ORIGINAL

Oral health of elderly with different frailty levels from the city of *Campinas*, *São Paulo*, Brazil

Saúde oral em idosos com diferentes estágios de fragilidade na cidade de Campinas, São Paulo

Lilian Berta RIHS[1]
Andrea Moscardini da COSTA[2]
Luísa Helena do Nascimento TÔRRES[3]
Anita Liberalesso NERI[4]
Maria Elena GUARIENTO[5]
Fernanda Aparecida CINTRA[6]
Maria José DELBOUX[6]
Maria da Luz Rosário de SOUSA[3]

ABSTRACT

Objetive

Oral changes in the elderly affect their quality of life, as it hinders eating, sociability, and emotional and psychological functions. This study evaluated the oral health of elderly with different levels of frailty.

Methods

The study included a community-dwelling sample seen at the Geriatric Outpatient Clinic of the Universidade Estadual de Campinas School of Medical Sciences. The oral

[1] Cirurgião-Dentista. Piracicaba, São Paulo, Brasil.
[2] Universidade Estadual de Campinas, Faculdade de Ciências Médicas, Departamento de Gerontologia. Campinas, SP, Brasil.
[3] Universidade Estadual de Campinas, Faculdade de Odontologia de Piracicaba, Departamento de Odontologia Social. Av. Limeira, Areião, 13414-903, Piracicaba, SP, Brasil. *Correspondência para*/Correspondence to: LHN TÔRRES. *E-mail*: <luzsousa@fop.unicamp.br>.
[4] Universidade Estadual de Campinas, Faculdade de Educação, Departamento de Psicologia. Campinas, SP, Brasil.
[5] Universidade Estadual de Campinas, Faculdade de Ciências Médicas, Departamento de Medicina Interna. Campinas, SP, Brasil.
[6] Universidade Estadual de Campinas, Faculdade de Ciências Médicas, Departamento de Enfermagem. Campinas, São Paulo, Brasil.

cavity was examined and the frailty phenotype determined. The sample was then divided into pre-frail and frail groups. The Mann-Whitney and Chi-square test for trend were used for comparing the results.

Results

The results are expressed as mean ± standard deviation. The sample consisted of 67 elderly aged 77.5±8.0 years, of which 61.2% (n=41) were edentulous. They had 4.8±7.5 teeth, a decayed, missing, and filled teeth index of 28.8±5.1 mainly due to the missing component (94.4%), and a decayed and filled root index of 0.45±1.21. The lower anterior sextant had the worst Community Periodontal Index. Most participants needed a complete denture, and 82.4% of those who already had complete dentures needed to have them replaced. Thirty-four (50.7%) elderly were pre-frail and 33 (49.3%) were frail. The pre-frail group had better oral health ($p<0.05$), but not periodontal health.

Conclusion

The sample had poor oral health, clearly worse in the frail group.

Indexing terms: Ageing. Geriatrics. Oral health. Public health.

RESUMO

Objetivo

Alterações orais em idosos afetam a qualidade de vida e interferem na alimentação, na sociabilidade e nas funções emocionais e psicológicas. Este estudo avaliou as condições de saúde bucal em uma população de idosos com diferentes graus de fragilidade.

Métodos

Trabalhou-se com amostra não institucionalizada atendida em ambulatório da Clínica de Geriatria da Faculdade de Medicina da Universidade Estadual de Campinas. Foram realizados exame das condições bucais e avaliação para verificar o fenótipo da fragilidade, a partir do qual os idosos foram divididos em dois grupos: pré-frágeis e frágeis. Na análise dos dados, foram utilizados o teste Mann Whitney e o Qui-quadrado de tendência para comparação dos resultados.

