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Impact of xerostomia and the use of dental prosthesis on the quality of life of elderly: a cross-sectional study

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Aim: To evaluate the impact of xerostomia, edentulism, use of dental prosthesis, and presence of chronic diseases on quality of life in relation to oral health in institutionalized elderly individuals. **Methods:** This is a cross-sectional study. A questionnaire was administered containing the following instruments: Oral Health Impact Profile (OHIP-14), which measures the quality of life related to oral health; the Summated Xerostomia Inventory questionnaire (SXI-PL) for evaluation of xerostomia, sociodemographic data, clinical description, and patient-reported factors was assessed (edentulism, use of dental prostheses, and chronic diseases). **Results:** Most elderly individuals did not have any teeth in their mouths and used dental prosthesis. The impact on quality of life, considering the mean of the OHIP-14 scores, was positive in 58.3% of the elderly. Those who used a dental prosthesis were three times more likely to have their oral health negatively impacted (OR=3.09; $_{95\%}$CI =1.17 8.11), compared to those who did not use, and individuals with xerostomia were more likely to have their oral health negatively impacted (OR=1.57; $_{95\%}$CI=1.25-1.98) compared to those without xerostomia. There was no difference in the quality of life of individuals with and without chronic diseases. **Conclusions:** The feeling of dry mouth and use of dental prostheses negatively impacted the quality of life in relation to oral health of the elderly.

Keywords: Xerostomia. Quality of life. Oral health. Aged. Chronic diseases. Aging. Dental prosthesis. Drug utilization. Mouth, edentulous.

Introduction

Aging of the global population is becoming increasingly evident. The increase in people's life expectancy can be attributed to socioeconomic development, advances in science, improvements in healthcare, and a greater focus on health promotion[1,2]. Thus, with an increase in life expectancy, there is also an increase in the number of institutionalized elderly people[3]. However, the aging process brings with it the issue of frailty in the elderly, a complex condition that affects their social, psychological, physical, and cognitive domains, increasing society's concern regarding the health of this rising population[3].

Aging has some consequences, such as an increase in chronic non-communicable diseases (NCD's), which can negatively impact the quality of life of these individuals[4,5]. In addition to NCD's, there are more chances of appearance of several lesions in the oral mucosa, which can arise from the absence of natural teeth, or can be manifestations of chronic oral diseases, oral infections, or other factor[6].

Some oral manifestations affect the elderly and generate feelings of discomfort. Xerostomia, a prevalent condition, is defined as a subjective sensation of dry mouth and is often associated with hypofunction of the salivary gland[7]. Most of the time, xerostomia causes discomfort in the oral mucosa and lesions in hard and soft tissues of the mouth, leading to inflammation, such as stomatitis, fissured tongue, glossitis, angular cheilitis, mucositis, stomatodynia (burning sensation), aphthous and ulcerative lesions, traumatic ulcerations, chapped lips, tongue without papillae, and difficulty in using prostheses[8-10]. It is unquestionable that these comorbidities represent a problem for global public health, reflecting on the quality of life and general health of the population[4].

There is, hence, a growing concern regarding the quality of life across various dimensions. Limitations of life concerning age are part of the physiological process, among which changes in the oral cavity stand out, which can cause poorer quality of food, social isolation, and dissatisfaction with life, among others[11]. Some studies have reported a direct relationship between oral health and quality of life; for example, when an individual's oral health is impaired, the quality of life will often also be affected[12-14]. Subjective perceptions of the amount of saliva in the mouth and the experience of speaking difficulty affected the quality of life in patients with xerostomia[13]. Dental prosthesis and edentulism negatively impacted the oral health of the elderly[5,12].

The hypothesis of this research is that edentulism, the use of dental prosthesis, and the presence of chronic diseases and xerostomia have a negative impact on the quality of life of the elderly.

Therefore, this study aimed to assess the impact of xerostomia, edentulism, use of dental prosthesis, and presence of chronic diseases on the quality of life about oral health in institutionalized elderly aged 70 years or older.

Materials and Methods

Study design and sample

Our research work was previously submitted to the Research Ethics Committee of Faculty IMED and approved under number 2.711.544, CAAE 90966718.0.0000.5319.

