Oral health status and nutritional deficit in noninstitutionalized older adults in Londrina, Brazil

Abstract

Objective: To examine the association between nutritional deficit and oral health problems in noninstitucionalized elderly adults in a Brazilian community. **Methods:** In this cross-sectional study, data were obtained from 267 elderly adults (160 women, 107 men) with ages between 60 and 74 years, identified through a census in the area covered by the Family Health Program in Londrina, Brazil. The Mini Nutritional Assessment score < 24 points was used to identify nutritional deficit. Oral evaluation consisted of an oral exam, measurement of stimulated salivary flow rate, and use of the Geriatric Oral Health Assessment Index (GOHAI) for self-perception data. Multivariate analyses were adjusted by sociodemographic variables, depression, and drug consumption. **Results:** Nutritional deficit was identified in 58 adults (21.7%). Among the dental conditions studied, absence of posterior occlusion (Odds Ratio, OR: 2.18; Confidence Interval, 95% CI: 1.06 – 4.45), stimulated salivary flow rate < 0.7 ml/minute (OR: 2.18, 95% CI: 1.06 – 4.50), advanced periodontal illness (OR: 6.54; 95% CI: 2.03 – 21.00), and negative self perception of oral health (OR: 3.41; 95% CI: 1.59 – 7.33) were associated with nutritional deficit regardless of sex, age, social class, education, smoking, depression, and drug consumption. **Conclusions:** Oral health impairment was associated with nutritional deficit and it requires a greater integration between dentistry and nutrition in the health promotion of older adults, especially in the prevention of tooth loss and in the posterior occlusal rehabilitation to avoid obstacles for an adequate diet.

Keywords: Geriatric assessment. Geriatric dentistry. Nutrition assessment. Oral health. Health of the elderly. Dental health surveys.

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Introduction

Nutritional disturbances have important effects on general heath, quality of life, morbidity and mortality, especially in the elderly[1,2]. In this age group, nutritional problems can be aggravated by advancing age[3-5], the presence of chronic diseases[1,4], the use of medications[6], worsening psychological and social conditions[1,7-9], institutionalization[10] and the presence of oral health problems [2-6,8]. In this context, the diversity of associated factors indicates that the evaluation of the nutritional state of the elderly depends on not only an analysis of anthropometric data, but also an understanding of general and subjective aspects of health.

The association between malnutrition and oral health problems, which are highly prevalent in the elderly[11], has been much studied in recent years because of the impact that these problems can generate on the health system[12]. It has also been observed that the selection and processing of foods by older adults are limited by oral alterations such as tooth loss[4,5], lack of or inadequate prosthetic rehabilitation[2,7], and the presence of pain or discomfort related to caries or tooth fractures[8,13]. Furthermore, periodontal disease[14,15] and hyposalivation[6] are also associated with worsening nutritional indicators, even though the temporal direction of these associations remains unclear.

However, most authors considered the worsening nutritional state as the low weight according to the Body Mass Index (BMI)[16-19]. To date, only one study has been published that has used a measurement capable of identifying nutritional risk, such as the Mini Nutritional Assessment (MNA)[14], with noninstitutionalized elderly Brazilians and demonstrated an association between the number of remaining teeth and nutritional status. However, there is no information on the possible association of nutritional deficit risk with other oral health indicators such as posterior occlusion, periodontal disease and hyposalivation for this population.

Furthermore, it has been demonstrated an association between the perception of alterations related to the oral cavity and nutritional risk[20], which highlights the importance of the subjective dimension of the oral condition in addition to the already known clinical indicators when analyzing this question.

Therefore, due to the need for a better understanding of this complex and multidimensional relationship, the objective of this study was to analyze the association between nutritional deficit and poor oral health, based on clinical and subjective aspects of both conditions, in a population of noninstitutionalized elderly from a community in Brazil.

Methods

Delineation and participants

This cross-sectional study was performed in a community in Londrina (a city in southern Brazil, with an estimated total population of 500,000). The study population was composed of people between 60 and 74 years old from the coverage area of a Family Health Program team, who identified subjects with a census. This population was selected because it presented sociodemographic conditions similar to those of the Brazilian elderly treated in basic care level facilities[21].

From the initial population of 336 older adults, 9 were excluded because they were bedridden and 4 others because they could not communicate without help from other people. Thus, 323 participants were included in the study.

This study was approved by the Committee for Research Ethics of the Universidade Estadual de Londrina (CEP 201/04), and all the subjects provided written informed consent.

