

Characterization of oral health status among the institutionalized elderly in a district capital of the central region of Portugal

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Research Article

Keywords: Elderly, Oral health, Oral rehabilitation, Oral hygiene

Posted Date: September 13th, 2024

DOI: <https://doi.org/10.21203/rs.3.rs-4914790/v1>

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Additional Declarations: No competing interests reported.

Abstract

Introduction

In the elderly population, oral health is often neglected due to poor oral health literacy. It is fundamental to promote adequate oral health behaviors among the elderly and their caregivers to improve oral hygiene and permit a decrease in the risk of oral and systemic pathology development.

Objectives

The aim of this study was to characterize oral health behaviors and the oral rehabilitation status of the institutionalized elderly that live permanently in nursing homes in a district capital in the central region of Portugal.

Materials and Methods

An observational cross-sectional study was designed, and data collection performed in nursing homes and daycare centers of Viseu, Portugal. The study was carried out based on a convenience sample consisting of 529 patients living in 5 nursing homes of Viseu, Portugal. The data collection was accomplished using the following instruments and methods: two customized questionnaires to assess systemic / oral health and the elderly oral rehabilitation and the intraoral clinical assessment following WHO standardized methodology.

Results

Regarding oral hygiene habits, 81.2% of the elderly accomplish their daily oral hygiene. Also, 44.0% had no teeth in their oral cavity (47.2% women vs 36.3% men, $p=0.044$). 70.5% confirm having pain and 64.0% of the elderly complains of having chewing difficulties. Regarding the use of dental prosthesis, it was observed that 63.2% of the elderly had dental prosthesis (mostly conventional complete dentures) and the remaining 36.8% do not use them, even when they have clinical indication to use. It was found that 84.1% of the participants felt better when placing their dental prosthesis during the day. Considering the prosthetic night rest, it was observed that 57.7% of the participants removed their dental prosthesis at night, with significant statistical differences among gender: 63.7% in the group of women and only 38.3% of the men ($p=0.001$).

Conclusions

This research demonstrated that nearly one third of the sample do not have a dental prosthesis which is essential to allow better chewing function capacity. Also, oral health behaviors need to be improved and better implemented in nursing homes, namely, prosthetic night rest, daily oral hygiene and more frequent oral health treatment to decrease orofacial pain. Therefore, it is important to continue to develop strategies and join efforts to improve oral health and, consequently, systemic health of institutionalized elderly.

Introduction

The concept of oral health was approved at the International Dental Federation General Assembly in 2016, being defined as *"multifaceted and including the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex"*.(1)

Oral health should be considered as an integral part of general health and, therefore, all individuals should be entitled to adequate oral healthcare.(2, 3) The Portuguese Oral Health Barometer of 2023 developed by the Portuguese Dental Association shows that only 41.1% of the population have all their natural teeth in the oral cavity. However, only 50.1% of portuguese with missing natural teeth that have some kind of oral rehabilitation. This report also demonstrates that 22.8% of the portuguese population have, at least, six or more teeth missing and that 18.2% are not rehabilitated.(2)

Gerodontology is becoming a field of increasing interest as we are facing a demographic transition, with worldwide population getting older resulting from a reduction in fertility rate, lower mortality, an increased average life expectancy which is concomitant with the presence of chronic pathologies that last for several years (4–7).

Population aging is a human success fact and a sign of development that reflects the improvement in public health, medicine, and economic and social issues, with an increase on disease control focused on disease prevention and health promotion. These changes on population aging structure inevitably leads us to an increase among the elderly. In 2019, there were 703 million people aged 65 years or over which is 9% of the population worldwide. The predictions for 2050 show that the elderly population may increase to 16% worldwide.(7)

Nowadays, many elderlies are institutionalized and the lack of availability of family members (due to working, economic or other reasons), the loss of a spouse or even the absence of family/friends who can care for their elderly, makes the institutions, namely nursing homes and daycare centers the main solution for this social problem.(5)

In the elderly population oral health is often neglected due to poor oral health literacy.(1, 5) It is fundamental to promote adequate oral health behaviors among the elderly and their caregivers to improve oral hygiene and permit a decrease in the risk of oral and systemic pathology development (8)

The aim of this study is to characterize oral health behaviors and the oral rehabilitation status of the institutionalized elderly that live permanently in nursing homes. The specific objectives defined for the present study were the following:

- To assess oral health status and oral hygiene habits.
- To characterize oral rehabilitation, namely the prevalence and the type of removal dental prosthesis.

