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**ASSOCIAÇÃO ENTRE SOBREPESO/OBESIDADE E DESFECHOS
ODONTOLÓGICOS EM ESCOLARES DE PORTO ALEGRE, RS**

Santa Maria, RS
2018

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Dissertação apresentada ao Curso de Mestrado do Programa de Pós-Graduação em Ciências Odontológicas, Área de Concentração em Odontologia, ênfase em Dentística, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do título de **Mestre em Ciências Odontológicas**.

Orientadora: Profa. Dra. Luana Severo Alves

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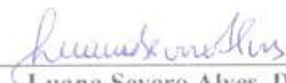
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RESUMO

ASSOCIAÇÃO ENTRE SOBREPESO/OBESIDADE E DESFECHOS ODONTOLÓGICOS EM ESCOLARES DE PORTO ALEGRE, RS

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A presente dissertação é composta por dois artigos científicos cujos objetivos são analisar a associação entre sobrepeso/obesidade e variação do índice de cárie dentária (Artigo I) e estudar a associação entre sobrepeso/obesidade e prevalência de gengivite (Artigo II) em escolares de Porto Alegre, RS. O estudo está vinculado a um levantamento epidemiológico realizado para avaliar as condições de saúde bucal de escolares de Porto Alegre, RS. No primeiro momento observacional, entre 2009 e 2010, 1.528 escolares foram examinados. Após um período médio de seguimento de 2,5 anos, entre 2012 e 2013, um componente longitudinal foi incorporado ao estudo transversal e 801 escolares foram reexaminados. A coleta de dados incluiu a aplicação de questionários, registro das medidas antropométricas (altura e peso) e exame clínico, que seguiu a seguinte sistemática: registro do índice de sangramento gengival, limpeza profissional, secagem, e registro do índice de cárie dentária (lesões não cavitadas e cavitadas, ativas e inativas). O desfecho primário do Artigo I foi a variação do índice CPOS, definida como a diferença entre o CPOS final e o basal. O desfecho primário do Artigo II foi prevalência de gengivite, definida com base na média/mediana (52% de sítios de sangrantes). Com base nos dados de altura e peso, o escore Z do IMC (índice de massa corporal) por idade foi calculado e os escolares foram classificados em normal, sobrepeso ou obeso de acordo com pontos de corte propostos pela Organização Mundial da Saúde. Em ambos os artigos, o estado de peso foi considerada a variável preditora principal. Análises preliminares foram realizadas para comparar os desfechos de acordo com as variáveis predictoras usando o teste de Wald. A associação entre variáveis predictoras e variação do CPOS e prevalência de gengivite foi avaliada usando modelos de regressão binomial negativa e Poisson, respectivamente (não ajustados e ajustados). Um modelo polinomial ajustado foi realizado para explorar a associação entre os escores Z do IMC por idade e a variação do CPOS. No Artigo I, escolares obesos apresentaram variação do CPOS significativamente menor do que os indivíduos de peso normal (0,42 versus 0,86, $p < 0,05$). Na análise de risco, foi encontrada uma tendência numérica de menor risco de variação do CPOS entre indivíduos obesos comparados aos de peso normal, mas não foi alcançada significância estatística. O modelo polinomial mostrou uma relação significativa não linear (forma de U invertido) entre os escores Z do IMC por idade e a variação do CPOS. No Artigo II, observou-se que meninas obesas apresentaram maior risco de ter gengivite (Razão de Prevalência ajustada = 1,20; IC 95% = 1,09-1,31; $p < 0,001$). Não foi observada esta associação entre os meninos. Este trabalho concluiu que (I) adolescentes obesos apresentaram menor variação de CPOS em um período de seguimento de 2,5 anos e (II) meninas obesas apresentaram maior risco de apresentar gengivite.

Palavras-chave: Cárie dentária. Gengivite. Obesidade. Sobrepeso.

ABSTRACT

ASSOCIATION BETWEEN OVERWEIGHT/OBESITY AND DENTAL DISORDERS AMONG SCHOOLCHILDREN FROM PORTO ALEGRE, RS

AUTHOR: Nicássia Cioquetta Lock
ADVISOR: Luana Severo Alves

The present dissertation is composed of two manuscripts whose objectives are to analyze the association between overweight/obesity and changes in dental caries index (Article I) and to study the association between overweight/obesity and the prevalence of gingivitis (Article II) among schoolchildren from Porto Alegre, RS. The study is linked to an epidemiological survey conducted to assess the oral health conditions of schoolchildren from Porto Alegre, RS. At baseline, between 2009 and 2010, 1,528 schoolchildren were examined. After a mean follow-up period of 2.5 years, between 2012 and 2013, a longitudinal component was incorporated to the cross-sectional study and 801 students were reexamined. Data collection included the application of questionnaires, the recording of anthropometric measures (height and weight) and clinical examination, according to the following systematics: recording of the gingival bleeding index, professional cleaning, drying and recording of the dental caries index (non-cavitated and cavitated, inactive and active lesions). The primary outcome of Article I was Δ DMFS index, defined as the difference between the final and the basal DMFS. The primary outcome of Article II was prevalence of gingivitis, defined on the basis of the mean/median (52% of bleeding sites). Based on height and weight data, the BMI(body mass index)-for-age Z-score was calculated and the students were classified as normal, overweight, or obese according to cut-off points proposed by the World Health Organization. In both manuscripts, weight status was considered the main predictor variable. Preliminary analyses were performed to compare the outcomes according to categories of predictor variables using the Wald test. The association between predictor variables and Δ DMFS and prevalence of gingivitis was evaluated using negative binomial and Poisson regression models, respectively (unadjusted and adjusted). An adjusted polynomial model was designed to explore the association between BMI-for-age Z-score and Δ DMFS. In Article I, obese schoolchildren presented significantly lower Δ DMFS than did normal weight subjects (0.42 versus 0.86, $p < 0.05$). In the risk assessment analysis, we found a numerical tendency of lower risk of Δ DMFS among obese individuals compared to normal weight ones, but statistical significance was not reached. The polynomial model showed a significant nonlinear relationship (inverted U shape) between the BMI-for-age Z-score and Δ DMFS. In Article II, it was observed that obese girls were at higher risk of having gingivitis (Adjusted Prevalence Ratio = 1.20, 95% CI = 1.09-1.31, $p < 0.001$). This association was not observed among boys. This study concluded that (I) obese adolescents had lower Δ DMFS over a period of 2.5 years, and (II) obese girls had a higher risk of presenting gingivitis.

Keywords: Dental caries. Gingivitis. Obesity. Overweight.

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1 INTRODUÇÃO

Segundo a Organização Mundial de Saúde (OMS), sobrepeso/obesidade é definido como uma condição anormal ou excessiva acumulação de gordura no tecido adiposo, afetando a saúde geral do indivíduo (OMS, 2000). A obesidade aumenta o risco de diversas doenças crônicas como doença cardiovascular, hipertensão, diabetes, acidente vascular cerebral, entre outras. Assim, a obesidade pode ser um fator de risco comum entre estas doenças que afetam a saúde sistêmica do indivíduo e as doenças orais incluindo doença periodontal e cárie (SHEIHAM; WATT, 2000). Além de acelerar o desenvolvimento dentário e diminuir o desempenho mastigatório, a principal consequência em longo prazo da obesidade infantil é a sua persistência na idade adulta, com todos os riscos de saúde associados. Portanto, o estabelecimento de hábitos saudáveis na infância é um importante fator para a prevenção da doença na vida adulta (ELANGOVAN; MUNGARA; JOSEPH, 2012; OMS, 2000).

No Brasil, o sobrepeso/obesidade em crianças e adolescentes tem aumentado nas últimas décadas. De acordo com o Instituto Brasileiro de Geografia e Estatística (IBGE), 31,2% das crianças na idade de 12 a 13 anos e 21,6% daquelas na idade de 14 a 15 anos estavam nesta condição em 2008 e 2009 (BRASIL, 2010). A região sul foi a que apresentou os maiores índices de sobrepeso/obesidade, com uma prevalência de 30,9% na população de 10 a 19 anos (BRASIL, 2010). Um estudo realizado na capital do Rio Grande do Sul, com uma amostra representativa da população de escolares de 12 anos encontrou uma prevalência de obesidade de 13,61%, enquanto 22,15% dos escolares avaliados apresentaram sobrepeso (ALVES et al., 2013).

A cárie é uma doença crônica de etiologia multifatorial e ocasiona a destruição localizada dos tecidos dentários duros por subprodutos da fermentação bacteriana de carboidratos da dieta (SELWITZ; ISMAIL; PITTS, 2007). A dieta desempenha um papel importante na ocorrência da obesidade e a elevada ingestão de açúcares e refrigerantes podem contribuir para o desenvolvimento desta condição em crianças e adolescentes e, simultaneamente, levar à ocorrência da cárie dentária (SILVA et al., 2013). Outro fator que parece estar envolvido nesta associação é a composição salivar. Crianças obesas apresentam diminuição do fluxo salivar devido ao déficit de proteínas na alimentação, devido à dieta composta por carboidratos e muitas comidas altamente industrializadas, e poucos alimentos ricos em proteínas (HONNE et al., 2012; PANNUNZIO et al., 2010).

Diversos estudos transversais investigando a associação entre sobrepeso/obesidade e a prevalência de cárie dentária em crianças e adolescentes mostraram resultados inconsistentes.

Enquanto a maioria dos estudos mostrou uma falta de associação entre obesidade e cárie dentária (ALVES et al., 2013; FARSI; ELKHODARY, 2016; KOTTAYI et al., 2016; SILVA et al., 2013), alguns autores encontraram uma associação direta (ALM et al., 2011; WILLERSHAUSEN et al., 2007; YAO et al., 2014) e outros encontraram uma relação inversa (FERNÁNDEZ et al., 2017; KOPYCKA-KEDZIERAWSKI et al., 2008; NARKSAWAT;TONMUKAYAKUL;BOONTHUM, 2009).

No que concerne à associação entre obesidade e incidência de cárie dentária, a revisão sistemática de estudos longitudinais publicada por Li et al. (2015a) mostrou que a evidência é conflitante e parece inconclusiva. A maioria dos estudos incluídos analisou o efeito do peso ao nascer sobre a ocorrência de cárie na dentição decídua, focando especialmente na associação entre desnutrição e cárie. Alguns poucos estudos com amostras de conveniência de tamanho reduzido foram conduzidos em indivíduos com dentição permanente. Existem apenas dois estudos longitudinais que investigaram a associação entre obesidade e cárie em adolescentes (BASHA et al., 2017; LI et al., 2017). Basha et al. (2017) observaram que adolescentes indianos de 13 anos com sobrepeso ou obesos tinham um risco aumentado de 3,7 vezes para o desenvolvimento de cárie dentária ao longo de 3 anos. Por outro lado, Li et al. (2017) não encontraram relação entre obesidade aos 12 anos e cárie aos 15 anos em uma amostra de 282 adolescentes de Hong Kong.

A gengivite é uma doença inflamatória, de natureza infecciosa, causada pelo acúmulo de placa na superfície dos dentes. A progressão da gengivite para periodontite é dependente do desequilíbrio entre a defesa do hospedeiro e a carga bacteriana e virulência; uma alteração nesta relação induzida por condições sistêmicas pode exacerbar a progressão da doença periodontal (GENCO; BORGNAKKE, 2013). A obesidade pode influenciar nos vasos sanguíneos periodontais e o excesso de tecido adiposo desregula a resposta imunológica, pois causa um desequilíbrio nos mediadores levando à destruição de tecido periodontal (PRESHAW; TAYLOR, 2011). Por esses motivos, uma possível associação entre obesidade e doenças periodontais têm sido investigada por alguns autores.

Uma recente revisão sistemática realizada por Li et al. (2015b) demonstrou que a obesidade está associada com alguns sinais de doença periodontal em crianças e adolescentes. No que concerne à associação entre obesidade e gengivite, os dados disponíveis na literatura são escassos. Existe apenas um estudo de base populacional avaliando esta associação (NASCIMENTO et al., 2013). Nesse estudo, conduzido com crianças entre 8 e 12 anos, a obesidade não se mostrou associada à ocorrência de gengivite. Esse estudo, além de incluir crianças com dentição mista, utilizou um protocolo de registro parcial, examinando apenas

alguns grupos de dentes. Não há estudos de base populacional utilizando exame completo realizados na idade de 12 anos, a qual é uma idade índice preconizada pela OMS, avaliando a associação entre obesidade e gengivite na dentição permanente.

Assim, considerando os contextos expostos, no presente trabalho serão apresentados dois artigos científicos. O primeiro deles, intitulado **“Association between obesity and dental caries among schoolchildren from South Brazil: a longitudinal study”**, visou avaliar a associação entre sobrepeso/obesidade e a variação do índice de cárie dentária. O segundo artigo é intitulado **“Sex differences in the association between obesity and gingivitis among 12-year-old South Brazilian schoolchildren”** e objetiva investigar a associação entre sobrepeso/obesidade e a prevalência de gengivite.

2 ARTIGO I - ASSOCIATION BETWEEN OBESITY AND DENTAL CARIES AMONG SCHOOLCHILDREN FROM SOUTH BRAZIL: A LONGITUDINAL STUDY

Este artigo será submetido ao periódico *Community Dentistry and Oral Epidemiology*, ISSN: 1600-0528, Fator de impacto = 2.302; Qualis A1. As normas para publicação estão descritas no Anexo D.

**Association between obesity and dental caries among schoolchildren from South Brazil:
a longitudinal study**

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ABSTRACT

Objective: To assess the association between weight status at 12 years and Δ DMFS among schoolchildren from South Brazil after a 2.5-year period.

Methods: A total of 801 schoolchildren attending 42 public and private schools were examined at baseline (12 years of age) and after 2.5 years (SD=0.3). Data collection included a structured questionnaire on socio-demographic information and oral hygiene habits, the recording of anthropometric measures (height and weight) and caries examination (non-cavitated and cavitated, inactive and active caries lesions). The primary outcome was Δ DMFS, defined as the difference between follow-up and baseline DMFS. Weight status based on BMI (Body Mass Index)-for-age Z-score was considered the main predictor variable. Preliminary analysis used the Wald test. The association between predictor variables and Δ DMFS used negative binomial regression models (unadjusted and adjusted). Rate ratios and their 95% confidence intervals were estimated. A multivariable fractional polynomial model was used to further explore the relationship between obesity and dental caries.

Results: Obese adolescents had significantly lower Δ DMFS than normal weight ones (0.42 versus 0.86, respectively, $p < 0.05$). In the risk assessment analysis, a numerical trend of lower risk for Δ DMFS among obese individuals compared with normal weight ones was observed, but no statistical significance was reached. The multivariable fractional polynomial model showed an inverted U shaped relationship with a decreasing DMFS with increasing BMI.

