LUÍSA HELENA DO NASCIMENTO TÔRRES

SAÚDE BUCAL E SUA ASSOCIAÇÃO COM O ESTADO NUTRICIONAL EM IDOSOS DE CAMPINAS, SÃO PAULO

Dissertação apresentada à Faculdade de Odontologia de Piracicaba da Universidade Estadual de Campinas, para obtenção do título de Mestre em Odontologia, área de concentração em Saúde Coletiva.

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“A Sabedoria não nos é dada,
É preciso descobri-la por nós mesmos,
Depois de uma viagem que ninguém nos pode poupar
Ou fazer por nós!!!”

Marcel Proust

“A maior recompensa do trabalho árduo não é aquilo que obtemos dele, mas aquilo que nos tornamos por meio dele.”

John Ruskin

“Tell me and I forget.

Teach me and I remember.

Involve me and I learn.”

Benjamin Franklin

Resumo

Uma saúde bucal precária, representada pela perda dentária parcial ou total, provoca significativas mudanças na seleção do alimento a ser consumido pelos idosos. Tal escolha acarreta a exclusão de certos alimentos, geralmente os de alto valor nutricional como frutas e vegetais, e, em alguns casos, a substituição destes por outros de alto valor calórico e de fácil mastigação pode levar os indivíduos a baixo peso ou a sobrepeso/obesidade. Pode-se observar na literatura uma associação entre saúde bucal precária e má nutrição, porém a importância da atividade física como confundidor nessa relação, até o presente momento é desconhecida. Assim, o objetivo deste estudo transversal é avaliar se o estado de saúde bucal precário é indicador de risco à baixo peso ou sobrepeso/obesidade medido por meio do Índice de Massa Corporal (IMC) nos idosos de Campinas, SP, considerando a prática de atividade física, dentre outras variáveis. Para este estudo foram utilizados dados coletados por um projeto maior da Rede FIBRA, que estuda fragilidade em idosos independentes. A amostra foi composta por 900 idosos e as medidas utilizadas neste estudo transversal incluíram um questionário com informações sociodemográficas, auto-relato de uso de medicação, hábito de tabagismo, auto-relato da presença de dificuldades na alimentação, sintomas depressivos, atividade física, condição bucal (número de dentes e presença de prótese dentária) e perfil antropométrico seguindo os critérios da OPAS, disponível para 875 idosos. A idade média dos idosos foi de 72.7 anos (±5.81), a mediana da escolaridade foi de 4 anos, a prevalência de edentulismo na amostra foi de 47.7% e a média de dentes presentes de 7.21 (±9.13). Ser edêntulo sem prótese apresentou maior chance para baixo peso (OR=3.94, 95%IC 1.14-13.64) e sobrepeso/obesidade (OR=2.88, 95%IC 1.12-7.40). Gênero feminino (OR=1.78, 95%CI 1.17-2.71) e uso de três ou mais medicações (OR=2.41, 95%CI 1.41-4.12) apresentaram maior chance de obesidade. Idosos que fumam (OR=2.62, 95%CI 1.26-5.44) apresentaram maior chance de baixo peso e os com renda familiar entre 3.1 a 5 salários mínimos em reais (OR=1.69, 95%CI 1.00-2.87) apresentaram maior chance de obesidade. Este é um dos primeiros trabalhos que verificaram a associação entre saúde bucal precária, representada por edentulismo sem reabilitação dentária protética, e índice de massa corporal desfavorável, independentemente de dois confundidores, atividade física e depressão. Portanto, a manutenção de uma dentição natural e a presença de reabilitação com prótese dentária,

quando necessária, podem contribuir para um estado nutricional satisfatório em idosos, com valores de IMC dentro do padrão eutrófico.

Palavras-chave: Odontologia Geriátrica, Índice de Massa Corporal, Perda de Dente, Estado Nutricional, Exercício.

Abstract

A poor oral health status, represented by partial or complete tooth loss, imposes important modifications in food choice by the elderly. It promotes the avoidance of hard to chew food, usually fruits and vegetables rich in nutrients, and eventually the selection of food with inadequate energy value and easy to chew, inducing them to underweight or overweight/obesity. The literature has shown an association between poor oral health and poor nutrition, although their relationship with important confounders, mainly physical activity is still unknown The aim of this cross-sectional study is to evaluate whether poor oral health status might be a contributing factor to underweight or obesity assessed with the body mass index (BMI) in older adults, adjusting for physical activity and other variables in Campinas, Brazil. It was used data collected in a major project – the FIBRA study, about frailty among independent-living older adults. Complete data that included a sociodemographic data, self-reported intake of medications, smoking habit, self-reported eating difficulties questionnaire, depressive symptoms assessment, physical activity assessment, oral status (number of teeth and presence of dental prosthesis) and anthropometric assessments following the WHO criteria was available for 875 persons. The mean age of the sample was 72.7 years (±5.81), the median schooling was 4.0 years, the prevalence of the edentulism in the sample was 47.7% and the mean of present teeth was 7.21 (±9.13). The mean age of the sample was 72.7 years (±5.81) and the prevalence of edentulism was 47.7%. Edentate individuals not wearing dentures were more likely to be underweight (OR=3.94, 95%CI 1.14-13.64) and overweight/obese (OR=2.88, 95%CI 1.12-7.40). Females (OR=1.78, 95%CI 1.17-2.71) and those using 3 or more medications (OR=2.41, 95%CI 1.41-4.12) were more likely to be overweight/obese. Individuals who smoke (OR=2.62, 95%CI 1.26-5.44) were

more likely to be underweight. Older individuals with family income between 3.1 and 5 Minimum Wage (OR=1.69, 95%CI 1.00-2.87) were more likely to be overweight/obese. To our knowledge, this is one of the first studies that associated poor oral health, represented by edentulism not rehabilitated with dentures, with unfavorable body mass, regardless of two major confounders, physical activity and depression symptoms. Thus, the maintenance of a natural dentition and the presence of dental prosthesis rehabilitation, when necessary, can contribute to a satisfactory nutritional status into old age and to an eutrophic BMI value.

Keywords: Geriatric Dentistry, Body Mass Index, Tooth Loss, Nutritional Status, Exercise.