Material and Methods

An epidemiological observational cross-sectional study was designed and data collection performed in five nursing homes and daycare centers of the district capital of Viseu, in the central region of Portugal.

Institutionalized elderly people over 65 years of age were included. A convenience sample was obtained after data collection with a total of 529 elderly people. Non-cooperating elderly and/or without legal representatives who did not authorize participation in the study through informed consent were excluded.

The data collection was accomplished using the following instruments and methods:

- Application of a customized questionnaire developed to assess general and oral health of the institutionalized elderly.
- Application of a questionnaire to assess the level of satisfaction, usage and hygiene of dental prosthesis by the elderly and other oral rehabilitation factors.
- Intraoral observations were performed using an observational kit (mirror and periodontal probe approved by the WHO) to identify and record oral status of the participants. (10)

The various examiners were properly calibrated among themselves. A total of 12 individuals were selected and were individually evaluated by each of the examiners and the results obtained were duly recorded. Subsequently, the results were compared and a Kappa value = 0.91 was obtained.

All the questionnaires were applied and completed by the interviewer based on the study participant's response and recorded directly in the database using one of the computing devices.

The research project was approved by the Ethics Commission for Health of Universidade Católica Portuguesa (approval report number 165). Data processing was carried out guaranteeing confidentiality and anonymity and used exclusively by the researchers involved in the research. The purpose of the questionnaires was previously explained, and the informed consent was obtained from all participants and all methods were performed in accordance with the Declaration of Helsinki principles for medical research involving human subjects.

The statistical analysis of the data was performed with IBM-SPSS® 24.0 (IBM, Chicago, Illinois, United States of America). Measures of central tendency (mean and standard deviation) and prevalence, expressed as a percentage, were calculated. The appropriate hypothesis tests necessary to perform the inferential statistics were also performed, using a significance level of 5%.

Results

This study consists of a final sample of 529 elderly people from which 69.4% (367) were women and 30.6% (162) were men. The mean age of the sample studied was 81.02 ± 8.3 years. Regarding the age

group of the individuals in the sample, it was found that 59.5% (315) were aged between 65 and 84 years and 40.5% (214) were over 85 years old.

Our sample is constituted by 14.6% (77) of illiterate elderly and 79.8% (422) who attended elementary school. Only 5.6% (30) of the sample finished high school or frequented a higher degree.

Regarding oral hygiene habits, it was found in our study that 81.2% of the elderly accomplish their daily oral hygiene, brushing teeth and/or prosthesis, at least, once a day.

Also, 44.0% of the study sample have no teeth in their oral cavity (47.2% women vs 36.3% men), 40.5% have between 1 and 19 teeth and 15.5% have almost or all their natural teeth. The mean for missing teeth was 20.23 ± 8.89 which is considerably high.

Table 1
Characteristics and oral health behaviors of the sample of the institutionalized elderly.