Resultados

A amostra foi composta por 67 idosos, com média de idade de 77,5 anos (±8,0). Eram edêntulos 61,2% (n=41); a média de dentes presentes foi de 4,8 (±7,5), e o índice de dentes cariados, perdidos ou obturados, de 28,8 (±5,1), com a maior parte do índice composta pelo componente perdido (94,4%); o índice de média de raízes cariadas e/ou restauradas foi de 0,45 (±1,21). O índice periodontal comunitário foi pior no sextante que correspondeu aos dentes anteriores inferiores. A maioria das necessidades protéticas era referente às próteses totais. Dos indivíduos que utilizavam prótese, 82,4% necessitavam substituí-la. Quanto à classificação de fragilidade, 50,7% (n=34) foram considerados pré-frágeis e 49,3% (n=33), frágeis. Quando as variáveis odontológicas foram comparadas com a condição de fragilidade na população, todas as condições orais avaliadas foram melhores nos indivíduos pré-frágeis (p<0,05), com exceção das condições peridontais.

Conclusão

Concluiu-se que a saúde bucal dos todos os idosos avaliados era precária e que nos idosos frágeis uma pior condição bucal era claramente observada.

***Termos de indexação**: Envelhecimento. Geriatria. Saúde bucal. Saúde pública.*

INTRODUCTION

In Brazil, many epidemiological studies on the elderly have found that they have poor oral health[1-3]. Their main problem is the loss of several teeth mostly due to caries and periodontal disease, reflecting extensive dental decay and consequent edentulism[2,3]. The high proportion of edentulism in this population may stem from a lack of information on preventive care[4] or low socioeconomic status[5].

Poor oral health clearly affects the elderly's quality of life, since it may cause discomfort and impair eating, socializing, and emotional and psychological functioning, among others[6]. Oral conditions along with certain systemic conditions may promote the frailty syndrome in this age group.

Frailty may be defined as a worsening of an individual's health status, increasing his vulnerability to disease[7]. At present, there is growing consensus that frailty indicators include old age associated with unintentional weight loss, low grip strength, fatigue, low walking performance, and low physical activity. Frailty requires the presence of several of these conditions[7,8]. Only 3% to 7% of the elderly aged 65 to 75 years are frail, but the prevalence of frailty increases with age and can reach 32% in elderly aged more than 90 years[9].

There is a close relationship between poor oral health and poor systemic health. Together with other factors, missing teeth may cause chronic malnutrition and eventually, sarcopenia, reducing metabolic rate, physical activity, and taste acuity. This closes the cycle, increasing debilitation and showing frailty's cumulative nature. Thus, frailty is a progressive syndrome that results in death. However, if diagnosed during the pre-fragile stage, the condition may be reversed[9]. This shows the importance of oral health for the elderly, since oral health directly impacts systemic health.

The aim of this study was to assess the oral health of community-dwelling elderly with different levels of frailty seen at the Geriatric Outpatient Clinic of the *Universidade Estadual de Campinas* (Unicamp) School of Medical Sciences.

METHODS

The study was approved by the Research Ethics Committee of Unicamp's School of Medical Sciences under protocol number 40/2003.

We assessed the oral health of 67 individuals aged 60 years or more seen at the Geriatric Outpatient Clinic of Unicamp's School of Medical Sciences from September 2006 to March 2008.

The Decayed, Missing, and Filled Teeth index (DMFT index) and Decayed and Filled Root index (DF-R index) were determined. These indices represent the mean number of teeth and roots that have experienced decay in the study sample. The gums were assessed by the Community Periodontal Index (CPI) and Periodontal Attachment Loss (PAL). We also investigated whether the patients needed dental care, whether they used or needed dentures[10], and the state of their dentures.

A single examiner collected data. The percentage of intra-examiner agreement was verified to determine whether the following items were reproducible: dental caries (coronal and root), periodontal status (CPI and PAL), and denture status. During calibration, Kappa remained above 0.85 for all items, and during data collection, Kappa remained above 0.88.

The exclusion criteria were: individuals who required a wheelchair or stretcher since they would not be able to undergo the physical tests required for determining frailty level[7], and individuals with below-satisfactory mini-mental state examination results according to educational level[11].

The criteria proposed by Fried *et al*.[7] were used for determining the patients' frailty phenotype. The following data were collected by interview: unintentional weight loss, grip strength, fatigue level, walking performance, and level of physical activity. A score was given to each item considered unsatisfactory according to the standards proposed for this age group. Thus, the elderly were classified as: non-frail (elderly without unsatisfactory results), pre-frail (elderly who scored 1 or 2 points), and frail (elderly who scored 3 or more points).