Lista de Abreviaturas e Siglas

ACSM - American College of Sports Medicine

AHA - American Hearth Association

BMI – Body Mass Index

EDG – Escala de Depressão Geriátrica

GDS - Geriatric Depression Scale

IDH - Índice de Desenvolvimento Humano

IMC- Índice de Massa Corporal

IVS – Índice de Vulnerabilidade Social

MMSE – Mini Mental State Exam

MET – Metabolic Equivalent of Task

OPAS – Organização Pan-Americana da Saúde

WHO – World Health Organization

Sumário

Introdução

Além da transição demográfica, com o aumento expressivo do número de idosos e aumento da expectativa de vida, a transição epidemiológica caracterizou-se pela mudança do perfil de alta mortalidade por doenças infecciosas para outro perfil onde as doenças crônicas, principalmente as cardiovasculares e as neurodegenerativas, passaram a ser um dos principais problemas de saúde pública e estão se tornando significativas causas de incapacidade e de morte prematura devido às mudanças na dieta e no estilo de vida nos países em desenvolvimento, trazendo carga adicional nos orçamentos da saúde (WHO, 2003).

No Brasil, no levantamento nacional de saúde bucal realizado em 2003 (Brasil, 2004) revelou que menos de 10% dos idosos brasileiros com idade entre 65 e 74 anos possuíam 20 ou mais dentes e que havia diferenças marcantes entre as regiões do país tanto no uso quanto na necessidade de prótese dentária, considerando a grande extensão do mesmo e as expressivas diferenças culturais. Além disso, também foi realizado um questionário de autopercepção em saúde bucal, onde 43,6% dos idosos da amostra classificaram sua saúde bucal como péssima, ruim ou regular e 47,8% relataram apresentar dificuldade mastigatória (péssima, ruim ou regular).

Problemas mastigatórios, dentre outros como alterações no trato gastrointestinal, incapacidades funcionais, baixo nível socioeconômico e isolamento social contribuem para um estado nutricional pobre (Ikebe *et al.*, 2006). No idoso, um estado bucal precário provoca diversos impactos negativos na sua saúde, especialmente na sua nutrição. A partir dessa constatação, pode-se observar na literatura diversos efeitos da relação entre a perda dentária e nutrição, com conseqüente eliminação de alimentos considerados de difícil mastigação ou seleção pelos mais calóricos e menos nutritivos e o efeito destas escolhas no Índice de Massa Corporal (IMC), afetando a saúde geral de diferentes maneiras. Sendo assim, é fundamental ressaltar que saúde geral precária e saúde bucal precária estão inter-relacionadas, especialmente entre idosos, principalmente por causa de fatores de risco comuns (Elter *et al.*, 2003).

Em uma amostra de idosos brasileiros os que apresentavam pior condição bucal e maior insatisfação com sua saúde gengival tinham maior probabilidade de risco de má nutrição e a presença de dentes naturais era fator de proteção contra o risco nutricional

ou desnutrição (De Marchi *et al.*, 2008). No Japão, verificou-se que indivíduos acima de 60 anos, com dificuldade mastigatória limitam sua seleção alimentar e, portanto, diminuem seu consumo de nutrientes (Ikebe *et al.* ,2006). Os autores também observaram que pessoas com menos de dez dentes naturais e pessoas com prótese total em pelo menos uma das arcadas eram significativamente mais predispostas a apresentarem baixo peso. Já nos Estados Unidos, verificou-se que o auto-relato de uso de dentadura e de dificuldade para mastigar ou engolir foi associado com um risco aumentado para má nutrição, fragilidade e mortalidade, sendo o valor do IMC baixo, um fator de risco para a elevação da mortalidade entre pessoas idosas (Semba *et al.*, 2006).

Em outros estudos foi verificada forte associação do IMC com o número de dentes, já que a presença de menos de 21 dentes naturais, em média, acarretou mais de três vezes a chance de obesidade em idosos do Reino Unido, tendo a manutenção de uma dentição natural e funcional um significativo papel adicional na conservação de uma dieta saudável rica em frutas e vegetais, um estado nutricional satisfatório e um índice de massa corporal (IMC) aceitável (Marcenes *et al.*, 2003). Resultado semelhante foi encontrado no Brasil, onde idosos com perda dentária parcial ou total, sem reabilitação protética, eram mais freqüentemente obesos do que idosos com dentes naturais (Hilgert *et al*., 2009).

Entretanto, na consideração desta relação dieta, nutrição e saúde, a atividade física deve ser avaliada, pois um dos principais fatores que contribuem para a epidemia global do sobrepeso e da obesidade é justamente a diminuição do gasto energético como conseqüência da redução da atividade física. A Organização Mundial da Saúde também acredita que para se obter sucesso na prevenção das doenças crônicas, as estratégias e programas empregados devem reconhecer a importância da dieta, da nutrição e da atividade física (WHO, 2003), na promoção do bem-estar geral e na reversão das tendências de obesidade e de doenças crônicas (Brooks, 2004). Hilgert *et al.* (2009) sugere a inclusão da avaliação da prática de atividade física como um importante determinante para a avaliação do ganho de peso e da obesidade.

Ainda existe pouca informação na literatura sobre as populações de países em desenvolvimento, como o Brasil, onde os indivíduos apresentam significativa perda dentária e edentulismo, sem reabilitação protética, podendo, com maior probabilidade, resultar em obesidade, baixo peso, dieta precária ou má nutrição (Hilgert *et al.*, 2009).

Apesar dos estudos publicados até o presente indicarem uma associação entre precária condição de saúde bucal e má nutrição, especialmente entre perda dental e/ou reabilitação protética, existem algumas lacunas que precisam ser investigadas. É importante ressaltar que alguns estudos prévios (Semba *et al.*, 2006; De Marchi *et al.*, 2008, Hilgert *et al.*, 2009) consideraram confundidores importantes na relação entre estado bucal e estado nutricional, incluindo presença de doença crônica, uso de medicamento e variáveis sócio-demográficas. Entretanto, a contribuição da atividade física como confundidora da associação entre estado bucal e estado nutricional necessita ser melhor investigada.

O Projeto Rede Fibra, que estuda a fragilidade em idosos, é multicêntrico e multidisciplinar tendo sido coletadas informações sobre idosos de 65 anos ou mais em 18 cidades brasileiras com diferentes Índices de Vulnerabilidade Social (IVS), totalizando aproximadamente 7.500 idosos. Para isso houve a união de 4 importantes pólos universitários (UNICAMP, USP, UFMG e UERJ). Seus resultados serão de grande valia para a identificação de como os idosos brasileiros estão envelhecendo e de seus principais problemas e para a busca de soluções para os mesmos.