	Women = 69.4% (367)	Men = 30.6% (162)	Total = 100% (529)
Age, years			
65–84	61.9% (227)	54.3% (88)	59.5% (315)
85 or more	38.1% (140)	45.7% (74)	40.5% (214)
Education			
Can't read	14.2% (52)	15.5% (25)	14.6% (77)
Elementary School	79.4% (291)	80.7% (131)	79.8% (422)
High School or University	6.4% (24)	3.8% (6)	5.6% (30)
Daily oral hygiene			
Yes	81.9% (300)	79.5% (129)	81.2% (429)
No	18.1% (67)	20.5% (33)	18.8% (100)
p = 0.512			
Number of teeth in the mouth			
0	47.2% (173)	36.3% (59)	44.0% (232)
1–19	37.1% (136)	48.6% (79)	40.5% (215)
20–32	15.7% (58)	15.1% (24)	15.5% (82)
p = 0.044			
Orofacial pain			
Yes	64.5% (237)	86.5% (140)	70.5% (377)
No	35.5% (130)	13.5% (22)	29.5% (152)
p < 0.001			
Chewing difficulty			
Yes	61.9% (227)	69.4% (112)	64.0% (339)
No	38.1% (90)	30.6% (50)	36.0% (140)
p = 0.163			
Visit the dental office in the last 12 months			
Yes	79.8% (293)	80.8% (131)	80.1% (424)

	Women = 69.4% (367)	Men = 30.6% (162)	Total = 100% (529)
No	20.2% (74)	19.2% (31)	19.9% (105)
p = 0.8			
Reasons to not visit the dental office			
Dental appointments are expensive	12.0% (44)	18.2% (29)	14.0% (73)
Fear of dentist	4.3% (16)	0.0% (0)	2.9% (16)
Don't need to go	68.5% (252)	79.5% (129)	72.1% (381)
Access difficulty	15.2% (55)	2.3% (4)	11.0% (59)
p = 0.045			

Concerning complaints of orofacial pain in the moment of the data collection, we can verify that 70.5% confirm having pain and 29.5% do not feel any sort of orofacial pain. We can also verify that there are more men with orofacial pain (86.5%) than women (64.5%), with a statistically significant difference between genders ($p = 0.001$).

There are 64.0% ($n = 339$) of the elderly complain of having chewing difficulties, with no statistically significant difference between genders in this item ($p = 0.163$). However, it is considered a high prevalence of elderly with this oral health issue.

In the present study, we noticed that 80.1% ($n = 424$) of the elderly had a dental appointment in the last 12 months. Only the remaining 19.9% ($n = 105$) did not have a dental appointment in the last year. The elderly reported that they didn't go to the dental office in the last 12 months mainly because they felt that they did not need a dental appointment (72.1%). Some of them refer that dental appointments are expensive (14.0%) or have difficulty in going to the dental office (11.0%). Others relate fear of treatment (2.9%) as a justification for not going to a dental appointment. There is a statistically significant difference between genders ($p = 0.045$). We also verified that elderly of the male gender say that they are not afraid of the dentist, they simply just don't need to attend a dental appointment, in their opinion.

Regarding the use of dental prostheses, it was observed in the sample that 63.2% (334) of the elderly wear prosthesis and the remaining 36.8% (195) do not use them.

Most of the elderly of our sample use removable complete dentures in the upper arch (78.9%). Of the remaining prosthesis wearers, 13.2% (32) have acrylic partial denture and 7.9% (19) have cast-metal partial denture. We noticed a statistically significant difference between genders ($p = 0.001$).

Table 2
Characterization of the use of a dental prosthesis.

	Women = 69.4% (367)	Men = 30.6% (162)	Total = 100% (529)
Use of prosthesis			
Yes	64.5% (237)	60.0% (97)	63.2% (334)
No	35.5% (130)	40.0% (65)	36.8% (195)
p = 0.332			
Upper prosthesis			
Total	79.8% (146)	76.3% (45)	78.9% (191)
Acrylic Partial	15.8% (29)	5.1% (3)	13.2% (32)
Cast-metal Partial	4.4% (8)	18.6% (11)	7.9% (19)
p < 0.001			
Lower prosthesis			
Total	79.8% (150)	86.0% (43)	81.1% (193)
Acrylic Partial	16.5% (31)	10.0% (5)	15.1% (36)
Cast-metal Partial	3.7% (7)	4.0% (2)	3.8% (9)
p = 0.523			
How often wear the prosthesis			
Always	94.4% (224)	93.7% (91)	94.2% (315)
Sometimes	3.1% (8)	0.0% (0)	2.3% (8)
Never	2.6% (5)	6.3% (6)	3.5% (11)
p = 0.143			
Prosthesis satisfaction			
Yes	89.0% (211)	71.9% (70)	84.1% (281)
No	11.0% (26)	28.1% (27)	15.9% (53)
p < 0.001			
Prosthesis hygiene			
Always	77.7% (184)	62.9% (61)	73.8% (245)
Sometimes	20.2% (48)	35.7% (34)	24.3% (82)

