

Dental Prosthetic Status and Prosthetic Needs of Institutionalized Elderly Population in Long-Term Residence in Skopje, Republic of N. Macedonia

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Abstract

Aim: Taking into consideration the poor oral health among the institutionalized elderly people the aim of this study was established: to determine the prosthetic status of the institutionalized elderly in the department “Mother Teresa”, nursing home for long-term care in Skopje, Republic of Macedonia.

Materials and Methods: Total number of 73 patients older than 65 years were examined. Research was conducted in the period from April to July 2018. Throughout the dental history we were noting whether the examined subjects wear prosthetic devices and whether they have problems with them. Also, the examinees were asked what are their dominant dental treatment needs. A thorough examination determined the presence and need of prosthetic appliances. Oral hygiene assessment of the prosthetic devices was done.

Results: The study revealed that less than half of the participants wear prosthetic devices (exactly 42.7%). A large percentage from the participants who have prosthetic devices (64.5%) were complaining of difficulties associated with wearing dentures. Most of the examined elderly participants (53.23%) need various prosthetic treatments Total anodontia was registered in 47.95% of the surveyed elderly.

Conclusion: The need for dental interventions is high, because the use of prostheses is quite low. Numerous problems associated with the use of prosthetic devices were noted. High prevalence of bimaxillary total anodontia and absence of prosthetic devices despite their unavoidable need is characteristic of institutionalized elderly. Also, unsatisfactory hygiene of prosthetic devices was noticed in our study.

Keywords: Dental Prosthetic Status; Prosthetic Need; Geriatric Dentistry; Edentulous; Gerodontology

Introduction

Dental community worldwide must recognize that the management of oral diseases and problems among elderly faces specific challenges and it is vital to generate new features for improved oral health care, including geriatric dentistry as a separate discipline in dentistry.

Protocols for oral health maintenance in institutionalized elderly are mainly based on the daily removal of bacterial plaque from teeth, dentures or both, cleaning the oral mucosa and constant oral hydration, because of the presented xerostomia.

Older patients with partial dentures are facing with another significant dental problem: circular caries close to the gingival margin, due to the retention elements of the partial dentures. Denture retention elements, such as clasps and attachments significantly make the plaque control difficult and become plaque retention area [1].

Presence of the prosthetic devices can accelerate the progress of periodontal disease, together with other factors such as occlusal trauma, systemic diseases, use of medications and reduced oral hygiene.

Extraction of even one single tooth leads to difficult and incomplete chewing and after a period of time it also leads to displacement of the teeth, which violates articulatory balance. When elderly people become totally anodont, it violates several functions such as eating, speaking and facial appearance. The facial expression among the elderly with total anodontia is caused not only because of the loss of teeth, but also because of the loss of alveolar process which provides facial muscles support. Losing teeth leads to bone loss, primarily due process of resorption. Among the patients who have been without dental prosthetic treatment, impaired articulation of the voice is regularly found, although the speech over time can normalize. Correction of the dizarthria happens due to the highly adaptable capabilities of the oral muscles, lips and tongue. By resetting the denture in the mouth, these entities occurs initial resistance to wearing a prosthetic appliances because of the difficulty in pronunciation of certain vocals. These elderly must have an extended period of normalization of the speech [2].

According to Allen., *et al.* [3] when the residual dentition has a poor prognosis, key teeth must be saved as prosthetic stabilizers and transition to total anodontia must be set as “step-by-step” procedure. When dentures are made, they can be retained by using dental implants to overcome the problems associated with conventional mobile prostheses. This is applied especially to the lower total denture, because most often patients complain of their instability.

According Nazliel., *et al.* [4] total loss of teeth in people between 65 and 69 years is lower compared to those who have 75 or more years. About one-sixth of all subjects, according to the same research, visited a dentist once in the last ten years, only three percent of them visited a dentist for a checkup in the last six months.

Krasta., *et al.* [5] noted that in recent decades among retired people in developed countries the number of remaining teeth is increased, while the number of untreated teeth affected by caries in developed countries over the past 20 years has decreased.