Conclusion: This population-based longitudinal study showed that obese adolescents had lower Δ DMFS over a 2.5-year follow-up period than normal weight individuals.

KEYWORDS

Dental caries, epidemiology, obesity, longitudinal study.

Introduction

Obesity is a highly prevalent chronic disease that affects children as well as adults in developing and developed countries. According to recent reports from the World Health Organization (WHO), over 340 million children and adolescents aged 5-19 were overweight or obese in 2016.¹ The prevalence of excessive body weight among 5-19-year-olds has risen dramatically from 4% in 1975 to approximately 18% in 2016.¹ National data from Brazil showed that 31.2% of children aged 12-13 years were overweight or obese in 2008-2009.² Obese children are more likely to become obese adults, which highlights the importance of establishing healthy habits in childhood in order to prevent several diseases that have been associated with obesity, including diabetes and cardiovascular disease.³ Poor dietary habits with the consumption of high-sugar food and soft drinks may contribute to the development of dental caries among children and adolescents, in addition to playing an important role in obesity.⁴

Studies investigating the association between overweight/obesity and dental caries in children and adolescents have shown inconsistent results. Whereas most cross-sectional studies have shown a lack of association between obesity and dental caries^{5,4,6,7}, a direct⁸⁻¹⁰ and even an inverse association have been reported.¹¹⁻¹³ Regarding the impact of obesity on the incidence of dental caries, a systematic review of longitudinal studies by¹⁴ showed conflicting evidence. Most studies analyzed the effect of birth weight on caries incidence,¹⁵⁻²³ commonly focusing on the association between malnutrition and caries.²⁴⁻²⁶ To the best of our knowledge, only two longitudinal studies investigated the association between obesity and caries in adolescents.^{27,28} Basha et al.²⁷ observed that overweight or obese 13-year-old adolescents from India had a 3.7-fold increased risk for developing dental caries over 3 years. On the other hand, Li et al.²⁸ found no significant association between obesity at 12 years of age and caries after 3 years among a sample of 282 adolescents from Hong Kong.

Considering the need for further longitudinal evidence on the association between overweight/obesity and dental caries among adolescents in different populations worldwide, the aim of this study was to assess the association between weight status at 12 years and Δ DMFS at 14-15 years among schoolchildren from South Brazil.

Methods

Sample

The sampling strategy is detailed elsewhere.²⁹ In brief, a probabilistic sample of the population of 12-year-old schoolchildren from Porto Alegre, South Brazil was drawn. The

primary sampling unit consisted of five geographical areas organized according to the municipal water fluoridation system. Within each area, the schools were randomly selected proportional to the number of public and private schools (42 schools: 33 public and 9 private). Schoolchildren born in 1997 or 1998 were then randomly selected proportional to school size. The following parameters were used for the sample calculation: caries prevalence of 60%,³⁰ precision level of $\pm 3\%$, design effect of 1.3, and a nonresponse rate of 40%. A final sample size of 1,528 12-year-old schoolchildren was included and examined. Following a mean period of 2.5 years (SD=0.3), 801 out of 1,528 (52.4%) schoolchildren (mean age=14.8, SD=0.5) were re-examined, as shown in Figure 1.

Data collection

Baseline data collection was carried out from September 2009 to December 2010. A structured questionnaire containing questions on socio-demographic information and oral hygiene habits was sent to the parents/legal guardians of the selected students. Each schoolchild answered another questionnaire on dietary habits, including the frequency of consumption of soft drinks.

Anthropometric measures were taken to assess adolescents' weight status. A 150 kg digital scale was used for weight recording. Initially, two readings were made. When a difference >0.3 kg was observed, a third assessment was taken. The mean of the two closest measurements was used to calculate the body mass index (BMI). Height was measured to the nearest full centimeter using an inelastic metric tape attached to a flat wall with no footer. Anthropometric measures were collected by a single researcher (NDT) with the students wearing light clothes and no shoes.

Clinical examination was conducted at the schools, with the students in a supine position, using artificial light, air compressor, and suction. After tooth cleaning and drying, a single calibrated examiner (LSA) recorded the presence of non-cavitated and cavitated, inactive and active caries lesions.³¹ Missing or filled teeth were also recorded.

Follow-up examinations were performed between August 2012 and May 2013 by another calibrated examiner (CDB), who was trained and calibrated by the first examiner (LSA). Schoolchildren were reexamined at the schools, following the same protocol previously described. The same questionnaires applied at baseline were answered at the follow-up visit.

Reproducibility

Training and calibration for dental caries examination were performed before the beginning of the study. During the survey, calibration was monitored by means of repeated examinations conducted on 5% of the sample. The lowest intra-examiner unweighted Cohen's kappa value observed were 0.80 (LSA) and 0.81 (CDB). The inter-examiner unweighted Cohen's kappa value was 0.78.

Data analysis

The primary outcome of this study was Δ DMFS, defined as the difference between follow-up and baseline DMFS. DMFS was calculated as the sum of decayed, missing, or filled surfaces. The decayed component included active non-cavitated caries lesions and cavitated ones.

BMI-for-age Z-scores were calculated using specific software (AnthroPlus, WHO, Geneva, Switzerland). BMI-for-age Z-score is a measure of the standard deviation (SD) away from standardized mean BMI. The sample was categorized using cutoffs recommended by the WHO,³² as follows: normal weight (BMI-for-age Z-score $\leq +1$ SD), overweight (BMI-for-age Z-score $> +1$ SD to $\leq +2$ SD), and obese (BMI-for-age Z-score $> +2$ SD).

Socioeconomic status was assessed according to the standard Brazilian economic classification,³³ which takes into account the educational level of the head of the family and the purchase power of the family. It classifies families into low (≤ 13 points), mid-low (≥ 14 to ≤ 22 points), mid-high (≥ 23 to ≤ 28 points) and high (≥ 29 points) socioeconomic status. For analytical purposes, socioeconomic status was dichotomized into high/mid-high and low/mid-low. Schoolchildren were classified as daily consumers of soft drinks when they reported daily consumption at both baseline and follow-up questionnaires. Brushing frequency collected at follow-up was categorized into 1 time/day, 2 times/day, or 3 times/day.

Data analysis was performed using STATA (Stata 14.2 for Windows; Stata Corporation, College Station, TX, USA). Baseline characteristics of followed individuals and those lost to follow-up were compared using the chi-square test and the Wald test. A weight variable considering the inverse probability of participation at follow-up according to sex and socioeconomic status was used in statistical analysis. Preliminary analysis was performed to compare Δ DMFS according to predictor variables using the Wald test. The association between predictor variables and Δ DMFS was assessed using negative binomial regression models (unadjusted and adjusted). Rate ratios and their 95% confidence intervals were estimated. Negative Δ DMFS were converted to zero to allow risk assessment analysis. Weight status was considered the main predictor variable. Sex, socioeconomic status, school, soft drinks consumption, and brushing frequency were included in the adjusted model due to

their possible association with dental caries. The chosen level of statistical significance was 5%.

A multivariable fractional polynomial model was used to further explore the relationship between obesity and dental caries. An algorithm that selected the linear regression model that best predicted Δ DMFS was used to select polynomial transformations of independent variables. BMI-for-age Z-scores, sex, socioeconomic status, school, soft drinks consumption, and brushing frequency were entered in the multivariable linear regression model. The fractional polynomial fitting algorithm converged after 2 cycles and the BMI-for-age Z-scores were transformed using the powers 1 and 2, indicating a non-linear relationship with Δ DMFS.

Ethical aspects

The study protocol was approved by the Federal University of Rio Grande do Sul Research Ethics Committee (299/08) and by the Municipal Health Department of Porto Alegre Research Ethics Committee (process number 001.049155.08.3/register number 288 and process n° 001.028618.12.2/register n° 807). All participants and their parents/legal guardians provided written informed consent.

Results

Table 1 shows a comparison of baseline characteristics of followed individuals and those lost to follow-up. There were a significantly higher proportion of public school attendees among participants than among those lost to follow-up. No significant differences were observed for sex, socioeconomic status, soft drinks consumption, brushing frequency or weight status. In regards to baseline caries experience, individuals lost to follow-up had significantly higher caries prevalence and mean DMFS at baseline than those followed-up.

Of the 801 schoolchildren who participated in the follow-up examination, 370 (46.2%) were caries free and 431 (53.8%) had previous caries experience at the baseline examination. Among individuals who were caries free at baseline, 91 had caries lesions at follow-up (incidence rate=24.6%, 95%CI=20.2-29.0). Among those with previous caries experience, 215 experienced new caries lesions (progression rate=49.6%, 95%CI=44.9-54.4).

Table 2 shows the frequency distribution of the sample and Δ DMFS by predictor variables. The Δ DMFS was significantly different between categories of school, brushing frequency, and weight status. Schoolchildren attending public schools and those reporting a brushing frequency ≤ 1 time/day showed a higher Δ DMFS than their counterparts from private

schools and those reporting a brushing frequency of 2 times/day, respectively. Regarding weight status, obese adolescents showed a significantly lower Δ DMFS than normal weight ones (0.42 versus 0.86, respectively).

The association between predictor variables and Δ DMFS is shown in Table 3. In the unadjusted analysis, a borderline association was found between weight status and Δ DMFS, with obese adolescents presenting a 30% lower risk for Δ DMFS than normal weight ones (IRR=0.70; 95% CI=0.47-1.03, p=0.06). A numerical trend of lower risk for Δ DMFS among obese individuals was also observed in the adjusted model, but no statistical significance was reached. School and brushing frequency were significantly associated with Δ DMFS in the adjusted model.

The multivariable fractional polynomial model showed a significant non-linear relationship between BMI-for-age Z-scores and Δ DMFS after adjusting for sex, socioeconomic status, school, soft drinks consumption, and brushing frequency. Figure 2 presents the predicted Δ DMFS according to BMI-for-age Z-scores showing an inverted U shaped relationship with a decreasing Δ DMFS with increasing BMI.

Discussion

This population-based longitudinal study assessed the association between obesity and changes in caries experience among South Brazilian adolescents over 2.5 years. In our main analysis, this association did not reach statistical significance; however, an exploratory analysis found an inverse relationship between Δ DMFS and BMI. To the best of our knowledge, this is the first longitudinal study assessing the relationship between obesity and dental caries in adolescents from developing countries.

Limitations of our study include reduced participation rate and lack of dietary information. Of the original sample, 801 out of 1,528 (52.4%) were reexamined after 2.5 years; 566 schoolchildren had moved to another school. Schoolchildren lost to follow-up had a significantly higher caries experience at baseline than those followed-up (2.42 vs. 2.06, p=0.04). To mitigate the impact of non-response, a weight variable taking into consideration the probability of participation was used to adjust the estimates. With regards to dietary habits, no data was collected which could help to explain the relationship between obesity and caries. Conversely, strengths of this study include its longitudinal design, the follow-up period of 2.5 years, and the high intra- and inter-examiner reproducibility.

No significant associations were observed between Δ DMFS over a 2.5-year period and BMI categories. Only two previous studies have investigated the association between obesity

and caries in adolescents using a longitudinal design. Li et al.²⁸ investigated the association between obesity and dental caries among 12-year-old adolescents from Hong Kong. Two rounds of follow-up were performed when the participants were aged 15 and 18 years. The authors found no relationship between obesity and dental caries at 15 years, which is in agreement with our finding. In contrast, the study by Basha et al.²⁷ found that obese and overweight Indian adolescents were at a higher risk for developing caries in a 3-year follow-up.

Systematic reviews^{34, 35, 14} showed that the association between obesity and caries is very inconsistent in the literature. Hooley et al.³⁴ suggested that this relationship might be nonlinear or even inverse in certain populations. In this regard, Kopycka-Kedzierawski et al.¹¹ examined the relationship between obesity and dental caries using data from 2,777 12-18-year-old U.S. adolescents that had participated in the NHANES III (1988-1994). After adjusting for important factors, it was found that being overweight was associated with decreased caries risk (OR=0.5, 95%CI=0.3-0.9, p=0.02). Corroborating these findings, Narksawat et al.¹² showed that normal weight Thai adolescents were more likely to had a DMFT \geq 1 than overweight/obese individuals (OR=1.94, 95%CI=1.25-3.00, p=0.004). A recent study by Fernández et al.¹³ conducted in Brazil that evaluated 1,210 schoolchildren aged 8 to 12 years, found lower dental caries in obese and overweight children. In order to further explore these issues, and owing to fact that a trend towards lower DFMS was observed with increasing BMI categories, an exploratory analysis using BMI-for-age Z-scores as a continuous variable was carried out. A non-linear relationship was observed and polynomial transformations of the BMI-for-age Z-scores were used. After adjusting for possible confounders, we found an inverse U-shaped relationship between BMI and Δ DMFS with obese schoolchildren having lower Δ DMFS than normal weight children. This finding contradicts our initial hypothesis that obesity could be associated with a high caries risk due to the increased consumption of sugar. We could speculate that the excessive body weight observed in our population may be related to a high consumption of fat instead of sugar in the Southern Brazil. According to national data evaluating nutrient consumption, the caloric participation of lipids in the Southern Brazilian region is higher than the national mean.³⁶ A possible protective effect of fat against dental caries has been previously suggested in the literature.^{37,38} This lower caries risk among obese individuals is in accordance with the cross-sectional survey that gave rise to the present study.⁵ In that study including a population-based representative sample of 1,528 12-year-old schoolchildren from South Brazil, a

numerical trend of lower caries experience with increasing weight status was observed (DMFT of 1.46, 1.30, and 1.19 for normal weight, overweight, and obese children).⁵

In conclusion, this population-based longitudinal study showed that obese adolescents showed lower Δ DMFS over a 2.5-year follow-up period than normal weight ones.

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Table 1

Table 1. Baseline characteristics of individuals according to participation at the follow up.

