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# Self-perceived oral health and associated factors among the elderly in Campinas, Southeastern Brazil, 2008-2009

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## ABSTRACT

**OBJECTIVE:** To describe self-perceived oral health among elderly people and assess associated sociodemographic and clinical factors.

**METHODS:** A cross-sectional study was carried out with 876 participants forming a representative sample of elderly people (65 years of age or over) in Campinas, Southeastern Brazil, in 2008-2009. Dental examinations were conducted in accordance with criteria standardized by the World Health Organization for epidemiological surveys on oral health. Self-perceived oral health was evaluated using the Geriatric Oral Health Assessment Index (GOHAI). Individuals were classified according to sociodemographic characteristics, dental factors and prevalence of biological frailty. Associations were assessed using Poisson regression analysis, taking into consideration sample weights and the complex structure of the cluster sampling.

**RESULTS:** The subjects' mean age was 72.8 years; 70.1% were women. The proportion of the individuals with more than 20 teeth present was 17.2%; 38.2% were using full dentures in both arches; 8.5% needed dental prostheses in at least one arch. On average, the GOHAI was high: 33.9 (maximum possible: 36.0). Retaining 20 teeth or more, using full dentures in both arches, not needing such treatment, not presenting any oral mucosa abnormalities and not presenting biological frailty were factors significantly associated with better self-perceived oral health ( $p < 0.05$ ).

**CONCLUSIONS:** Assessment of self-perceived oral health made it possible to identify the main factors associated with this outcome. This tool may contribute towards planning dental services and guide health promotion strategies for improving the quality of life of individuals within this age group.

**DESCRIPTORS:** Aged. Oral Health. Self-Assessment. Socioeconomic Factors. Cross-Sectional Studies.

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## INTRODUCTION

Oral health is a component of general health that is essential for well-being<sup>24</sup> and it is directly related to socioeconomic conditions and access to information and health services.<sup>8</sup> Exclusive use of clinical indicators to assess oral health conditions is a limitation for dental studies.<sup>2</sup> These studies fail to take into consideration an important instrument for the planning of health services when they do not recognize the need to evaluate the self-perception of oral health and the impact of oral health on quality of life.

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<sup>24</sup> Ministério da Saúde. Relatório final da 1ª Conferência Nacional de Saúde Bucal; 1986 out 10-12; Brasília (DF). Brasília (DF): MS; UNB; 1986.

Self-perception of oral health is a multidimensional measurement that reflects individuals' subjective experience of their functional, social and psychological wellbeing and often determines their search for dental treatment.<sup>13</sup> Among the factors that can influence the perception of oral health are socioeconomic characteristics,<sup>4,12,17,27</sup> such as educational level and income, and clinical conditions,<sup>4,6,25,27</sup> such as dental loss and the use and need for dentures. Despite the importance of assessing self-perception of oral health, few studies carried out in Brazil have focused on this topic using representative samples.

Rapid growth in the proportion of elderly people in the population is a global phenomenon that challenges the health systems of many countries. Studies carried out in Brazil<sup>11,15-17,19</sup> have suggested that the elderly population is the most affected by unfavorable oral health conditions, such as dental caries, periodontal disease and edentulism, as well as having less access to and less effective use of dental services. Notwithstanding their growing proportional share of the global population, oral health perception among the elderly has been little studied.<sup>23</sup>

The relationship between oral health and general health is complex and multifaceted, especially among the elderly. Some unfavorable general health conditions that are more prevalent among this age group can act as predisposing factors for oral health impairment, such as diabetes, which can induce xerostomy and reduction of the saliva flow. Oral conditions that are more prevalent among the elderly, such as tooth loss and periodontal disease, may act as predisposing factors for malnutrition and restrictions on the intake of certain foods. In this sense, it is important to focus on the relation between oral health self-perception among the elderly and their general health condition.

The objective of the present study was to describe self-perceived oral health among elderly people and identify associated factors.