This scientific article was written in accordance with the report of STROBE (*Strengthening the Reporting of Observational Studies in Epidemiology*)[15].

This cross-sectional study was conducted in 2020. The sampling was of the non-probabilistic type, consisting of interviews with the institutionalized elderly living in the seven nursing homes in the southern Brazil municipality (Passo Fundo, Rio Grande do Sul).

The following inclusion criteria were employed: elderly aged 70 years or older, absence of neurological disease, and the possibility of answering the research questionnaire (not be illiterate).

The strategy to select the sample was based on the total number of elderly residents of the twelve Long-stay Institutions for the Elderly in the municipality. The total number of institutionalized elderlies in these institutions was 300, however, only 202 elderly people met the inclusion criteria of this study. Of these, 46 refused to participate in the research, and the final sample consisted of 156 individuals.

Data collection instruments

For data collection, a questionnaire was used to address the following parameters: sex, age, presence of diabetes, depression or anxiety, hypertension, rheumatoid arthritis, or other chronic diseases; edentulism; use of dental prostheses; self-reported xerostomia; and impact of quality of life-related to oral health.

For the geriatric quality of life associated with oral health, the Oral Health Impact Profile instrument, in its reduced version (OHIP-14)[16,17], was used, containing questions related to the last four weeks, divided into seven dimensions: 1. Functional limitations (Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?; Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?); 2. Physical pain (Have you had painful aching in your mouth?; Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?); 3. Psychological discomfort (Have you felt self-conscious because of problems with your teeth, mouth or dentures?; Have you felt tense because of problems with your teeth, mouth, or dentures?); 4. Physical disability (Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?; Have you had to interrupt meals because of problems with your teeth, mouth, or dentures?); 5. Psychological disability (Have you found it difficult to relax because of

problems with your teeth, mouth or dentures?; Have you been a bit embarrassed because of problems with your teeth, mouth, or dentures?); 6. Social disability (Have you been a bit irritable with other people because of problems with your teeth,

mouth or dentures?; Have you had difficulty doing your usual jobs because of problems with your teeth,

mouth, or dentures?); and 7. Social Handicap (Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures?; Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or dentures? The answer options were never, hardly ever, occasionally, fairly often, or very often. Subsequently, scores were assigned to each answer: never = 0, hardly ever = 1, occasionally = 2, fairly often = 3, and very often = 4[16,17].

To check the self-reported xerostomia, a short version of the Xerostomia Inventory (Xerostomia Inventory) was used as designed by Thomson et al.[18]. The Summated Xerostomia Inventory questionnaire (SXI-PL) was validated in the Portuguese version and was used to check for dry mouth sensation in the Brazilian population[19]. It was composed of five questions, with each item having four possible answers (never, occasionally, frequently, always): "Do you feel dry mouth during meals?", "Do you feel dry mouth?", "Do you have difficulty eating dry foods?" , "Do you have difficulty swallowing certain foods?", "Do your lips feel dry"? The responses had values of 1, 2, 3, and 4, respectively, which when added together, generated a score ranging from 5 to 20; the higher the value, greater the severity of xerostomia.

First, a pilot test was carried out with 10 participants, similar to definitive research, making it possible to train the researcher in data-collection and guide the application of the questionnaire to the elderly, thus minimizing bias.

Variables in the study

For this research, the outcome variable was "impact of oral health on quality of life", according to OHIP-14 values[16,17], which was dichotomized in the presence and absence of impact on quality of life, with at least one answer meaning presence, such as "occasionally", "fairly often", or "very often", and the answers "never" and "hardly ever" in the two items corresponded to the absence of impact on the quality of life of each

The exposure variables analysed were: sex (male/female), age group (70-80 years/81-90 years), edentulism (yes/no), use of dental prosthesis (yes/no), self-reported xerostomia (values quantitative - responses with values of 1, 2, 3 and 4 were added together, generating a total score - continuous variable), and presence of chronic diseases (yes/no) - all comorbidities: the presence of diabetes, depression or anxiety, high blood pressure, rheumatoid arthritis and other chronic diseases were combined in this variable.