	Women = 69.4% (367)	Men = 30.6% (162)	Total = 100% (529)
Never	2.1% (5)	1.4% (2)	1.9% (7)
p = 0.035			
Prothesis night rest			
Always	63.7% (151)	38.3% (37)	57.7% (188)
Sometimes	7.8% (19)	23.3% (23)	11.5% (42)
Rarely	3.1% (7)	0.0% (0)	2.3% (7)
Never	25.4% (60)	38.4% (37)	28.5% (97)
p < 0.001			

In the lower arch, 81.1% (193) of our sample use total denture. The remaining prothesis users, 15,1% (36) have acrylic partial denture and only 3,8% (9) have cast-metal partial denture.

When asked about the frequency of use of dental prostheses, 94.2% (315), said they always used it, 2.3% (8) said they used dental prostheses sometimes and 3.5% (11) mentioned never using them.

It was found that 84.1% (281) of the participants felt better when placing their dental prosthesis during the day. On the other hand, 15.9% (53) revealed that they did not feel any improvement when placing the prosthesis. There is a statistically significant difference between genders ($p = 0.001$), with women being more satisfied with the use of the prothesis. Regarding the hygiene of dental prostheses, we found that 73.8% (245) always performed daily prosthetic hygiene (more women than men, with $p = 0.035$), 24.3% (82) only did sometimes and 1.9% (7) never did it.

Considering the prosthetic night rest, it was observed that 57.7% (188) of the participants in this study remove their prosthesis at night. On the other hand, we verified that 28.5% (97) refer that they never practice prosthetic night rest. It was also found that 11.5% (42) remove the prosthesis during the night sometimes and 2.3% (7) rarely remove their prosthesis during the night. We found statistically significant differences between genders ($p = 0.001$).

Table 3
Characterization of the use of a upper and lower total dental prosthesis among elderly with total edentulism.

	Women = 69.4% (157)	Men = 30.6% (53)	Total = 100% (210)
Use of upper and lower total prothesis (among elderly with total edentulism)			
Yes	77.8% (137)	22.2% (39)	83.8% (176)
No	58.8% (20)	41.2% (14)	16.2% (34)
p = 0.001			

Among the elderly with total edentulism, which means that did not present any natural teeth in their oral cavity, 83.8% presented upper and lower total dental prosthesis, with a higher prevalence among the female gender (77.8% vs 22.2%, $p = 0.001$).

Table 4
Chewing difficulty associated with the use or non-use of upper and lower total dental prosthesis among elderly with total edentulism.

Use of upper and lower total dental prosthesis among elderly with total edentulism	Yes = 83.8% (176)	No = 16.2% (34)
Chewing difficulty		
Yes	35.2% (62)	48.7% (16)
No	64.8% (114)	51.3% (18)
p = 0.116		

The elderly with total edentulism who used upper and lower total dental prosthesis presented a lower prevalence of chewing difficulties, however no statistical differences were found between elderly with total edentulism user and non-user of upper and lower total dental prosthesis ($p = 0.016$). Among elderly of total edentulism non-user of dental prosthesis, our study shows that 51.3% refer not having chewing difficulties.

