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Use and need of removable dental prostheses in an institutionalized Brazilian elderly population: a cross-sectional study

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Abstract: The aim of this study was to assess the use and need of conventional removable prostheses (total and partial) and their associated factors among institutionalized elders. A cross-sectional study was conducted with 1003 elderly people living in non-profit private long-term care institutions in Belo Horizonte, Brazil. Inclusion criteria required a minimum Mini Mental State of Examination (MMSE) score of 21. After the test, 191 individuals were included. Oral examination and interviews were conducted to identify participants' use (throughout the day/every day) and need (do not have/have but do not use) of removable dental prostheses. Socioeconomic health indicators and behaviours were collected from institutional records and via interviews. Bivariate analysis was performed using chi-square test (p<0.05). Poisson regression with robust variance was used in multivariate analysis. Most elders were female (76.4%) and independent in their daily activities (56.5%). Elderly men (PR 1.26) and those whose dental visit was more than one year ago (PR 1.38) showed higher need of dental prostheses. Elderly women (PR 1.68) and individuals with morbidities (PR 1.33) had higher prostheses use. This study demonstrates how socio-demographic characteristics, health indicators, and oral health services impact the use and need of dental prostheses among elders and how these can contribute to public oral health policy development.

Keywords: Dentures; Aged; Long-Term Care; Oral Health.

Introduction

Several countries have identified that the oral health of elderly people living in private long-term care institutions is poor.[1,2,3] Institutionalized elders have multi-morbidities, which lead to lower quality of life.[2,4] Generally, they are frailer and affected by more comorbidities than elders living with their family or in the community.[2] Severe frailty and malnutrition are frequent and associated with mortality.[1,2,3] They score negatively on autonomy in activities of daily living (ADL), which result in simple changes, such as in self-care (instrumental), and more complex

ones.[4,5] Fragile elderly people have a greater chance of limitations in instrumental ADL.[6]

Brazilian elders comprise 8.4% of the total population and this percentage is expected to increase by 50% over the next 10 years.[7] About 0.5% of them live in non-profit private long-term care institutions (NPLTCI). Institutionalization is a stigma in Brazilian society, and it is considered that only deprived or frail elders commonly live in NPLTCI. The latest Brazilian census (2011) revealed 83,970 elderly people live in 3,548 NPLTCI, concentrated in the south-eastern part of the country, in larger cities; of these institutions, 65% were private non-profit organisations. Elders living in Brazilian NPLTCI come from low socio-economic backgrounds and require housing. They are independent in performing daily activities at the time they enter the institution.[8]

The latest Brazilian National Oral Health Survey[9] (SBBRASIL) reported 27.5 Decayed, Missing, and Filled Teeth Index in the 65–74-year-olds age group, with a high predominance of missing teeth. The need for dental prostheses in this group was 92.5%, and the use of dental prostheses was 76.1% and 53.0% in upper and lower arches, respectively.[9]

Dental care for elders in Brazilian NPLTCI encounters various obstacles, which subsequently increase oral health risks. For example, approximately 50% of NPLTCI residents present xerostomia, 20% present dysphagia, and 10% report chewing problems due to inadequate use of dentures.[1] The residents often have poor cognition, are physically frail, and underweight.[2] Most NPLTCI residents are from low socioeconomic levels and need specific public policies to improve their situation.

Poorly fitting prostheses can lead to difficulty in chewing and swallowing. Further, they may cause pain, dissatisfaction, negative psychological reaction, and malnutrition, and are associated with frailty in older adults.[2,10,11] Poor oral conditions and the use of inadequate prostheses impact their quality of life considerably.[3,12]

Despite the glaring problem, SBBRASIL[9] did not survey the use and need of removable prostheses in institutionalized elderly people separately. Knowledge of the use and need of prostheses among institutionalized Brazilian elders would facilitate age-group-specific oral health care. Whereas the Brazilian National Oral Health Policy (NOHP)[13] guarantees access to removable prostheses for elders, those living in NPLTCI encounter barriers for accessing these in public primary healthcare. The aim of this study was, therefore, to assess the use and need of conventional removable prostheses (total and partial), and their associated factors in institutionalized Brazilian elders.

Methodology

Study design and ethical aspects

A cross-sectional study was conducted from July to December 2017 with elderly people who lived in NPLTCI in Belo Horizonte, Brazil. The city has a Human Development Index of 0.84; it has over two million inhabitants, of which 12% are older people.[14]

The study was reviewed and approved by the Human Research Ethics Committee of the Universidade Federal de Minas Gerais (UFMG) (CAAE 69112817.5.0000.5149/2017). A signed informed consent form was obtained from all participants.