The Mann-Whitney and Chi-square tests were used for comparing the results with a significance level of 5% ($p<0.05$). The data were treated by the software Statistical Package for the Social Sciences (SPSS) version 18. Comparisons were done according to frailty phenotype and oral health status. The Mann-Whitney test compared the mean number of healthy, missing, decayed, and filled teeth between the pre-frail and frail groups, and the Chi-square test compared edentulism between the same groups.

RESULTS

Sixty-seven elderly of a total of 150 were examined. The results are expressed as mean ± standard deviation. Their age was 77.5±8.0 years, 34.3% (n=23) were male, 68.7% (n=46) were Caucasians, 58.2% (n=39) lived in urban regions, 49.2% (n=33) were widowed, 40.3% (n=27) were married, and 10.5% (n=7) were separated or single.

Sample loss due to refusal to undergo examination, death, relocation to another city, and health deterioration during the data collection period (September 2006 to March 2008).

Oral Health

The participants had 4.8±7.6 teeth; 79.1% (n=53) had no posterior teeth and 61.2% (n=41) were edentulous.

The Decayed, Missing, and Filled Teeth index was 28.8±5.1, most of it due to the missing component (94.4%). Only 13 (19.4%) individuals had root caries, and the DF-R index was 0.45±1.21. The whole sample's DMFT Index and its components were compared with those of dentate participants (Figure 1). The dentate participants had better oral health than the sample.

Periodontal health was determined by the CPI and PAL. The CPI reflects changes in the tissues that support the tooth, ranging from gingivitis to periodontal pockets (Figure 2). Sextant 5, corresponding to the mandibular anterior teeth, had many periodontal changes. Many sextants were considered null since the exam excludes sextants with fewer than 2 teeth.

The PAL reflects the percentage of individuals with a periodontal attachment loss greater than four millimeters (>4mm) (Figure 3). The pre-frail group had a higher percentage of individuals with changes in the tissues that support the teeth.

Only 18.9% (n=12) of the elderly required curative treatments. Of these, most required restoration of one surface (70.0%) or two or more surfaces (30.0%), but 33.3% needed dental extractions, which would increase edentulism.

Figure 4 shows the elderly who use both maxillary and mandibular dentures and those who need them according to the World Health Organization[10] (WHO). Most participants wore a complete maxillary denture, and most of those who needed dentures needed complete dentures. A high percentage (82.4%) of those who wore dentures needed to have them replaced.

Oral health and frailty

About half (50.7%, n=34) the sample was pre-frail and half (49.3%, n=33) was frail. Nobody in the study outpatient clinic was classified as non-frail. The oral health of the pre-frail group was compared with that of the frail group (Figure 5). Pre-frail elderly had fewer missing teeth (p=0.001), more filled teeth (p=0.022), lower mean DMFT (p=0.001), and more healthy teeth (p=0.001), denoting better oral health. Also, 67.6% (n=23) of the pre-frail group had posterior edentulism as opposed to 90.9% (n=30) of the frail group, a significant difference according to the chi-square test (p=0.019).

DISCUSSION

Few studies have investigated the oral health of frail elderly. Nevertheless, we emphasize the

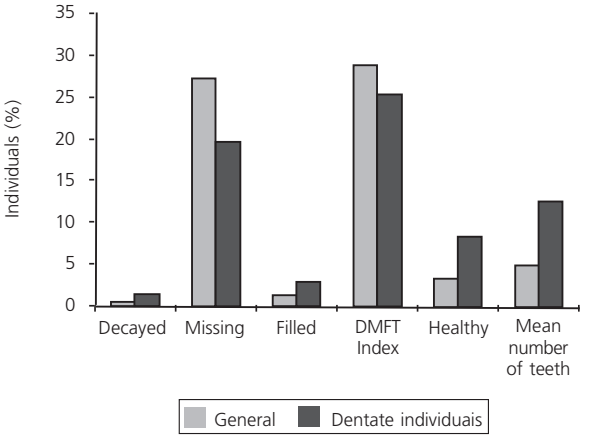


Figure 1. Decayed, missing, and filled teeth index and respective components for the whole sample and for the dentate elderly. *Campinas* (SP), Brazil, 2008.