	Present sample (n = 801)		Lost to follow-up (n = 727)		p [†]
	N	%	n	%	
Socio-demographics					
Sex					
Female	387	48.3	371	51.0	0.29
Male	414	51.7	356	49.0	
Socioeconomic status					
High/Mid-high	258	32.2	241	33.1	0.70
Mid-low/Low	543	67.8	486	66.9	
School					
Private	117	14.6	144	19.8	0.01
Public	684	85.4	583	80.2	
Behavioral characteristics					
Soft drinks consumption*					
Non-daily	574	71.7	505	69.6	0.37
Daily	227	28.3	221	30.4	
Brushing frequency					
≤ 1 time/day	177	22.1	164	22.6	0.70
2 times/day	349	43.6	328	45.1	
≥ 3 times/day	275	34.3	235	32.3	
Weight status					
Normal	515	64.3	471	64.8	0.64
Overweight	182	22.7	153	21.0	
Obese	104	13.0	103	14.2	
Caries experience					
Prevalence	%	95% CI	%	95% CI	p ^{††}
	53.8	50.3-57.3	59.7	56.1-63.3	0.02
Extent (DMFS)	Mean	95% CI	Mean	95% CI	p ^{††}
	2.06	1.83-2.29	2.42	2.17-2.67	0.04

*Missing data. † Chi-square test. †† Wald test.
CI = Confidence Interval.

Table 2

Table 2. Sample distribution and Δ DMFS by predictor variables (n=801).

	n (%)	Δ DMFS	
		Mean	95% CI
Socio-demographics			
Sex			
Female	387 (48.3)	0.89 ^a	0.65- 1.12
Male	414 (51.7)	0.74 ^a	0.53- 0.96
Socioeconomic status			
High/Mid-high	258 (32.2)	0.63 ^a	0.39- 0.87
Mid-low/Low	543 (67.8)	0.90 ^a	0.70- 1.11
School			
Private	117 (14.6)	0.38 ^a	0.03- 0.74
Public	684 (85.4)	0.89 ^b	0.71- 1.07
Behavioral characteristics			
Soft drinks consumption*			
Non-daily	647 (80.8)	0.88 ^a	0.70-1.06
Daily	154 (19.2)	0.54 ^a	0.17- 0.90
Brushing frequency			
≤ 1 time/day	101 (12.8)	1.30 ^a	0.74- 1.86
2 times/day	338 (42.9)	0.65 ^b	0.42- 0.87
≥3 times/day	350 (44.4)	0.77 ^{ab}	0.53- 1.00
Weight status			
Normal	515 (64.3)	0.86 ^a	0.65- 1.07
Overweight	182 (22.7)	0.91 ^{ab}	0.59- 1.23
Obese	104 (13.0)	0.42 ^b	0.03- 0.80
Total	801 (100)	0.81	0.65- 0.97

CI = Confidence interval.

Different letters indicate a statistically significant difference between categories using Wald test ($P < 0.05$). * Schoolchildren reporting daily consumption at baseline and follow-up questionnaires.

Table 3

Table 3. Association between predictor variables and Δ DMFS (unadjusted and adjusted Negative binomial regression analysis, n=801).

	Unadjusted		Adjusted	
	IRR (95% CI)	p	IRR (95% CI)	P
Socio-demographics				
Sex				
Female	1.00		1.00	
Male	0.92 (0.72-1.17)	0.48	0.93 (0.73- 1.18)	0.55
Socioeconomic status				
High/Mid-high	1.00		1.00	
Mid-low/Low	1.37 (1.06-1.78)	0.01	1.26 (0.96- 1.67)	0.09
School				
Private	1.00		1.00	
Public	1.59 (1.10- 2.30)	0.01	1.47 (1.03- 2.10)	0.03
Behavioral characteristics				
Soft drinks consumption*				
Non-daily	1.00		1.00	
Daily	0.87 (0.64- 1.19)	0.38	0.99 (0.72- 1.35)	0.94
Brushing frequency				
≤ 1 time/day	1.00		1.00	
2 times/day	0.58 (0.41- 0.81)	<0.001	0.60 (0.43- 0.84)	<0.001
≥3 times/day	0.66 (0.47- 0.92)	0.01	0.67 (0.49- 0.94)	0.01
Weight status				
Normal	1.00		1.00	
Overweight	0.97 (0.72- 1.29)	0.82	0.98 (0.73- 1.31)	0.90
Obese	0.70 (0.47- 1.03)	0.06	0.77 (0.51- 1.16)	0.21

CI = Confidence interval; IRR = Incidence Risk Ratio.

*Schoolchildren reporting daily consumption at baseline and follow-up questionnaires.

Figure 1

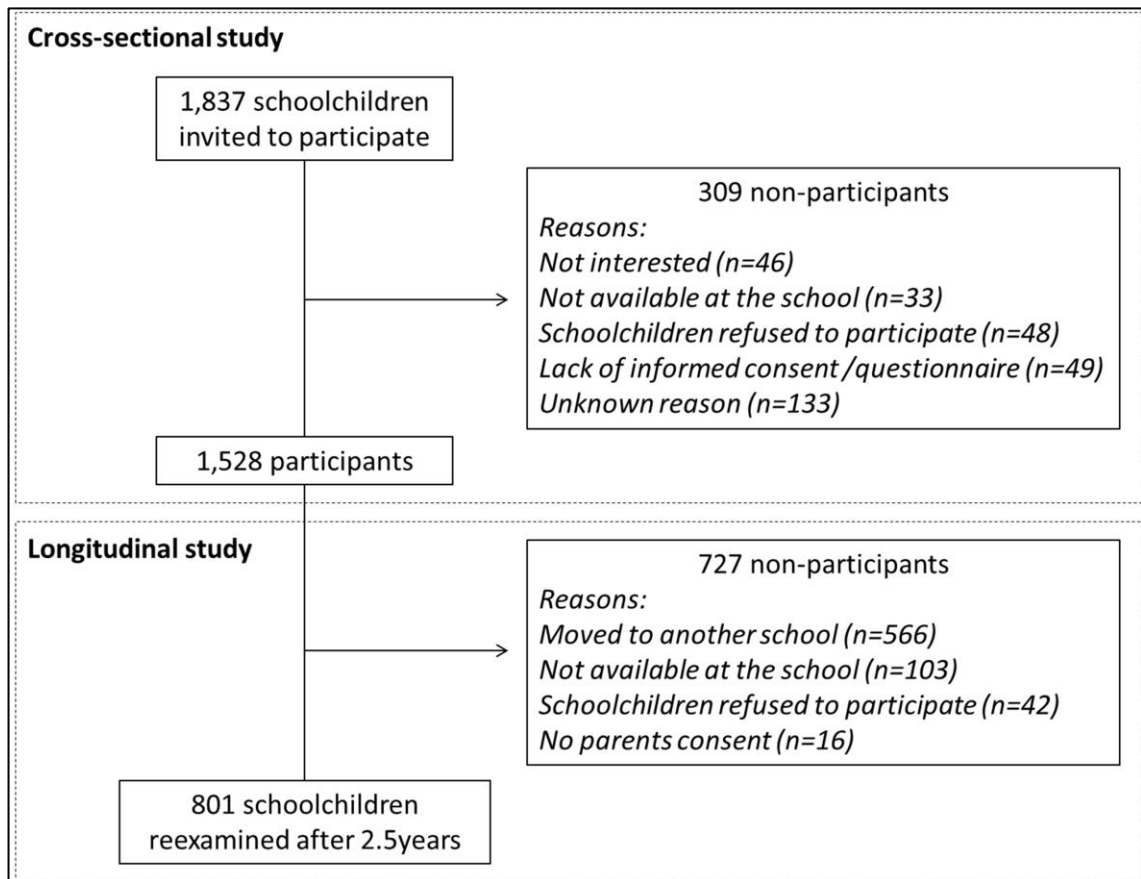


Figure 1. Flowchart of the study.

Figure 2

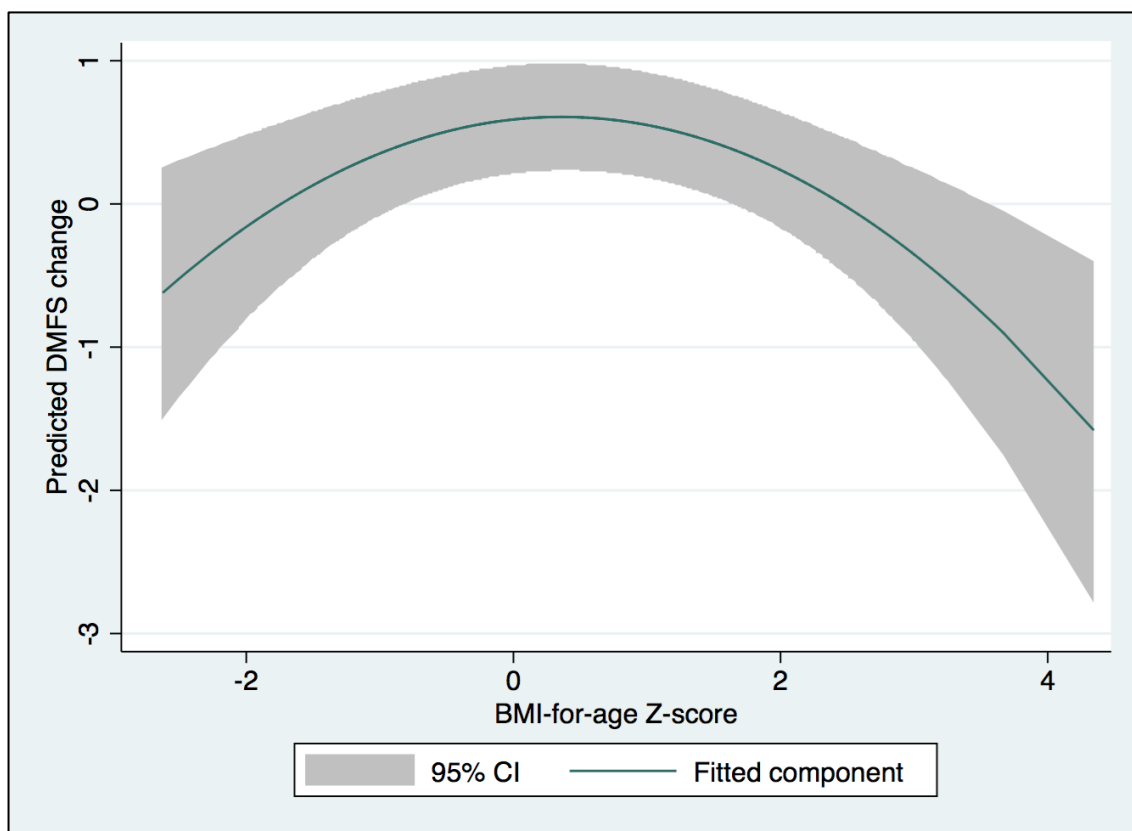


Figure 2. Predicted Δ DMFS according to BMI-for-age Z-score adjusted for sex, socioeconomic status, school, soft drinks consumption and brushing frequency

3 ARTIGO II - SEX DIFFERENCES IN THE ASSOCIATION BETWEEN OBESITY AND GINGIVITIS AMONG 12-YEAR-OLD SOUTH BRAZILIAN SCHOOLCHILDREN

Este artigo será submetido ao periódico *Journal of Periodontology*, ISSN: 0022-3492, Fator de impacto = 2.844; Qualis A1. As normas para publicação estão descritas no Anexo E.

Sex differences in the association between obesity and gingivitis among 12-year-old South Brazilian schoolchildren

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Running title: Association between obesity and gingivitis in South Brazil

Summary: Obese girls had an increased prevalence for gingivitis in comparison with normal weight girls.

ABSTRACT

Background: Data on the association between obesity and gingivitis in children and adolescents are scarce in the literature.

Objective: To assess the association between weight status and gingivitis in a representative sample of 12-years-old schoolchildren from South Brazil.

Methods: A cross-sectional study was conducted in Porto Alegre, South Brazil, from September 2009 to December 2010 and included a representative sample of 1,528 12-year-old schoolchildren who were attending public and private schools. Data collection included the application of a questionnaire, recording of anthropometric measures (weight and height) and clinical examination (gingival bleeding index, recorded in four sites per tooth). The outcome of the study was prevalence of gingivitis, defined as the proportion of schoolchildren presenting $\geq 52\%$ of bleeding sites (based on the mean=median). Weight status was categorized as normal, overweight, or obese, and were considered the main predictor variable. The association between predictor variables and gingivitis prevalence was assessed using Poisson regression models. Unadjusted and adjusted prevalence ratios (PR) and their 95% confidence intervals (95% CI) were estimated.

Results: Gingivitis prevalence was 48.7% (95%IC=33.8-63.6) and, on average, schoolchildren presented 51.8% (95%IC=46.2-57.5) of bleeding sites. Obese individuals had 13% higher prevalence for presenting gingivitis than did normal weight ones (PR=1.13, 95%CI=1.08-1.17, $p < 0.001$). The stratified analysis showed that this association was sex-specific: obese girls presented a greater chance of having gingivitis (adjusted PR=1.20, 95%CI=1.09-1.31, $p < 0.001$), but such association was not observed among boys (PR=1.06, 95%CI=0.95-1.19, $p = 0.28$).

Conclusions: This study showed sex differences in the association between obesity and gingivitis among 12-year-old South Brazilian schoolchildren.

Keywords: Gingivitis, prevalence, obesity, cross-sectional study, epidemiology

Introduction

According to the World Health Organization (WHO), overweight and obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, affecting the overall health of the individual.¹ Obesity increases the risk of many chronic diseases such as hypertension, diabetes, stroke, cancer, cardiovascular disease, among others. The obesity epidemic, firstly observed in high-income countries, has spread to developing countries in the last decades. In Brazil, 31.2% of children aged 12-13 years were considered overweight or obese in 2008-2009; southern Brazil having the highest prevalence rates.²

Dental plaque-induced gingival diseases are inflammatory diseases caused by dental biofilms, and its most prevalent form is gingivitis. Whereas classic studies have shown that gingivitis inevitably develops following prolonged biofilm accumulation, recent studies have explored heterogeneity in the clinical manifestation and individual susceptibility.³ Systemic factors, medications, and nutrition have long been known to affect gingival health.⁴ Recent meta-analyses have shown that obese individuals have higher likelihood of having periodontitis than nonobese individuals,^{5,6} and that obese individuals have a 35% increased risk for having new incidence of periodontitis compared to normal weight individuals.⁷ It is still unclear the biological mechanisms that could explain an association between obesity and periodontal diseases; however, impaired immune response and increased risk of infection have been associated with obesity.^{8,9}

A recent systematic review by Li et al.¹⁰ found that obesity was significantly associated with several periodontal parameters, including dental plaque, bleeding on probing, and probing depth in children and adolescents. Only one population-based study evaluated the association between obesity and gingivitis in children.¹¹ In this cross-sectional survey that included 1,211 8-12-year-old Brazilian schoolchildren, obesity was associated with the occurrence of gingivitis among boys, but not girls. A partial recording protocol was used and deciduous and permanent teeth were examined. To the best of our knowledge, no population-based study evaluating the association between obesity and gingivitis in the permanent dentition using a full-mouth examination protocol has been reported.