## METHODS

This was a multicenter and multidisciplinary population-based cross-sectional study on 876 elderly people in Campinas, Southeastern Brazil, in 2008 and 2009. The study was part of the research project "Frailty among Brazilian elderly people"; known as "*Rede FIBRA*". The number of elderly people (65 years of age or over) residing in Campinas, in 2008, was estimated to be 82,560 inhabitants, which corresponded to 7.8% of the population of the city. The minimum size for the sample was calculated as 601 by means of the finite population formula,<sup>26</sup> seeking to obtain statistical representation for descriptions of the prevalence of biological frailty, use of and need for dentures, presence of teeth and abnormalities in soft tissues of the mouth, with

prevalence estimates of 50% each (maximum safety margin) and sampling error of 4%.

Probabilistic sampling by clusters was carried out and 88 census tracts were drawn as the primary sampling unit. The interviewers received a map of each census tract that they should visit and were instructed to move through the tract from the center to the periphery, in a clockwise spiral, firstly seeking the houses on the right side and then the ones on the left, and disregarding commercial, leisure, teaching or religious establishments. Households in the census tracts that were drawn were visited until the specified quota of elderly people had been obtained. This strategy resulted in inclusion of 900 individuals (secondary sampling unit), corresponding to oversampling of 50% of the minimum stipulated, according to the statistical criteria. The participants were inhabitants of the urban region of Campinas, and received explanations about the objectives of the study and the ethical issues relating to their participation.

The capacity to understand the instructions for undergoing a physical examination and answering a questionnaire were also inclusion criteria. Elderly individuals who presented severe cognitive deficits, were in a wheelchair or bedridden, had serious sequelae from strokes, had Parkinson's disease at a severe or unstable stage, had serious hearing or eyesight deficiencies or were at a terminal stage were not considered to be eligible.

The elderly individuals in the study group were invited to go to a community location with easy access (primary healthcare units or residents' associations, among others), to undergo the dental examination. Out of the total number of eligible individuals, 2.7% did not show up for the examination and were considered to be sampling losses. After the subjects had signed a free and informed consent statement, three dental surgeons with specific training carried out the examinations and applied a questionnaire on self-perceived oral health. Following this, an evaluation of general health conditions (biological frailty) was performed for the benefit of the FIBRA study.

The dental examination was carried out based on the criteria recommended by the World Health Organization (WHO)<sup>33</sup> for epidemiological studies on oral health relating to examination on soft tissues of the mouth, presence of teeth and use of and need for dentures. These conditions were classified in a simple and dichotomous manner, with the aim of minimizing the possibility of observation errors.

The presence of teeth was counted, including the third molars, and the elderly individuals who presented up to 20 teeth (including edentulous individuals) were differentiated from those with 21 or more teeth present. The use of and need for removable total dentures was reported separately for the upper and lower dental

arches and was also dichotomized. The first variable differentiated between the elderly people who used total dentures in both arches and those who did not use them or who used them for only one arch. The second variable differentiated between the elderly people who needed dentures for one or two arches and those who did not need this resource.

The clinical evaluation on soft tissues of the mouth allowed the classification of elderly individuals with healthy oral mucosa and those that presented signs of some abnormality:<sup>33</sup> suspected neoplasia, leukoplakia, lichen planus, aphthous ulcers, herpetic or traumatic ulcers, acute necrotizing gingivitis, candidiasis or abscesses. Although it is difficult to standardize the diagnoses of these different lesions, this difficulty would not have stood in the way of a simple observation of health condition, as opposed to defining the presence of any abnormality of the oral mucosa.

Instruments have been developed to evaluate the impact of oral conditions on quality of life. Among these is the Geriatric Oral Health Assessment Index (GOHAI),<sup>4</sup> which was specifically developed for studying the impact of oral problems on elderly people's quality of life and is also used in other segments of the adult population. This instrument consists of a questionnaire on self-perceived oral health, which has been translated into Portuguese and is considered valid for application among elderly people in Brazil.<sup>27</sup>

The questionnaire consists of 12 questions on factors relating to three dimensions: physical or functional (four questions), psychosocial (five questions) and pain or discomfort (three questions). The answers are ordered in the form of a scale, with three response categories (always, sometimes or never), which receive values from one to three points (1 = "always", 2 = "sometimes" and 3 = "never"), with the exception of questions 3, 5 and 7, in which the values were inverted to maintain the attribution of higher scores for positive conditions in all questions. The greater the sum of the scores for the overall index and for each of its dimensions was, the more favorable the indication of quality of life relating to oral health would be.<sup>25,27</sup>

