

## Optimal Oral Health among Institutionalized Elderly in Republic of N. Macedonia

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### Abstract

Having at least twenty teeth that are able to chew and speak properly, and also look good, is considered as optimal oral health. However, a major flaw in this definition is that having twenty teeth, without specific details about their location, might not be enough for good chewing and could also not ensure the patient is happy with how they look or sound. Additionally, having this number of teeth in the mouth might be enough for good appearance and sound, particularly if the remaining teeth are in the front, and the need for good chewing might not be as strict. Considering the large number of institutionalized elderly people who have a big number of extracted teeth, we set the main goal - to assess the presence of optimal oral health among institutionalized elderly people in the Republic of North Macedonia.

The total number of subjects in this study was 118 and all of the included subjects were institutionalized elderly people over 65 years-old in three long-term care institutions. For each of the subjects, the number of remaining teeth and DMF index were assessed.

2.61% of the elderly subjects have more than 20 or more, which can be considered indicative of optimal oral health. 41.74% of the elderly subjects had total tooth loss. The average number of teeth observed in individuals was  $6.26 \pm 3.9$ . No participant in the study reported the presence of all natural teeth. The calculated mean value for the DMFT index ranges from  $25.48 \pm 8.65$ .

In conclusion, the neglect of oral health among the elderly, particularly those in long-term care facilities, poses a significant risk to their overall health and quality of life. By recognizing the interconnectedness of oral health and systemic health, stakeholders can work towards improving care practices and ensuring that oral hygiene is given the attention that deserves in the comprehensive care in vulnerable populations such as the institutionalized elderly.

**Keywords:** Institutionalized elderly; Oral Health; Optimal Oral Health; Long-Term Institutionalization

### Introduction

Maintaining good health and overall well-being is a cornerstone of human life, shaped by a spectrum of societal values and community attitudes. This multifaceted concept encapsulates the essential physiological, social, and psychological elements crucial for an enriching quality of life. The state of health is significantly affected by the individual's evolving experiences, perceptions, expectations, and their capacity to adapt to various circumstances.

Among these dimensions, oral health plays a crucial role in the comprehensive well-being, encompassing not only the health of the teeth but also the health of the periodontal tissues, the oral mucosa, the salivary glands, and the adjacent structures. The significance of oral health transcends mere physical attributes; it is intricately linked to various functions that define human interactions and daily activities.

Oral health encompasses a complex array of functions, including the capacity to articulate speech, exhibit a confident smile, experience taste, perceive tactile sensations, chew food efficiently, facilitate swallowing, and express a spectrum of emotions through facial expressions. Moreover, it involves the absence of pain, discomfort, and disease within the craniofacial complex, enabling individuals to maintain these functions with confidence. Thus, oral health is not merely a subset of overall health; it is a vital component that influences both physical and psychological well-being.

The health of oral and dental structures localized within the oral cavity represents a significant socio-medical concern. Research interest into the etiology and epidemiology of dental caries, periodontal disease, and other oral health conditions has gained momentum in recent years. For instance, studies have confirmed the unsatisfactory oral health and oral hygiene status among institutionalized elderly, as reported by Rihs., *et al.* [1] their findings revealed a high prevalence of lost teeth and a significant incidence of anodontia. Such conditions not only reflect poor oral hygiene but also indicate a broader societal neglect of the oral health needs of vulnerable populations. The implications of compromised oral health are profound.

The extraction of even a single tooth can significantly affect chewing ability, and over time, leading to complications such as tooth displacement or tooth migration. Over time, this disruption can alter the balance of articulation, affecting speech and communication. In individuals with prolonged absences of dental prostheses, a deterioration in the articulation of speech has been observed, although it normalizes with time. The correction of dysarthria, a condition characterized by speech impediment, occurs through the adaptive capabilities of the muscles surrounding the mouth, lips and tongue.

Oral health as one of the relatively minor concerns within the institutions for long-term care, where even the simplest interventions can cause substantial benefits in enhancing the quality of life, psychological well-being, and, ultimately, the satisfaction of adults with their life circumstances. This is supported by the established correlation between dental health and mortality, as well as morbidity, among the institutionalized elderly. Consequently, oral health care assumes a more critical and substantial role in the care of the institutionalized elderly. Holmlund., *et al.* [2] have found evidence suggesting that tooth loss can increase the risk of developing significant general health conditions.