Discussion

This study was performed to assess the oral health characteristics and behaviors. It also intends to analyze the type of prosthetic rehabilitation and hygiene habits. According to the 2021 Census developed in Portugal, the portuguese population has been aging, with a decrease in the younger age groups and a clear and constant increase in the elderly population. (11)

The same demographic phenomenon occurs worldwide, as explained in the 2015 World Health Organization World Report on Ageing and Health. (8, 12, 13) The low birth rate and increased longevity

seen in recent decades, reflects in a narrowing of the base age groups and a widening of the more advanced ages. (8, 11)

In the present study, there is a higher prevalence of women participating, probably because they are more responsive to questionnaires or have more health conditions that allow the participation in the study. Also, we must include the fact of higher life expectancy for women being a reality. On average, women are living five years longer than men – 74,7 years and 69,9 years, respectively. (7)

In the last decade, the level of education of the population has increased significantly, with the reinforcement of the population with higher education and with secondary and post-secondary education. (11) However, as our study targets an older population, the level of illiteracy is still considered being high among the Portuguese institutionalized elderly.

As for oral hygiene habits, in the 2023 National Oral Health Barometer presented by the Portuguese Dental Association, it was found that 78.8% of the Portuguese population toothbrush their teeth regularly (twice a day). (2) In our sample, 81.2% answered toothbrushing regularly or having daily oral hygiene habits, which is considered being a good value.

The numbers of the last National Oral Health Barometer tell us that 6.2% of the portuguese population do not present any natural tooth in the oral cavity. However, this study has an average age of 47, which is not suitable for comparison with our study. (7.6% has between 4 and 24 teeth and 86.2% has between 24 and 32 teeth).

A study developed in Germany by Jordan *et al.* reveals that edentulism in that country decreased by over 50% between 1997 and 2014 and that until 2030 it shall decrease to 65%. This is due to the implementation of oral health programs and strategies towards oral disease prevention and improvement of oral health behaviors among the population. In the study developed by Jordan *et al.*, the authors found an association between edentulism and the female gender, being a former or current smoker, and having a lower educational level.(14) The same strategies are the goal that should be achieved in Portugal to decrease oral health problems verified among the population.

Cardoso *et al.*, in a study developed in Brazil, founded that edentulism is declining in their country among adolescents and middle-aged adults, however, it will continue to increase among the elderly for the next decades. (15)

Another study about edentulism and its relationship with socioeconomics and health factors made in Sweden, showed that edentulism in people aged 65 and older are associated with male sex, low educational level, living in rural areas, low income level, social isolations and have other health problems. (16)

Regarding the chewing ability, it is always very committed when we have some kind of oral disorder or lack of teeth. Furthermore, this lack of chewing capacity is clearly related to general health status which is an important health issue towards Portuguese elderly.(17–19)

A considerable number of elderly with total edentulism non-user of dental prosthesis referred not having chewing difficulties. This perception can be influenced by the type of foods cooked and consumed daily in the nursing home. The ingestion of soft foods will create the perception of non-difficulties in food ingestion by the elderly.

However, and considering the high number of missing teeth and prevalence of edentulism and the fact of 68.4% of the elderly with total edentulism user of upper and lower dental prosthesis refer not having chewing difficulties, rehabilitation of edentulous spaces is always desirable, to avoid extrusion of opposing teeth and mesialization or distalization of adjacent teeth. These changes can cause occlusal imbalances and consequently difficulties in the chewing process which may affect the quality of life of the institutionalized elderly.

A study developed by Inukai *et al.* at the Tokyo Medical and Dental University's Prosthodontic Clinic to perceive chewing ability in partially dentate patients, showed that higher chewing ability was correlated with better quality of life. This correlation was influenced by gender, education, treatment demand and denture status, but not by age or number of teeth. (20) In our study we found 64% of the elderly with chewing difficulties.

Montero *et al.*, showed that after spanish patients receive conventional prosthetic treatment the levels of chewing ability increased. Although, 20% of these patients complained of lower levels of comfort and chewing ability. The best results were verified in patients rehabilitated with cast-metal partial dentures and in cases of a larger number of missing teeth. (18)

Unfortunately, we verified many participants in the study (80%) had not been to the dentist in the last 12 months. Obviously, this fact is not favorable for maintaining and improving their oral health status and justifies the high prevalence of orofacial pain answered by the elderly during data collection. This idea is in line with the conclusions of Montero *et al.*, that report in their study that regular dental check-up appointments are associated with better dental status (21).