Biological frailty was evaluated taking into consideration the criteria of the frailty phenotype proposed by Fried et al (2001).<sup>9</sup> These criteria enable classification of individuals as frail (three or more frailty components), pre-frail (one or two components) and non-frail (no component). Biological frailty was defined as a clinical syndrome characterized by the conjunction of the following components: unintentional weight loss (at least 4.5 kg during the previous year) and reports of exhaustion, weakness, difficulty in walking and reduced capacity to undertake physical activities.

Associations with self-perceived oral health (GOHAI and its dimensions) were analyzed with regard to age

group, gender, educational level, income, clinical oral health variables and biological frailty.

Poisson regression analysis enabled estimation of the ratios between the mean scores attributed by the comparison groups to GOHAI and each of its dimensions. Since GOHAI gives higher values to more favorable conditions, when values that are significantly greater than 1.00 are found for the ratio between scores, the indication is advantageous for the comparison group in relation to the reference group. On the other hand, values that are less than 1.00 indicate a disadvantage for the comparison group. Values that are not significantly different from 1.00 indicate equivalence of conditions between the two groups.

The analyses were carried out using the Stata 10.0 software. Estimations of proportions and assessment of associations were done using the "survey" mode commands, taking into consideration the sample weights (defined as the inverse of the sampling fraction of each census tract) and the insertion of each participant in the respective census tract.<sup>28</sup>

The study gave due regard to ethical criteria carried in national legislation and in international protocols and was approved by the Ethics Committee of the School of Medical Sciences of the Universidade Estadual de Campinas (Procedural No. 208/2007) and the School of Dentistry of the Universidade de São Paulo (Procedural No. 136/2008).

## RESULTS

The elderly individuals' mean age was 72.8 years (standard deviation: 5.84); 70.1% were women; 40.8% had income of between two and five minimum monthly wages; and 36.6% declared that they had had less than four years of education. Biological frailty was identified in 7.0%. Less than a fifth of the sample still had more than 20 teeth; 38.2% used total dentures in both dental arches. Almost one tenth was in need of prosthetic treatment; more than half presented an abnormality of the oral mucosa (Table 1).

Application of the GOHAI questionnaire resulted in average scores that were near to the upper limit of the range of measurements of the scale, for the overall index and its three dimensions. In other words, in a general manner, the elderly subjects gave a favorable assessment of their oral health (Table 2).

Table 3 presents comparative data on the mean scores for this measurement, according to categories of the sociodemographic and clinical variables of interest. Comparative analysis on the scores between the socio-demographic classification groups did not indicate any associated factors, with the exception of the physical dimension measurement, which was significantly

**Table 1.** Distribution of the elderly subjects according to sociodemographic and clinical characteristics. Campinas, Southeastern Brazil, 2008-2009.

Variable / Category	% (95%CI)
<b>Sociodemographic characteristics</b>	
Gender	
Male	29.9 (25.8;34.3)
Female	70.1 (65.7;74.2)
Age group (years)	
65-69	34.7 (30.9;38.6)
70-74	31.5 (27.5;35.9)
75-79	19.1 (16.2;22.3)
80 or over	14.7 (12.1;17.8)
Educational level	
Less than 4 years (first part of elementary education incomplete)	36.6 (31.0;42.6)
From 4 to 7 years (second part of elementary education)	37.4 (33.5;41.4)
From 8 to 10 years (start of high school)	9.2 (6.7;12.4)
More than 11 years (high school completed / tertiary-level education)	16.9 (12.9;21.7)
Family income (minimum monthly wages)	
Up to 2	22.2 (17.8;27.2)
From 2.1-5	40.8 (35.3;46.4)
More than 5	24.4 (19.4;30.2)
No response	12.6 (9.6;16.4)
Clinical conditions	
Presence of teeth	
More than 20 teeth	17.2 (13.5;21.5)
Up to 20 teeth	82.8 (78.5;86.5)
Use of full dentures	
Not used / used in one arch	61.8 (57.8;65.6)
Used in both arches	38.2 (34.4;42.2)
Need for full dentures	
Need in one or two arches	8.5 (6.7;10.8)
Not needed	91.5 (89.2;93.3)
Abnormalities of the oral mucosa	
Absence	43.8 (40.0;47.7)
Presence	56.2 (52.3;60.0)
Biological frailty	
Non-frail	41.0 (37.7;44.3)
Pre-frail	52.0 (48.3;55.6)
Frail	7.0 (5.4;9.1)