Variables of the study

Nutritional status

The nutritional evaluation was performed using the data collection methods set out in the Portuguese version of the

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MNA[22]: anthropometric parameters (weight and height, circumference of the arm and the calf), the general status of the patient, a diet questionnaire, and a subjective evaluation. According to the stratification of the total MNA score (range: 0 to 30 points), the categories considered to be in nutritional deficit were "nutritional risk" (<24 and ≥17 points) and "malnourished" (<17 points). Nutritional deficit was considered the dependent variable for this study.

Oral health conditions

Information related to the following clinical variables of oral health was collected: number of teeth present, use of a removable prosthesis, posterior occlusion, stimulated salivary flow, and periodontal condition.

All the teeth having visible crowns were registered as "present", and the participants were grouped according to the following categories: edentulous, 1-9, 10-19 and 20-32 teeth present. The relation between better masticatory capacity and a greater number of teeth is well-established in the literature, and previous studies have used similar categorization when examining the relationship between number of teeth and nutritional state[17,18,23]. On the other hand, there is no consensus about the functional parameters necessary for efficient mastication (occlusal pattern, number and position of occlusal pairs, etc.), which explains the heterogeneity of criteria used in studies about masticatory function and nutritional condition[2,13,19,23,24]. In this study, posterior occlusion was evaluated according to the presence of occlusal pairs between molars and/or pre-molars, with an occlusal pair defined as every relation of contact between antagonist teeth, both natural and artificial. The presence of at least one occlusal pair in each posterior segment of the arcade (right and left) was the criteria used to define posterior occlusion as bilateral (category of reference), unilateral or absent. This classification was adopted because it permitted the study of an association between nutritional deficit and absence of posterior occlusal pairs, a parameter that has been used in several studies to examine the factors associated with total collapse of masticatory function[17,19,23]. Furthermore, information about the presence of occlusal contact in the anterior segment (between antagonist canines and incisors) was also obtained in order to examine its possible confounding effect on the association between posterior occlusion and nutritional deficit[13].

Likewise, various criteria related to periodontal condition have been used to study its association with nutritional state[4,14,15,25]. In this study, periodontal condition was evaluated using the "Community Periodontal Index of Treatment Needs" (CPITN)[26]. Besides being a standard index in epidemiologic studies, the CPITN is highly sensitive for identifying alterations needing periodontal treatment; it is also easy to perform because it only requires the examination of six index teeth rather than the complete set. Measurements from three surfaces of the index teeth of each sextant were collected through periodontal probing, and the periodontal state of each participant was defined according to the worst existing periodontal condition. In this study, advanced periodontal disease was considered present when at least one sextant with pockets ≥ 6 mm deep was found.

The stimulated salivary flow was measured by the mean volume produced per minute during the chewing of a thin-walled latex tube, which was funneled into a graduated cylinder with 0.02 ml markings. In order to allow comparison with other studies, hyposalivation was defined according to two different cutoff points that were studied separately: stimulated salivary flow <0.5 ml/minute[27,28] and <0.7 ml/minute[29,30].

In addition to the objective variables mentioned above, the "Geriatric Oral Health Assessment Index" (GOHAI)[31] questionnaire was applied as an indicator of self-perception of oral health. Aside from having been previously adapted and validated in Portuguese [32], this questionnaire was adopted due to its ease of application for individuals with low schooling, its wide

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application in oral health epidemiology, and for its recognized validity in studies on self-perception of oral health[20,31]. This instrument consists of 12 questions about the perception of oral problems in their physical and psychosocial aspects, as well as about pain and/or discomfort in the oral cavity. In the Portuguese version, three possible answers (always, sometimes, never) are registered, resulting in a general score of 12 to 30 points, with a lower score indicating a more negative self-perception of oral health. In the present study, the expression "negative self-perception of oral health" was used when the GOHAI score was ≤ 30 points. This cutoff point, also used in a previous study[33], was adopted because it establishes the first quintile of the population studied, that is, patients with the lowest quality of life related to oral health. The cutoff point of ≤ 30 points is also equivalent to the ≤ 50 points considered in the originally proposed index[31], which had an upper limit of 60 points.