Based on research by Nazliel., *et al.* [3] it's been found that individuals aged 65 to 69 lose fewer teeth compared to those aged 75 and older. Research done by these authors revealed that one-sixth of the participants hadn't seen a dentist in the past decade, and only 3% had undergone a dental check-up in the last six months.

Krasta., *et al.* [4] noted a trend in recent years among retired individuals in advanced economies, showing an increase in the number of remaining teeth and a decrease in the number of untreated teeth affected by decay over the last two decades.

Scutariu., *et al.* [5] looked into the imbalance in the oral and facial structures and found that monomaxillary or bimaxillary edentulism, rises with age, particularly among the elderly living in long-term care institutions.

As people get older, it's natural for the number of individuals with complete dentition to decrease. This means that as age goes up, the proportion of people without any teeth increases. For example, among those aged 35 to 55, 5.35% are toothless, rising to 17.25% for those aged 55 to 65, and 45.33% for those over 65, regardless of whether they live independently or in institutions. The number of teeth

tends to decrease with age, regardless of living situation [6]. These statistics highlight a concerning trend: as people age, the percentage of those without teeth rises significantly. This deterioration in dental health can lead to various complications, including malnutrition, social isolation and mental health issues. McEntee, *et al.* [7] highlighted that untreated oral conditions, especially in the elderly with severe disabilities, can exacerbate discomfort and lead to a decline in both physical and psychological health.

Having at least twenty teeth that are able to chew and speak properly, and also look good, is considered as optimal oral health. However, a major flaw in this definition is that having twenty teeth, without specific details about their location, might not be enough for good chewing and could also not ensure the patient is happy with how they look or sound. Additionally, having this number of teeth in the mouth might be enough for good appearance and sound, particularly if the remaining teeth are in the front, and the need for good chewing might not be as strict. Even though optimal oral health is lower than perfect oral health, it's hard to spot this in older people. This is especially true for those living in long-term care facilities for the elderly.

The factors that influence oral health in institutionalized elderly vary, particularly in those who live in institutions, especially those with a low level of ability to function independently or take care of themselves. As healthcare professionals become more aware for the oral health issues faced by older adults living in institutions, it's crucial for all parts involved to grasp and acknowledge the specific oral health challenges these vulnerable groups confront.

The average number of missing, decayed, and filled teeth, along with the percentage of those suffering from tooth decay or loss of teeth and those who have received dental fillings, ranged from 15.0 to 24.9, 1.2 to 3.5, 0.6 to 2.2, and 0.2 to 8.0, respectively [8].

Losing teeth was much more common among individuals with lower income, less education, and poorer oral or overall health status. Losing teeth and becoming edentulous are the ultimate outcomes of periodontal disease, signaling a breakdown in the dental care system. Being edentulous is linked to nutritional deficiencies and greatly affects the well-being of older adults, with research suggesting that losing teeth increases the risk of death [9]. Coronal and root caries, along with retained roots, are prevalent among individuals with dementia. This prevalence may be attributed to cognitive and behavioral decline, which diminishes the capacity to engage in routine oral hygiene practices. Furthermore, in the elderly population with dementia, there is a reduction in saliva flow rates, alterations in dietary habits towards more cariogenic foods, and deterioration in motor skills and coordination, resulting in decreased efficiency in chewing and swallowing [10].

It is also crucial to acknowledge the challenges posed by oppositional and aggressive behaviors towards oral care, as well as the decline in communication skills, which act as significant barriers to maintaining oral hygiene and receiving assistance. These challenges can be addressed through the provision of oral care education for caregivers and the enhancement of dental check-ups for elderly individuals with dementia.

The neglect of oral health among the elderly can be attributed, in part, to the multifaceted care needs of those who are dependent on assistance for various aspects of daily living. These care requirements, which encompass activities such as eating, medication administration, dressing, bathing, overall health management, and physical therapy, often leave limited time available for what are traditionally perceived as less critical tasks, including oral hygiene. This oversight in oral care represents a significant, yet often overlooked, health risk. Dental and periodontal health are recognized as crucial components of overall well-being and quality of life, with the loss of natural teeth frequently leading to malnutrition, pain, and significant functional and aesthetic challenges. These issues, in turn, adversely affect the oral health-related quality of life and the ability to perform daily activities.