O objetivo deste estudo transversal é avaliar se o estado de saúde bucal precário é indicador de risco à baixo peso ou sobrepeso/obesidade medido por meio do Índice de Massa Corporal (IMC) nos idosos de Campinas, SP, considerando a prática de atividade física, dentre outras variáveis. Portanto, é pela ausência de evidências na relação entre saúde bucal e nutrição, considerando esse importante confundidor, prática de atividade física, que se justifica a realização deste trabalho no pólo UNICAMP, Campinas, no qual foram coletados dados de saúde bucal.

Capítulo I

Association between underweight and overweight/obesity with oral health among independently living Brazilian older people

Running title: Nutritional and Oral Status of Brazilian Elderly

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Abstract

Objectives: Poor oral status, represented by partial or complete tooth loss, may lead to changes in food choice, which may ultimately lead to underweight, overweight or obesity. The aim of this study is to evaluate if poor oral health is associated with underweight or overweight/obesity, regardless of physical activity.

Design: This cross-sectional study is part of a major project, the FIBRA study carried out in Campinas, Brazil (2008-2009).

Subjects: The sample was composed of 900 independent-living older adults. Complete data was available for 875 individuals.

Methods: Data collected included sociodemographic aspects, self-reported amount of medications used and eating difficulty questionnaire, smoking habit, depressive symptoms, physical activity, oral examination and anthropometric assessments according to the WHO criteria. Underweight and overweight/obesity were used as outcomes. The associations were assessed using multinomial logistic regression, adjusted for confounding variables.

Results: The mean age of the sample was 72.7 years (±5.81) and the prevalence of edentulism was 47.7%. Edentate individuals not wearing dentures were more likely to be underweight (OR=3.94, 95%CI 1.14-13.64) and overweight/obese (OR=2.88, 95%CI 1.12-7.40). Females (OR=1.78, 95%CI 1.17-2.71) and those using 3 or more medications (OR=2.41, 95%CI 1.41-4.12) were more likely to be overweight/obese. Individuals who smoke (OR=2.62, 95%CI 1.26-5.44) were more likely to be

underweight. Older individuals with family income between 3.1 and 5 Minimum Wage (OR=1.69, 95%CI 1.00-2.87) were more likely to be overweight/obese.

Conclusion: To our knowledge, this is one of the first studies that associated poor oral health, represented by edentulism not rehabilitated with dentures, with unfavorable body mass, regardless of two major confounders, physical activity and depression symptoms. Thus, the maintenance of a natural dentition and the presence of dental prosthesis rehabilitation, when necessary, can contribute to a satisfactory nutritional status into old age and to an eutrophic BMI value.

Keywords: Geriatric Dentistry, Body Mass Index, Tooth Loss, Nutritional Status, Exercise.

Introduction

The elderly population in Brazil is growing fast. In 2000, they represented 5% of the Brazilian population and in 2050, it is expected that the Brazilian older population will represent 18% [1]. According to national data, less than 10% of Brazilian older individuals from 65 to 74 years-old have 20 teeth or more [2], and this can lead to clinically important outcomes.

Poor oral health and poor general health are interrelated, especially among older individuals due to common risk factors[3]. Oral health changes such as tooth loss influence the individuals' lives, increasing their chance of having a poor quality of life [4]. If tooth loss occurs, it may also result in decreased masticatory efficiency and function [5].

A minimum of 20 teeth are needed for satisfactory chewing ability and functional dentition[6]. Dental status can impact on food choice and on the intake of important nutrients [7-9]. More edentate than dentate individuals tend to consume less than two-thirds the recommendations of most nutrients [10]. This finding is supported by several studies that evaluated the relationship between oral health and nutritional status [11-15, 9].

The number of teeth, regardless of whether they are replaced or natural, may have an impact on the body mass index (BMI) [16]. Thus, oral rehabilitation with complete denture does not necessarily imply a perfect chewing ability[17]. Denture use is associated with decreased masticatory capacity[18]. In addition, it can be determinant of poor nutrition because older adults tend to change their eating habits as a result of the reduced masticatory efficiency [11, 19-21].

Furthermore, poor nutrition can possibly lead to changes in BMI, resulting in weight loss or weight gain. Partial or complete tooth loss not rehabilitated with denture was associated with obesity in a population from Southern Brazil [22]. Obesity is increasing among the elderly population worldwide, representing not only a global outbreak [23] but also an important public health problem [24] due to its association with disability, which directly affects health care costs [25]. According to some studies, there is a relationship between low physical activity, high BMI and inadequate dietary standards [26,27]. According to Tsai et al[28], physical activity seems to have the potential of impacting the aging-associated anthropometric changes. Despite being a key factor for weight gain and obesity, the effects of physical activity has not been well established in this relationship up to this moment[11,22]. Although a significant number of studies have shown that oral status, mainly partial and complete tooth loss, is associated with BMI, there is no evidence showing if this relationship keeps its significance if adjusted to physical activity, which is a well-known determinant of BMI, is carried out using a multivariate analytical approach. To our knowledge, there is no evident data in literature showing if the association between oral status and unfavorable body mass is independent of an important confounder, which is physical activity.

Difficulty in chewing or swallowing was associated with lower body mass index among older women in the USA[20]. Significant increased mortality risk was also associated with underweight [29]. Therefore, it is complex to study the nutritious status in older adults since their health is a result of the interaction between the way they aged and lived and the habits they had throughout their lives.

The hypothesis of the present study is that oral status, represented by partial or complete tooth loss not rehabilitated with dentures is positively associated with

underweight or overweight/obesity, regardless of confounders, including physical activity. The aim of this study is to evaluate the relationship between underweight and overweight/obesity and oral health status using data from the FIBRA study.

Subjects and Methods

Study Design

This cross-sectional study is part of a larger study on independent-living older individuals from the city of Campinas, Brazil – the "Rede FIBRA" study, which is a multicenter and multidisciplinary study designed to better understand the prevalence, characteristics and main factors associated with frailty in Brazilian elderly. The data was collected between 2008 and 2009.

Probabilistic, cluster sample was used, taking into consideration urban census sectors. The number of elderly individuals in Campinas was calculated in 82,560, corresponding to 7.8% of the city's population. Based on this number, the sample was calculated through the formula of finite population, taking into account the achievement of statistical representativeness to describe the prevalence of frailty, use and need of dental prosthesis, presence of teeth and oral soft tissue injuries. A random selection of 90 of the 835 urban census sectors of Campinas and for the 900 participants was performed.