The aim of this study was to assess the association between weight status and gingivitis in a representative sample of 12-years-old schoolchildren from South Brazil.

Methods

Sample

This cross-sectional study was conducted in southern Brazil, from September 2009 to December 2010 with schoolchildren aged 12 years old who were attending public and private schools. The study protocol was approved by the Federal University of Rio Grande do Sul Research Ethics Committee (299/08) and by the Municipal Health Department of Porto Alegre Research Ethics Committee (process n° 001.049155.08.3/register n° 288). All participants and their parents/legal guardians provided written informed consent.

In order to select a representative sample of schoolchildren, a multistage probability sampling strategy was used. The primary sampling unit consisted of five geographical areas organized according to the municipal water fluoridation system. Within each area, the schools were randomly selected proportional to the number of private and public schools (42 schools: 33 public and 9 private). Schoolchildren born in 1997 or 1998 were then randomly selected proportional to school size. The following parameters were used for the sample calculation: caries prevalence of 60%¹² with a precision level of $\pm 3\%$ for the 95% confidence interval and to assume a design effect of 1.3. The minimum sample size required for this study was 1,331 schoolchildren. A nonresponse error of 40% was added, and a final sample size of 1,837 was estimated. A total of 1,528 schoolchildren were examined, as shown in Figure 1.

Data collection

Data collection included the application of a questionnaire, recording of anthropometric measures and clinical examination. A structured questionnaire containing questions on socio-demographic information and oral health related habits was sent to the parents/legal guardians of the selected students.

Anthropometric measures were taken by a single researcher (NDT) with the students wearing light clothing and no shoes. Participants were weighed using a 150 kg digital scale, and two readings were made. A third assessment was taken if a difference >0.3 kg was observed between measurements. The mean of the two closest measurements was used to calculate BMI (body mass index). Height was measured to the nearest full centimeter using inelastic metric tape attached to a flat wall with no footer.

Clinical examination was conducted at the schools, with the students in a supine position, using artificial light, air compressor, and suction. A sterile clinical mirror and a millimeter periodontal probe were used. A trained examiner (NDT) recorded the gingival bleeding index¹³ in four sites per tooth (buccal, lingual, mesial, and distal) of all erupted permanent teeth. The examiner was trained by a periodontist.

Non-response analysis

Detailed information on non-response analysis can be found elsewhere.¹⁴ In brief, response rates of 77.4% (261/337) and 84.5% (1,267/1,500) were found for private and public schools, respectively. A total of 176 parents/legal guardians of the non-respondents provided information on the reason for non-participation: 26% reported no interest due to previous access to dental care, 27% of schoolchildren refused to participate, 24% did not return the informed consent or questionnaire, and 4% showed concern about biosecurity or refused to answer socioeconomic questions. Nineteen percent of students were not available at school during the normal survey schedule.

A sample of 80 non-respondents provided demographic and socioeconomic data and was compared with participants (chi-square and Fisher exact test). No significant differences were observed with regards to sex ($p=0.31$), race ($p=0.13$) and school type ($p=0.70$). In regards to socioeconomic status, non-respondents were of higher socioeconomic status than participants ($p<0.001$). Given this discrepancy between the study participants and non-respondents, a weighted variable based on information provided by the Primary Education School Census of 2010¹⁵ was used in the statistical analysis to minimize non-response bias.

Data analysis

Prevalence of gingivitis was defined as the percentage of individuals presenting $\geq 52\%$ of bleeding sites, based on the mean=median of bleeding sites. Extent of gingivitis was defined as the proportion of bleeding sites.

BMI-for-age Z-scores were calculated using specific software (AnthroPlus, WHO, Geneva, Switzerland). BMI-for-age Z-score is a measure of the standard deviation (SD) away from standardized mean BMI. It is considered one of the most appropriate measures of weight in children and adolescents because it accounts for the wide, natural variation in growth. Using cutoffs recommended by the WHO,¹⁶ the sample was categorized as follows: normal weight (BMI-for-age Z-score $\leq +1$ SD), overweight (BMI-for-age Z-score $> +1$ SD to $\leq +2$ SD), and obese (BMI-for-age Z-score $> +2$ SD).

Socioeconomic status was assessed according to the standard Brazilian economic classification,¹⁷ and families were classified as low (≤ 13 points), mid-low (≥ 14 to ≤ 22 points), mid-high (≥ 23 to ≤ 28 points) and high (≥ 29 points) socioeconomic status. Mother's education was dichotomized as ≤ 8 years and > 8 years. Brushing frequency was categorized into 1 time/day, 2 times/day, or 3 times/day. Last dental visit was categorized into ≤ 1 year or > 1 year.

Data analysis was performed using STATA (Stata 14.2 for Windows; Stata Corporation, College Station, TX, USA) and using survey commands that take into account the survey design, including clustering, weighing and robust variance estimation. A weight variable based on the probability of selection and population distribution according to sex, school type and city area was used to adjust for the potential bias in the population estimates, as previously described.¹⁴ Preliminary analysis comparing gingivitis prevalence and extent by categories of predictor variables was performed using the Wald test. The level of statistical significance was 5%.

The association between predictor variables and gingivitis prevalence was assessed using Poisson regression models. Unadjusted and adjusted prevalence ratios (PR) and their 95% confidence intervals (95% CI) were estimated. Weight status was considered the main predictor variable, being included and maintained in the adjusted model irrespective of its p-value. Socio-demographic characteristics and oral health related habits were included in the adjusted model as controlling variables. An additional analysis stratified by sex was performed to assess the association between weight status and gingivitis prevalence among females and males.

Results

Overall, 35.5% of schoolchildren had excessive body weight, and 13.6% were considered obese. Sample distribution according to weight status is presented in Table 1. No significant differences were observed in regards to sex, school, tooth brushing, and last dental visit ($p>0.05$). The proportion of obese individuals increased as mother's education and socioeconomic status increased ($p<0.05$).

Gingivitis prevalence and extent by predictor variables are described in Table 2. Gingivitis prevalence was 48.7% (95%CI=33.8-63.6) and, on average, schoolchildren presented 51.8% (95%CI=46.2-57.5) sites with bleeding. Girls had a significantly higher prevalence of gingivitis than boys. Public school attendees, schoolchildren of lower socioeconomic status, with less educated mothers, reporting a lower brushing frequency and those who visited the dentist more than one year ago showed significantly higher prevalence and extent of gingivitis. No significant differences in gingivitis experience were observed among weight status categories.

Table 3 shows the association between predictor variables and gingivitis prevalence. All variables were significantly associated with gingivitis prevalence in the unadjusted models, with the exception of weight status. Notwithstanding, in the adjusted model, weight

status appeared as a significant predictor of gingivitis prevalence. Obese individuals had 13% higher prevalence for presenting gingivitis than did normal weight ones (PR=1.13, 95% CI=1.08-1.17).

Table 4 presents the association between weight status and gingivitis prevalence stratified by sex. Obese girls presented a greater chance of having gingivitis (adjusted PR=1.20, 95% CI=1.09-1.31), whereas no association was not observed among boys.

Discussion

This population-based cross-sectional study assessed the relationship between weight status and gingivitis prevalence among 12-year-old schoolchildren from South Brazil. Our main finding was that obese girls had an increased prevalence for gingivitis than did normal weight ones, but such association was not found among boys. To the best of our knowledge, there is no population-based study evaluating the association between obesity and gingivitis in the permanent dentition using a full-mouth examination protocol in South Brazil.

The present study found that obese schoolchildren had 13% higher prevalence for presenting gingivitis than did normal weight individuals (PR=1.13, 95%CI=1.08-1.17, $p<0.001$). An additional analysis stratified by sex showed that this association was sex-specific: obese girls presented a greater chance of having gingivitis (adjusted PR=1.20, 95%CI=1.09-1.31, $p<0.001$), but such association was not observed among boys (PR=1.06, 95%CI=0.95-1.19, $p=0.28$). This increased prevalence for gingivitis among obese girls may be explained by hormonal issues related to puberty, which is, in some extent, influenced by adiposity. Puberty is characterized by sexual maturation in which physical and behavioral changes occur in the human being resulting from the increase of sex hormones. The major sex hormones that exert influence over the periodontium are estrogen and progesterone, making girls more likely to suffer the “periodontal consequences” of puberty than boys. An endocrine systemic imbalance may have an impact on the periodontal pathogenesis and vice versa, so that periodontal changes may be associated with variations in the levels of these hormones.^{18,19} Furthermore, it is well known that the onset of puberty occurs earlier in girls than in boys.²⁰ Some authors have shown that the precocious puberty observed in girls may be related to high BMI because adiposity leads to earlier activation of the sex hormones.^{21,22} In conjunction, all these evidences allow us to speculate that a possible synergistic effect of obesity and puberty on the periodontium could manifest among 12-year-old girls, but not among 12-year-old boys. This finding is in disagreement with the study by Nascimento et al.,¹¹ who investigated the association between weight status and gingival inflammation

among 8-12-year-old schoolchildren from South Brazil. The authors found no association between obesity and gingivitis when the whole sample was analyzed; however, a significant association was found among boys, with overweight/obese boys showing 22% higher prevalence for gingivitis than normal weight ones. Although the authors justify this findings based on issues related to oral hygiene, estimates were adjusted for visible plaque accumulation. In addition, this study has some limitations, such as the adoption of a partial recording protocol to assess the presence of gingival bleeding. Only contra-lateral incisors and first molars were examined, which notably may compromise the assessment of periodontal diseases.²³ The use of inflation factors designed to adjust the estimates for the introduced bias²³ could allow a more meaningful comparison with ours and others full-mouth surveys.

This study has some limitations that need to be addressed. The cross sectional design prevents the establishment of causal and temporal relationship between weight status and gingivitis. In regards to data collection, the lack of data on dental plaque accumulation may also be seen as a limitation of our study. Among the strengths of our study, we could emphasize the full-mouth examination protocol to assess the occurrence of gingivitis, and the fact that all clinical examinations were performed by a single examiner, which improves examination reliability.

In conclusion, this population-based longitudinal study found sex differences in the association between obesity and gingivitis prevalence among 12-year-old schoolchildren from South Brazil. A significant increased prevalence was found among girls, with no association among boys.

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Figure

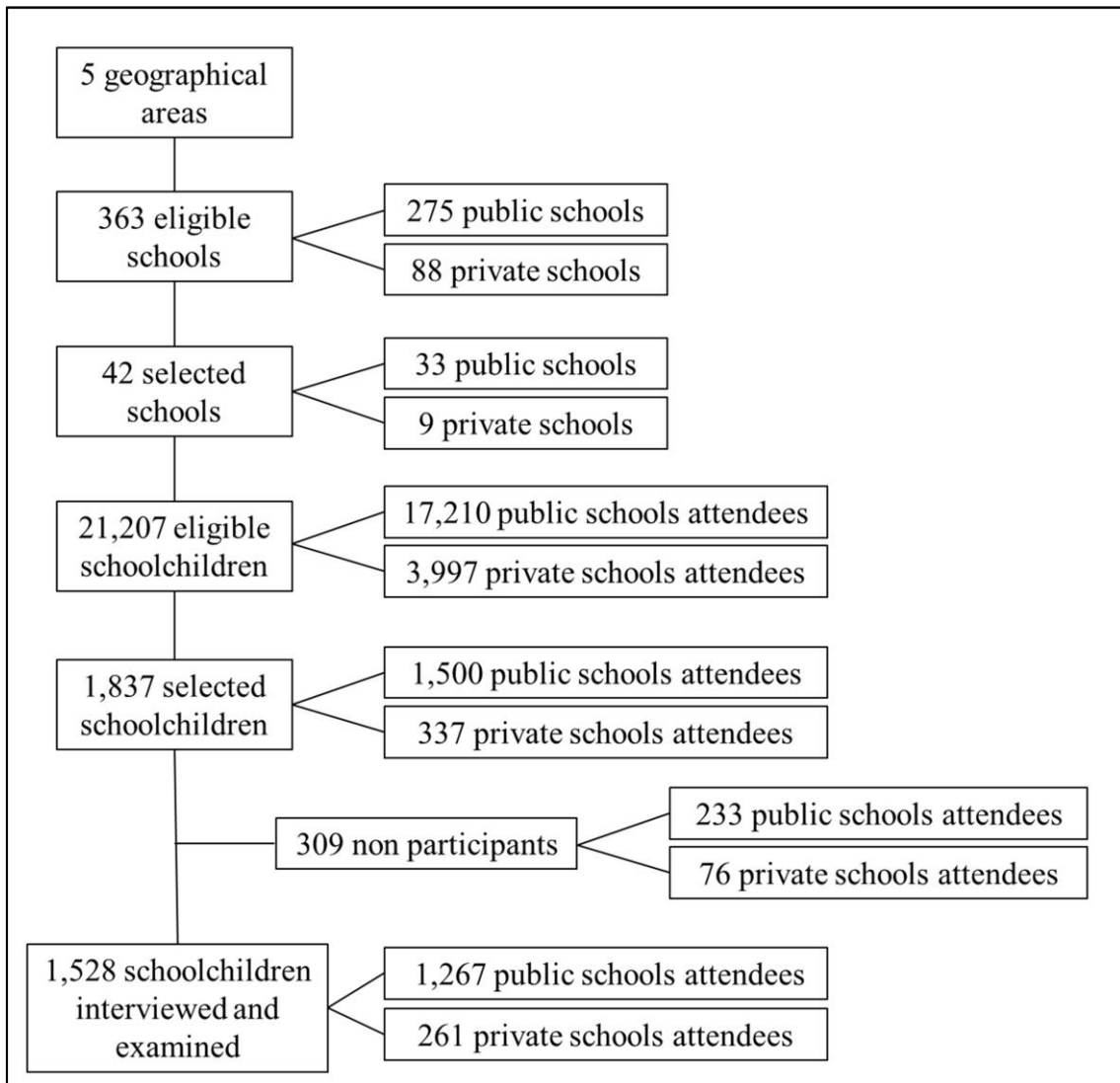


Figure 1. Flowchart of the study.

Table 1

Table 1. Sample distribution according to weight status.