Moreover, dental and periodontal conditions are strongly associated with the prevalence and severity of various systemic diseases. These include diabetes, cardiovascular disease, atherosclerosis, rheumatoid arthritis, kidney function, pneumonia, multiple sclerosis, and

other immune-related conditions. Additionally, research has indicated a correlation between chewing difficulties and poor oral health, as well as cognitive impairment and the accumulation of amyloid plaques which are linked to Alzheimer's disease [11]. These findings emphasize the importance of maintaining oral health for cognitive function and the overall quality of life in aging populations.

The impact of oral health on overall health appears to be even more profound among the elderly residing in long-term institutions. This demographic is particularly susceptible to opportunistic infections due to higher levels of *Candida* species and *Staphylococcus aureus* in their oral cavity [12].

Research conducted across various nations has revealed that the oral health status (OHS) of residents of long-term care institutions for elderly is notably suboptimal, necessitating immediate attention for enhancement. The majority of these studies have endeavored to assess the determinants identified by medical staff, caregivers, and managers as obstacles to oral hygiene maintenance and as barriers to the accessibility of dental care services [13].

Considering the large number of institutionalized elderly people who have a big number of extracted teeth, we set the main goal - to assess the presence of optimal oral health among institutionalized elderly people in the Republic of North Macedonia.

### Materials and Methods

The total number of subjects in this study was 118 and included all institutionalized elderly people over 65 years in three long-term care institutions.

In these institutions, most of the institutionalized persons are functionally dependent individuals, with domination of chronic diseases. This multimorbidity leads to serious disability or dependence on other people's help, and on the other hand, these people need long-term care.

When performing the examination, all persons who were in the terminal phase of the disease, had dementia and other cognitive disorders, patients in whom a nasogastric tube is placed and patients who are placed on artificial ventilation were excluded. Likewise, people who do not cooperate due to various behavioral disorders, aggression or do not allow a clinical examination to be performed are not included in the study group itself.

To conduct a comprehensive evaluation of the oral health status among the elderly residents in institutional settings, specifically those designated for elderly care, an oral examination protocol was implemented. This protocol encompassed various components for an adequate assessment, which included:

1. Visual Inspection: Number of the remaining teeth;
2. DMFT index: The DMFT index is designed to quantify carious lesions, missing teeth (or extracted teeth) and filled teeth, and this index combines these factors to provide a broader overview of the oral health status. The values for this index was statistically analyzed to understand the prevalence of dental extractions, fillings, and carious conditions within the study population, both on a per-individual and an average level.

The dental examination was conducted within the premises of the facilities, in adequate offices, patient rooms, or wheelchair areas. The dental professional utilized tools like a dental probe, a dental mirror, disposable gloves, and an artificial illumination device (portable lamp) to facilitate the examination. Following the examination, all instruments and disposable gloves were properly disposed of in special designated medical waste areas.

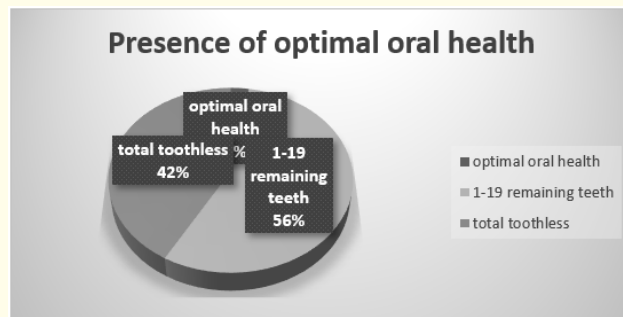
**Results and Discussion**

The average age of the participants within the study was  $74.26 \pm 4.64$  years, ranging from 65 to 94 years (with a confidence interval from 72.74 to 77.02 years). Highest number was observed among those institutionalized elderly aged 65 to 70 years (about 40%). Notably, the study did not record any respondents older than 90 years, with the exception of a one 93-year-old individual.

In terms of gender distribution, the analysis indicated that female participants outnumbered their male subjects (56.77% vs. 43.43%).