higher in the groups with higher educational level ( $p = 0.028$ ) (Table 4).

Elderly individuals with 20 teeth or less present had

**Table 2.** Self-perceived oral health among elderly subjects: mean scores, confidence interval and range of scores for GOHAI. Campinas, Southeastern Brazil, 2008-2009.

Variable	Mean	95%CI	Range
GOHAI (12 questions)	33.9	(33.6;34.2)	15 to 36
Physical dimension (4 questions)	10.9	(10.8;11.0)	5 to 12
Psychosocial dimension (5 questions)	14.3	(14.1;14.5)	5 to 15
Pain/discomfort dimension (3 questions)	8.7	(8.6;8.8)	4 to 9

GOHAI: Geriatric Oral Health Assessment Index

significantly smaller total GOHAI score ( $p = 0.021$ ) and physical dimension score ( $p < 0.001$ ) than shown by their counterparts with greater preservation of natural teeth, in the regression analysis. The use of total removable dentures in both arches was associated with better indicators for the total index ( $p = 0.043$ ) and for the psychosocial dimension ( $p < 0.001$ ) and pain/discomfort dimension ( $p = 0.001$ ). The elderly people who needed dentures in at least one arch reported worse indicators for the physical dimension ( $p < 0.001$ ) and for the total index ( $p = 0.002$ ) (Table 4).

The presence of abnormalities of the oral mucosa was associated with worse quality of life relating to oral health, as indicated by lower total GOHAI score ( $p = 0.020$ ) and physical dimension score ( $p = 0.002$ ). Worse indicators were also associated with manifestation of progressive degrees of biological frailty:  $p = 0.023$  for the overall indicator of quality of life relating to oral health;  $p = 0.017$  for the physical dimension; and  $p = 0.042$  for pain/discomfort (Table 4).

## DISCUSSION

The main results from the present study indicated that a more favorable perception of oral health among the elderly individuals was associated with presentation of functional dentition, use of total dentures in both arches, lack of need for total dentures, absence of oral mucosa abnormalities and non-frail status.

The average scores for GOHAI were high and near to the upper limit of the range of measurements of the scale. Studies involving elderly individuals living in Recife<sup>29</sup> and Fortaleza<sup>7</sup> (both in Northeast Brazil) obtained average scores indicating worse self-perceived oral health. However, these studies examined small samples of elderly individuals and cannot be considered representative. There are no reference values for comparison of GOHAI scores, which means that these data cannot be interpreted as high or not high, within the national context. This interpretation is restricted by the scarcity of studies that applied this questionnaire among representative samples of elderly people.<sup>19</sup>

**Table 3.** Mean scores and standard deviations of GOHAI, according to sociodemographic and clinical characteristics. Campinas, Southeastern Brazil, 2008-2009.