After analyzing the dishomeostasis of the stomatognathic system, Scutariu., *et al.* [6] concluded that the presence of unimaxillar or bi-maxillar anodontia increases with age and is especially widespread among the institutionalized elderly.

With increasing age, as expected, reducing the number of people who have all the teeth can be noticed, ie with increasing age the number of individuals with total anodontia (5.35 percent among those 35 to 55 years, 17.25 percent among persons 55 to 65 years and 45.33 per cent for those over 65 years). With increasing age the number of remaining teeth reduces regardless of whether elderly live alone or are institutionalized [7].

According to a survey of oral health in institutionalized elderly published by Kossioni, oral hygiene is unsatisfactory for over 80 percent of subjects. The same study indicates that over 60 percent of dental prostheses in these subjects had a lack of patient’s subjective report certain difficulties related to their use [8].

According Vadiz., *et al.* [9], the indicators suggest that the quality of oral hygiene among non-institutionalized elderly is better than any of those placed in institution for long-term care if comparing the groups with the same age is done. Among Lithuanian pensioners at least once a year visit the dentist (control group in the study), the rate of total anodontia is relatively rare, as opposed to that of institutionalized elderly, which often have both total anodontia. The indicators concerned with prosthodontic therapy for persons placed in institution for long-term care are also unsatisfactory. The dental prostheses have been used for decades and a number of assisted persons despite indications never possessed braces [10].

Most frequently reported barrier for good oral hygiene is that nurses and other persons responsible for care of the elderly do not take into account the oral health as a priority or part of the daily responsibilities and activities to maintain hygiene in patients. Therefore, according to Gil-Montoya., *et al.* [11] in the health policies and protocols for the care of older people with serious functional dependency sufficient attention must be focused on oral hygiene. Contrary to reports suggesting that there is a link between insufficient oral hygiene with high levels of morbidity, especially in the elderly, still maintaining oral hygiene by nurses and others who provide assistance to the elderly is not a priority.

According to a research of Alnar et Wyatt [12] oral hygiene among institutionalized elderly is inadequate. According to these authors, poor oral hygiene is associated with systemic infections from which the most common respiratory infections and nutritional disorders and vitamin deficiency.

Also anodontia, especially total anodontia is associated with systemic health disorders and increased mortality especially with increasing age. Anasai., *et al.* [13] found that losing teeth is a significant indicator of mortality, especially when associated with socioeconomic status.

Dental work with the elderly is crucial, because diagnosis of special needs may affect them and of course to make the appropriate treatment planning will have an impact on health and the needs at the sametime. Great influence on the planning of treatment has general health of the elderly, which is often compromised [14].

Among residents in long- term care institutions who have partial anodontia in most cases in the oral cavity have only a few remaining teeth which have need of treatment. Mobile and fixed dental prostheses used by patients do not meet the quality criteria [15].

Taking into consideration the facts about oral health mentioned above, the presence of numerous dental problems and increased health needs and poor health among institutionalized elderly it is established the aim of this study- to determine the prosthetic status and prosthetic needs of the institutionalized elderly in "Mother Teresa"-Skopje, Republic of Macedonia.

Materials and Methods

To realize the aim of the study, a research was conducted in the period from April to July 2018, in the department "Mother Teresa", nursing home for long-term care, which functioning within the PHI Gerontology Institute "XIII-th November," Skopje, Republic of Macedonia.

Total number of 73 patients older than 65 years were examined. Most of the institutionalized people are functionally dependent individuals, with chronic diseases dominate. While performing the examination all the patients who were in terminal-stage of disease, patients with dementia and the ones who have cognitive disorders, patients with inserted nasogastric tube and patients with artificial ventilation were excluded from this study. Also, all individuals who do not cooperate because of various behavioral disorders, aggression or do not allow performing clinical examination were excluded from the examined group. From the research were excluded people who do not understand the native Macedonian language, too.