Control variables

Data was collected about the following potentially confounding socio-demographic variables: gender, age (in years, as a continuous variable), schooling (in years studied, as a continuous variable), and economic class (upper, upper middle, lower middle or lower, according to a standardized classification for the Brazilian population)[34]. The participants were also asked about aspects of their lifestyle, such as smoking (non-smoker, ex-smoker, smoker), and the weekly frequency of alcohol consumption (abstinent, occasional consumer, i.e., < 3 times a week, frequent consumer, i.e., ≥ 3 times a week). In order to obtain information related to health status, the Geriatric Depression Scale[35] was applied, and participants were considered depressed when they scored 6 or more points. Furthermore, the patients were requested to present the packaging of the medications they used daily, and were denominated frequent users when they took 3 or more medications per day.

Data collection

The data was collected between January and April of 2005 during home visits conducted by two dentists who performed the examinations with the assistance of an undergraduate student of Medicine or Nursing.

In order to assure uniform intra- and inter-examiner interpretation and application of the dental evaluation criteria, a calibration process was performed beforehand. First, the two dentists studied the criteria together, looked at images in textbooks and discussed possible divergent points in their observations. Afterwards, a sample of 10 older adults with socio-demographic characteristics similar to those from the study population was selected, and each individual was examined by both dentists on two occasions on consecutive days. The intra-examiner concordance was complete for all the parameters analyzed (number of teeth present, occlusal pairs and CPITN). The observation of tooth presence and occlusal pairs also presented 100% sensitivity and specificity. Furthermore, the Kappa (K) statistical test demonstrated satisfactory inter-examiner concordance for the CPITN index (K=0.89).

In the beginning of the interview, the questions included in the GOHAI, the MNA, and those about the control variables were asked. After that, the anthropometric measurements were registered: participant weight was measured with a calibrated portable digital scale, height was measured using a metal measuring tape, and the circumference of the arm and the calf were taken with a flexible measuring tape.

Finally the intra-oral exam was performed in a spacious location under natural illumination while the subject sat with his head supported. The methodological recommendations of the World Health Organization (WHO)[36] for research on oral health were followed, including: characteristics of the materials and instruments, measures to control infection, conditions of the location of the examination (the positions of both examiner and patient, illumination, etc.),

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sequence of teeth/regions to be examined, and structure of the data collection form. The materials used for the examination were: flat oral mirror number 5, sterilized clinical tweezers and periodontal probe, disposable wooden tongue depressors and a medium-sized flashlight when necessary.

Statistical analysis

In the initial stage, the bivariate analysis of categorical variables was carried out using the Chi-square and Fisher's exact tests. The analysis of variance (ANOVA) and the Kruskal-Wallis test were used for group comparison regarding the continuous numeric variables.

Subsequently, logistic multivariate regression models were built to analyze the association between nutritional deficit and each of the oral health conditions studied. Nutritional deficit was the independent variable in all models. Besides the main independent variable (oral health condition), each model included as control variables the socio-demographic, lifestyle and health status characteristics that presented significance level of $p<0.15$ in the previous bivariate analysis. The association between periodontal condition and nutritional deficit was examined only in non-edentulous participants, and those who presented one or more excluded sextants were eliminated because they could not be evaluated for lack of an index tooth. Furthermore, considering the consistent association found in the literature between alcohol consumption and periodontal disease[37], the frequency of alcohol drinking was also adjusted when the association between periodontal condition and nutritional deficit was analyzed.

Finally, a complementary analysis was performed to adjust the association between posterior occlusion and nutritional deficit for the occlusal contacts in the anterior segment.

The statistical analyses were performed using Epi Info, version 3.5.1 (CDC, Atlanta, GA 2008). The level of significance was set at 5% for all tests.

Results

Of the 323 participants eligible for the study, 13 (4.0%) refused to participate and 43 (13.3%) were not at home in the three attempts made. Therefore, the sample, which was predominantly female (59.9%), consisted of 267 older adults. The mean age was 66.5 years (standard deviation, SD=4.1 years), and the mean schooling was 3.2 years (SD=3.6 years). Approximately 60% of the participants were illiterate or had studied for less than 3 years and 48.3% were from the lower economic class. No statistically significant differences were detected between genders for these variables.

Regarding the nutritional evaluation, 53 subjects presented nutritional risk (MNA <24 points) and 5 were malnourished (MNA <17), totaling 58 participants with nutritional deficit (21.7%). Nutritional deficit was associated with lower economic class, smoking, depression, and higher consumption of medications (Table 1).