Note: DMFT: Decayed, Missing, and Filled Teeth.

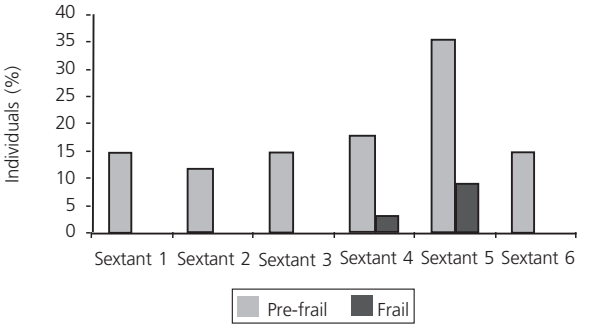


Figure 2. Periodontal health determined by the Community Periodontal Index for pre-frail and frail elderly. *Campinas* (SP), Brazil, 2008.

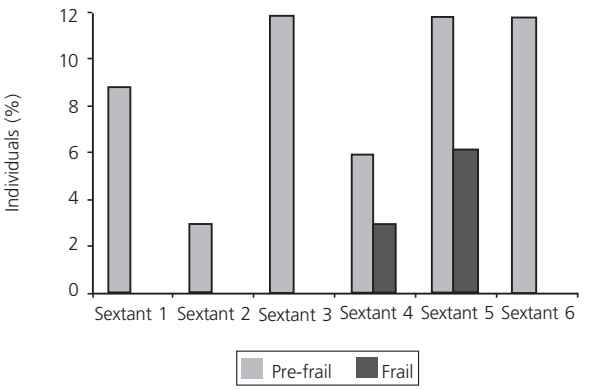
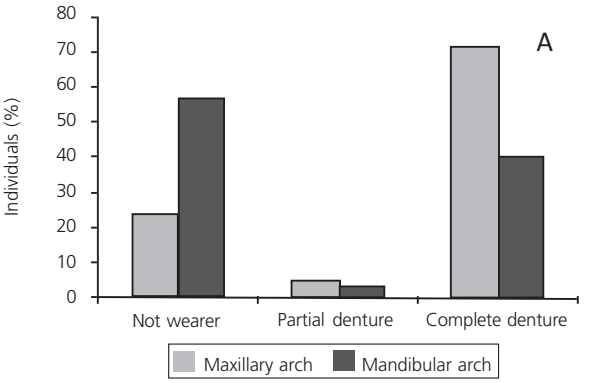


Figure 3. Pre-frail and frail elderly with a periodontal attachment loss >4mm. *Campinas* (SP), Brazil, 2008.



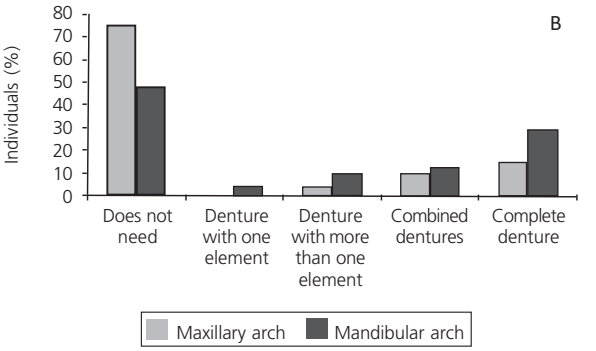


Figure 4. Elderly denture wearers (A) and elderly in need of partial or complete maxillary or mandibular dentures (B). *Campinas* (SP), Brazil, 2008.

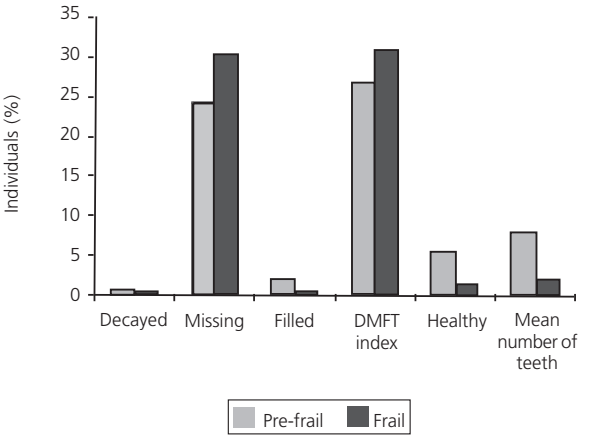


Figure 5. Elderly oral health according to frailty level. *Campinas* (SP), Brazil, 2008.