Sampling

Sample calculation required estimation of association between predictors and outcome (need for dental prostheses). Study population were 1,003 individuals living in 22 NPLTCI; prevalence of the outcome was 85.6 %,[15] confidence level was set at 95%, and statistical power was 80%. Minimum sample was 160 individuals.

To be eligible for the final sample, participants were required to achieve a minimum Mini-Mental State Examination (MMSE)[16,17] score which would enable them to understand and answer the study questions. MMSE is the most commonly used screening test to assess people's mental status and symptoms of dementia. It explains changes in ADL, behaviour, intellectual functioning, and mood. MMSE score ranges from 0 to 30, with scores > 21 indicating good cognition.[16,17] Correct answers score one and incorrect answers score zero. The lower the score, the more significant the cognitive impairment. All 1003 elders living in 22 NPLTCI were assessed for their mental status, using Mini-Mental State Examination

(MMSE).[16,17] A final sample of 191 individuals with MMSE > 21 were eligible for this study.

In a pilot study, five elders were examined to assess study methods. One trained and calibrated researcher conducted all clinical examinations (Kappa 0,67) and interviews, and notes were taken by one assistant.

Clinical data collection

The 191 participants were clinically examined by one calibrated examiner for use and need of dental prostheses. Examinations followed World Health Organization's (WHO) criteria.[18] Need of prostheses was characterized by their absence in the presence of partial and total teeth loss during examination. Participants were questioned to confirm that they did not have prostheses. When they reported having dental prostheses, but did not use them for the whole day or removed them during meals, they were considered in need of prostheses.[19] Following SBBRASIL criteria,[9] prostheses present at data collection were evaluated for retention, stability and reciprocity, fixation, and aesthetics. If they were inadequate, participants were considered as both in use and in need of prostheses.[19]

Non-clinical data collection

Study participants were interviewed using a questionnaire inquiring about their sex (female/male); marital status (with partner or not); self-reported skin colour (white, black, brown, yellow; indigenous colours were dichotomised as white and non-white);[7] time since last dental visit (up to one year/more than one year), present smoking (yes/no), and present alcohol drinking habits (yes/no).

Additional non-clinical data were collected from NPLTCI records and included: age in years (grouped into 60-75 and 76-98 years); years of schooling (grouped into 0-3 and 4-17 years); presence of systemic arterial hypertension (yes/no); presence of diabetes mellitus (yes/no); and presence of other morbidities (0/> 1).

Katz Index of Activities of Daily Living (ADL) is the most appropriate instrument to assess individual ability to independently perform ADL. Its Brazilian version ranks participant's performance in six activities: bathing, dressing, toileting, transferring, continence, and feeding.[20] Participants were classified as independent when they performed all six activities (score 0), and as dependent when they could not perform one or more activities (scores 1–5).

Statistical analysis

Stata statistical software version 12.0 (StataCorp., College Station, US) was used to evaluate the association between predictors, and use and need of dental prostheses. Bivariate analysis used chi-square test ($p < 0.05$). Poisson regression with robust variance was used in the multivariate analysis to obtain prevalence ratio (PR) and 95% confidence interval (CI). Multivariate analysis included all variables presenting $p < 0.20$ significance level in bivariate analysis, and those with $p < 0.05$ significance were retained in the models. Outcomes theoretical study model is presented in Figure.

Results

Of the 191 individuals: 107 (56%) scored MMSE 21–24; 108 (56,5%) were independent; 146 (76.4%) were female; 114 aged ≥ 76 years (59.7%); and 129 (67.5%) were non-white. Some 134 (70.1%) individuals used either adequate or inadequate removable dental prostheses (95%CI 63.1–76.5). Removable prostheses were needed by 142 (74.3%) participants (95%CI 67.5–80.4). Further, more than two-thirds of the elders had at least one morbidity (79.1%).

After bivariate analysis, male individuals ($p = 0.011$) and individuals with more time elapsed since their last dental appointment (> 1 year) ($p = 0.001$), had greater need of dental prostheses. Prevalence of dental prostheses use was higher in females ($p < 0.001$), older individuals (≥ 76 years) ($p = 0.052$), elders with systemic arterial hypertension ($p = 0.053$), and those with other morbidities ($p = 0.018$) (Table 1). MMSE score and skin colour were not statistically associated with prostheses use or need.