With respect to oral health condition, a mean of 8 teeth present was observed (SD=9.3 teeth); 43.1% were totally edentulous, and 27% had no posterior occlusion. The prevalence of hyposalivation was 35.6%, which was defined as a stimulated salivary flow less than 0.5 ml/minute, and 54.7% were under the cutoff point of 0.7 ml/min.

Among the 152 non-edentulous participants selected for periodontal evaluation, 5 (3.3%) presented a healthy periodontal condition, 1 (0.7%) bled during probing, 37 (24.3%) presented supra- or subgingival calculus, 32 (21.1%) presented pockets from 4 to 5 mm, 56 (36.8%) pockets of 6 mm or more (advanced periodontal disease), and 21 (13.8%) had at least one sextant excluded due to lack of the index tooth.

Negative self-perception of oral health was observed in 50 participants (18.7%). The GOHAI mean was lower in the group of people with nutritional deficit (30.2 points, SD=4.8 points) than in those with a better nutritional state (33.5 points, SD=2.8 points), and the difference between means was statistically significant ($p<0.001$).

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The number of teeth present, the use of a removable prosthesis, and stimulated salivary flow <0.5 ml/minute were not associated with nutritional deficit. On the other hand, the absence of posterior occlusion, stimulated salivary flow <0.7ml/minute and negative self-perception of oral health were associated with nutritional deficit independently of gender, age, economic class, schooling, smoking, presence of depression and use of medications (Table 2). Among the 131 non-edentulous subjects in whom it was possible to probe index teeth in all sextants, advanced periodontal disease was also associated with nutritional deficit independently from alcohol consumption when the other confounding variables were controlled. The association between the absence of posterior occlusion and nutritional deficit also remained when adjusted for anterior occlusion.

DISCUSSION

In the present study, the worst oral health conditions were associated with nutritional deficit in noninstitutionalized elderly. Nutritional deficit was concretely associated with the absence of posterior occlusion, hyposalivation (stimulated salivary flow <0.7ml/minute), advanced periodontal disease, and negative self-perception of oral health.

Among the clinical conditions examined, the number of teeth present was not associated with nutritional deficit identified by the MNA. While using the same instrument for nutritional evaluation, the Spanish Geriatric Oral Health Research Group studied 3460 institutionalized and noninstitutionalized older adults, and nutritional risk was identified in similar proportions in both edentulous and non-edentulous subjects (43 and 39%, respectively)[38].

Sheiham et al.[16] examined data from 629 seniors in England, including institutionalized individuals, and observed that the edentulous elderly had a higher risk of presenting low weight according to BMI than those with 10 or more teeth. Marcenes et al.[17] investigated a similar population to that studied by Sheiham et al.[16], and concluded that the presence of 20 teeth or more was associated with normal BMI. However, the populations examined in both studies presented heterogeneous characteristics, including people with advanced age and functional limitations, which possibly limited comparison with elderly in a good functional state and up to 74 years old, as were those selected for the present study. Furthermore, defining the nutritional state based exclusively on anthropometric measurements, such as the BMI, does not cover qualitative aspects important for the evaluation of older people, such as self-perception, the presence of comorbidities and diet, which are all covered in the MNA[39] and considered in both this study and the study by the Spanish Geriatric Oral Health Research Group [38].

Among the clinical conditions associated with nutritional deficit, the absence of posterior occlusion and periodontal disease would be directly related to masticatory function. In general, the results are consistent with several other studies and according to different criteria related to nutritional state. De Marchi et al.[14] observed that the use of only a single prosthesis in totally edentulous people, that is, with no occlusal rehabilitation, increases nutritional risk according to the MNA. Moreover, de Andrade et al.[40] found a significant association between a lower number of posterior occlusal pairs and the reduced consumption of nutrients. In a study by Ritchie et al.[4], individuals with more posterior teeth and functional units (pairs of natural or artificial teeth in contact) presented a lower risk of weight loss. Sahyoun et al.[19] reported that people with no opposing pairs of posterior teeth consumed fewer fruits and vegetables and reported a less varied diet. In the only study found in which the occlusal situation was not associated with nutritional risk, the sample was reduced to 51 frail elderly subjects, in whom the poor state of health could have masked the present association[41].

The association between advanced

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Table 1 - Description of the study population regarding nutritional state, Londrina, Brazil, 2005.