	Normal	Overweight	Obese	Total	p*
	N (%)	N (%)	N (%)	N	
Sex					
Female	490 (64.7)	177 (23.3)	91 (12.0)	758	0.13
Male	496 (64.4)	158 (20.5)	116 (15.1)	770	
School					
Private	154 (59.0)	64 (24.5)	43 (16.5)	261	0.11
Public	832 (65.7)	271 (21.4)	164 (12.9)	1,267	
Socioeconomic status					
High	85 (60.3)	31 (22.0)	25 (17.7)	141	<0.001
Mid-high	205 (57.3)	95 (26.5)	58 (16.2)	358	
Mid-low	574 (65.9)	183 (21.0)	114 (13.1)	871	
Low	122 (77.2)	26 (16.5)	10 (6.3)	158	
Mother's education					
> 8 years	447 (61.0)	179 (24.4)	106 (14.5)	732	0,02
≤ 8 years	536 (67.9)	153 (19.4)	100 (12.7)	789	
Tooth brushing					
≤ 1 time/day	225 (66.0)	76 (22.3)	40 (11.7)	341	0.73
2 times/day	427 (63.1)	153 (22.6)	97 (14.3)	677	
≥3 times/day	337 (65.5)	106 (20.8)	70 (13.7)	510	
Last dental visit					
≤ 1 year	533 (63.1)	193 (22.9)	118 (14.0)	844	0.45
> 1 year	453 (66.2)	142 (20.8)	89 (13.0)	684	
TOTAL	986 (64.5)	335 (21.9)	207 (13.6)	1,528	

* Chi-square test.

Table 2

Table 2. Gingivitis prevalence and extent by predictor variables.

	Gingivitis prevalence		Gingivitis extent	
	%	95% CI	Mean	95% CI
Sex				
Female	51.5 ^a	36.8-66.1	53.0 ^a	46.9-59.1
Male	46.0 ^b	30.5-61.5	50.7 ^a	45.3-56.1
School				
Private	28.5 ^a	11.0-46.0	44.1 ^a	36.3-51.9
Public	54.4 ^b	40.6-68.1	54.0 ^b	49.5-58.5
Socioeconomic status				
High	32.0 ^a	15.6-48.5	44.0 ^a	35.6-52.3
Mid-high	37.6 ^a	26.1-49.2	47.9 ^a	43.5-52.4
Mid-low	54.2 ^b	43.4-65.1	54.2 ^b	50.5-57.9
Low	65.8 ^b	48.5-83.2	58.0 ^c	53.6-62.3
Mother's education				
> 8 years	39.9 ^b	27.5-52.3	48.3 ^a	42.6-54.1
≤ 8 years	58.2 ^a	43.5-72.9	55.6 ^b	51.5-59.8
Tooth brushing				
≤ 1 time/day	63.8 ^a	55.0-72.7	57.3 ^a	53.6-60.9
2 times/day	48.2 ^b	31.3-65.1	52.0 ^b	46.5-57.4
≥ 3 times/day	39.9 ^c	25.7-54.2	48.3 ^c	41.4-55.2
Last dental visit				
≤ 1 year	42.0 ^a	28.5-55.4	49.3 ^a	43.7-54.9
> 1 year	57.7 ^b	41.7-73.8	55.3 ^b	50.3-60.3
Weight status				
Normal	49.2 ^a	33.6-64.8	52.3 ^a	46.3-58.2
Overweight	45.5 ^a	30.8-60.2	50.8 ^a	44.6-57.0
Obese	51.5 ^a	38.3-64.8	51.5 ^a	47.6-55.4
TOTAL	48.7	33.8-63.6	51.8	46.2-57.5

CI = confidence interval.

Different letters indicate a statistically significant difference between categories using Wald test ($p < 0.05$).

Table 3

Table 3. Association between predictor variables and gingivitis prevalence (unadjusted and adjusted Poisson regression analysis).

	Unadjusted			Adjusted		
	PR	95% CI	p	PR	95% CI	p
Sex						
Female	1.00			1.00		
Male	0.89	0.83-0.96	0.001	0.85	0.78-0.91	<0.001
School						
Private	1.00			1.00		
Public	1.91	1.31-2.77	0.001	1.51	1.06-2.15	0.02
Socioeconomic status						
High	1.00			1.00		
Mid-high	1.17	0.95-1.45	0.12	0.94	0.86-1.03	0.17
Mid-low	1.69	1.31-2.20	<0.001	1.10	0.94-1.28	0.22
Low	2.06	1.45-2.92	<0.001	1.21	0.97-1.50	0.09
Mother's education						
> 8 years	1.00			1.00		
≤ 8 years	1.46	1.23-1.72	<0.001	1.12	1.00-1.25	0.05
Tooth brushing						
≤ 1 time/day	1.00			1.00		
2 times/day	0.75	0.64-0.89	0.001	0.87	0.76-1.00	0.07
≥3 times/day	0.63	0.52-0.75	<0.001	0.72	0.64-0.81	<0.001
Last dental visit						
≤ 1 year	1.00			1.00		
> 1 year	1.38	1.17-1.62	<0.001	1.15	1.02-1.29	0.02
Weight status						
Normal	1.00			1.00		
Overweight	0.92	0.85-1.00	0.06	0.96	0.87-1.07	0.51
Obese	1.05	0.97-1.13	0.22	1.13	1.08-1.17	<0.001

PR = prevalence ratio; CI = confidence interval.

Table 4

Table 4. Association between weight status and gingivitis prevalence stratified by sex (unadjusted and adjusted Poisson regression analysis).

	Unadjusted			Adjusted*		
	PR	95% CI	p	PR	95% CI	p
Female (n=758)						
Weight status						
Normal	1.00			1.00		
Overweight	0.94	0.83-1.07	0.37	1.00	0.86-1.17	0.98
Obese	1.18	1.05-1.31	0.01	1.20	1.09-1.31	<0.001
Male (n=770)						
Weight status						
Normal	1.00			1.00		
Overweight	0.90	0.79-1.00	0.07	0.92	0.82-1.04	0.19
Obese	0.96	0.83-1.10	0.54	1.06	0.95-1.19	0.28

PR = prevalence ratio; CI = confidence interval.

* Estimates are adjusted for school, socioeconomic status, mother's education, tooth brushing, and last dental visit.

4 DISCUSSÃO

As evidências sobre obesidade são relatadas desde a era Greco-romana, porém houve pouco progresso científico até o século XX. No século XIX foi publicado o primeiro livro sobre dieta, intitulado “Letter on Corpulence” de autoria de Sr. W. Banting (OMS, 2000).

Segundo a OMS, a obesidade infantil é considerada um problema de saúde pública do século XXI. Esse problema global vem aumentando no decorrer das décadas, e está afetando tanto países em desenvolvimento, quanto países desenvolvidos (POPKIN; DOAK, 1998). Entre 1975 e 2016, os dados mundiais sobre obesidade triplicaram, a prevalência de sobrepeso e obesidade entre crianças e adolescentes de 5 a 19 anos aumentou drasticamente de apenas 4% em 1975 para pouco mais de 18% em 2016 (OMS, 2017). Em 2016, mais de 340 milhões de crianças e adolescentes de 5 a 19 anos estavam com sobrepeso ou obesos (OMS, 2017).

É conhecido que a obesidade é um fator de risco comum para várias doenças sistêmicas crônicas, como diabetes, doenças cardiovasculares, câncer, entre outras. Mais recentemente, uma possível associação com doenças orais como a cárie dentária e as doenças periodontais tem sido investigada. Em vista disso, o objetivo deste estudo foi avaliar a associação entre obesidade e desfechos odontológicos. Ao avaliar a associação entre obesidade e cárie dentária em um estudo longitudinal (Artigo I), observou-se uma associação inversa, com maior alteração no índice CPOS entre adolescentes obesos comparativamente aos de peso normal. Em relação à associação entre obesidade e prevalência de gengivite (Artigo II), foi encontrada uma associação direta, porém sexo-específica: maior prevalência de gengivite entre meninas obesas. Essa associação não foi observada entre os meninos.

Uma possível relação inversa entre obesidade e cárie dentária já foi sugerida na literatura odontológica previamente. Na revisão sistemática de Hooley et al. (2011), os autores sugeriram que essa relação poderia ser não-linear ou mesmo inversa em certas populações. Nesse sentido, Kopycka-Kedzierawski et al. (2008) examinaram a relação entre obesidade e cárie dentária utilizando dados de 2.777 adolescentes americanos de 12 a 18 anos que participaram do NHANES III (1988-1994). Após o ajuste para importantes cofatores, verificou-se que o excesso de peso foi significativamente associado à redução do risco de cárie (OR = 0,5, IC 95% = 0,3-0,9, p = 0,02). Corroborando esses achados, Narksawat et al. (2009) mostraram que adolescentes tailandeses com peso normal eram mais propensos a ter um CPOD \geq 1 que indivíduos com sobrepeso/obesidade (OR = 1,94, IC 95% = 1,25-3,00, p = 0,004). Um estudo recente de Fernández et al. (2017), realizado no Brasil que avaliou 1210

escolares de 8 a 12 anos, encontrou menor experiência de cárie em crianças obesas e com sobrepeso. No presente estudo, observou-se menor variação do índice CPOS entre obesos do que entre escolares de peso normal (0,42 versus 0,86, respectivamente). Observou-se, ainda, na análise de risco, uma tendência de menor variação do CPOS com o aumento das categorias de IMC, corroborando os resultados do estudo transversal realizado anteriormente com a amostra que originou o presente trabalho (ALVES et al., 2013). Tendo em vista essa consistente tendência de menor risco entre os obesos, foi realizada uma análise exploratória utilizando os escores Z do IMC por idade como variável contínua. Observou-se uma relação não-linear, em forma de U invertido entre os escores Z do IMC por idade e a variação do índice CPOS, com escolares obesos apresentado menor variação do que os de peso normal. Esse achado contradiz nossa hipótese inicial de que a obesidade poderia estar associada a um risco aumentado de cárie dentária devido ao aumento do consumo de açúcar. Pode-se especular que a obesidade observada nesta população de adolescentes do Sul do Brasil possa estar relacionada com um consumo exagerado de gorduras, ao invés de açúcares. Um possível efeito protetor da gordura contra a cárie já foi sugerido na literatura (BRUDEVOLD; KASHKET; KENT, 1990; GIACAMAN; MUÑOZ-SANDOVAL, 2014).

O maior risco de gengivite entre as meninas obesas pode estar relacionado a questões hormonais típicas da puberdade. Esse período, caracterizado pela maturação sexual, mudanças físicas e comportamentais, se dá pelo aumento no nível de hormônios sexuais, como o estrógeno e a progesterona, e ocorre mais precocemente entre as meninas do que entre os meninos. Um desequilíbrio sistêmico endócrino pode ter um impacto na patogênese periodontal e, vice-versa, as alterações periodontais podem estar associadas a variações nos níveis desses hormônios (MARKOU et al., 2009; MASCARENHAS et al., 2003). Alguns autores mostraram que a obesidade contribui para a puberdade precoce observada nas meninas, em que a adiposidade leva à ativação precoce dos hormônios sexuais (BIRO; KIESS, 2016; LI et al., 2017). Desse modo, um possível efeito sinérgico da obesidade e da puberdade sobre o periodonto poderia se manifestar nas meninas de 12 anos e não nos meninos. Esse achado está em desacordo com os dados observados por Nascimento et al. (2013), que investigaram a associação entre estado do peso e inflamação gengival em escolares de 8 a 12 anos do sul do Brasil. Os autores encontraram uma associação positiva entre sobrepeso/obesidade e gengivite apenas entre os meninos. Embora os autores justifiquem essa associação com base em questões relativas à autocuidado e higiene, a análise de risco ajustou as estimativas para acúmulo de placa visível. Além disso, esse estudo

apresenta algumas limitações, como o fato de ter utilizado um protocolo de registro parcial para avaliar a presença de sangramento gengival.

5 CONCLUSÃO

Com base nos achados da presente dissertação, pode-se concluir que:

- A obesidade conferiu proteção contra a cárie dentária entre adolescentes do Sul do Brasil após um período de seguimento de 2,5 anos;
- A obesidade pode ser considerada um indicador de risco para gengivite entre meninas de 12 anos do Sul do Brasil.

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**ANEXO A – CARTA DE APROVAÇÃO DO COMITÊ DE ÉTICA EM PESQUISA
DA UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL (ESTUDO
TRANSVERSAL)**



Universidade Federal do Rio Grande do



Faculdade de Odontologia

COMITÊ DE ÉTICA EM PESQUISA

RESOLUÇÃO

O Comitê de Ética em Pesquisa e a Comissão de Pesquisas da Faculdade de Odontologia da Universidade Federal do Rio Grande do Sul analisaram o Projeto:

Número: 299/08

Título: ESTUDO DA PREVALÊNCIA DE CÁRIE DENTÁRIA, GENGIVITE E FLUOROSE DENTÁRIA EM ESCOLARES BRASILEIROS: EM 1998 E 2008.

Investigador(es) principal(ais): Professores Berenice Barbachan e Silva, Marisa Maltz, Cristiano Susin e CD. Luana Severo Alves.

O Projeto foi aprovado na reunião do dia 14/08/2008, Ata nº 08/08 do Comitê de Ética em Pesquisa e da Comissão de Pesquisas, da UFRGS, por estar adequado ética e metodologicamente de acordo com a Resolução 196/96 do Conselho Nacional de Saúde.

Porto Alegre, 15 de agosto de 2008.

Profª. Heloísa Emilia Dias da Silveira
Coordenadora do Comitê de Ética em Pesquisas

Profª. Deise Pozzoni
Coordenadora da Comissão de Pesquisas

**ANEXO B - CARTA DE APROVAÇÃO DO COMITÊ DE ÉTICA EM PESQUISA
DA PREFEITURA MUNICIPAL DE PORTO ALEGRE (ESTUDO
TRANSVERSAL)**



**Prefeitura Municipal de Porto Alegre
Secretaria Municipal de Saúde
Comitê de Ética em Pesquisa
PARECER CONSUBSTANCIADO**

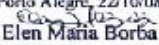
Pesquisador (a) Responsável: Mariza Maltz
Equipe executora:
Registro do CEP: 288 Processo Nº. 001.049155.08.3
Instituição onde será desenvolvido: Escolas municipais
Utilização: TCLE
Situação: APROVADO

O Comitê de Ética em Pesquisa da Secretaria Municipal de Saúde de Porto Alegre analisou o processo Nº.001.049155.08.3, referente ao projeto de pesquisa: "Estudo da prevalência de cárie dentária, gengivite e fluorose dentária em escolares de Porto Alegre, RS: em 1998 e 2009", tendo como pesquisador responsável Mariza Maltz cujo objetivo é "Geral: Estudar a prevalência de cárie dentária, gengivite e fluorose dentária em escolares de 12 anos do município de Porto Alegre, RS, 2008 e comparar os dados obtidos com dados coletados em 1998. Objetivos específicos: Verificar as condições atuais de saúde bucal de escolares de 12 anos regularmente matriculados em escolas públicas e particulares do município de Porto Alegre, RS; Avaliar a presença de modificações na prevalência de cárie dentária, gengivite e fluorose dentária na população estudada nos últimos dez anos; Avaliar a existência de associação entre variáveis demográficas, socioeconômicas e comportamentais e as doenças em estudo".