The city had 82.560 older inhabitants (65 years-old or more) in the year 2008, which corresponded to 7.8% of the entire city population. Individuals aged 65 years or over were invited in their homes by health agents, undergraduate students, pastoral care workers and social workers to take part of the study. Data was collected in a previously

scheduled meeting that took place in Health Units, churches, schools, communitarian centers from September 2008 to June 2009 in Campinas, Brazil.

Population and sample

The inclusion criteria included being 65 years-old or more, being able to understand the instructions, being permanent resident in the home and in the census sector. The exclusion criteria[30] included severe cognitive impairment, temporary or permanent inability to walk (which impedes the attendance at the unit where data were collected), localized strength loss and aphasia due to serious stroke, serious impairment due to Parkinson, severe communication difficulties, chemotherapy treatment, severe sensory deficit and terminal stage.

It was randomly selected 90 urban census sectors. On average 10 elderly were randomly selected in each census sector. The sample size was calculated in 900 older people living independently in the community. Two hundred and eleven individuals did not achieve the cutoff point to the Mini Mental State Exam (MMSE), but they still responded the first part of the protocol. Due to answered data, only 875 individuals participated in this study.

Ethics

This study was carried out after approval from the Research Ethics Committee involving Human Beings of the University of Campinas, report number 208/2007, and the Piracicaba Dental School/University of Campinas, through report No. 15/2009.

Measurements

The purpose of the study was explained to participants before informed consent form was obtained. After the agreement to participate in the study, the interview started with identification and the MMSE (cut-off according to Brucki[31]). The elders that scored below values considered satisfactory according to the educational level in the MMSE took part of the data collection including the following: sociodemographic aspects and amount of medications questionnaires, anthropometric, frailty and oral examination assessments. Those who scored in the MMSE continued answering the second part of the protocol. Data collection took place in a single session in previously scheduled and easy-located places.

Variables

Questionnaire

- *Sociodemographic data, self-reported intake of medications, smoking habit, self-reported eating difficulties questionnaire and depressive symptoms assessment*

Sociodemographic data included information regarding age, monthly family income, schooling, race/skin color, gender and marital status. The variables were assessed through the application of an interview questionnaire. Independent variables monthly family income and age were transformed from continuous into ordinal variables, dividing the older individuals into income and age groups, which would allow comparisons with other studies.

The current smoking status was also assessed through interview. The intake of medications was assessed as the amount of medications daily taken, prescribed or not over the last three months. A summary measure of the number of medications was used in the analyses.

Self-reported eating difficulties assessment was performed through the following question: “Do you have difficulties in chewing or swallowing food over the last 12 months?”

Depressive symptoms were assessed with the Geriatric Depression Scale (GDS)-short version with 15 items validated for use in Brazilian Portuguese[32]. The cutoff point was GDS ≤ 5 for absence of symptoms and GDS > 5 when depression symptoms were present.

- *Physical Activity Assessment*

It was obtained through self-reported regular practice of physical activities (weekly time expended on exercise of moderate, at least 150 min, and high intensity, at least 120 min, and daily duration of the exercise in minutes and active sports performed within the week, based on recommendations of the American College of Sports Medicine (ACSM) and American Hearth Association (AHA)[33]. The exercise intensity classification was according to Haskell et al[34], which consider energy expenditure under 3 metabolic equivalent of task (METs) as mild intensity, 3 to 6 METs as moderate intensity and above 6 METs as high intensity.

Sixteen items were used to assess physical exercise and active sports (walking, stair climbing as a way of exercise, cycling, ballroom dancing, gymnastics, stretching, yoga, tai-chi; jogging, mild or vigorous walking, workout, swimming, volleyball, soccer and refereeing soccer games). There were also an open question in which it was asked if the participant practiced another type of exercise or sports not included in the previous question and practiced in the leisure time.

Anthropometric measures

Height and weight were used to calculate the body mass index (BMI), which is a ratio between weight in kilograms and the height in squared meters (kg/m^2). Anthropometric measures were carried out using classic protocols that required digital plate scales (standardized to every data collection) and measuring tape. Participants were classified as underweight (BMI < $23kg/m^2$), eutrophic (23 – 27.99 kg/m^2), overweight (28 – $29.99kg/m^2$) and values over $30kg/m^2$ were considered as obese according to PAHO's recommendation for older individuals [35]. For analysis purposes, overweight and obese categories were considered in this study as a single one. The reference category was eutrophic.

Oral examinations

- *Number of teeth and presence of dental prosthesis*

Dental status was assessed by recording the number of natural teeth and the use of dental prostheses for both arches according to the WHO criteria[36]. Data regarding the number of natural teeth and presence of dental prostheses were used to generate a new variable named "Oral Status". The World Health Organization[37] (WHO) recommends the presence of at least 20 teeth for function and esthetic natural dentition. Thus, participants were categorized into: edentulous wearing none or one complete denture, edentulous wearing upper and lower complete denture, < 20 teeth without prosthesis, < 20 teeth with prosthesis, ≥ 20 teeth without prosthesis and ≥ 20 teeth with prosthesis. All examinations were carried out by three dentists trained to perform oral examination and application of questionnaires according to the WHO criteria [36].

Statistical analyses

Chi-square test was performed for categorical variables. To test the study hypothesis, all independent variables that showed association with $p<0.25$ in the univariate analyses were candidates to the multivariate model[38]. Variables that did not contribute to the model ($p>0.25$) were excluded and a new model was developed. The old and new models were always compared using the likelihood ratio test. A multinomial logistic regression analysis was used to estimate the crude and adjusted odds ratio (OR) and 95% confidence intervals were calculated for the variables of interest with both categories of the BMI outcomes (underweight and overweight/obesity).

Associations with BMI categories (i.e. underweight and overweight/obesity) were adjusted by means of multinomial logistic regression for sociodemographic variables, including age (65-69, 70-74, 75-79, ≥80 years-old), race/skin color (white or non-white), gender (male or female), marital status (married or not), schooling (illiterate, ≤ 8 years, >8 years), monthly family income – minimum wage (≤1 MW in Reais, 1.1-3 MW in Reais, 3.1-5 MW in Reais, > 5.1 MW in Reais - Brazilian currency). It was also adjusted for intake of medications (amount of medications in use: 0, 1-2, ≥3), depression - GDS (yes or no), smoking habit (current smoker or not), physical activity (sedentary or active) and oral status (number of present teeth, prosthesis use (presence or absence of prosthesis) and self-reported eating difficulties assessed through the question “Do you have difficulties in chewing or swallowing food?” (always, sometimes or never).