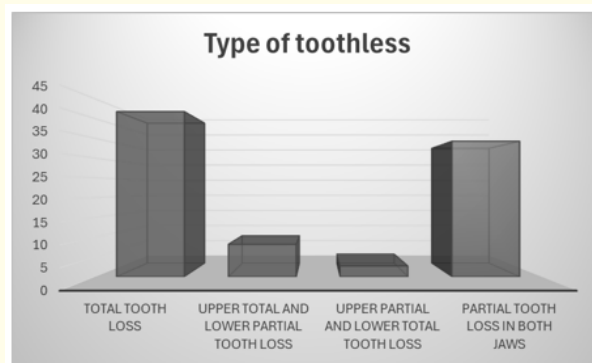
The mean duration of stay within the care institution for the participants was 6 years and 2 months ( $6.12 \pm 4.42$  years).

According to the data presented, it has been found that 2.61% of the elderly subjects have more than 20 or more, which can be considered indicative of optimal oral health. 41.74% of the elderly subjects had total tooth loss.



*Figure 1: Presence of optimal oral health.*

Among individuals aged 65 and over, the study observed that 41.74% of subjects experienced total tooth loss, whereas the remaining portion exhibited a combination of partial tooth loss, with 8.22% suffering from upper total and lower partial or upper partial and lower total tooth loss was present in 2.74. Further analysis revealed that 34.25% of the individuals had partial tooth loss in both jaws (Figure 2).



*Figure 2: Type of toothless.*

The average number of teeth observed in individuals who had retained at least one natural tooth was  $6.26 \pm 3.9$ . No participant in the study had presence of all natural teeth. This is particularly evident in a significant subset of 1.69% of the subjects, who have the 24 teeth, suggesting a unique factor contributing to their dental preservation.

These findings underscore the importance of dental health, as seen in the disparity in tooth number among genders and the prevalence of total tooth loss in the elderly population. Further investigations are warranted to explore potential correlations between these factors and overall health status.

The calculated mean value for the DMFT index ranges from  $25.48 \pm 8.65$  (with a range from 0 to 28 and a Confidence interval of 23.77 to 27.64).

It should be noted that elderly individuals without any dental caries tend to be those who were edentulous, indicating complete toothlessness.

The average value of the number of teeth with definitive restorations was relatively low, at 18.9%.

Upon analyzing data concerning total edentulism, it was noted that this condition is notably more prevalent among female participants than male participants. Specifically, 58.5% of females were with total edentulism, indicating a significant disparity in the representation of total edentulism across genders ( $p < 0.0001$ ).

Age emerges as a critical factor in the likelihood of total tooth loss, with more than half of the participants over the age of 75 years experiencing bimaxillary total edentulism.

Concerning the utilization of prosthetic aids, the findings suggest that a substantial majority, 54.79% to be precise, of the participants do not use any prosthetic aids.

Comparing data from this study with other epidemiological studies was difficult because there are many differences in diagnostic methods and criteria between different studies. A problem is the lack of published data about the oral health of adults in our country, which cannot be compared with our data.

The main factors that affect the oral health of the elderly are an increased number of remaining roots, tooth loss, teeth that are not with properly fillings or teeth with decay, and missing teeth in elderly people who live alone [14]. According to Ünlüer., *et al.* [15], age, routine dental examinations, and health insurance are associated with edentulism.

“Ideal oral health” is clearly defined by biological criteria, including all 32 teeth in good occlusion in the mouth, not affected by disease and without pathological changes. It is important to set high standards for the definition of oral health, even in countries where public interest is highly developed. “Optimal oral health” means knowing the minimum number of teeth in the mouth. A minimum of 20 teeth free from pain or disease, with the ability to chew and speak, and achieve esthetic function are objective measures that indicate optimal oral health in the aging population. Of course, 20 teeth is the minimum, but since chewing and speaking skills are different, this number of teeth cannot guarantee patient satisfaction [16].

The number of missing teeth is the dominant component in the DMFT index, not only in this study but also in numerous other studies related to the institutionalized elderly, where a higher mean number of extracted teeth is often reported, especially among those older than 75 compared to those aged 65 to 74. The main characteristics in terms of oral health in institutionalized elderly people are the presence of a greater number of missing teeth, root caries, mobile teeth, teeth with inadequate fillings or with advanced caries and, of

course, the high prevalence of toothlessness compared to elderly people who live independently [17]. According to Dogan and Gokalp [18] age, dental check-ups and health insurance are associated with edentulism.