In a National Oral Health Survey developed in Brazil with 7496 elderly participants (65–74 years of age) the results of dental prostheses use were 78.2%. (6) In the present study, we reported 63.2% of dental prosthesis users (65 years or more). Of these, 55% were 65–84 years old and 45% were 85–100 years old, in which 43% had 20–32 remaining teeth, 35% had removable dentures, and 41% were assessed as having a need for dental care. This also requires a need to increase the number of dental appointments to better control the state, retention and stability of the dental prosthesis that the elderly use on a daily basis and also requires improvement towards oral health literacy and, consequently, daily oral hygiene methods. (22, 23)

Using dental prosthesis provides not only the chewing ability, help to avoid malnutrition and the satisfaction of being able to smile, it restores the dignity of the person. It is important a good oral health so that way we can maintain a good physical as well as cognitive and psychological health. This is especially important among the elderly population.(24)

In our study, we verified that 73,8% of the institutionalized elderly make a daily prosthetic hygiene and 24,3% only would accomplish this daily habit sometimes. Marchini et al, reported that 93% of brazilian institutionalized elderly that made a daily hygiene of their prosthesis.(25) Other brazilian study, shows us a similar value of 98% of the elderly that presented the daily habit of oral hygiene, event among elderly that were rehabilitated with dental prothesis.(26) A systematic review about hygiene practices and habits of removable protheses users made by Papadiochou *et al.*, says that around 30 to 50% of removable denture wearers brush their prothesis once daily. Women do it more and better than men.(27)

Regarding the habit of removing the dentures overnight, our results demonstrates that 57,7% of the elderly accomplish this habit daily. However, other studies demonstrate lower levels of this procedure that varies from 36% (26) to 44.8%.(28) It is a good value for this parameter, but still not perfect. According to the Guidelines for the Care and Maintenance of Complete Dentures of the American College of Prosthodontists, "it is not recommended that dentures should be worn continuously (24 hours per day) in an effort to reduce or minimize denture stomatitis". That way, all prothesis wearers should remove the dentures from the oral cavity during sleep. (29) The study already mentioned of Papadiochou *et al.*, reveals 9 studies where over 50 per cent of denture wearers did not remove their removable prothesis during the night. This habit is more often in women than men.(27)

Conclusions

This is the first dataset to examine the oral health status among a sample of institutionalized elderly in the central region of Portugal. The study demonstrated that nearly one third of the sample do not use removable dental prothesis which is essential to permit better chewing function capacity. Also, oral health behaviors need to be improved and better implemented in nursing homes, namely, prosthetic night rest, daily oral hygiene and more frequent oral health treatment to decrease orofacial pain. Therefore, it is important to continue to develop strategies and join efforts to improve oral health and, consequently, the systemic health of institutionalized elderly.

Declarations

Acknowledgements

The authors would like to acknowledge the participants in the study and professionals and responsible that helped in the data collection of the nursing homes that participated in the study.

Authors' contributions

AMS, NV, AC and JMM were responsible for the conceptualization and design of the project. AMS, PC and CF were responsible for the data collection. NV, PC, HC and AMS were responsible for the statistical analysis and contributions to the various analytical approaches and interpretations of data. AMS, NV, AC and JMM drafted the main manuscript and made major contributions to the revising of the manuscript. All authors read and approved the final manuscript submitted.

Funding

This work is financially supported by National Funds through FCT—Fundação para a Ciência e a Tecnologia, I.P., under the project UIDP/04279/2020.

Availability of data and materials

The data used to generate and support the findings of this study are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research was approved by the Health Ethics Committee of the Universidade Católica Portuguesa (Approval report number 165). Written informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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