Data analysis

For data analysis, all variables were descriptively analyzed accordingly. The Pearson's chi-square test ($p < 0.05$), a univariate analysis, was performed between the outcome and exposure variables. Logistic models were also used for bivariate and multivariate regression tests with the associated variables ($p < 0.20$). In the multivariate analysis, odds ratios (OR) and their respective 95% confidence intervals

were estimated, both crude and adjusted for exposure variables in a binary logistic regression model (p-value <0.05) and were reported accordingly. The data were analyzed using the statistical program IBM SPSS® software (Statistical Package for the Social Sciences, version 20.0, Armonk, NY, USA).

Results

The study included 156 participants who completed the questionnaires. Table 1 shows the descriptive results of the elderly, most of whom were women (64.1%), with a mean age of 80 years old (± 10.5). Regarding chronic diseases, most of the elderly reported having depression and/or anxiety (45.5%), 41% hypertension, 22.4% diabetes, 21.2% heumatoid arthritis, and 46.2% reported having another disease(s), except those mentioned. Regarding chronic diseases, 86.5% of the elderly had at least one comorbidity. More than half (51.3%) used some type of dental prosthesis, (complete dental prostheses to fixed rehabilitation) and 25.6% did not have any teeth in their mouth (edentulism).

Table 1. Description of demographic variables, diseases chronic, and oral conditions, southern Brazil municipality, 2020. (n = 156).

Variables	n	%
Sex		
Feminine	100	64.1
Male	56	35.9
Age		
70-80 years	88	56.4
81-97 years	68	43.6
Diabetes		
No	121	77.6
Yes	35	22.4
Depression / anxiety		
No	85	54.5
Yes	71	45.5
Hypertension		
No	92	59.0
Yes	64	41.0
Rheumatoid arthritis		
No	123	78.8
Yes	33	21.2
Other diseases		
No	84	53.8
Yes	72	46.2

Continue

Continuation		
Edentulism		
Yes	40	25.6
No	116	74.4
Dental prosthesis		
Yes	80	51.3
No	76	48.7

Table 2, which refers to the questions of the Xerostomia Inventory, shows that 56.4% of the elderly did not report dry mouth when eating a meal; however, 37.8% reported that their mouth frequently felt dry. When asked about the difficulty when eating dry foods, 55.1% reported not having any difficulties, and 9% reported frequently encountering difficulties while eating dry foods. Regarding dry lips, a significant number (23.1%) of the elderly reported that their lips were always dry. For the prevalence of self-reported xerostomia, all answers were either "frequently" or "always" for the five questions in the questionnaire, resulting in a prevalence of 18.5%.

Table 2. Xerostomia Inventory Data - Summated Xerostomia Inventory-5 (SXI-PL) - of institutionalized elderly, southern Brazil municipality, 2020. (n = 156).

Variables	**n**	**%**
1. My mouth feels dry when eating a meal		
Never	88	56.4
Occasionally	43	27.6
Frequently	9	5.8
Always	16	10.3
2. My mouth feels dry		
Never	58	37.2
Occasionally	59	37.8
Frequently	13	8.3
Always	26	16.7
3. I find it difficult to eat dry food		
Never	86	55.1
Occasionally	48	30.8
Frequently	7	4.5
Always	15	9.6
4. I have difficulty swallowing certain foods		
Never	101	64.7
Occasionally	41	26.3
Frequently	6	3.8
Always	8	5.1

Continue

Continuation		
5. I feel my lips dry		
Never	50	32.1
Occasionally	63	40.4
Frequently	7	4.5
Always	36	23.1

When analysing the measures of central tendency of the scores of the Reduced Xerostomia Inventory-5 (SXI-PL), an overall average of self-reported xerostomia of 8.5 was observed. Regarding the means, standard deviation, minimum and maximum quality of life, and the seven dimensions of the OHIP-14 questionnaire, the average quality of life was 1.26 (± 1.13), whose domain was physical pain, which most negatively impacted the quality of life, having a value of 2.21 (± 2.08) (Table 3).