During the examination the subjects answered questions which helped us to determine the main risk factors responsible for the present oral health status and their habits in the maintaining oral hygiene were evaluated. Clinical examination is conducted to the participants in order to objectively note the various changes in oral health.

So, before performing the comprehensive clinical examination, in order to get a complete picture about the oral health and dental prosthesis status among institutionalized elderly, an interview is committed to the subjects. Throughout the dental history we were noting if the examined subjects have prosthetic devices and whether they have problems with them. Also, subjects were asked whether they have need of dental procedures and what are their dominant dental treatment needs.

Before conducting an interview on the examined population adequate vocabulary adaptation was made to the required level and by using the proper terminology the details about the examination and research were explained to the subjects. The interviews were conducted after obtaining verbal consent to participate in the examination of the patient.

Interviews were conducted in patients' rooms, a room for that purpose or in the physician office, because there is not dental office in the object, always respecting the fundamental tenets of the privacy and dignity of the patient.

In order to make an objective assessment of oral health and prosthetic treatment status among the institutionalized elderly a comprehensive oral examination was performed. Through the examination determination of need for prosthetic treatment and presence of prosthetic appliances was made. Also, assessment of the hygiene of the prosthetic devices was done. Hygiene of mobile prosthetic devices is assessed and graded as: 1. excellent (if not present dental plaque or only a few small areas with dental plaque were present), 2. good (prosthesis with the presence of dental plaque more than the previous mentioned, but less than half of the prosthetic base), and 3. unsatisfactory (when more than half of the prosthetic base is covered with dental plaque, pigmentation and solid deposits-dental calculus). Assessment of the level of hygiene of prosthetic appliances was only made to persons who carry total or partial dentures.

Dental clinical examination was carried out in the institution, in physician's office, in the rooms of the institutionalized elderly or in a certain room for this purpose. The examination was performed on a patient seated on a chair, wheelchair or lying on bed.

For examination we used a dental probe, dental mirror and gloves and portable lamp for artificial illumination. After the examination the used instruments and medical gloves were stored in appropriate places for store medical waste.

Data obtained from the interview and the clinical examination was appropriately statistically processed. For statistical analysis we have used special software for statistical analysis of data- Statistica 7.1. The results are presented using tables and graphics.

Results

The average age of participants in the study was 74 years (exactly $73,79 \pm 6,92$ years, ranging from 65 - 93 years with confidence interval from 73.18 to 75.41 years). Female subjects in the examined group are more numerous compared to male subjects (61.64% vs. 38.36%). The average number of remaining teeth among subjects was $5,81 \pm 7,34$ (range 0 - 24 with Confidence interval from 4.09 to 5.52). The mean number of extracted teeth in the upper jaw was $12,24 \pm 4,21$ teeth, while the average number of extracted teeth in the lower jaw was $11,74 \pm 3,56$.

After processing the collected data about the presence of prosthetic devices it was found that less than half of the participants wear prosthetic devices (exactly 42.7%). A large percentage from the patients wearing prosthetic devices (64.5%) were complaining on subjective difficulties associated with wearing dentures. (Figure 1).

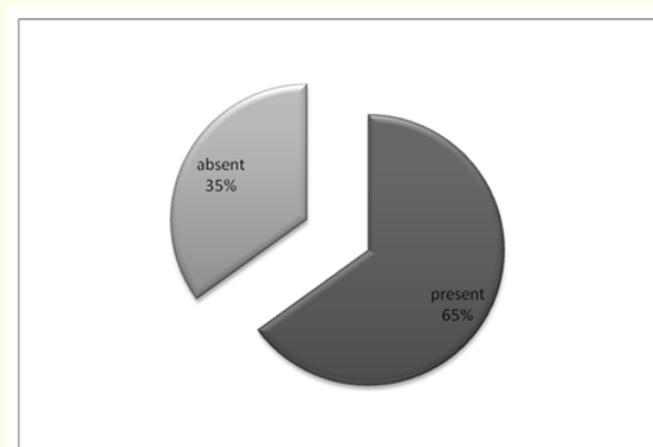


Figure 1: The presence of subjective difficulties in wearing prosthetic devices.