Crude analysis of the multivariate model of dental prostheses need showed that males had 27% greater prevalence of the outcome when compared to females (PR 1.26, 95%CI 1.09–1.48). Those whose last dental visit was over one year ago had 39% greater prevalence when compared to those who had a more recent dental visit (up to 1 year) (PR 1.39, 95%CI 1.12–1.73) (Table 2).

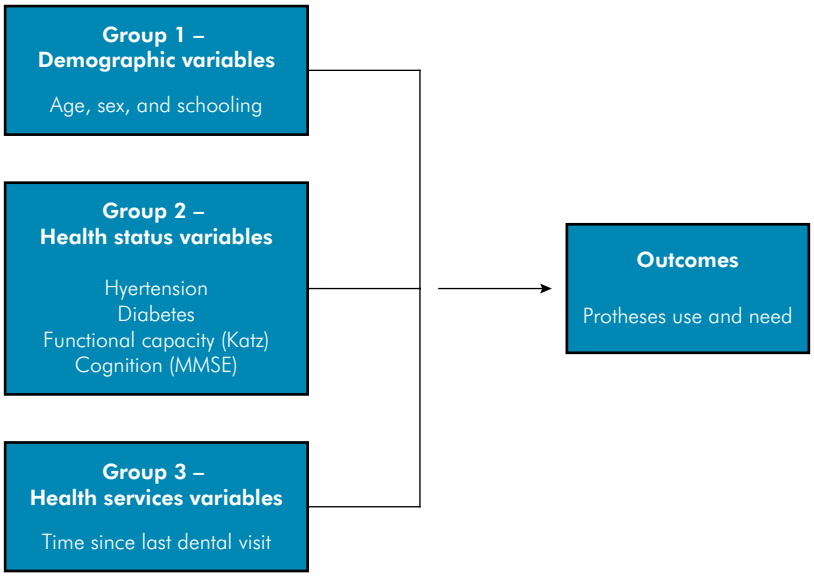

Figure. Outcomes theoretical study model.

Crude analysis of the multivariate model of dental prostheses use showed that females had 76% higher prevalence when compared to males (PR 1.76, 95%CI 1.25–2.46). Those whose last dental visit was more than one year ago had 39% greater prevalence when compared to those who had a more recent dental visit (up to 1 year) (PR 1.39, 95% CI 1.12–1.73) (Table 3).

Discussion

In the studied population, prevalence of removable prostheses need (74.3%) was lower than in other studies with institutionalized elders[21,22,23] and lower than among all Brazilian elders.[9] This indicates that the studied population may have better access to oral health care. In 2004, Brazilian NOHP established a prostheses policy for all Brazilians,[13] and more recent studies have demonstrated a decrease in prostheses need among Brazilian elders.[24,25,26] Better funding, more equipment, and more dental personnel can be associated with such improvement.[24] However, despite their growing number and vulnerability, no Brazilian national oral survey of institutionalized elders has been conducted to identify the need for such prostheses.[7]

This study's findings are in line with prior research, which reported that prostheses need increases among older men.[11,27] This might be because women are more motivated and seek more dental appointments throughout their lives.[2,27] However, despite greater use, the need for prostheses in women is also influenced by construction, adaptation, and maintenance flaws.[24,25]

Extant literature states that people with higher education have lower need for prostheses and that oral health-related knowledge influences oral healthcare positively.[11,28] Such findings could not be confirmed in this study. The fact that 50.3% of the participants had few years of schooling could explain why the variable was not statistically significant.

Drugs prescribed to treat morbidities can impair patient's self-care and oral hygiene, negatively impacting dental caries, periodontal diseases, and tooth loss. Individuals in use of antihypertensives have had higher caries prevalence, more periodontal diseases and prosthetic need.[26,29,30] Arterial hypertension and diabetes mellitus were not significantly associated with the use and need of prostheses in our studied sample, whereas other morbidities were associated with prostheses use but not their need. This population had lower dental prosthetic need than other institutionalized elders.[21,22,23] Although yet to be evaluated in future research, better access to dental care could explain

Table 1. Sample characteristics and association between exposures and outcomes of use and need of dental prostheses in institutionalized elderly (N=191)