All statistical analyses were carried out using the PASW Statistics software version 18 (SPSS inc, Chicago, USA).

Results

The mean age of the sample was 72.7 years (±5.81) and the median schooling was 4.0 years (25^{th} percentile 2 years and 75^{th} 6 years). There were a larger percentage of women in the sample (69.3%). Most participants were white (72.6%) and almost half were married (53.9%). The average monthly family income was equivalent to 2.67 (±0.94) minimum wages (approximately USD 667.50). Almost half of the participants were edentulous and among those, the majority was underweight or overweight/obese. Among individuals with 20 teeth or more, the majority was in the eutrophic category. The mean number of natural teeth was 7.21 (±9.13) and the 75^{th} percentile was equivalent to 13 teeth. The characteristics of the sample in relation to the BMI categories are shown in Table 1.

Table 1: Characteristics of study participants in relation to BMI categories. Campinas, Brazil.

Characteristics	*n (%)*	*% Underweight (n=140)*	*% Eutrophic (n=385)*	*% Overweight/ Obese (n=373)*
Age				
65-69 years-old	309 (34.3)	28.6	33.2	37.8
70-74 years-old	286 (31.8)	25.7	31.2	34.9
75-79 years-old	185 (20.6)	29.3	20.5	18.8
≥ 80 years-old	120 (13.3)	16.4	16.6	8.6
Gender				
Male	276 (30.7)	37.1	34.8	23.9
Female	624 (69.3)	62.9	65.2	76.1
Race/skin color				
White	636 (70.7)	70.7	73.2	68.1
Non-white	264 (29.3)	29.3	26.8	31.9
Marital status				
Married	464 (51.6)	50.7	53	50.4
Divorced/widow/single	436 (48.4)	49.3	47	49.6
Oral Status*				
Edentulous wearing none or one denture	83 (9.4)	13.2	7.4	10.2
Edentulous wearing upper	346 (39.5)	35.3	37.5	43

and lower complete denture				
< 20 teeth without prosthesis	36 (4.1)	2.9	4	4.7
< 20 teeth with prosthesis	276 (31.5)	38.2	32.2	28.4
≥20 teeth without prosthesis	52 (5.9)	3.7	7.2	5.2
≥20 teeth with prosthesis	84 (9.6)	6.6	11.7	8.5
Problems chewing or bitting*				
Always	128 (14.5)	19.9	12	15.4
Sometimes	346 (39.5)	40.4	40.4	38
Never	403 (46)	39.7	47.6	46.6
Depression - GDS*				
Non-depressed	547 (80.6)	80	83.5	77.8
Depressed	132 (19.4)	20	16.5	22.2
Amount of medications in use*				
None	123 (18.2)	26.3	22	11.5
1-2 medications	228 (33.6)	39.4	33.7	31.4
≥3 medications	327 (48.2)	34.3	44.3	57.1
Physical activity – ACSM*				
Sedentary	503 (57)	54.3	53.6	61.5
Active	380 (43)	45.7	46.4	38.5
Current smoker*				
Yes	77 (11.2)	21.6	9.3	9.2
No	612 (88.8)	78.4	90.7	90.8
Family income (minimum wage – MW)				
≤1 MW in reais	70 (8.9)	12.4	9.3	7.4
1.1-3 MW in reais	314 (40.1)	37.2	40.7	40.5
3.1-5 MW in reais	207 (26.5)	24.8	22.5	31
> 5.1 MW in reais	192 (24.5)	25.6	27.5	21.2

**Does not equal 900 because of missing values*

Variables independently associated with underweight and obesity adjusted by means of multinomial logistic regression are listed in Table 2. Edentate older individuals not wearing dentures were more likely to be underweight (OR=3.94, 95%CI 1.14-13.64) and overweight/obese (OR=2.88, 95% CI 1.12-7.40). Being female (OR=1.78, 95%CI 1.17-2.71) and using 03 or more medications (OR=2.41, 95%CI 1.41-4.12) increased the chances of being obese. Older individuals that smoke (OR=2.62, 95%CI 1.26-5.44) were more likely to be underweight while those with family income ranging from 3.1 to 5 MW (OR=1.69, 95%CI 1.00-2.87) were more

likely to be obese. Smoking status, family income, depression and physical activity adjusted the model.

Table 2: Crude and adjusted odds ratio (OR) and respective 95% confidence intervals (95% CI) of the variables associated with underweight and obesity.

	Underweight			*Overweight+Obesity*		
Variables	*Crude OR (95% CI)*	*Adjusted OR (95% CI)*	*P**	*Crude OR (95% CI)*	*Adjusted OR (95% CI)*	*P**
Gender						
Female	0.90 (0.60-1.35)	1.20 (0.68-2.10)	0.51	1.70 (1.24-2.34)	1.78 (1.17-2.71)	0.007
Male	1	1		1	1	
Family income (minimum wage - MW)						
≤1 MW in reais	1.43 (0.68-3.0)	0.58 (0.18-1.85)	0.36	1.03 (0.55-1.91)	0.54 (0.23-1.25)	0.15
1.1-3 MW in reais	0.98 (0.57-1.66)	0.67 (0.34-1.35)	0.27	1.29 (0.87-1.91)	0.95 (0.57-1.57)	0.84
3.1-5 MW in reais	1.18 (0.66-2.13)	1.09 (0.53-2.24)	0.81	1.79 (1.16-2.76)	1.69 (1.00-2.87)	0.04
> 5.1 MW in reais	1	1		1	1	
GDS						
Depression symptoms	1.26 (0.70-2.26)	1.30 (0.64-2.64)	0.46	1.44 (0.95-2.19)	1.45 (0.87-2.42)	0.14
No depression symptoms	1	1		1	1	
Current smoker						
Yes	2.73 (1.47-5.05)	2.62 (1.26-5.44)	0.01	1.01 (0.58-1.77)	1.37 (0.72-2.59)	0.32
No	1	1		1	1	
Amount of medications in use						
≥3 medications	0.64 (0.35-1.17)	0.57 (0.29-1.11)	0.10	2.46 (1.52-3.98)	2.41 (1.41-4.12)	0.001
1-2 medications	0.98 (0.54-1.76)	0.83 (0.42-1.61)	0.58	1.78 (1.07-2.96)	1.76 (0.99-3.11)	0.05
None	1	1		1	1	
Oral status						
Edentulous wearing none or one denture	3.14 (1.24-7.96)	3.94 (1.14-13.64)	0.03	1.87 (0.95-3.67)	2.88 (1.12-7.40)	0.02