The reasons for discomfort in wearing of prosthetic devices were: moving or slipping of prosthetic devices (40,63%), inability to chew certain foods (25.00%), the occurrence of painful conditions in the oral cavity that are consequence of wearing the prosthetic devices (15.62%), difficulty speaking (9.38%), inability to set in the prosthetic devices (6.25%) and absence of tooth on the prostheses (3,12%) (Table 1).

Characteristic of the problem	No	Per cent
Moving or slipping of prosthetic devices	13	40,63%
Inability to chew certain foods	8	25,00%
The occurrence of painful conditions in the oral cavity resulting in wearing of the prosthetic devices	5	16,20%
Difficulties in speaking	3	9,38%
Difficulties in setting prosthetic devices	2	6,25%
Absence of teeth from the prosthesis	1	3,12%

Table 1: Subjective assessment of difficulties associated with wearing mobile prostheses among the institutionalized elderly.

Only 61.64% of the examinees had subjective opinion that they need dental treatment, while the remaining 38.36% of institutionalized elderly people said they do not need dental procedures.

According to the processed data from the questionnaire and regarding the subjective opinion of the examined elderly about what treatment they need most, the results revealed that the examined elderly are most in need of various interventions in the field of dental prosthetics (53.23%) (Table 2).

The percentage of examined elderly people who have 20 or more teeth (the criterion of optimal oral health) was only 4.11%. Total anodontia was observed in 47.95% of the surveyed elderly (Figure 2). In the examined group there was no subject who has all the natural

Dental intervention needs	No.	Per cent
Restorative procedures	17	27,42%
Extraction of teeth	10	16,13%
Prosthetic activities	33	53,23%
Treatment of the gingiva and periodontal tissues	1	1,61%
Dental checkup	1	1,61%

Table 2: Subjective assessment for the type of necessary dental interventions among institutionalized elderly.

teeth (thus were excluded left and right upper and lower third molars). The maximum number of natural teeth observed in one respondent was 24. This high number of remaining teeth was observed in only one respondent (1.74% of the examined population).

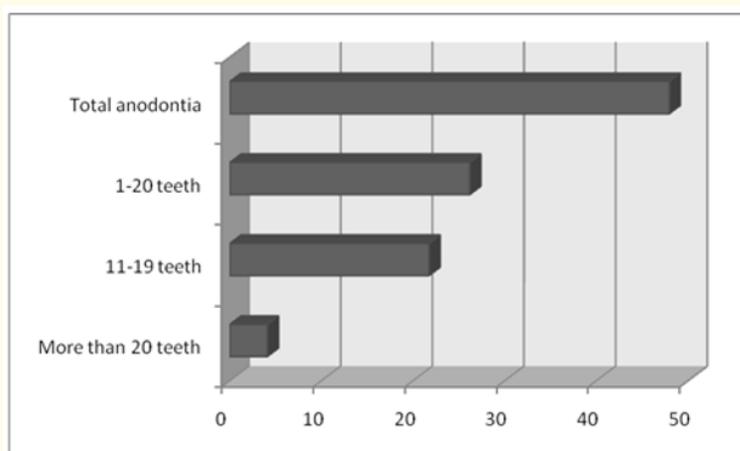


Figure 2: Number of remaining teeth examined among the examined elderly.

Among the examined individuals aged over 65 years, 47.95% of the subjects both jaws were totally anodontal, while in the rest subjects, in 15.06% was observed combined anodontia (total upper and partial lower anodontia or partial upper and lower total anodontia). The percentage of respondents with partial anodontia in both jaws was 36.99 (Figure 3).

Age is an important predictor of total loss of teeth, which revealed that over half of subjects over 75 years have bimaxillary total anodontia (Table 3).

In regard of the presence and use of prosthetic devices, the results show that over half (more precisely 57.53%) of subjects did not wear any prosthetic aids, 9.59% wear only one total prosthesis and just 24.66% of wearing dentures in both jaws. Only three subjects (4.11%) wear upper and lower partial denture. Fixed prosthetic devices are extremely rare and were noticed in 2.74% (Table 4).