Variables	N	(%)	Use dental prostheses*		p-value 95%CI	Need dental prostheses*		p-value 95%CI
			N	%		N	%	
Sex					< 0.001			0.011
Male	45	(23.6)	20	44.4	29.6–59.2	40	88.9	79.5–98.2
Female	146	(76.4)	114	78.08	71.3–84.8	102	69.9	62.3–77.4
Age (years)					0.052			0.674
60–75	77	(40.3)	48	62.3	51.3–73.3	56	72.7	62.6–82.8
76–99	114	(59.7)	86	75.4	67.4–83.4	86	75.4	67.4–83.4
Self-reported skin color					0.865			0.976
White	62	(32.5)	44	70.9	59.5–82.4	46	74.1	63.1–85.2
Non-white	129	(67.5)	90	69.7	61.7–77.7	96	74.4	66.8–82.0
Marital status					0.968			0.169
Without partner	174	(91.1)	122	70.1	63.2–76.9	127	72.9	66.3–79.6
With partner	17	(8.9)	12	70.6	48.1–93.0	15	88.2	63.5–98.5
Years of Study					0.524			0.068
0–3	96	(50.3)	69	72.6	62.5–81.7	76	80.0	70.5–87.5
4–17	95	–49,8	65	68.4	58.9–77.8	65	68.4	58.0–77.6
Smoking					0.482			0.112
Yes	19	(10.0)	12	63.1	40.7–85.6	17	89.5	66.8–98.7
No	172	(90.0)	122	71.0	64.0–77.7	125	72.7	65.4–79.1
Alcohol consumption					0.940			0.826
Yes	13	(6.8)	9	69.2	42.9–95.5	10	76.9	46.1–94.9
No	178	(93.2)	125	70.2	63.4–77.0	132	74.1	65.9–81.4
Arterial hypertension					0.053			0.720
Yes	70	(36.6)	55	78.6	67.1–87.4	51	72.9	60.9–82.8
No	121	(63.4)	79	65.3	56.0–73.7	91	75.2	66.5–82.6
Diabetes mellitus					0.107			0.501
Yes	33	(17.3)	27	81.8	64.3–93.0	23	69.7	51.3–84.4
No	158	(82.7)	107	67.7	59.8–74.9	119	75.3	67.8–81.8
Time since last dental visit (years)					0.393			0.001
Until one	67	(35.0)	49	74.2	61.9–84.2	39	59.0	46.2–71.0
> 1	124	–64,9	84	68.3	59.2–76.3	101	82.1	74.1–88.4
Morbidities					0.018			0.607
None	40	(21.0)	22	55.0	39.3–70.7	31	77.5	64.3–90.6
≥ 1	151	(79.0)	112	74.1	67.1–81.2	111	73.5	66.4–80.6
Functional capacity					0.177			0.271
Independent	108	(56.5)	80	74.0	64.7–82.0	77	71.3	62.6–79.9
Dependent	83	(43.5)	54	65.0	53.8–75.2	65	78.3	69.3–87.2
Mini-mental score					0.510			0.854
21–24	107	(56.0)	73	68.2	59.3–77.1	79	73.8	65.4–82.2
25–30	84	(44.0)	61	72.6	62.9–82.2	63	75.0	65.6–84.3

*Total N (use + need) is higher than 191 when prostheses in use need replacement.

Table 2. Crude and Adjusted Prevalence (PR) and Confidence Intervals 95% (95% CI) of occurrence of need for dental prostheses according to independent variables in institutionalized elderly.

Variables	Crude model			Adjusted model*		
	PR	95%CI	p-value	PR	95%CI	p-value
Sex			0.002			0.001
Male	1.27	(1.09–1.48)		1.26	(1.10-1.48)	
Female	1.00			1.00		
Age (years)			0.678	*		
60–75	1.00					
76–99	1.04	(0.87–1.23)				
Self–reported skin color			0.974			
White	1.00					
Nonwhite	1.00	(0.84–1.20)				
Marital status			0.058			0.242
Without partner	1.00			1.00		
With partner	1.21	(0.99–1.47)		1.13	(0.92-1.40)	
Years of study			0.072			0.122
0–3	1.16	(0.98–1.38)		1.13	(0.97-1.34)	
4–17	1.00			1.00		
Smoking			0.023			0.288
Yes	1.23	(1.03–1.47)		1.11	(0.91-1.36)	
No	1.00			1.00		
Alcohol consumption			0.817	*		
Yes	1.04	(0.76–1.41)				
No	1.00					
Arterial hypertension			0.724	*		
Yes	0.97	(0.81–1.15)				
No	1.00					
Diabetes mellitus			0.885	*		
Yes	1.02	(0.81–1.28)				
No	1.00					
Time since last dental visit (years)			0.003			0.002
Until one	1.00			1.00		
> 1	1.39	(1.12–1.73)		1.38	(1.11-1.70)	
Morbidities			0.591	*		
None	1.00					
≥ 1	0.75	(0.98–1.15)				
Functional capacity			0.265	*		
Independent	1.00					
Dependent	1.10	(0.93–1.29)				
Mini–mental score			0.854	*		
21–24	1.00					
25–30	1.01	(0.86–1.20)				