Table 3. Descriptive statistics of the scores of the five dimensions and self-reported total xerostomia Summated Xerostomia Inventory-5 (SXI-PL) and the negative impact of oral health on quality of life related to oral health and the seven domains (OHIP-14) of the elderly, southern Brazil municipality, 2020 (n = 156).

	Minimum	Maximum	Average	Standard deviation
1. Dry mouth when eating meal	1	4	1.35	0.78
2. Dry mouth	1	4	1.58	1.00
3. Difficulty eating dry foods	1	4	1.65	1.05
4. Difficulty swallowing food	1	4	2.04	1.19
5. Dry lips	1	4	1.82	1.15
Total Xerostomia scores	5	20	8.5	3.80
1. Functional Limitation	0	8	1.10	1.65
2. Physical Pain	0	8	2.21	2.08
3. Psychological Discomfort	0	8	1.77	2.00
4. Physical Disability	0	8	1.18	1.70
5. Psychological Disability	0	7	1.27	1.73
6. Social Disability	0	7	0.63	1.20
7. Social Handicap	0	8	0.65	1.35
OHIP-14 scores	0	7	1.26	1.13

However, in reaction to the impact of oral health on the quality of life of the elderly, it was observed that it was positive in 58.3% of the elderly and negative in 41.7%.

To perform the binary logistic regression, all variables that were associated with Pearson's chi-square test with p <0.20 were entered in the crude model: sex, age, use of dental prosthesis, edentulism, self-reported xerostomia, and disease chronicles with variable oral health outcomes in quality of life. After multivariate adjustment, the vari-

ables used for dental prosthesis and self-reported xerostomia remained significant (p<0.05), with the other variables losing their association in the final adjusted model of the multivariate regression analysis (Table 4). Elderly people who use a dental prosthesis are 3.09 times (OR = 3.09; 95% CI 1.17-8.11) more likely to have a negative impact on oral health, and those with self-reported xerostomia were 1.57 times, more likely to have a negative impact on oral health (OR = 1.57; 95% CI 1.25-1.98).

Table 4. Bivariate (crude) and multivariate (adjusted) binary logistic regression model for the impact of oral health on oral health-related quality of life (OHIP-14) of institutionalized elderly, southern Brazil municipality, 2020.

	Crude OR (95% CI)	p-value *	Adjusted OR (95% CI)	p-value **
Age				
70 to 80	1	***0.029***	1	
81 to 97	2.22 (1.08-4.55)		0.73 (0.24-2.25)	0.596
Sex				
Male	1	0.116		
Feminine	1.63 (0.88-2.99)		-	-
Use of dental prosthesis				
No	1	***0.001***	1	***<0.001***
Yes	3.50 (1.70-7.21)		3.09 (1.17-8.11)	
Edentulism				
No	1	***0.036***	1	0.967
Yes	2.09 (1.05-4.17)		1.02 (0.34-3.01)	
Chronic diseases				
No	1	0.091	1	
Yes	2.23 (0.88-5.69)		2.92 (0.62-5.88)	0.252
Self-reported Xerostomia	1.60 (1.29-1.99)	***<0.001***	1.57 (1.25-1.98)	***0.022***

* Chi-square test; ** Wald test (p <0.05 - statistically significant)
OR - Chance Ratio; 95% CI - 95% confidence interval
% - Frequency-percentage
Adjusted for the variables: age group, sex, use of dental prosthesis, edentulism, chronic diseases, and self-reported xerostomia (p <0.05).

Discussion

This study evaluated the impact of certain conditions on the quality of life of institutionalized elderly people, and it was found that xerostomia and usage of dental prosthesis had a negative impact on their quality of life in relation to oral health.

This study revealed that individuals who have self-reported xerostomia are 1.57 times more likely to have a negative impact on their oral health. In a study of 566 patients from a dental clinic, patients with xerostomia had worse quality of life

scores than those without xerostomia[19]. In another study of 2,209 New Zealanders aged 75 and over, quality of life was worse in individuals with xerostomia[20]. Studies report problems that individuals affected by xertostomia may have: dysgeusia, dysphagia, dysphonia, masticatory efficiency reduction, nutritional inadequacy, candidiasis, oral lesions and ulcerations, atrophic tongue, dental caries, periodontal diseases, halitosis, loss of denture retention[21-26].