Since the biggest number of present teeth in one subject was 24, it means that versus the actual need for prostheses appliances that is noticed by the large number of lost teeth, there was the absence of prosthetic devices in over half of the subjects (57,53%).

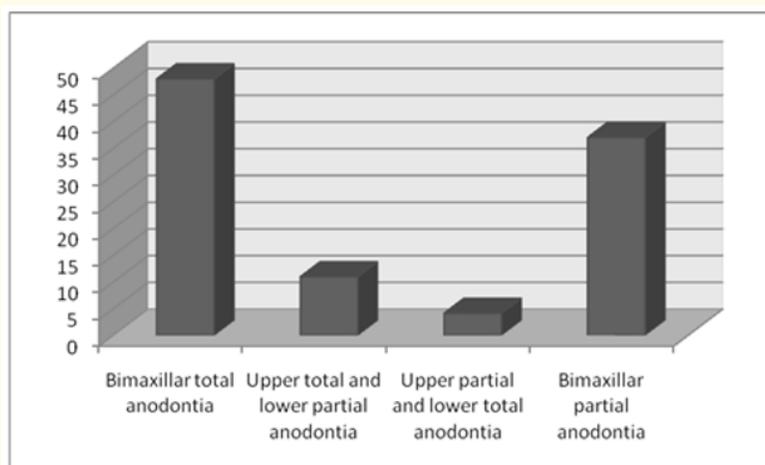


Figure 3: Types of anodontia among institutionalized elderly.

Characteristic	Presence of total anodontia	p-value
Age		
65 - 74 years	45,45%	0,00019
75+ years	51,75%	
Gender		
Male	28,5%	0,34
Female	60,00%	

Table 3: Proportion of total anodontia analyzed by age and sex among examined elderly.

Characteristic	No.	Percentage
A pair of dentures	18	24,66%
Only upper total denture	7	9,59%
Only lower total denture	0	0,00%
A pair of partial dentures	3	4,11%
Only partial upper denture	1	1,37%
Only lower partial denture	0	0,00%
Combined fixed and mobile prosthetic devices	0	0,00%
Braces in one jaw	1	1,37%
Braces in two jaws	1	1,37%
Absence of prosthetic devices	42	57,53%

Table 4: Presence of prosthetic devices among examined elderly.

After processing the data relating to total anodontia it was noted that it was significantly more prevalent in female persons than among male subjects (60%: 28.5%), so it was discovered significant differences in the total anodontia in individuals of male and female gender ($p = 0.34$) (Table 3). From the statistical analysis it may be noted that in spite of the high prevalence of total anodontia only about half of them used prosthetic devices. It may also be noted that higher number of people with bimaxillar total anodontia wear upper dentures in correlation with the lower total prosthesis.

After processing the data relating to the present hygiene prosthetic appliances it was found that about half of subjects, holders of prosthetic devices hygiene is poor (51.72%), with a large amount of biofilm, debris, pigmentation and dental calculus too (Table 5).

Hygiene of the prosthetic devices	No.	Percentage
Excellent	8	27,59%
Satisfactory	6	20,69%
Unsatisfactory	15	51,72%

Table 5: Assessment of hygiene of the prosthetic devices among examined elderly.

Discussion

The increase of the number of people who are in their seventies and eighties of life is in correlation with the number of lost teeth and the growing use and need of prosthetic devices [16]. The number of remaining teeth not only has the effect of mastication, and hence on food, also have an impact on aesthetics and phonation among the elderly.