Assim, o projeto preenche os requisitos fundamentais das resoluções. O Comitê de Ética em Pesquisa segue os preceitos das resoluções CNS 196/96, 251/97 e 292/99, sobre as Diretrizes e Normas Regulamentadoras de Pesquisa Envolvendo Seres Humanos, do Conselho Nacional de Saúde / Conselho Nacional de Ética em Pesquisa / Agência nacional de Vigilância Sanitária. Em conformidade com os requisitos éticos, classificamos o presente protocolo como APROVADO.

O Comitê de Ética em Pesquisa, solicita que :

1. Enviar primeiro relatório parcial em seis meses a contar desta data;
2. Informar imediatamente relatório sobre qualquer evento adverso ocorrido;
3. Comunicar qualquer alteração no projeto e no TCLE;
4. Entregar junto com o relatório, todos os TCLE assinados pelos sujeitos de pesquisas e a apresentação do trabalho.
5. Após o término desta pesquisa, o pesquisador responsável deverá apresentar os resultados junto à equipe da unidade a qual fez a coleta de dados e/ou entrevista, inclusive para o Conselho Local da Unidade de Saúde.

Porto Alegre, 22/10/08

Elen Maria Borba
Coordenadora do CEP

**ANEXO C - CARTA DE APROVAÇÃO DO COMITÊ DE ÉTICA EM PESQUISA
DA PREFEITURA MUNICIPAL DE PORTO ALEGRE (ESTUDO
LONGITUDINAL)**



**Prefeitura Municipal de Porto Alegre
Secretaria Municipal de Saúde
Comitê de Ética em Pesquisa**

PARECER CONSUBSTANCIADO

Pesquisador (a) Responsável: Marisa Maltz

Registro no CEP: 807 Processo N°. 001.028618.12.2

Instituição onde será desenvolvido: 42 escolas do município de Porto Alegre (09 particulares e 33 públicas)

Utilização: TCLE

Situação: APROVADO

O Comitê de Ética em Pesquisa da Secretaria Municipal de Saúde de Porto Alegre analisou o processo N°.001.028618.12.2, referente ao projeto de pesquisa: **"Condições de saúde bucal e de adolescentes de Porto Alegre e fatores associados: estudo de coorte"**.

De acordo com os procedimentos internos estabelecidos nesta instituição, bem como as exigências das Resoluções do Conselho Nacional de Saúde n.ºs 196/96, 251/97 e 292/99, este Comitê de Ética em Pesquisa considera **APROVADO** o referido projeto, em sua Reunião Ordinária realizada em 14 de agosto de 2012.

O Comitê de Ética em Pesquisa solicita o atendimento aos itens abaixo:

1. Enviar primeiro relatório parcial em seis meses a contar desta data;
2. Informar imediatamente qualquer evento adverso ocorrido;
3. Comunicar qualquer alteração no projeto e no TCLE;
4. Entregar com o relatório final todos os TCLEs assinados pelos sujeitos de pesquisas, juntamente com o formulário disponível no site e CD com trabalho concluído;
5. Após o término desta pesquisa, o pesquisador responsável deverá apresentar os resultados junto à equipe da unidade a qual fez a coleta de dados e/ou entrevista, inclusive para o Conselho Local da Unidade de Saúde.

Porto Alegre, 14/08/2012.


Maria Mercedes Bendati
Coordenadora do CEP

ANEXO D – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO *COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY*

Author Guidelines

Content of Author Guidelines: 1. General, 2. Ethical Guidelines, 3. Submission of Manuscripts, 4. Manuscript Format and Structure, 5. After Acceptance

Relevant Documents: Colour Work Agreement Form

Useful Websites: Submission Site, Articles published in *Community Dentistry and Oral Epidemiology*, Author Services, Wiley Blackwell's Ethical Guidelines, Guidelines for Figure

1. GENERAL

The aim of *Community Dentistry and Oral Epidemiology* is to serve as a forum for scientifically based information in community dentistry, with the intention of continually expanding the knowledge base in the field. The scope is therefore broad, ranging from original studies in epidemiology, behavioural sciences related to dentistry, and health services research, through to methodological reports in program planning, implementation and evaluation. Reports dealing with people of any age group are welcome. The journal encourages manuscripts which present methodologically detailed scientific research findings from original data collection or analysis of existing databases. Preference is given to new findings. Confirmation of previous findings can be of value, but the journal seeks to avoid needless repetition. It also encourages thoughtful, provocative commentaries on subjects ranging from research methods to public policies. Purely descriptive reports are not encouraged, and neither are behavioural science reports with only marginal application to dentistry. Knowledge in any field advances only when research findings and policies are held up to critical scrutiny. To be consistent with that view, the journal encourages scientific debate on a wide range of subjects. Responses to research findings and views expressed in the journal are always welcome, whether in the form of a manuscript or a commentary. Prompt publication will be sought for these submissions. Book reviews and short reports from international conferences are also welcome, and publication of conference proceedings can be arranged with the publisher. Please read the instructions below carefully for details on the submission of manuscripts, and the journal's requirements and standards, as well as information on the procedure after acceptance of a manuscript for publication in *Community Dentistry and Oral Epidemiology*. Authors are encouraged to visit Wiley Blackwell Author Services for further information on the preparation and submission of articles and figures.

2. GUIDELINES FOR RESEARCH REPORTING *Community Dentistry and Oral Epidemiology* adheres to the ethical guidelines below for publication and research

2.1. Authorship and Acknowledgements **Authorship:** Authors submitting a manuscript do so on the understanding that the manuscript has been read and approved by all authors, and that all authors agree to the submission of the manuscript to the Journal. *Community Dentistry and Oral Epidemiology* adheres to the definition of authorship set up by the International Committee of Medical Journal Editors (ICMJE). According to the ICMJE criteria, authorship should be based on (1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content and (3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3. It is a requirement that all authors have been accredited as appropriate upon submission of the manuscript. Contributors who do not qualify as authors should be mentioned under Acknowledgments.

Acknowledgements: Under *acknowledgements*, please specify contributors to the article other than the authors accredited and all sources of financial support for the research.

2.2. Ethical Approvals

In all reports of original studies with humans, authors should specifically state the nature of the ethical review and clearance of the study protocol. Informed consent must be obtained from human participants in research studies. Some reports, such as those dealing with institutionalized children or mentally retarded persons, may need additional details of ethical clearance.

Research participants: research involving human participants will be published only if such research has been conducted in full accordance with ethical principles, including the World Medical

Association Declaration of Helsinki (version 2008) and the additional requirements (if any) of the country where the research has been carried out.

Manuscripts must be accompanied by a statement that the experiments were undertaken with the understanding and written consent of each participant and according to the above mentioned principles. All studies should include an explicit statement in the Methods section identifying the review and ethics committee approval for each study, if applicable. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used.

Ethics of investigation: Manuscripts not in agreement with the guidelines of the Helsinki Declaration (as revised in 1975) will not be accepted for publication.

Animal Studies: When experimental animals are used, the methods section must clearly indicate that adequate measures were taken to minimize pain or discomfort. Experiments should be carried out in accordance with the Guidelines laid down by the National Institute of Health (NIH) in the USA in respect of the care and use of animals for experimental procedures or with the European Communities Council Directive of 24 November 1986 (86/609/EEC) and in accordance with local laws and regulations.

2.3. Clinical Trials

Clinical trials should be reported using the CONSORT guidelines available at <http://www.consort-statement.org>. A CONSORT checklist should also be included in the submission material.

Community Dentistry and Oral Epidemiology encourages authors submitting manuscripts reporting from a clinical trial to register the trials in any of the following free, public clinical trials registries: www.clinicaltrials.gov, <http://clinicaltrials.ifpma.org/clinicaltrials>, <http://isrctn.org/>. The clinical trial registration number and name of the trial register will then be published with the manuscript.

2.4. Observational and Other Studies

Reports on observational studies such as cohort, case-control and cross-sectional studies should be consistent with guidelines such as STROBE. Meta-analysis for systematic reviews should be reported consistent with guidelines such as QUOROM or MOOSE. These guidelines can be accessed at www.equator-network.org. Authors of analytical studies are strongly encouraged to submit a Directed Acyclic Graph as a supplementary file for the reviewers and editors. This serves to outline the rationale for their modelling approach and to ensure that authors consider carefully the analyses that they conduct.

2.5. Appeal of Decision

The decision on a manuscript is final and cannot be appealed.

2.6. Permissions

If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the primary author's responsibility to obtain these in writing and provide copies to the Publishers.

Photographs of People

Community Dentistry and Oral Epidemiology follows current HIPAA guidelines for the protection of patient/participant privacy. If an individual pictured in a digital image or photograph can be identified, his or her permission is required to publish the image. The corresponding author may submit a letter signed by the patient authorizing the *Community Dentistry and Oral Epidemiology* to publish the image/photo. Alternatively, a form provided by *Community Dentistry and Oral Epidemiology* (available by clicking the "Instructions and Forms" link in Manuscript central) may be downloaded for your use. You can also download the form here. This approval must be received by the Editorial Office prior to final acceptance of the manuscript for publication. Otherwise, the image/photo must be altered such that the individual cannot be identified (black bars over eyes, etc.).

2.7. Copyright Assignment

If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to log into Author Services, where, via the Wiley Author Licensing Service (WALS), they will be able to complete the licence agreement on behalf of all authors on the paper.

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3.SUBMISSION OF MANUSCRIPTS

Manuscripts should be submitted electronically via the online submission site <http://mc.manuscriptcentral.com/cdoe>. The use of an online submission and peer review site enables immediate distribution of manuscripts and consequentially speeds up the review process. It also allows authors to track the status of their own manuscripts. *Community Dentistry and Oral Epidemiology* requires the submitting/corresponding author (only) to provide an ORCID iD when submitting their manuscript. If the author does not have an ORCID iD, an easy-to-use application to obtain one is available through the journal's ScholarOne system. Complete instructions for submitting a manuscript are available online and below. Further assistance can be obtained from the Editorial Assistant, Natalie Brown, n.brown@otago.ac.nz

Editorial Office:

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Editor

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3.1. Getting Started

•Launch your web browser (supported browsers include Internet Explorer 6 or higher, Netscape 7.0, 7.1, or 7.2, Safari 1.2.4, or Firefox 1.0.4 or higher) and go to the journal's online Submission Site: <http://mc.manuscriptcentral.com/cdoe>

•Log-in or click the 'Create Account' option if you are a first-time user •If you are creating a new account:- After clicking on 'Create Account', enter your name and e-mail information and click 'Next'. Your e-mail information is very important. - Enter your institution and address information as appropriate, and then click 'Next.' - Enter a user ID and password of your choice (we recommend using your e-mail address as your user ID), and then select your area of expertise. Click 'Finish'

•If you have an account but have forgotten your log-in details, go to Password Help on the journals online submission system <http://mc.manuscriptcentral.com/cdoe> and enter your e-mail address. The system will send you an automatic user ID and a new temporary password.

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3.2. Submitting Your Manuscript

- After you have logged in, click the 'Submit a Manuscript' link in the menu bar.
- Enter data and answer questions as appropriate. You may copy and paste directly from your manuscript and you may upload your pre-prepared covering letter.
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- You are required to upload your files.
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 - Select the designation of each file in the drop down next to the Browse button.
 - When you have selected all files you wish to upload, click the 'Upload Files' button.
- Review your submission (in HTML and PDF format) before sending to the Journal. Click the 'Submit' button when you are finished reviewing.

3.3. Manuscript Files Accepted

Manuscripts should be uploaded as Word (.doc or .docx) or Rich Text Format (.rtf) files (not write-protected), along with separate Figure files. For the latter, GIF, JPEG, PICT or Bitmap files are acceptable for submission, but only high- resolution TIF or EPS files are suitable for printing. Tables should be done in Word rather than in Excel. The files will be automatically converted to HTML and a PDF document on upload, and those will be used for the review process. The text file must contain the entire manuscript, including the title page, abstract, text, references, tables, and figure legends, but no embedded figures. Figure tags should be included in the file. Manuscripts should be formatted as described in the Author Guidelines below.

3.4. Suggest Two Reviewers

Community Dentistry and Oral Epidemiology attempts to keep the review process as short as possible to enable rapid publication of new scientific data. In order to facilitate this process, please suggest the names and current email addresses of two potential international reviewers whom you consider capable of reviewing your manuscript. Whether these are used is up to the Editor.

3.5. Suspension of Submission Mid-way in the Submission Process

You may suspend a submission at any phase before clicking the 'Submit' button and save it to submit later. The manuscript can then be located under 'Unsubmitted Manuscripts' and you can click on 'Continue Submission' to continue your submission when you choose to.

3.6. E-mail Confirmation of Submission

After submission, you will receive an email to confirm receipt of your manuscript. If you do not receive the confirmation email within 10 days, please check your email address carefully in the system. If the email address is correct, please contact your IT department. The error may be caused by some sort of spam filtering on your email server. Also, the emails should get through to you if your IT department adds our email server (uranus.scholarone.com) to their whitelist.

3.7. Review Procedure

All manuscripts (except invited reviews and some commentaries and conference proceedings) are submitted to an initial review by the Editor or Associate Editors. Manuscripts which are not considered relevant to oral epidemiology or the practice of community dentistry or are of interest to the readership of *Community Dentistry and Oral Epidemiology* will be rejected without review. Manuscripts presenting innovative, hypothesis-driven research with methodologically detailed scientific findings are favoured to move forward to peer review. All manuscripts accepted for peer review will be submitted to at least 2 reviewers for peer review, and comments from the reviewers and the editor will be returned to the corresponding author.

3.8. Manuscript Status

You can access ScholarOne Manuscripts (formerly known as Manuscript Central) any time to check your 'Author Centre' for the status of your manuscript. The Journal will inform you by e-mail once a decision has been made.

3.9. Submission of Revised Manuscripts

Revised manuscripts must be uploaded within two or three months of authors being notified of conditional acceptance pending satisfactory Minor or Major revision respectively. Locate your manuscript under 'Manuscripts with Decisions' and click on 'Submit a Revision' to submit your revised manuscript. Please remember to delete any previously-uploaded files when you upload your revised manuscript. Revised manuscripts must show changes to the text in either bold font, coloured font or highlighted text. Do NOT use track changes for this. Prepare and submit a separate "Response to reviewers" document, in which you address EACH of the points raised by the reviewers.