Although the purpose of this study was not to verify the association between xerostomia and oral problems, there is much evidence to support this relationship. Lesions in the hard and soft tissues of the mouth, which many patients report as causing discomfort and pain, are common in patients with xerostomia, due to dryness on the surface of the tongue, palate, oral floor, and mucosa[15,21,27]. The xerostomia scores in this study were high, consistent with other studies[13,19,24,28-31]. In the present study, 45.5% of the elderly have depression or anxiety. With the growth of the elderly population, the number of chronic physical and behavioural diseases increases and, consequently, the use of continuous medication. Thus, it may be that the use of continuous medication for anxiety/depression or other diseases by the elderly has contributed to the prevalence of xerostomia.

In the present study, having one or more chronic diseases and quality of life were not found to be associated with oral health in the elderly. It is emphasized that, often, an increase in life expectancy and longevity occurs with the increase in the prevalence of chronic diseases[32]. Currently, longevity is an achievement of human beings; however, the high prevalence of chronic diseases is associated with the ability to live longer[33]. Statistics show that between 80 to 85% of the elderly aged 65 years or older have at least one chronic medical condition[34]. The prevalence of comorbidities and multimorbidity, especially in the elderly, is high and may lead to, above all, a poor quality of life[30,35,36].

Regarding the use of dental prostheses, it was found in the present study that the elderly are three times more likely to experience a negative impact on their oral health. This result corroborates that of a study by Masood et al.[37], conducted in 1,277 elderly people in the United Kingdom, in which the use of total prosthesis negatively impacted oral health, and prosthetic wearers were twice as likely to have functional limitations, physical discomfort, and psychological discomfort than non-users. Other studies have also reported an association between the use of dental prostheses and worse quality of life[5,38,39]. One of the ziggest consequences of poor oral health is edentulism[12,40]. Data from the National Oral Health Survey (SB Brazil)[41] showed that the characteristic of not having any teeth was common in many elderly people in the country, with a rate of 53.7%. In the present study, even though the prevalence of total edentulism patients is lower (25.6%) than that in the national survey, it is still quite high. In interpreting the results, it should be taken into account that the quality of the dental prosthesis and the masticatory efficiency were not evaluated in this study, which could influence the impact on quality of life. Dental prostheses are not always ideal, so many individuals are not satisfied with the clinical effects of their dentures, due to deficiencies in feeding and speech, discomfort, poor retention, and stability[42]. In addition, dental care is not offered to institutionalized elderlies in the municipality investigated in the present research.

It is important to highlight and recognise the limitations of the present study. One of the limitations is the fact that the study was not population-based, and therefore, the results cannot be generalised for the population of this age in the city. However, this limitation does not invalidate the present study. The study raises unique questions because the institutionalised population represents an often-forgotten contingent. Besides, another limitation was the lack of information about the quality of the prosthesis and the evaluation of masticatory efficiency. We also point out as limitation, the absence of data on income, education, and knowledge of oral health by the elderly. Increasing age, low education, ethnicity, low income, lack of knowledge about oral health has a negative impact on oral health-related quality of life among the elderly[43].

Thus, the relevance of the quality of life of institutionalized elderlies is clear. It is also essential to carry out further studies on this condition, as it frequently presents itself in the elderlies, since there is a general increase in life expectancy and the geriatric contingent is increasingly on the rise. Future research is encouraged, with a larger sample and from other locations, aiming at a greater understanding of the factors that contribute to the quality of life in relation to oral health.

In conclusion, self-reported xerostomia and the use of dental prostheses negatively affected the quality of life with the oral health of the elderly, and people who have these conditions are more likely to have a worse quality of life.

Author contribution

Larissa Steilmann Demarchi: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - original draft. Mayara Trapp Vogel: Writing - review & editing, Visualization. Gabrielle Haubert: Supervision, Project administration. Lilian Rigo: Investigation, Resources, Formal analysis, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration. All authors actively participated, revised and approved the final version of the manuscript.

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