The average number of remaining teeth in institutionalized elderly presented by Morales-Suárez-Varela, *et al.* [17] (17,1), Eustaquio-Raga, *et al.* [18] (14,29), Samson, *et al.* [19] (13.07) and Arpin, *et al.* [20] (12.91) is higher than the average number of remaining teeth in our study ($5,81 \pm 7,34$). A similar prevalence have shown Marin-Zaluaga, *et al.* [21] where the number of remaining teeth was 8.2 and Petelin, *et al.* [22] where the number of present teeth was $6,76 \pm 7,47$. Lower number of remaining teeth among the institutionalized elderly is presented in the study of Piuvezam and de Lima [23] in Brazil, where the average number of remaining teeth in institutionalized elderly was $4 \pm 6,6$.

Masticatory forces that are generated during the process of chewing largely depend on whether it comes from natural teeth or from prosthetic devices. Masticatory effect with artificial devices depends from the neuro- muscular control and muscle strength [24]. In the natural dentition chewing depends predominantly on the number of teeth and preservation of the occlusal surface. Hence the loss of teeth minimize masticator activities and affect the ability chewed among elderly, where the number of natural teeth is the decreased [25].

Problems with chewing are common among institutionalized persons, so it was found that this situation is typical for about half of the respondents, not only in our study, but also in the study published by Marin- Zaluaga, *et al.* [21], Kossioni and Karkazis [26], Gift, *et al.* [27] and Ekeleund [28]. Baran and Nalcaci [29] published lower prevalence of chewing problems among the institutionalized elderly, unlike Lo, *et al.* [30] which presented higher rates of these problems.

Some authors believe that elderly over time get used to the prosthetic devices and even they can cause variation of under-prosthetic tissues and beside of their obvious inadequacy, the elderly won't want replacing them. Such inadequate dentures can lead to the problems of oral mucosa [31,32]. The high prevalence of lesions associated with wearing the prostheses in most cases except from dentures instability is due to inadequate oral hygiene and irregular control dental check ups [33].

The main characteristics in terms of oral health of institutionalized elderly is the presence of a large remaining roots, root caries, mobile teeth, teeth with improper dental fillings or with advanced caries and of course high presence of anodontia compared to the elderly who live alone [34,35]. According to Dogan and Gokalp [36] age, control dental checkups and health insurance are associated with anodontia.

Poor oral health in institutionalized elderly is usually associated with irregular dental controls, irregular oral hygiene, use of carbohydrates and cigarette smoking. These elderly people more often suffer from coronary and root caries as well as periodontal disease. The ultimate effect of these often present oral infections occur increased loss of teeth. Mostly institutionalized elderly attending dentist for prosthetic needs or oral surgery, apart from preventive and reconstructive procedures that they are rarely solved.

The needs for dental care in these patients is large, but it is impossible these problems to be taken care of because in the center there is not a dentist or any other person trained or educated to perform dental procedures. Gurbuz., *et al.* [37] found that 58.5% of subjects were in need of treatment. The results presented in this study about the subjective need for dental treatment show that 61.64% of subjects have need of dental treatment. Fonesca., *et al.* [38] found that 85.9% of subjects were in need of some treatment. The same authors found that 57.3% of subjects were in need of prosthetic treatment, unlike the data presented in this study where subjective need for prosthetic treatment was noticed in 52.23% (Table 2). Chaware., *et al.* [39] among institutionalized elderly found that there is a need for prostheses in 85% from the examined.

The number of people in the study who have a desire, as a subjective need for new dental prostheses is big, but in our country or countries like ours this is often impossible due to poor financial capability. The presence of total bimaxillar anodontia among the elderly is quite large and the data on its prevalence in the literature vary. Thus, the representation of bimaxillar total anodontia in France examined by Tramini., *et al.* [40] was 26.9%, in the US according to Saunders., *et al.* [41] was 43.1%, according to Starr., *et al.* [42] in Scotland was 51.7%, in Brazil, according to Colussi., *et al.* [43] was 74.9%, in India, according to Shigli., *et al.* [44] was 66.6%. Marin-Zaluaga., *et al.* [21] among institutionalized elderly noticed bimaxillar anodontia in total 32.5% of subjects, Estaquio-Raga., *et al.* [18] found that prevalence of this phenomenon among 20.7% of subjects. Gaiao., *et al.* [45] noticed prevalence of this phenomenon among 39.5%, Zusman., *et al.* [46] published the prevalence of 26%, Mc Millan., *et al.* [47] found presence of total anodontia of 19% and Bourgeois., *et al.* [48] published the representation of total anodontia of 17.4% of subjects in France. Samson., *et al.* [19] in their study found that after monitoring who was 16 years of total anodontia among institutionalized persons in Norway decreased from 71% to 43%. Comfort., *et al.* [34] in their study in Fuji in 2003 found the total anodontia is noticed among 43% of the institutionalized elderly. Triantos [49] in his study in Greece found prevalence of total anodontia of 79%, similar to Vucićević-Boras., *et al.* [50] in Croatia where total anodontia is present in 70% of the subjects. Evren., *et al.* [51] published the prevalence of the total anodontia as 66.6%.