Edentulous wearing upper and lower complete denture	1.90 (0.75-3.66)	1.16 (0.42-3.18)	0.76	1.57 (0.94-2.62)	1.68 (0.85-3.35)	0.13
< 20 teeth without prosthesis	1.30 (0.35-4.85)	1.21 (0.23-6.15)	0.81	1.60 (0.70-3.69)	1.41 (0.42-4.68)	0.56
< 20 teeth with prosthesis	2.10 (0.95-4.61)	1.99 (0.77-5.16)	0.15	1.20 (0.71-2.05)	1.42 (0.71-2.80)	0.31
≥20 teeth without prosthesis	0.90 (0.27-2.98)	0.80 (0.17-3.75)	0.77	0.99 (0.47-2.10)	1.07 (0.38-2.97)	0.89
≥20 teeth with prosthesis	1	1		1	1	
Physical activity – ACSM						
Sedentary	1.03 (0.69-1.52)	1.06 (0.62-1.82)	0.80	1.38 (1.03-1.85)	1.11 (0.76-1.64)	0.56
Active	1	1		1	1	

**p-value for adjusted analysis.*
*** Reference category: eutrophic*

Discussion

The results of this cross-sectional study suggest that complete tooth loss not rehabilitated with complete dental prostheses is associated with both underweight and overweight/obesity in independent-living older individuals. Many studies[6,12-15] have shown an association between number of teeth and BMI, although no previous study showed that poor oral status is associated with compromised BMI, regardless of physical activity. The number of natural teeth may affect the ability to eat certain foods[14], affecting the intake of essential nutrients. Having 20 teeth or more helps preventing underweight, overweight and obesity and can increase the possibility of having normal BMI values, thus contributing to general health [6,15]. It is important to stress that the majority of the edentulous individuals were either underweight or overweight/obese.

Conflicting results have been reported when considering the relationship between compromised dentition, artificially restored dentition, food selection and nutritional status [39-41,5]. Compared to edentulism, the presence of some teeth may reflect some changes in the eating habits and consequently a better nutrition, causing minor variations in BMI. Sheiham et al.[9] concluded that the presence of even a few natural teeth is of some value, when comparing the food intake values of dentate individuals with very few teeth with edentulous subjects. Although the presence of some teeth contributes to healthy BMI values, the replacement of lost teeth by dental prostheses could allow the recovery of the masticatory ability[41], also showing a protective effect against obesity [22]. These results are in line with ours, since edentulous individuals without dental prosthesis rehabilitation were more likely to be underweight or overweight/obese.

It is known that many older individuals use inadequate dental prosthesis only for aesthetic reasons and eventually remove it to eat. A significant number of these individuals may also have partial or complete tooth loss not rehabilitated by dental prostheses[17]. Both conditions may cause weight changes. In a study conducted with independent-living elderly living in Southern Brazil, obesity was associated with partial or complete tooth loss not rehabilitated with dental prostheses[22]. These findings are in agreement with those of the present study. The authors of the former study, however, did not adjust the analysis for physical activity, which is an important determinant of body mass index [11,22].

Body mass is affected by several factors, which is not only determined by the number of teeth, but also by medical problems, intake of several medications, dietary

habits and socioeconomic status, which can affect the way older individuals make choices including those related to food[42,43,15]. According to the Brazilian National Household Sample Survey[44], 6% of families living in private households have income ranging from 3.1 to 5 MW. In addition, almost 83.6% of families living in private households live with less than that. Our results show that individuals who have family income ranging from 3.1 to 5 MW are more likely to be overweight / obese. These findings suggest that households with intermediate family income spend more on low-quality food rich in fat and sugar. Such assumption is confirmed by empirical data obtained in the Brazilian National Household Food Budget Survey[45], which showed that, compared to lower family incomes, families in the mid-range income strata consume an excessive proportion of calories from total and saturated fats and sugar. This result is in accordance with Barreto[46], who reported that obesity was more common among non-poor when compared to poor individuals as a result of the combination between lipid-rich diets with reduced physical activity. Although for Griffths & Bentley[47], what may be protecting poor individuals from obesity is physically active occupations and lack of income to purchase unhealthy foods.

Many studies that evaluated the association between tooth loss and nutrition have not taken into account physical activity. Nevertheless, this study assessed this relation because physical activity is an important predictor of weight control. Physical activity was used as a confounding variable in the studied association, but it was not significant. Similarly, Mack et al.[16] found no association between physical activity and BMI when studying Sweden elderly men. However, Barreto et al.[46] found association between obesity and sedentarism. Okay et al.[48] wondered about how much physical activity is required to be significant in weight reduction. Interestingly, sedentary and

moderately active women in Canada were more likely to be obese compared with highly active ones[49]. In the present study, older individuals were categorized as active if performed both high and moderate physical activities.

Co-morbidities increase with the aging of populations and the intake of medications may lead to several side effects. The importance of chronic diseases and use of drugs is due to their impact on the quality of aging, health and health care costs. In the present study, individuals that use three or more medications were more likely to be overweight/obese. Although questions such as the type of medications in use or if the participants felt any side effect when using them were not made, usually older individuals who use medications have chronic diseases, which means that they have an increased chance of being overweight or obese. Another possible consequence for the use of multiple medications could be appetite suppression, gastrointestinal upset, anorexia, nausea and the excretion of important minerals and vitamins[5]. Individuals who do not need to take any medication can be considered healthy and their BMI tend to range in the eutrophic category.

Healthy aging is a result of multidimensional interaction between physical and mental health, independence in daily living, social integration, family support and economic independence[50]. Depression is a common condition among the elderly mainly because it is connected to general age-related changes. One of the major consequences of this disorder is that it can lead to isolation, negligence with oral hygiene and overall health and consequently the act of avoiding the preparation of foods and nutritional meals. Compared to other studies in literature, depression was not associated with BMI in this study. An explanation for that may be the fact that depression is a complex and multifaceted disease with many contributing factors[52].