Variable	Índice GOHAI e dimensões			
	Physical Mean (SD)	Psychosocial Mean (SD)	Pain/discomfort Mean (SD)	Total GOHAI Mean (SD)
Sociodemographic conditions				
Gender				
Male	11.01 (1.22)	14.28 (1.43)	8.65 (0.68)	33.94 (2.65)
Female	10.84 (1.28)	14.20 (1.35)	8.64 (0.68)	33.68 (2.65)
Age group (years)				
65-69	10.90 (1.39)	14.07 (1.51)	8.62 (0.72)	33.59 (2.98)
70-74	11.00 (1.10)	14.34 (1.25)	8.70 (0.56)	34.04 (2.20)
75-79	10.86 (1.21)	14.19 (1.48)	8.60 (0.80)	33.65 (2.85)
80 or over	10.67 (1.33)	14.42 (1.02)	8.63 (0.62)	33.72 (2.33)
Family income (monthly minimum wage)				
≤ 2	10.64 (1.38)	14.06 (1.54)	8.52 (0.83)	33.22 (3.03)
2,1 – 5.0	10.94 (1.24)	14.24 (1.34)	8.72 (0.62)	33.90 (2.60)
> 5.0	11.07 (1.14)	14.37 (1.30)	8.64 (0.62)	34.08 (2.29)
No response	10.94 (1.24)	14.26 (1.25)	8.62 (0.61)	33.83 (2.45)
Educational level				
First part of elementary education incomplete	10.75 (1.30)	14.28 (1.37)	8.67 (0.69)	33.69 (2.72)
Second part of elementary education	10.97 (1.22)	14.29 (1.22)	8.64 (0.68)	33.90 (2.45)
Start of high school	10.94 (1.24)	13.82 (1.83)	8.57 (0.73)	33.34 (2.95)
High school completed and tertiary-level education	11.10 (1.20)	14.15 (1.45)	8.61 (0.63)	33.86 (2.45)
Clinical conditions				
Presence of teeth				
More than 20 teeth	11.51 (0.95)	14.31 (1.34)	8.54 (0.69)	34.37 (2.50)
Up to 20 teeth	10.79 (1.28)	14.21 (1.38)	8.66 (0.68)	33.66 (2.65)
Use of full dentures				
Not used / used in one arch	10.93 (1.31)	14.08 (1.54)	8.57 (0.74)	33.58 (2.89)
Used in both arches	10.84 (1.18)	14.45 (1.02)	8.74 (0.59)	34.03 (2.19)
Need for full dentures				
Not needed	11.00 (1.18)	14.28 (1.25)	8.65 (0.66)	33.94 (2.44)
Needed for one and/or two arches	10.00 (1.49)	13.77 (2.09)	8.55 (0.82)	32.32 (3.63)
Oral mucosa				
Absence of abnormalities	11.09 (1.23)	14.33 (1.27)	8.64 (0.68)	34.06 (2.57)
Presence of abnormalities	10.75 (1.27)	14.15 (1.45)	8.64 (0.68)	33.54 (2.69)
Biological frailty				
Non-frail	11.04 (1.13)	14.36 (1.22)	8.72 (0.58)	34.13 (2.37)
Pre-frail	10.83 (1.34)	14.14 (1.50)	8.60 (0.74)	33.57 (2.83)
Frail	10.53 (1.27)	14.06 (1.18)	8.50 (0.74)	33.09 (2.55)

SD: Score ratio

GOHAI: Geriatric Oral Health Assessment Index

The self-perception indicators were high, even for the subgroups of elderly individuals with worse conditions of tooth loss, use of and need for total dentures, abnormality of oral mucosa and biological frailty. This is consistent with other studies that evaluated different measurements of quality of life relating to oral health

and concluded that elderly individuals assessed their oral health favorably even when the clinical condition was unsatisfactory.<sup>5,16,20,22,25,27</sup>

Objective dental conditions may be weakly predictive of self-perceived oral health among elderly people.<sup>13,27</sup>

**Table 4.** Ratios of GOHAI scores according to sociodemographic and clinical characteristics. Campinas, Southeastern Brazil, 2008-2009.