In our study the prevalence of bimaxillar anodontia is 47.95% (Figure 3). A similar representation of bimaxillar anodontia found Puivezam and de Lima [23], Dogan and Gokalp [36] and Chen., *et al.* [52]. The prevalence of total bimaxillar anodontia in Macedonia range from 43.17% (according to Pandilova., *et al.* [53]) to 66.8% for people over 65 (according to Sapuric and Tozija [54]). Considering this data, we may conclude that there is no difference in the prevalence of the total anodontia among non-institutionalized adult population and institutionalized elderly people.

Not all anodontal subjects own prosthetic devices. According to our study only 24.66% of subjects had dentures vs. total anodontia present in 47.95%. Pregliasco., *et al.* [55] and De Visschere., *et al.* [56] showed that about quart of the respondents do not own prosthetic devices which coincides with the results of this study. Evren., *et al.* [51] and Triantos [49] showed that less than 20% of respondents did not have prosthesis. Greater absence of prosthetic devices showed Zubiene., *et al.* [57] and Unluer., *et al.* [58].

Considering that the largest number of teeth present in one subject of our study is 24, it means that versus the actual need for prosthetic appliances which is visible by the large number of lost teeth, there is the absence of prosthetic devices in over half of the respondents - in 57.53% from the subjects.

According to Guguvchevski [2] the basic principles for constructing an appropriate prosthetic construction in elderly, including institutionalized individuals must be fully preserved or slightly modified.

Hygiene of the prosthetic devices is very poor, containing deposits of dental plaque, tartar and fungi and it may be responsible for stomatitis protetica, cheilitis angularis, inflammatory fibrous hyperplasia, halitosis, dental caries (when it comes to partial anodontia), mucositis, periimplantitis, accelerated destruction of dental materials [59,60]. In our study we found that more than half of the respondents had poor oral hygiene of their prosthetic devices (in 51.72% of subjects who had mobile dentures) (Table 5). Excellent hygiene prosthetic devices was observed in 27.59% of respondents wearing mobile prosthetic devices, while the remaining 20.69% had good (satisfactory) hygiene of their mobile prostheses.

After processing of the data we noticed that at least half of the institutionalized elderly have a plaque on at least one side of the prosthesis. Hence, the perceived importance of the removal of such deposits from the prosthetic devices for preserving the oral health. According Knabe and Kran [61] 45% of respondents had satisfactory hygiene of their prostheses, indicating better oral hygiene and dental care than in our study. Unlike previously mentioned, Evren., *et al.* [51] indicated that only 14% of institutionalized elderly maintained good hygiene to dentures. Baran and Nalcaci [29] published results indicating that 48.4% of the subjects in institutions for long-term care, brush their prostheses.

Conclusion

Among the institutionalized elderly we had noticed that the need for dental interventions is high, with predominance of prosthetic interventions, because the use of prostheses is quite low. Also numerous problems associated with the use of prosthetic devices were noticed. High prevalence of bimaxillary total anodontia and absence of prosthetic devices despite their unavoidable need is characteristic of institutionalized elderly. Also unsatisfactory hygiene of prosthetic devices was noticed in our study.

Conflict of Interest

We declare that we do not have any financial interest or any conflict of interest.

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