Variable	Total	Good nutritional state	Nutritional deficit	OR (CI 95%)	p [a]
Gender, n (%)					
Male	107 (40.1)	89 (42.6)	18 (31.0)	Reference	
Female	160 (59.9)	120 (57.4)	40 (69.0)	1.65 (0.86-3.26)	0.11
Age in years, mean (SD)	66.6 (4.2)	66.4 (4.2)	67.3 (4.1)		0.14 [b]
Schooling in years, mean (SD)	3.2 (3.6)	3.4 (3.6)	2.5 (3.4)		0.08 [b]
Economic class, n (%)					
Upper/Upper Middle	129 (48.3)	115 (55.0)	23 (39.7)	Reference	
Lower Middle/Lower	138 (51.7)	94 (45.0)	35 (60.3)	1.86 (1.03-3.37)	0.04
Smoking, n (%)					
Non-smoker/ex-smoker	225 (84.3)	181 (86.6)	44 (75.9)	Reference	
Smoker	42 (15.7)	28 (13.4)	14 (24.1)	2.06 (1.00-4.23)	0.05
Consumption of alcoholic beverages, n (%)					
Abstinent/occasional consumption	239 (89.5)	186 (89.0)	53 (91.4)	Reference	
Frequent consumption (≥3x/week)	28 (10.5)	23 (11.0)	5 (8.6)	0.76 (0.22-2.19)	0.60
Depression [c], n (%)					
No	213 (79.8)	179 (85.6)	34 (58.6)	Reference	
Yes	54 (20.2)	30 (14.4)	24 (41.4)	4.21 (2.07-8.45)	<0.01
Daily use of medications n (%)					
Used <3 medications/day	169 (63.3)	148 (70.8)	21 (36.2)	Reference	
Used ≥3 medications/day	98 (36.7)	61 (29.2)	37 (63.8)	4.27 (2.22-8.31)	<0.01

OR, Odds Ratio; CI, Confidence Interval; SD, Standard Deviation.
[a] Chi-Square Test, except where other test is indicated.
[b] Analysis of Variance – ANOVA
[c] Geriatric Depression Scale ≥6 points

periodontal disease and nutritional deficit identified in this study has not been previously published. Al-Zahrani et al.[15] analyzed the relation between periodontitis and BMI, but found no association in the elderly. In a recent study, Yoshihara et al.[25] observed that the greatest number of periodontal disease events were associated with the consumption of products of limited nutritional value, like cereal and candy. However, it is necessary to consider that the association between periodontitis and nutrition could be bidirectional, since malnutrition has repercussions on the immune response and, as a consequence, it can aggravate infectious processes[42]. For this reason, longitudinal studies are required for clarifying the direction of this association.

Hyposalivation, defined as stimulated salivary flow <0.5 ml/minute, was more frequent among participants with nutritional deficit, even though there was no statistically negative association. However, salivary flow <0.7 ml/minute was associated with nutritional deficit independently of adjusted confounding factors. This agrees with previous studies indicating that hyposalivation defined by this same cutoff point was associated with loss of appetite [27] and lack of satisfaction when eating [28]. Therefore, questioning the use of a fixed cutoff point to identify hyposalivation in

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Table 2 - Association between nutritional deficit and oral health conditions, Londrina, Brazil, 2005.

Oral health indicator	Good nutritional state	Nutritional deficit n (%)	Crude OR [a] (CI 95%)	Adjusted OR [b] (CI 95%)
Number of natural teeth				
20 - 32	35 (16.7)	9 (15.5)	Reference	Reference
10 – 19	42 (20.1)	9 (15.5)	0.83 (0.30-2.33)	0.63 (0.19-2.08)
1 – 9	48 (23.0)	9 (15.5)	0.73 (0.26-2.02)	0.69 (0.21-2.30)
Edentulous	84 (40.2)	31 (53.5)	1.44 (0.61-3.33)	0.64 (0.23-1.83)
Use of removable prosthesis				
No	48 (23.0)	15 (25.9)	Reference	Reference
Yes	161 (77.0)	43 (74.1)	0.85 (0.44-1.67)	0.61 (0.28-1.35)
Posterior occlusion				
Bilateral	142 (67.9)	33 (56.9)	Reference	Reference
Unilateral	17 (8.2)	3 (5.2)	0.76 (0.21-2.74)	1.03 (0.23-4.48)
No posterior occlusion	50 (23.9)	22 (37.9)	1.89 (1.01-3.55)	2.18 (1.06-4.45)
Stimulated salivary flow (ml/minute)				
≥0.5	140 (67.0)	32 (55.2)	Reference	Reference
<0.5	69 (33.0)	26 (44.8)	1.65 (0.87-3.10)	1.24 (0.61-2.53)
Stimulated salivary flow (ml/minute)				
≥0.7	102 (48.8)	19 (32.8)	Reference	Reference
<0.7	107 (51.2)	39 (67.2)	1.96 (1.06-3.83)	2.18 (1.06-4.50)
Advanced periodontal disease [c]				
No	69 (63.9)	6 (26.1)	Reference	Reference
Yes	39 (36.1)	17 (73.9)	5.01 (1.83-13.76)	6.54 (2.03-21.00)
Negative self-perception of oral health [d]				
No	181 (86.6)	36 (62.1)	Reference	Reference
Yes	28 (13.4)	22 (37.9)	3.95 (2.04-7.67)	3.41 (1.59-7.33)