Variable	GOHAI and its dimensions			
	Physical (5-12 points) SR (95%CI)	Psychosocial (5-15 points) SR (95%CI)	Pain/discomfort (4-9 points) SR (95%CI)	Total GOHAI (15-36 points) SR (95%CI)
<b>Sociodemographic conditions</b>				
Gender	p = 0,127	p = 0,699	p = 0,413	p = 0,268
Male	1	1	1	1
Female	0,98 (0,97;1,00)	1,00 (0,98;1,01)	0,99 (0,98;1,01)	0,99 (0,98;1,00)
Age group (years)	p = 0,279	p = 0,124	p = 0,494	p = 0,949
65-69	1	1	1	1
70-74	1,01 (0,99;1,04)	1,02 (1,00;1,04)	1,01 (1,00;1,02)	1,01 (1,00;1,03)
75-79	0,99 (0,97;1,02)	1,01 (0,99;1,03)	1,00 (0,98;1,01)	1,00 (0,98;1,02)
80 or over	0,98 (0,95;1,02)	1,02 (1,00;1,04)	0,99 (0,97;1,02)	1,00 (0,98;1,02)
Family income (monthly minimum wage)	p = 0,162	p = 0,188	p = 0,942	p = 0,122
≤2	1	1	1	1
2.1 – 5.0	1,03 (1,00;1,06)	1,01 (0,99;1,03)	1,02 (1,00;1,04)	1,02 (1,00;1,04)
> 5.0	1,04 (1,00;1,08)	1,01 (0,99;1,04)	1,01 (0,99;1,04)	1,02 (1,00;1,05)
No response	1,04 (1,01;1,07)	1,02 (1,00;1,04)	1,01 (0,99;1,04)	1,02 (1,01;1,04)
Educational level	p = 0,028	p = 0,121	p = 0,179	p = 0,988
First part of elementary education incomplete	1	1	1	1
Second part of elementary education	1,02 (1,00;1,04)	1,00 (0,98;1,01)	0,99 (0,98;1,01)	1,00 (0,99;1,02)
Start of high school	1,02 (0,99;1,06)	0,98 (0,95;1,00)	0,99 (0,97;1,01)	1,00 (0,98;1,02)
High school completed and tertiary-level education	1,04 (1,00;1,07)	0,98 (0,96;1,01)	0,99 (0,97;1,00)	1,00 (0,98;1,02)
<b>Clinical conditions</b>				
Presence of teeth	p < 0,001	p = 0,740	p = 0,096	p = 0,021
More than 20 teeth	1	1	1	1
Up to 20 teeth	0,94 (0,92;0,95)	1,00 (0,98;1,02)	1,02 (1,00;1,04)	0,98 (0,96;1,00)
Use of full dentures	p = 0,231	p < 0,001	p = 0,001	p = 0,043
Not used / used in one arch	1	1	1	1
Used in two arches	0,99 (0,97;1,01)	1,02 (1,01;1,04)	1,02 (1,01;1,03)	1,01 (1,00;1,02)
Need for full dentures	p < 0,001	p = 0,198	p = 0,672	p = 0,002
Not needed	1	1	1	1
Needed for one and/or two arches	0,91 (0,88;0,94)	0,98 (0,95;1,01)	0,99 (0,97;1,02)	0,96 (0,94;0,98)
Oral mucosa	p = 0,002	p = 0,105	p = 0,735	p = 0,020
Absence of abnormality	1	1	1	1
Presence or abnormality	0,97 (0,95;0,99)	0,99 (0,97;1,00)	1,00 (0,98;1,01)	0,98 (0,97;1,00)
Biological frailty	p = 0,017	p = 0,264	p = 0,042	p = 0,023
Non-frail	1	1	1	1
Pre-frail	0,98 (0,97;1,00)	0,99 (0,98;1,01)	0,99 (0,98;1,00)	0,99 (0,98;1,00)
Frail	0,97 (0,93;1,00)	0,99 (0,97;1,01)	0,98 (0,96;1,01)	0,98 (0,96;1,00)

SR: Score ratio

GOHAI: Geriatric Oral Health Assessment Index

Consistent with this hypothesis, Matos & Lima-Costa (2006)<sup>17</sup> reported that 59% of the elderly people that they studied assessed their oral health as good or excellent, although 65.5% did not present any teeth. Hugo et al (2007)<sup>11</sup> also reported that edentulous individuals tended to classify the smile and appearance in a positive manner.

In 2003, WHO, the World Dental Federation and the International Association for Dental Research appointed a commission that would propose overall goals for oral health by 2020, as guidelines for health services. Maintenance of at least 21 teeth was selected by the study group as the condition for functional

dentition.<sup>10</sup> Hence, there is an interest in evaluating the extent of tooth loss among elderly individuals in this manner.