3.10. Conflict of Interest

Community Dentistry & Oral Epidemiology requires that sources of institutional, private and corporate financial support for the work within the manuscript must be fully acknowledged, and any potential grant holders should be listed. Acknowledgements should be brief and should include information concerning conflict of interest and sources of funding. It should not include thanks to anonymous referees and editors.

3.11. Editorial Board Submissions

Manuscripts authored or co-authored by the Editor-in-Chief or by members of the Editorial Board are evaluated using the same criteria determined for all other submitted manuscripts. The process is handled confidentially and measures are taken to avoid real or reasonably perceived conflicts of interest.

4. MANUSCRIPT FORMAT AND STRUCTURE

4.1. Word Limit and Page Charges

Articles should be limited to 3,700 words (including references) and 6 Tables or Figures; alternatively, 4,000 words and 5 Tables or Figures may be used. This equates to seven published pages, **and authors are strongly encouraged to stay within those limits.** The Methods and Results sections are usually where the word count can “blow out”, and authors are encouraged to consider submitting heavily detailed material for inclusion in a separate online Appendix to their article (at no cost). **Articles exceeding seven published pages are subject to a charge of USD 300 per additional page. One published page amounts approximately to 5,500 characters (including spaces) of text but does not include Figures and Tables.**

4.2. Format

Language: All submissions must be in English; both British and American spelling conventions are acceptable. Authors for whom English is a second language must have their manuscript professionally edited by an English speaking person before submission to make sure the English is of high quality. It is preferred that manuscript is professionally edited. A list of independent suppliers of editing services can be found at <http://wileyeditingservices.com/en/>. All services must be paid for and arranged by the author, and use of one of these services does not guarantee acceptance or preference for publication.

Font: All submissions must be 1.5 spaced using a standard 12 -point font size, and preferably in the Times Roman font.

Abbreviations, Symbols and Nomenclature: Authors can consult the following source: CBE Style Manual Committee. Scientific style and format: the CBE manual for authors, editors, and publishers. 6th ed. Cambridge: Cambridge University Press, 1994

4.3. Structure All manuscripts submitted to *Community Dentistry and Oral Epidemiology* should follow the structure guidelines below.

Title Page: the names and institutional affiliations of all authors of the manuscript should be included.

Abstract: All manuscripts submitted to *Community Dentistry and Oral Epidemiology* should use a structured abstract under the headings: Objectives – Methods – Results – Conclusions.

Main Text of Original Articles should include Introduction, Methods, Results and Discussion. Subheadings are not encouraged.

Introduction: should be focused, outlining the historical or logical origins of the study and not summarise the findings; exhaustive literature reviews are not appropriate. It should close with an explicit statement of the specific aims of the investigation.

Methods must contain sufficient detail such that, in combination with the references cited, all studies reported can be fully reproduced. As a condition of publication, authors are required to make materials and methods used freely available to other academic researchers for their own use.

Discussion: this may usually start with a brief summary of the major findings, but repetition of parts of the Abstract or of the Results sections should be avoided. The section should end with a brief conclusion and a comment on the potential clinical program or policy relevance of the findings. Statements and interpretation of the data should be appropriately supported by original references.

4.4. References

Authors are required to cite all necessary references for the research background, methods and issues discussed. Primary sources should be cited. Relevant references published in CDOE are expected to be among the cited literature.

The list of references begins on a fresh page in the manuscript. All references should be numbered consecutively in order of appearance and should be as complete as possible. In text citations should cite references in consecutive order using Arabic superscript numerals. Sample references follow:

Journal article:

1. King VM, Armstrong DM, Apps R, Trott JR. Numerical aspects of pontine, lateral reticular, and inferior olivary projections to two paravermal cortical zones of the cat cerebellum. *J Comp Neurol* 1998;390:537-551.

Book:

2. Voet D, Voet JG. *Biochemistry*. New York: John Wiley & Sons; 1990. 1223 p.

Please note that journal title abbreviations should conform to the practices of Chemical Abstracts.

For more information about AMA reference style - AMA Manual of Style

4.5. Tables, Figures and Figure Legends

Tables are part of the text and should be included, one per page, after the References. Please see our Guide to Tables and Figures for guidance on how to lay these out. All graphs, drawings, and photographs are considered figures and should be sequentially numbered with Arabic numerals. Each figure must be on a separate page and each must have a caption. All captions, with necessary references, should be typed together on a separate page and numbered clearly (Fig.1, Fig. 2, etc.).

Preparation of Electronic Figures for Publication: Although low-quality images are adequate for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit EPS (lineart) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented programmes. Scans (TIFF only) should have a resolution of 300 dpi (halftone) or 600 to 1200 dpi (line drawings) in relation to the reproduction size (see below). Please submit the data for figures in black and white or submit a colour work agreement form. EPS files should be saved with fonts embedded (and with a TIFF preview if possible). For scanned images, the scanning resolution (at final image size) should be as follows to ensure good reproduction: line art: >600 dpi; half-tones (including gel photographs): >300 dpi; figures containing both halftone and line images: >600 dpi

Further information can be obtained at Wiley Blackwell's guidelines for figures: <http://authorservices.wiley.com/bauthor/illustration.asp>.

Check your electronic artwork before submitting it: <http://authorservices.wiley.com/bauthor/eachecklist.asp>

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Figure Legends: All captions, with necessary references, should be typed together on a separate page and numbered clearly (Fig. 1, Fig. 2, etc.).

Special issues: Larger papers, monographs, and conference proceedings may be published as special issues of the journal. The full cost of these extra issues must be paid by the authors. Further information can be obtained from the editor or publisher.

ANEXO E – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO *JOURNAL OF PERIODONTOLOGY*

This update includes changes to the Review Articles section. The *Journal of Periodontology* publishes articles relevant to the science and practice of periodontics and related areas. Manuscripts are accepted for consideration with the understanding that text, figures, photographs, and tables have not appeared in any other publication, except as an abstract prepared and published in conjunction with a presentation by the author(s) at a scientific meeting, and that material has been submitted only to this journal. The *Journal of Periodontology* accepts manuscript submissions online at ScholarOne Manuscripts. To start a new submission, enter the Author Center and click "Click here to submit a new manuscript." Details regarding each submission step are located at the top of the page in ScholarOne Manuscripts. Authors should prepare manuscripts in accordance with the instructions below. Failure to do so may result in delays or manuscript unsubmission.

MANUSCRIPT CATEGORIES AND SPECIFIC FORMATS

Submissions to the *Journal of Periodontology* should be limited to one of the categories defined below. Specific information regarding length and format is provided for each category. Please also refer to the instructions provided under General Format and Style. All manuscripts will be reviewed by the Editors for novelty, potential to extend knowledge, and relevance to clinicians and researchers in the field. Some manuscripts will be returned without review, based on the Editors' judgment of the appropriateness of the manuscript for the *Journal of Periodontology*.

ORIGINAL ARTICLES

These are papers that report significant clinical or basic research on the pathogenesis, diagnosis, and treatment of the different forms of periodontal disease. Papers dealing with design, testing, and other features of dental implants are also included.

Format

Original articles must be limited to 4,000 words (excluding the abstract, references, and figure legends). The reference list should not exceed 50 references, and the total combined number of figures and tables must be six or fewer. Multi-panel figures are acceptable.

Abstract

All original articles should be submitted with a structured abstract, consisting of no more than 250 words and the following four paragraphs:

- **Background:** Describes the problem being addressed.
- **Methods:** Describes how the study was performed.
- **Results:** Describes the primary results.
- **Conclusion(s):** Reports what authors have concluded from these results, and notes their clinical implications.

Introduction: The Introduction contains a concise review of the subject area and the rationale for the study. More detailed comparisons to previous work and conclusions of the study should appear in the Discussion section.

Materials and Method: This section lists the methods used in the study in sufficient detail so that other investigators would be able to reproduce the research. When established methods are used, the author need only refer to previously published reports; however, the authors should provide brief descriptions of methods that are not well known or that have been modified. Identify all drugs and chemicals used, including both generic and, if necessary, proprietary names and doses. The populations for research involving humans should be clearly defined and enrollment dates provided.

Results: Results should be presented in a logical sequence with reference to tables, figures, and supplemental material as appropriate.

Discussion: New and possible important findings of the study should be emphasized, as well as any conclusions that can be drawn. The Discussion should compare the present data to previous findings. Limitations of the experimental methods should be indicated, as should implications for future research. New hypotheses and clinical recommendations are appropriate and should be clearly identified. Recommendations, particularly clinical ones, may be included when appropriate.

Publication of Accepted Original Articles

Please note that accepted manuscripts which are classified by the Editors as "Discovery Science" will be placed on an accelerated schedule for **online-only publication**. See [Online-Only Publication](#) below.

REVIEW ARTICLES

The JOP is no longer accepting submissions of reviews. **Authors may be invited to submit reviews for potential publication, but unsolicited reviews will no longer be accepted.**

COMMENTARIES

The purpose of these papers is to provide a forum for discussion of controversies and other issues as they relate to the practice of periodontics and implant dentistry. Full and balanced discussion of controversies on important issues is encouraged. This may result in several authors each presenting a relevant viewpoint. Commentaries should be concise (2,000 to 3,000 words) with no more than 50 references; however, they should be complete and balanced, which may require that the issue or controversy addressed be highly focused.

Introduction: This section should clearly state the clinical question or issues to be discussed and document their importance and timeliness.

Body: The body should present the information supporting all aspects of the issues. This portion of the Commentary may be subdivided as appropriate with headings. Figures, tables, and other illustrative materials may be incorporated. The total combined number of figures and tables should not exceed six.

Summary: The summary should place the issue in perspective and point a way for future directions in addressing the controversy.

Acknowledgment(s): Since these papers allow authors to express their opinions on a subject, it is extremely important that authors disclose any and all affiliations, financial position, or any other information that constitutes a real or perceived conflict of interest.

CASE SERIES

The *Journal of Periodontology* no longer publishes Case Reports. Authors are encouraged to submit Case Reports to *Clinical Advances in Periodontics*. The *Journal of Periodontology* publishes selected Case Series that describe unusual case presentations, complex diagnoses, and novel approaches to treatment within the scope of practice of periodontology. These Case Series provide valuable information for clinicians and teachers in the field. Case Series report a sufficient number of consecutive or randomized cases to make a persuasive argument for or against the procedure, technique, or concept under discussion. Cases should be relatively homogeneous so that a systematic evaluation of one type of disease, lesion, or condition is made for the procedure under consideration. Also, treatment and documentation should be consistent and standardized for all cases. It is recognized that definitive evidence for the safety and efficacy of any procedure, drug, or device comes primarily from well-designed, randomized, controlled trials. However, well-executed Case Series may lead to hypotheses about the usefulness of new and innovative procedures, drugs, or devices and may therefore be of value to the progress of clinical science. The requirements for patient consent, privacy, and institutional approval are well defined for manuscripts describing research on human subjects. These basic requirements are described by the International Committee of Medical Journal Editors (ICMJE) in their Uniform Requirements for Manuscripts Submitted to Biomedical Journals (available at: www.icmje.org) and are interpreted in the instructions to authors of all peer-reviewed biomedical journals, including the *Journal of Periodontology*. Due to the changing ethical and legal environment around the use of patient information, the editorial team has received multiple questions about the need for subject consent from patients described in Case Series submitted for publication. The following applies to most Case Series. It should be noted that the Editors will determine whether specific Case Series require additional approvals beyond what is described below.

Requirement for Ethics Board Approval

Most Case Series are a retrospective description of clinical findings in cases or an observed course of events that document a new aspect of patient management during the normal course of clinical treatment. Since there is no hypothesis testing, no systematic data collection beyond that which is part of routine clinical practice, no data analysis, and the work has already been done, Case Series do not

usually qualify as "research" requiring approval from ethical boards designed to protect humans involved in clinical research.

(U.S. Fed. definition: "RESEARCH is any systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.")

Example 1: Series of private practice implant cases in patients who have been taking bisphosphonates. Authors describe the findings in each case, which are collected and reported in a table format.

Example 2: Authors collect series of private practice implant cases in patients who have or have not been taking bisphosphonates. The sample size is sufficient for data analysis, and authors analyze and report the incidence of complications.

Example 1 does not qualify as "research," but example 2 does qualify and requires ethical approval.

Please see "[Does My Case Series Need IRB Approval?](#)" for more information.

Privacy in Case Series

No patient identifiers should be included in Case Series. If the authors choose to include any subject identifiers, the authors must include the patient's informed written consent to publish the information.

Our policy conforms to the Uniform Requirements, which states: "Patients have a right to privacy that should not be violated without informed consent. Identifying information, including names, initials, or hospital numbers, should not be published in written descriptions, photographs, or pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives written informed consent for publication. Informed consent for this purpose requires that an identifiable patient be shown the manuscript to be published. Authors should disclose to these patients whether any potential identifiable material might be available via the Internet as well as in print after publication."

It should be noted that patients may have given a signed "consent to treat," but that does not constitute permission to publish their case with personal identifiers unless they have explicitly approved the manuscript. Likewise, patient consent under government privacy rules, such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States, does not constitute permission to publish their case with personal identifiers unless they have explicitly approved the manuscript.

Format: Case Series must be limited to 2,000 to 3,000 words (excluding the abstract, references, and figure legends). The reference list should not exceed 50 references, and the total combined number of figures and tables must be six or fewer. Multi-panel figures are acceptable.

Abstract: Case Series should be submitted with a structured abstract, consisting of no more than 250 words and the following four paragraphs:

- Background: Describes the clinical situation being discussed.
- Methods: Describes the clinical procedures (surgical and non-surgical) performed.
- Results: Describes the clinical results.
- Conclusion(s): Reports what authors have concluded, specifically clinical implications in practice situations.

Introduction: This section should include a critical review of the pertinent literature.

Case Description and Results

This section describes the cases, including all relevant data. For ease of presentation, tables describing longitudinal data in a chronological form may be useful. Carefully selected, high-quality clinical photographs in full color, as well as radiographs, are encouraged.

Discussion: This should include findings, put into perspective with respect to the field and literature. Unique arguments and new information gained should be summarized. Consideration of the clinical significance of the cases should be emphasized in all sections.

GUEST EDITORIALS

Guest Editorials may be invited or may be submitted from authorities in certain areas as a means of offering their perspective on one or more articles published in the *Journal*, or on other items of interest to the readership.

LETTERS TO THE EDITOR

Letters may comment on articles published in the *Journal* and should offer constructive criticism. If a letter comments on a published article, the author(s) will be provided 30 days to respond to the observations. Letters to the Editor may also address any aspect of the profession, including education and training, new modes of practice, and concepts of disease and its management. Letters should be

brief (<1,000 words), focused on one or a few specific points or concerns, and can be signed by no more than five individuals. Citations should be handled as standard references.