Note: DMFT: Decayed, Missing, and Filled Teeth.

importance of such studies because oral health is directly related to their general health and quality of life. Dentists should be included in the multidisciplinary health teams responsible for these individuals to improve their oral health and, consequently, their systemic health and lifespan.

The oral health of the sample was associated with their level of frailty: the pre-frail had better oral health than the frail. This suggests that poor oral health promotes frailty, as reported by Ahmed *et al*.[9], who stated that poor dentition is involved in the frailty cycle, since it may lead to chronic malnutrition and eventual sarcopenia. Furthermore, periodontal problems may increase inflammatory markers.

Since our pre-frail elderly had more teeth, they had more assessable supporting tissue, which resulted in worse periodontal health according to the CPI. The same is true for PAL: it is not that the frail group has better periodontal health; it is that they lack teeth for periodontal assessment. This can mislead to the conclusion that the frail have better oral health than the pre-frail. Periodontal changes only occur when teeth are present.

According to the CPI, the fifth sextant was the most affected, since it usually has the highest number of remaining teeth. Although the pre-frail elderly had worse periodontal health, their periodontal health was satisfactory for their age, since their attachment loss was around 10%.

The great limitation of these two indices is that their assessment of periodontal health is based on only some teeth, called index teeth, instead of all teeth. This may not always reflect reality, only a trend in those with at least 2 teeth per sextant. To this day, little attention has been given to elderly's periodontal health, which is lamentable because periodontal disease may increase inflammatory markers and promote frailty, justifying better care.

The present sample had poor oral health, a finding corroborated by other Brazilian studies on elderly populations[1,3]. However, oral health would be even worse if the edentulous were not included in the counts of individuals with caries and periodontal changes. For example, 61.9% of the sample had root caries when the edentulous (n=46) were excluded, showing that the oral health of the dentate was also unsatisfactory.

The prevalence of root caries is high among the elderly, ranging from 20% to 45% depending on country. Some risk factors for root caries described in the literature are poor oral hygiene, low saliva production, use of medications that reduce saliva production, low income, low education level, certain races, chronic and neurodegenerative diseases that prevent proper oral hygiene, and depression, among others. Age has also been described in the literature as an important risk factor but the ageing process *per se* does not affect caries susceptibility. Rather than age, the presence of one or more changes and diseases that are common in the elderly is the main promoter of root caries.

There are several hypotheses in the literature linking periodontitis with ageing. Some experimental rat studies have indicated that changes in the Hypothalamic-Pituitary-Adrenal (HPA) axis similar to those observed in ageing would be associated with greater periodontal destruction. For example, HPA hyperactivation could increase plasma corticosterone, a powerful endogenous corticoid in rodents associated with a predominantly Th2 inflammatory response. In the presence of certain periodontal pathogens, the Th2 response would cause greater inflammation, thereby greater degradation of the periodontal collagen and bone destruction. Clinically, this response translates into periodontitis getting worse with age[12,13].

There is also a growing amount of evidence indicating a connection between periodontitis and systemic conditions common in the elderly, especially diabetes and cardiovascular disease. Uncontrolled type-2 diabetes is a widely recognized risk factor for severe periodontitis. Moreover, some epidemiological studies and clinical trials indicate that periodontitis impacts diabetes. However, the present study found no relationship between periodontitis and frailty, possibly because of the abovementioned limitations of the instruments used[14].

In addition to the high percentage of edentulism, 33.3% of the participants who were in need of curative procedures needed extractions, denoting the lack of attention given to this population. This is confirmed by Holm-Pedersesn & Nitshke[4], who found that European elderly with some degree of frailty have difficulty accessing oral care, possibly because of the low fees paid by the government for their treatment and/or the dentists' fear of prescribing medications to an already multi-medicated population.