*Variables not included in the multivariate model (not statistically significant)

Table 3. Crude and Adjusted Prevalence Ratios and Confidence Intervals 95% (95% CI) of occurrence of use of dental prostheses according to independent variables in institutionalized elderly. Belo Horizonte, Brazil, 2017.

Variables	Crude model			Adjusted model*		
	PR	95%CI	p-value	PR	95%CI	p-value
Sex			0.001			0.002
Male	1.00			1.00		
Female	1.76	(1.25–2.46)		1.68	(1.20–2.35)	
Age (Years)			0.066			0.249
54–75	1.00			1.00		
76–99	1.21	(0.98–1.48)		1.12	(0.92–1.35)	
Self–reported skin color			0.865	*		
White	1.00					
Nonwhite	0.98	(0.81–1.20)				
Marital status			0.967	*		
Without partner	1.00					
With partner	1.00	(0.73–1.39)				
Years of study			0.526	*		
0–3	1.06	(0.88–1.28)				
4–17	1.00					
Smoking			0.525	*		
Yes	0.89	(0.62–1.27)				
No	1.00					
Alcohol consumption			0.941	*		
Yes	0.98	(0.68–1.43)				
No	1.00					
Arterial hypertension			0.043			0.222
Yes	1.20	(1.01–1.44)		1.12	(0.93–1.34)	
No	1.00			1.00		
Diabetes mellitus			0.056			0.375
Yes	1.21	(0.99–1.47)		1.09	(0.89–1.33)	
No	1.00			1.00		
Time since last dental visit (years)			0.381	*		
Until one	1.00					
> 1	0.92	(0.76–1.11)				
Morbidities			0.048			0.046
None	1.00			1.00		
≥ 1	1.35	(1.01–1.81)		1.33	(1.01–1.76)	
Functional capacity			0.189			0.106
Independent	1.14	(0.94–1.38)		1.16	(0.97–1.40)	
Dependent	1.00			1.00		
Mini–Mental score			0.508	*		
21–24	1.00					
25–30	1.06	(0.88–1.28)				

*Variables not included in the multivariate model (not statistically significant)

the lower significance of the impact of diabetes, arterial hypertension, and other morbidities on prosthetic need among the studied population.

Literature shows that dental treatment prevents teeth extractions and prosthetic need.[31,32] More recent dental visits thus allow a reduction in prosthetic need. As a consequence, in this population, those whose last dental visit was over a year ago were more likely to need dental prostheses than those who reported more recent dental visits.

Most study participants failed to achieve minimum MMSE score, as expected among long-term care elderly residents.[32] The 191 participants were elders living in NPLTCI, with good cognition, who were likely to pay attention to their oral health, search dental treatment, and have better oral health care.[33,34,35]

Functional capacity assessed by Katz ADL was not associated with the use and need of prostheses in this sample, which differs from literature data.[32,36,37] Participants in this sample presented good cognition and were mostly independent in ADL. Their predominant autonomy impaired the association between Katz's ADL and outcomes.

Despite being a legal right[38] prostheses supply for Brazilian institutionalized elders is insufficient to meet their need. Dental prosthetic need was lower in this study sample than in similar studies,[21,22,23] and yet, it remained high. This paper provides useful information for local and national health promotion and healthcare policies designed for institutionalized elders.[39]

This is a cross-sectional study, which cannot determine a temporal relationship between exposure and outcome. Minimum MMSE score as eligibility criterion ensured the level of cognition required for reliable data collection. However, socioeconomic and education levels of the sample are comparable to other Brazilian elders in NPLTCI[23,40] and the use of WHO's[18] and nationally adopted[9] criteria increases the study's reproducibility.

Conclusion

Overall, study results showed that most elderly people with good cognition living in NPLTCI already used removable dental prostheses. However, total prosthetic need was high, especially among men and those whose last dental visit was more than a year ago. Such data on the oral health of institutionalized elders are essential for evidence-based local and national health policies designed for them.

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