Poor oral health in institutionalized elderly is frequently linked to a range of behavioral and systemic factors including irregular dental check-ups, hygiene practices, a high intake of carbohydrates and cigarette smoking. Such elderly people suffer much more often from coronary and root caries, as well as from periodontal disease. The culmination of these issues often leads to increased tooth loss, which further complicates residents' oral health status. Most often, the institutionalized elderly visit the dentist only for prosthetic or oral-surgical interventions, in contrast to preventive and reconstructive procedures, which are rarely addressed [19].

The assessment of oral health also indicates the high need for various types of dental interventions, such as periodontal, restorative-endodontic, prosthetic and oral-surgical. The needs for dental care for these patients are great, but it is impossible to take care of such problems because there is no dentist or any other person trained or educated to perform dental interventions in these long-term institutions.

The presence of total bimaxillary edentulism in the elderly over the age of 65 is quite high and the data on its representation in literature vary greatly. For instance, the reported prevalence of total edentulism is as follows: in France, it stands at 26.9% according to Tramini, *et al.* [20], while in the USA, Saunders, *et al.* [21] report a prevalence of 43.1%, in Scotland presents a higher presence with 51.77% according to Starr, *et al.* [22], Brazil shows even higher prevalence of 74.9% [23] and in India according to Shigli, *et al.* [24] it is 66.6%. Marin-Zaluaga, *et al.* [25] among institutionalized elderly people found bimaxillary total edentulism in 32.5% of the subjects, similarly to Estaquio-Raga, *et al.* [26] who found a representation of this phenomenon in 20.7% of the subjects, similarly as well as Gaiao, *et al.* [27] where the representation of this phenomenon is 39.5%. Zusman, *et al.* [28] published a prevalence of 26%, Mc Millan, *et al.* [29] found a prevalence of total edentulism of 19% and Bourgeois, *et al.* [30] published a prevalence of total edentulism of 17.4% of respondents in France. Samson, *et al.* [31] in their study found that in a periodontal follow-up of 16 years, the prevalence of total edentulism among institutionalized persons in Norway decreased from 71% to 43%. Triantos [32] in his research in Greece found a prevalence of total edentulism of 79%, similar to Vucićević-Boras, *et al.* [33] in Croatia where total edentulism was present in 70% of subjects.

A significant portion of the elderly population have need for dental prostheses, reflecting a prevalent desire to restore functionality and aesthetics lost due to tooth loss. However, financial constraints pose a formidable barrier to acquiring these essential prosthetic aids.

Not all edentulous subjects have prosthetic devices. According to our study, only 24.66% of the subjects wore total prostheses against the represented total toothlessness, which is 41.74%. Pregliasco, *et al.* [34] and De Visschere, *et al.* [35] showed that about half of the respondents did not own prosthetic devices, which coincides with the results of this study. Evren, *et al.* [36] and Triantos [32] showed that less than 20% of subjects did not own prostheses. Greater absence of prosthetic devices was shown by Zubiene, *et al.* [37] and Unlier, *et al.* [38].

Given that the largest number of teeth present in one respondent from our study is 24, this means that despite the real need for prosthetic aids, which is seen in the large number of lost teeth, there is still an absence of prosthetic aids in over half of the subjects (54.73%).

### Conclusion

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



A problem faced by many countries in the world, including ours, is that the institutional capacities for long-term care of the elderly are limited. In different countries, that percentage ranges between 1 - 3% of people over 65 years old. In our country, that percentage is even lower.

Addressing these challenges requires a multifaceted approach that includes increasing awareness of the importance of oral health among caregivers, enhancing access to dental care, and providing education and training for both staff and residents in long term care facilities. Implementing routine oral health assessments, establishing clear protocols for oral hygiene care, and fostering a supportive environment that encourages regular dental visits can significantly improve the oral health status of elderly individuals in institutional settings.

In conclusion, the neglect of oral health among the elderly, particularly those in long-term care facilities, poses a significant risk to their overall health and quality of life. By recognizing the interconnectedness of oral health and systemic health, stakeholders can work towards improving care practices and ensuring that oral hygiene is given the attention it deserves in the comprehensive care in vulnerable populations such as the elderly.

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