Being female was more likely to be overweight/obesity. Other studies also found that being female had a significant correlation with high BMI[11,22]. According to Campos et al[53], a possible explanation for the higher likelihood of women being overweight or obese is the largest accumulation of visceral fat, differences in food intake and increased life expectancy. In addition, the authors argue that menopause is accompanied by weight gain and adiposity.

Older individuals that smoke were currently more likely to be underweight, a finding that is in agreement with Barreto et al.[46]. Smokers tend to be careless with their health and this is possibly because smokers have a less healthy diet and among smokers with underweight, there are fewer individuals who stop smoking due to concerns about weight gain and loss of attractiveness after quitting smoking, at least women presented these concerns. According to Intorre et al[55] smoking is a modifiable risk factor for disease in older individuals and it is related to the association between underweight and mortality rate, reflecting the relationship between illness and weight loss[46].

This study presents some limitations, specially considering that it is a cross-sectional study; therefore causality cannot be inferred. A longitudinal study is needed to clarify the effect of physical activity in the relation between oral status and BMI, particularly in weight control and reduction. Although evaluating the association between BMI and oral health, dietary intake data was not collected. This information would allow the identification of the elders' dietary restrictions and food choices considering the family income. Self-reported amount of medication daily taken may be considered another study limitation. Older individuals might be confused if the question was related to the number of pills daily taken or the amount of medicines that they were

asked about. This study would benefit from a more precise medication intake assessment.

The assessment of the patients' diet by health care providers is also important to be carried out and necessary to better understand their nutritional habits. Ettinger [5] reported that even if the lost teeth are replaced, increasing the masticatory function and the self-assessed chewing ability, only a few individuals change their dietary intake, suggesting the need for dietary counseling. Thus, the results of the present study suggest the need for greater interaction between health professionals, focusing in the maintenance of oral health and functional dentition and oral rehabilitation whenever necessary. As a consequence of natural teeth retention, older individuals may increase nutritional food intakes aiming at healthy aging, especially within normal BMI values. Moreover, prevention and health promotion programs should target elderly health care, focusing mainly on the common risk factors to prevent a number of health disorders. Therefore, such measures may help reducing the morbidity and mortality risk among older individuals and assure their quality of life.

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Conflict of interest

The authors declare no conflict of interest.

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Conclusões Gerais

Os resultados do presente estudo sugerem a associação entre saúde bucal e saúde geral, principalmente pelo achado dos idosos edêntulos sem reabilitação completa apresentarem mais chance de baixo peso e de sobrepeso/obesidade. O que pode indicar que não só a manutenção da dentição funcional tem um impacto na saúde geral, mas que a reabilitação também é de grande importância, especialmente para o controle do IMC nos padrões de normalidade.

As mulheres apresentaram maior chance de obesidade que os homens, possivelmente pelas mudanças próprias do envelhecimento na estrutura corporal das mesmas contribuindo para o acúmulo de gordura ao longo dos anos.

A renda familiar em salários mínimos mostrou que quanto maior o rendimento familiar, maior a chance de obesidade, o que sugere que possivelmente as famílias de maior rendimento gastam mais com alimentos não saudáveis do que as que ganham menos.

Os indivíduos idosos que usam três ou mais medicações apresentaram maior chance de serem obesos do que os que não usam medicações. Resultado que sugere que a medicação ou a própria condição de saúde possivelmente interfere no estado nutricional ou ainda, que os efeitos adversos dos medicamentos, possam interferir nos hábitos ou no organismo contribuindo para as alterações no IMC.

O hábito de fumar apresentou-se como fator de risco para o baixo peso, uma possível explicação é o fato dos indivíduos fumantes não terem outros hábitos considerados saudáveis, como uma adequada alimentação.

Outro resultado que se destacou foi a variável atividade física que, apesar de não ter se apresentado significativa, mostrou-se como uma variável de confundimento na relação IMC e condição bucal. O que nos faz questionar o quanto a atividade física interfere na manutenção do peso, sugerindo que novos estudos avaliem a interferência da atividade física na relação entre estado nutricional e condição bucal. A variável depressão também contribuiu para o ajuste do modelo, apesar de ter deixado de ser significativa.

As implicações deste estudo demonstram que as condições bucais podem provocar mudanças na saúde sistêmica dos idosos com reflexos importantes na qualidade de vida desses indivíduos. Concomitantemente, os problemas de ordem sistêmica também podem promover alterações na seleção dos alimentos a serem ingeridos e podem levar ao agravamento da condição de saúde dos mesmos. Tal fato deixa claro que o organismo está interligado e que as ações de saúde devem estar voltadas aos fatores de risco comuns.

Portanto, é necessária a interação entre os profissionais de saúde para que sejam realizadas ações conjuntas visando o bem-estar e um envelhecimento saudável a esta população que cresce ainda em ritmo intenso nos países em desenvolvimento.

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* De acordo com a norma da UNICAM/FOP, baseadas nas normas do International Committee of Medical Journal Editors – Grupo de Vancouver. Abreviatura dos periódicos em conformidade com o Medline.

ANEXO I

NOME DO IDOSO: XXXXXXXXXXXXXXXXXXXXXXX

Polo:	**Cidade:**	**Estado:**
Rua: XXXXXXX	**Nº. e complemento:**	**Bairro:**
Tipo de domicílio:	1. Casa 2. Apartamento 3. Casa de fundos	( ) ( ) ( )

DATA: __ / __ / ___ **LOCAL:_____**

HORÁRIO: _____ **ENTREVISTADOR: _____ (CÓDIGO)**

CARACTERÍSTICAS SÓCIO-DEMOGRÁFICAS

Sexo	Masculino Feminino	(1) (2)
Idade/data de nascimento	___anos nascido em ___/___/ _____	
Qual é o seu estado civil?	Casado(a) ou vive com companheiro(a) Solteiro(a) Divorciado(a), separado(a) ou desquitado(a) Viúvo(a) NR	(1) (2) (3) (4) (99)
Qual sua cor ou raça?	Branca Preta Mulata/cabocla/parda Indígena Amarela/oriental NR	(1) (2) (3) (4) (5) (99)
O senhor(a) é alfabetizado, isto é, é capaz de ler e escrever um bilhete simples? (Se a pessoa responder que aprendeu a ler e escrever mas esqueceu, ou que só é capaz de assinar o próprio nome, marcar Não.	Sim Não NR	(1) (0) (99)