This association between self-perceived oral health and maintenance of teeth corroborates studies carried out in developed countries. Steele et al (2004)<sup>30</sup> affirmed that the number of teeth present is an important determinant of the subjective perception of oral health; Ekanayke & Perera (2005)<sup>8</sup> reported that the assessment of oral health was more favorable among elderly individuals with more than 20 teeth. Within the Brazilian context, Hugo et al (2007)<sup>11</sup> showed that elderly people with fewer than 20 teeth assessed their chewing capacity negatively.

The contribution of using total dentures to mitigate the impairment of oral health among the elderly was recognized in a study with a representative sample of elderly individuals in São Paulo, SP.<sup>20</sup> That study suggested that, considering the high prevalence of tooth loss among this age group, the use of total dentures involves consistent benefits that are not limited to one or other dimension of quality of life relating to oral health.

In accordance with this, the present study showed worse GOHAI indicators for the elderly individuals who were in need of dentures. Biazevic et al (2004)<sup>6</sup> studied elderly people in a city in southern Brazil and emphasized the importance of maintaining the natural teeth and of carrying out oral rehabilitation by means of prosthetic treatment for quality of life relating to oral health. Nunes & Abegg (2008)<sup>22</sup> concluded that elderly individuals who were in need of total dentures attributed a higher negative impact on their self-perceived oral health, particularly regarding their chewing function.

More than half of the participants in the study presented oral mucosa lesions, which was a factor associated with self-perception of oral health among the elderly people in Campinas. This high proportion reinforces the importance of using dental services, including among edentulous individuals, for early diagnosis, prevention and treatment of these lesions. Elderly individuals tend to use these services less frequently,<sup>3</sup> and the use is even more reduced among those whose teeth have not been preserved.<sup>15</sup>

In the present study, the only sociodemographic factor associated with self-perceived oral health among the elderly was educational level, which was the same relationship found in other studies.<sup>4,12</sup> This suggests that better material conditions may favor the oral health of elderly individuals.

The association between oral health and biological frailty is complex and may have different meanings. Frail elderly people may present worse quality of life relating to oral health due to greater difficulty in accessing dental treatment. Moreover, these elderly individuals may postpone their visits to the dentist because of their other health demands. On the other hand, impaired oral health conditions may contribute towards eating disorders,<sup>18</sup> which may lead to depletion, chronic malnourishment and sarcopenia. Poor oral health conditions can also evoke development of infections and increased inflammatory markers, which contributes towards the risk of frailty.<sup>1</sup> Frail elderly people frequently present serious dental problems, including functional compromise, which makes them assess their oral health negatively.<sup>31</sup>

Evaluation of a representative sample of elderly individuals that took into consideration sample weights and the complex structure of the cluster sampling was an important point in the present study. The relevance of these features was underlined in a recent debate on epidemiological studies.<sup>21</sup> The cross-sectional design was recognized as a limitation of the study that would prevent causal inferences for any associations identified. The small number of studies on this topic and the absence of reference values for GOHAI among the elderly were also recognized as limitations of this study.

The proportion of women in the sample (70.1%) was greater than the population of the same age group in this city (58.8%), which suggests that men were under-represented. The greater proportional participation of women is a limitation common to several household surveys, such as the national oral health study (*Projeto SB Brasil*) carried out between 2002-2003,<sup>b</sup> and the telephone survey surveillance system for risk and protection factors relating to chronic diseases (*Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*; 2009).<sup>c</sup>

Measurements of self-perceived oral health are considered to be an essential component of oral health surveys<sup>14</sup> and essential for assessing the results from therapeutic and preventive dental treatments.<sup>32</sup> The data obtained from the present study may provide a basis for future research, thereby serving as a reference point for comparisons of the magnitude of quality-of-life indicators relating to oral health. The associated factors that were identified may contribute towards planning oral healthcare services, from a broader perspective of health promotion and integration of preventive and rehabilitative actions with educational activities that encourage and guide elderly people regarding the importance of self-care.

<sup>b</sup> Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Projeto SB Brasil 2003: condições de saúde bucal da população brasileira 2002-2003: resultados principais. Brasília; 2004.

<sup>c</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. Vigitel Brasil 2009: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília; 2010.

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