OR, Odds Ratio; CI, Confidence Interval
[a] Chi-Square Test or Fisher's Exact Test
[b] Logistic regression of the association between each indicator of oral health and nutritional deficit adjusted for gender, age, schooling, economic class, smoking, depression, and medication use.
[c] Presence of pockets ≥6 mm in 131 non-edentulous participants with no sextants excluded (CPITN=4). In this case, logistic regression was adjusted for the previous variables as well as by alcohol drinking habits.
[d] "Geriatric Oral Health Assessment Index" ≤30 points

elderly populations is warranted, especially considering that elderly people consume more medications that could reduce the salivary flow rate[29].

Negative self-perception of oral health or poor quality of life related to oral health was one of the variables associated with nutritional deficit. As previously published, this subjective measurement of oral health was not associated with clinical alterations, but with depression and being female, variables controlled in the present analysis[43]. Similar results were found by Gil-Montoya et al.[20] in a representative sample of elderly Spanish subjects in that nutritional risk was associated with a lower mean score on the

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GOHAI. While evaluating nutritional state according to the MNA, de Marchi et al.[14] observed that a lack of satisfaction with gum health was associated with nutritional risk in Brazilian elderly. On the other hand, in a study carried out in Ireland, Allen[8] found no association between nutritional state/diet and oral self-perception. Nevertheless, the sample was limited to 35 edentulous adults, which might explain the divergence with the present study and other studies cited herein.

Several mechanisms could explain the associations found between poor oral conditions and nutritional deficit. Among them, masticatory difficulties could limit the selection, grinding and ingestion of food, as well as the absorption of their nutrients[17,19,40,44]. The absence of posterior occlusion or the reduced masticatory efficiency associated with greater tooth mobility (in teeth with advanced periodontal problems) would restrict the diet to softer foods with a higher energy value and a lower nutritional value[19,25]. Low saliva production causes difficulties forming the bolus in the early masticatory stages, especially with foods rich in fiber, such as meat and vegetables, and thus compromises their consumption[45]. Furthermore, a negative self-perception of oral health is not only an indicator of functional problems, but also of the psychosocial impact of oral health on nutrition[23,46], such as discouragement due to social isolation during mealtimes or the extra burden of the family having to prepare a special menu.

Some methodological comments are necessary to assure correct interpretation of the present study. First, a cross-sectional study cannot establish a causal relation between the oral problems studied and nutritional deficit. This study also cannot discard inverse causality, that is, a poor nutritional state could have aggravated the oral conditions examined. Second, the results are limited to a specific community from a specific city located in the South of Brazil, even though the population studied presents socio-demographic characteristics similar to those of elderly treated in basic care level facilities[21]. Third, the analysis was controlled for important confounding factors of the association between oral health and nutritional state, such as depression and use of medications. Furthermore, depression was identified with a validated scale and with better sensitivity and specificity than the self-reported information that is frequently used. Finally, the exclusion of participants with a more advanced age (>74 years) or a high level of functional dependence was an effort to control the effect of comorbidities associated with these conditions, which could confound the relation between oral health and nutrition.

In conclusion, in this sample of noninstitutionalized elderly subjects from a community in southern Brazil, a decline in oral health characterized by the absence of posterior occlusion, hyposalivation (stimulated salivary flow <0.7ml/minute), advanced periodontal disease, and the negative self-perception of oral health was associated with nutritional deficit as defined by the MNA. Therefore, it is necessary to emphasize an integration of dentistry and nutrition in promoting the health of the elderly, especially in tooth loss prevention, prosthetic rehabilitation and the maintenance of a good, effective and safe oral condition that will not hamper an adequate diet.

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