Qual foi o curso mais elevado que freqüentou?	Nunca foi à escola, ou não chegou a concluir a 1ª série primária ou o curso de alfabetização de adultos Curso de alfabetização de adultos Primário (atual nível Fundamental 1ª a 4ª série) Ginásio (atual nível Fundamental, 4ª a 8ª série) Científico, Clássico (atuais Curso Colegial) ou Normal (Curso de Magistério) Curso Superior Pós-graduação, com obtenção do título de Mestre ou Doutor NR	(0) (1) (2) (3) (4) (5) (99)
Até que série desse curso o senhor estudou?	_____ NR	(99)
Qual a renda mensal das pessoas que moram em sua casa, incluindo o(a) senhor(a)?	_____ NR	(99)

Uso de Medicação e Hábito tabagismo

Uso de Medicação		
O Sr/a tem usado alguma medicação nos últimos três meses (prescrita ou não)?	Sim Não NR	(1) (0) (99)
Quantas medicações o senhor usa?		
Hábito tabagismo		
O senhor/a fuma atualmente?	Sim Não NR	(1) (0) (99)

Agora eu gostaria de saber sobre possíveis mudanças ou dificuldades para se alimentar que o (a) senhor(a) tem sentido **nos últimos 12 meses**.

Dificuldade para mastigar ou engolir os alimentos?	Sim Não NR	(1) (0) (99)

Modelo da ficha de exame bucal

INFORMAÇÕES GERAIS

Número de identificação: ☐☐☐

Data do exame: _____/_____/_____

Nome: XXXXXXXX

CONDIÇÃO PROTÉTICA

Uso de prótese — Sup ☐ Inf ☐ — Necessidade de prótese — Sup ☐ Inf ☐

Troca recomendada? ( ) Sim ( ) não

Motivo da troca:

( ) Tempo de uso

( ) Prótese quebrada

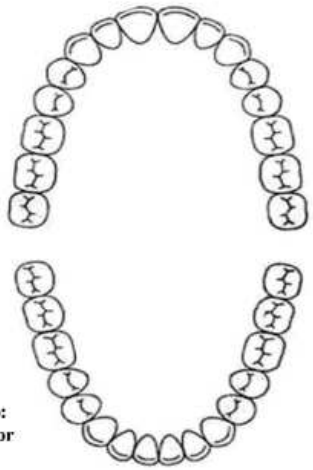
( ) Prótese não funcional/desadaptada

( ) Câmara de sucção

( ) Outros

( ) nsa

PERDA DENTÁRIA (identificar todos os dentes)



Pares em oclusão: Anterior / posterior ☐

Total de dentes presentes ☐

ATIVIDADES ESPORTIVAS
O(a) senhor(a) pratica esportes? (Caminhada, subir escadas, andar de bicicleta, dança de salão, ginástica, alongamento, yoga, tai-chi, corrida, caminhada moderada ou vigorosa, malhação, natação, futebol e atuar como juiz de futebol)
(a)Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)
(b) Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)
(c) Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)
ATIVIDADES DE TEMPO LIVRE
O(a) senhor(a) pratica alguma outra atividade no seu tempo livre?

(a) Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)
(b) Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)
(c) Nome_____ Intensidade_____(a) Horas/semana_____(b) Períodos do ano_____(c)

Variáveis Antropométricas
Peso (Kg)
Altura (cm)
IMC

ESCALA DE DEPRESSÃO GERIÁTRICA

VOU LHE FAZER ALGUMAS PERGUNTAS PARA SABER COMO O/A SENHOR/A VEM SE SENTINDO NA ÚLTIMA SEMANA.	**SIM**	NÃO	**NR**
O/A SENHOR/A ESTÁ BASICAMENTE SATISFEITO COM SUA VIDA?			
O/A SENHOR/A DEIXOU MUITOS DE SEUS INTERESSES E ATIVIDADES?			
O/A SENHOR/A SENTE QUE SUA VIDA ESTÁ VAZIA?			
O/A SENHOR/A SE ABORRECE COM FREQÜÊNCIA?			
O/A SENHOR/A SE SENTE DE BOM HUMOR A MAIOR PARTE DO TEMPO?			
O/A SENHOR/A TEM MEDO DE QUE ALGUM MAL VÁ LHE ACONTECER?			
O/A SENHOR/A SE SENTE FELIZ A MAIOR PARTE DO TEMPO?			
O/A SENHOR/A SENTE QUE SUA SITUAÇÃO NÃO TEM SAÍDA?			
O/A SENHOR/A PREFERE FICAR EM CASA A SAIR E FAZER COISAS NOVAS?			
O/A SENHOR/A SE SENTE COM MAIS PROBLEMAS DE MEMÓRIA DO QUE A MAIORIA?			
O/A SENHOR/A ACHA MARAVILHOSO ESTAR VIVO?			
O/A SENHOR/A SE SENTE UM/A INÚTIL NAS ATUAIS CIRCUNSTÂNCIAS?			
O/a senhor/a se sente cheio/a de energia?			
O/a senhor/a acha que sua situação é sem esperança?			
O/a senhor/a sente que a maioria das pessoas está melhor que o/a senhor/a?			
Pontuação total na Escala de Depressão Geriátrica _____			

Fim da sessão de coleta de dados: ___h ___min
Duração da sessão de coleta de dados: ___h ___min

ANEXO II

COMITÊ DE ÉTICA EM PESQUISA
FACULDADE DE ODONTOLOGIA DE PIRACICABA
UNIVERSIDADE ESTADUAL DE CAMPINAS

CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa **"Saúde bucal e sua associação com indicadores sociais e do estado nutricional em idosos de Campinas, São Paulo"**, protocolo nº 015/2009, dos pesquisadores Luísa Helena do Nascimento Tôrres, Fernando Neves Hugo e Maria da Luz Rosário de Sousa, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 24/04/2009.

The Ethics Committee in Research of the School of Dentistry of Piracicaba - State University of Campinas, certify that the project **"Oral health and its association with social and nutritional indicators in older adults from Campinas, São Paulo"**, register number 015/2009, of Luísa Helena do Nascimento Tôrres, Fernando Neves Hugo and Maria da Luz Rosário de Sousa, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee at 04/24/2009.

Prof. Dr. Pablo Agustin Vargas
Secretário
CEP/FOP/UNICAMP

Prof. Dr. Jacks Jorge Junior
Coordenador
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.
Notice: The title of the project appears as provided by the authors, without editing.