Pérez, G., de Lima, K. C., Casals-Pedro, E., & Borrell, C. (2013). Oral Health-Related Quality of Life in institutionalized elderly in Barcelona (Spain). *Medicina oral, patología oral y cirugía bucal*, 18(2), e285–e292. <https://doi.org/10.4317/medoral.18280>
- Du, M., Jiang, H., Tai, B., Zhou, Y., Wu, B., & Bian, Z. (2009). Root caries patterns and risk factors of middle-aged and elderly people in China. *Community dentistry and oral epidemiology*, 37(3), 260–266. <https://doi.org/10.1111/j.1600-0528.2009.00461.x>
- Esmeriz, C. E., Meneghim, M. C., & Ambrosano, G. M. (2012). Self-perception of oral health in non-institutionalised elderly of Piracicaba city, Brazil. *Gerodontology*, 29(2), e281–e289. <https://doi.org/10.1111/j.1741-2358.2011.00464.x>
- Gati, D., & Vieira, A. R. (2011). Elderly at greater risk for root caries: a look at the multifactorial risks with emphasis on genetics susceptibility. *International journal of dentistry*, 2011, 647168. <https://doi.org/10.1155/2011/647168>
- Gil-Montoya, J. A., de Mello, A. L., Cardenas, C. B., & Lopez, I. G. (2006). Oral health protocol for the dependent institutionalized elderly. *Geriatric nursing (New York, N.Y.)*, 27(2), 95–101. <https://doi.org/10.1016/j.gerinurse.2005.12.003>
- Gökalp, S., & Doğan, B. G. (2012). Root caries in 35-44 and 65-74 year-olds in Turkey. *Community dental health*, 29(3), 233–238.
- King, T., & Kapadia, D. (2003). Oral health status and treatment needs of institutionalized elderly and disadvantaged population in Fiji (1997). *Pacific health dialog*, 10(1), 35–40.
- Lo, E. C., Luo, Y., & Dyson, J. E. (2004). Oral health status of institutionalised elderly in Hong Kong. *Community dental health*, 21(3), 224–226.
- Mariño RJ, Fu CS, Giacaman RA. Prevalence of root caries among ambulant older adults living in central Chile. *Gerodontology*. 2013 Jun 26. doi: 10.1111/ger.12060.

- Матовска, Јб.(2011). Кариологија , Сигмапрес , Скопје
- Mason, J., Pearce, M. S., Walls, A. W., Parker, L., & Steele, J. G. (2006). How do factors at different stages of the lifecourse contribute to oral-health-related quality of life in middle age for men and women?. *Journal of dental research*, 85(3), 257–261.
- Petrovski M, Terzieva-Petrovska O (2018) Basics Of Geriatric Dentistry. LAP LAMBERT Academic Publishing. ISBN 978-620-2-05734-9
- Piuevezam, G., & de Lima, K. C. (2013). Factors associated with missing teeth in the Brazilian elderly institutionalised population. *Gerodontology*, 30(2), 141–149. <https://doi.org/10.1111/j.1741-2358.2012.00655.x>
- Rao, A., Sequeira, P., Peter, S., & Rajeev, A. (1999). Oral health status of the institutionalized elderly in Mangalore, India. *Indian journal of dental research : official publication of Indian Society for Dental Research*, 10(2), 55–61.
- Rihs, L. B., da Silva, D. D., & de Sousa, M. (2009). Dental caries in an elderly population in Brazil. *Journal of applied oral science : revista FOB*, 17(1), 8–12. <https://doi.org/10.1590/s1678-77572009000100003>
- Vehkalahti, M. M., Vrbic, V. L., Peric, L. M., & Matvoz, E. S. (1997). Oral hygiene and root caries occurrence in Slovenian adults. *International dental journal*, 47(1), 26–31. <https://doi.org/10.1111/j.1875-595x.1997.tb00674.x>
- Wyatt C. C. (2002). Elderly Canadians residing in long-term care hospitals: Part II. Dental caries status. *Journal (Canadian Dental Association)*, 68(6), 359–363.
- Zusman, S. P., Ponizovsky, A. M., Dekel, D., Masarwa, A. E., Ramon, T., Natapov, L., & Grinshpoon, A. (2010). An assessment of the dental health of chronic institutionalized patients with psychiatric disease in Israel. *Special care in dentistry : official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry*, 30(1), 18–22. <https://doi.org/10.1111/j.1754-4505.2009.00118.x>