The most striking feature of this sample was the number of missing teeth due to extensive decay. Most (61.2%) were edentulous, 79.1% had no posterior teeth, and missing teeth was the main component (94.4%) of the DMFT index. Other Brazilian studies[2,3,15,16] and studies elsewhere[17,18] have also found high percentages of partial or complete edentulism among the elderly. A cohort study that followed healthy elderly individuals from Edinburgh, Scotland, for nine years found that 51.7% were edentulous, and many had lost their last tooth between the ages of 35 and 45 years. The authors concluded that poor physical health, poor nutrition, disability, and low self-esteem were associated with tooth loss[17].

The frail elderly also had a higher percentage of posterior edentulism. Edentulism may affect the systemic health of frail elderly because of all the difficulties associated with incomplete dentition. Perhaps in the future edentulism may be used as an indicator of higher frailty risk.

Having at least some teeth facilitates eating, which improves nutrition, systemic health, and resistance to health problems.

Tooth loss and consequent prosthetic rehabilitation are considered a remarkable factor in the ageing process. In this study, most patients wore complete maxillary dentures, but many still needed dentures: 13.4% and 28.4% needed complete maxillary and mandibular dentures, respectively. A Brazilian study that assessed institutionalized elderly found that 32.3% wore complete dentures in the two arches, and 42.6% wore no dentures despite needing them, showing that the oral cavity of Brazilian elderly has not been given due attention[16].

A high percentage (82.4%) of elderly needed to have their ill-fitting dentures replaced or complete dentures fitted. This is noteworthy because ill-fitting dentures and partial or complete edentulism reduce chewing ability, affecting food choices and thereby, nutrient intake, which may have a negative impact on systemic health[17,19]. The masticatory efficiency of elderly with complete maxillary and mandibular dentures is 30.0% to 75.0% lower than that of people with natural dentition. Denture wearers have worse diets because dentures impact food choices, chewing ability, and formation of the food bolus[20], leading to chronic malnutrition and eventually, sarcopenia, one of the most important frailty markers[9]. Unintentional weight loss, one of the five identification criteria of the frailty phenotype in the elderly, may stem from avoiding the use of poor-fitting dentures, which should be borne in mind by the multidisciplinary teams that follow these patients.

As recommended by the WHO[10], only the individuals who did not have a denture were considered to need them. If we also count those with poor-fitting dentures in need of new ones, the percentage of elderly in need of dentures is extremely high, increasing the amount of resources needed to meet the demand.

Until 2005, the Brazilian public health care system had few dental laboratories. In 2008, the system counted on 530 laboratories throughout the country, a historical expansion of the National Oral Health Policy, which celebrated 10 years in 2013. One of its objectives is to provide universal access to dentures by 2018[21].

There is much controversy regarding denture replacement because the elderly do not get adapted to new dentures easily. Nevalainen *et al.*[22] found that new dentures are better accepted when the dentist and patient agree on their need; when the need is based solely on clinical criteria, the rate of acceptance is lower. There is also discussion about the WHO's criteria[10] for fitting new dentures: Collussi & Freitas[23] noted that those criteria do not take into account patients' satisfaction with their appearance.

This study also assessed the sample's need of new dentures by checking if the dentures were intact, adapted to the bony ridge, and had a suction chamber, among others. Of those without complete dentition, 83.7% needed to have their dentures replaced, a finding corroborated by Nevalainen *et al.*[22].

Pre-frail elderly had better oral health than the frail, suggesting that oral health plays an important role in their systemic health. Nevertheless, many elderly were edentulous, indicating that, throughout their lives, they had limited or no access to information and procedures that prevented oral diseases and/or to conservative treatments. Therefore, specific dental programs should focus on the adult population to improve their health, prevent and treat caries and periodontal disease, and ensure long-lasting natural teeth, since these enable the consumption of a more diverse diet which contributes to systemic health.

CONCLUSION

The present elderly sample had poor oral health, and as their level of frailty increased, their oral health clearly decreased.

CONTRIBUTORS

LB RIHS and AM COSTA participated in all phases of the article writing. LHN TORRES collaborated with data analysis and wrote the 'Results' section. AL NERI, ME GUARIENTO, FA CINTRA and MJ DELBOUX collaborated with study development and wrote the 'Methods' section. ML SOUSA revised the article and supervised the study.

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