GENERAL FORMAT

Manuscripts must be submitted in Microsoft Word. Margins should be at least 1" on both sides and top and bottom and all text should be double-spaced. Materials should appear in the following order:

- Title Page
- Abstract (or Introduction) and Key Words
- Text
- Footnotes
- Acknowledgment(s)
- References
- Figure Legends
- Tables

Figures should not be embedded in the manuscript. Please see the *Journal of Periodontology Digital Art Guidelines* for more information on submitting figures. Authors should retain a copy of their manuscript for their own records.

TITLE PAGE

The title page should contain:

1. a concise but informative title;
2. first name, middle initial, and last name of each author, with the highest academic degree and the current institutional affiliation, including department, for each (please use footnote symbols in the sequence *, †, ‡, §, ¶, #, **, etc. to identify authors and their corresponding institutions);
3. disclaimers, if any;
4. the name and address (including fax number and e-mail) of the author responsible for correspondence (please indicate whether fax number and e-mail can be published);
5. word count and number of figures, tables, and references in the manuscript;
6. a short running title of no more than 60 characters, including spaces;
7. a one-sentence summary describing the key finding(s) from the study.

KEY WORDS

A maximum of six key words or short phrases, drawn from MeSH documentation, to facilitate indexing should be listed below the abstract.

ACKNOWLEDGMENT(S) AND CONFLICTS OF INTEREST

Acknowledgment(s)

Following the Discussion, acknowledgments may be made to individuals who contributed to the research or the manuscript preparation at a level that did not qualify for authorship. This may include technical help or participation in a clinical study. Authors are responsible for obtaining written permission from persons listed by name. Acknowledgments must also include a statement that includes the source of any funding for the study, and defines the commercial relationships of each author.

Conflicts of Interest

In the interest of transparency and to allow readers to form their own assessment of potential biases that may have influenced the results of research studies, the *Journal of Periodontology* requires that all authors declare potential competing interests relating to papers accepted for publication. Conflicts of interest are defined as those influences that may potentially undermine the objectivity or integrity of the research, or create a perceived conflict of interest.

Authors are required to submit:

1. A statement in the acknowledgments section of the manuscript that includes the source of any funding for the study, and defines the commercial relationships of each author. If an author has no commercial relationships to declare, a statement to that effect should be included. This statement should include financial relationships that may pose a conflict of interest or potential conflict of interest. These may include financial support for research (salaries, equipment, supplies, travel reimbursement); employment or anticipated employment by any organization that may gain or lose financially through publication of the paper; and personal

financial interests such as shares in or ownership of companies affected by publication of the research, patents or patent applications whose value may be affected by this publication, and consulting fees or royalties from organizations which may profit or lose as a result of publication. An example is shown below.

2. A conflict of interest and financial disclosure form for each author. A link to this electronic form will be e-mailed to each author after manuscript submission.

Conflict of interest information will not be used as a basis for suitability of the manuscript for publication.

Example of Conflict of Interest Statement

This study was supported by a grant from the Acme Implant Corporation, Seoul, Korea. Dr. Lee is on the scientific advisory board for Acme Implant Corporation and gives lectures sponsored by the company. Dr. Smith is a consultant and shareholder of the Brownstone Implant Corporation, Boston, Massachusetts. Dr. Wang is employed full-time as chief technical officer of the Acme Implant Corporation. Drs. Able, Kim, and Bruce report no conflicts of interest related to this study.

REFERENCES

References should be numbered consecutively in the order in which they appear in the text. A journal, magazine, or newspaper article should be given only one number; a book should be given a different number each time it is mentioned, if different page numbers are cited.

All references are identified, whether they appear in the text, tables, or legends, by Arabic numbers in superscript. Journal title abbreviations should be those used by the U.S. National Library of Medicine. If you are uncertain about the correct abbreviation for a journal title, please search for the journal at <http://www.ncbi.nlm.nih.gov/nlmcatalog>.

The use of abstracts as references is strongly discouraged. Manuscripts accepted for publication may be cited and should include the manuscript's DOI, if known. Material submitted, but not yet accepted, should be cited in text as "unpublished observations." Written and oral personal communications may be referred to in text, but not cited as references. Please provide the date of the communication and indicate whether it was in a written or oral form. In addition, please identify the individual and his/her affiliation. Authors should obtain written permission and confirmation of accuracy from the source of a personal communication. Presented papers, unless they are subsequently published in a proceedings or peer-reviewed journal, may not be cited as references. In addition, Wikipedia.org may not be cited as a reference. For most manuscripts, authors should limit references to materials published in peer-reviewed professional journals. In addition, authors should verify all references against the original documents. References should be typed double-spaced. Examples of references are given below. Authors are encouraged to consult EndNote for the *Journal of Periodontology*'s preferred reference style.

Journals

1. Standard journal reference. Note: list all authors if six or fewer; when seven or more, list only first three and add et al. Kurita-Ochiai T, Seto S, Suzuki N, et al. Butyric acid induces apoptosis in inflamed fibroblasts. *J Dent Res* 2008;87:51-55.
2. Corporate author. Federation Dentaire Internationale. Technical report no. 28. Guidelines for antibiotic prophylaxis of infective endocarditis for dental patients with cardiovascular disease. *Int Dent J* 1987;37:235.
3. Journal paginated by issue. Card SJ, Caffesse RG, Smith BA, Nasjleti CE. New attachment following the use of a resorbable membrane in the treatment of periodontitis in dogs. *Int J Periodontics Restorative Dent* 1989;9(1):59-69.
4. Non-English-language titles translated into English. Buchmann R, Khoury F, Hesse T, Müller RF, Lange DE. Antimicrobial therapy of peri-implant disease (in German). *Z Zahnärztl Implantol* 1996;12:152-157.

Books and Other Monographs

5. Personal author(s). Tullman JJ, Redding SW. *Systemic Disease in Dental Treatment*. St. Louis: The CV Mosby Company; 1983:1-5.
6. Chapter in a book. Rees TD. Dental management of the medically compromised patient. In: McDonald RE, Hurt WC, Gilmore HW, Middleton RA, eds. *Current Therapy in Dentistry*, vol. 7. St. Louis: The CV Mosby Company; 1980:3-7.

7. Agency publication. Miller AJ, Brunelle JA, Carlos JP, Brown LJ, Loë H. Oral Health of United States Adults. Bethesda, MD: National Institute of Dental Research; 1987. NIH publication no. 87-2868.
8. Dissertation or thesis. Teerakapong A. Langerhans' cells in human periodontally healthy and diseased gingiva. [Thesis]. Houston, TX: University of Texas; 1987. 92 p.

Electronic Citations

Note: DOIs are preferred for journal articles. If a DOI is not available, please provide a URL and access date.

9. Online-only article. Rasperini G, Acunzo R, Limiroli E. Decision making in gingival recession treatment: Scientific evidence and clinical experience. *Clin Adv Periodontics* 2011;1:41-52. doi:10.1902/cap.2011.100002.
10. Ahead of print. McGuire MK, Scheyer ET, Nevins M, et al. Living cellular construct for increasing the width of keratinized gingiva. Results from a randomized, within-patient, controlled trial [published online ahead of print March 29, 2011]. *J Periodontol*; doi:10.1902/jop.2011.100671.
11. Web sites. Centers for Disease Control and Prevention. Periodontal Disease. Available at: http://www.cdc.gov/OralHealth/topics/periodontal_disease.htm. Accessed September 29, 2010.

TABLES

Tables should be numbered consecutively in Arabic numbers in the order of their appearance in the text. A brief descriptive title should be supplied for each. Explanations, including abbreviations, should be listed as footnotes, not in the heading. Every column should have a heading. Statistical measures of variations such as standard deviation or standard error of the mean should be included as appropriate in the footnotes. Do not use internal horizontal or vertical rules. The submission system will easily read tables created with Word's table utility or when inserted into Word from Excel.

FIGURES

Please see the *Journal of Periodontology* [Digital Art Guidelines](#) for detailed instructions on submitting high-quality images.

Figure Legends

Legends should be typed double-spaced with Arabic numbers corresponding to the figure. When arrows, symbols, numbers, or letters are used, explain each clearly in the legend; also explain internal scale, original magnification, and method of staining as appropriate. Panel labels should be in capital letters. Legends should not appear on the same page as the actual figures.

FOOTNOTES

Footnotes should be used only to identify author affiliations; to explain symbols in tables and illustrations; and to identify manufacturers of equipment, medications, materials, and devices. Use the following symbols in the sequence shown: *, †, ‡, §, ¶, #, **, ††, etc.

SUPPLEMENTARY MATERIAL

The *Journal of Periodontology* includes supplementary material in the online Journal (www.joponline.org). All supplemental material should be called out in the text.

Supplementary Figures and Tables

Journal of Periodontology articles are limited to a combined total of six figures and tables in the print publication. Any additional figures and tables should be submitted as supplementary files. Each supplementary figure or table should be submitted as a separate file. Please follow the guidelines regarding resolution, format, etc. for printed figures (see [Digital Art Guidelines](#)) and tables (see above) when preparing supplementary figures and tables. In summary, each figure, table, or multimedia file should be uploaded separately and the file names should clearly identify the file (i.e., SupplementaryFigure1.tif, SupplementaryTable1.xls, etc.). If file size limitations prevent you from uploading your supplemental material, please e-mail jerry@perio.org.

Supplementary Videos

The *Journal of Periodontology* publishes short videos to supplement a paper when appropriate. Most standard video formats are accepted. Videos should be edited to remove extraneous material. Authors should adhere to OSHA regulations when preparing their videos. Please e-mail bethanne@perio.org for information on how to submit videos. If your video is accepted for

publication, all authors will need to submit a video copyright form. This form can be found on ScholarOne Manuscripts in the upper right-hand corner under "Instructions & Forms."

STYLE

Please follow the guidelines below when preparing a manuscript:

- Be sure to put the genus and species of an organism and journal names in the reference section in italics.
- Do not italicize common Latin terms such as *in vitro*, *in vivo*, e.g., or i.e.
- Use a block style; do not tabulate or indent material.
- Refer to the newest edition of the Glossary of Periodontal Terms published by the American Academy of Periodontology for preferred terminology.
- Authors are encouraged to use the disease classification as outlined in the Annals of Periodontology, volume 4 (1999 International Workshop for a Classification of Periodontal Diseases and Conditions).
- Create equations as text, treating any mathematical symbols as special characters and assigning them the Symbol font.
- Measurements of length, height, weight, and volume should be reported in metric units or their decimal multiples. Temperatures should be given in degrees Celsius and blood pressure in millimeters of mercury. All hematologic and clinical chemistry measurements should be reported in the metric system in terms of the International System of Units (SI). Description of teeth should use the American Dental Association (i.e., Universal/National) numbering system.
- Statistical methods should be described such that a knowledgeable reader with access to the original data could verify the results. Wherever possible, results should be quantified and appropriate indicators of measurement error or uncertainty given. Sole reliance on statistical hypothesis testing or normalization of data should be avoided. Data in as close to the original form as reasonable should be presented. Details about eligibility criteria for subjects, randomization, methods for blinding of observations, treatment complications, and numbers of observations should be included. Losses to observations, such as dropouts from a clinical trial, should be indicated. General-use computer programs should be listed. Statistical terms, abbreviations, and symbols should be defined. Detailed statistical, analytical procedures can be included as an appendix to the paper if appropriate.

AUTHORSHIP

Individuals identified as authors must meet all of the following criteria established by the International Committee of Medical Journal Editors: 1) substantial contributions to conception and design, or acquisition, analysis, or interpretation of data; 2) drafting the article or revising it critically for important intellectual content; 3) final approval of the version to be published; and 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Once the *Journal* has received a manuscript, any changes in authorship must be faxed to the editorial office at 312/573-3225 (attn: Jerry Eberle, Editorial Specialist) or e-mailed to jerry@perio.org and must contain the signature of the author who has been added or removed from the paper. Authors who are added must submit a conflict of interest and financial disclosure form (see below).

Conflict of Interest and Financial Disclosure Forms

A conflict of interest and financial disclosure form must be submitted by each author. A link to this electronic form will be e-mailed to each author after manuscript submission. Due to this, **all authors are required to have accounts with valid e-mail addresses in ScholarOne Manuscripts** and be listed as authors for the submitted paper. Submitting authors are able to create accounts for co-authors.

CLINICAL TRIALS

If your manuscript is reporting a randomized clinical trial, you are required to submit a CONSORT checklist with your manuscript. More information can be found at www.consort-statement.org. All clinical trials must be registered prior to submission to the *Journal of Periodontology* at one of the registration sites listed below. The registration number and date of registration should be included in the Materials and Methods section. **Starting January 1, 2016, all clinical trials must be registered prior to initiation (i.e., recruitment) of the trial.** Please see <http://www.clinicaltrials.gov/ct2/about-studies/learn#WhatIs> for more information regarding clinical trials.

- U.S. National Institutes of Health Clinical Trials Registry - <http://www.clinicaltrials.gov>
- EU Clinical Trials Register - <https://www.clinicaltrialsregister.eu>
- WHO International Clinical Trials Registry Platform - <http://www.who.int/ictrp/en>

ANIMAL AND HUMAN TRIALS

All manuscripts reporting the use of human subjects must include a statement that the protocol was approved by the author's institutional review committee for human subjects **AND** that the study was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2013. Do not use any designation in tables, figures, or photographs that would identify a patient, unless written consent from the patient is submitted.

For research involving the use of animals, it is necessary to indicate that the protocol was approved by the author's institutional experimentation committee or was in accordance with guidelines approved by the Council of the American Psychological Society (1980) for the use of animal experiments.

PRODUCT IDENTIFICATION

Use of brand names within the title or text is not acceptable, unless essential when the paper is comparing two or more products. When identification of a product is needed or helpful to explain the procedure or trial being discussed, a generic term should be used and the brand name, manufacturer, and location (city/state/country) cited as a footnote.

REVISED MANUSCRIPTS

Revised manuscripts should be submitted online at [ScholarOne Manuscripts](#) by the same author who submitted the original manuscript. Authors have 30 days to submit a revision. Revisions should adhere to the same requirements as original submissions. Additionally:

1. A detailed response to each reviewer comment for the original manuscript should be included. This response should also describe what changes were made in the manuscript to address each comment in the reviews.
2. Only the most recent version of each file should be uploaded. You may have to delete older files from the Author Center.
3. **Please upload a version of the manuscript with changes highlighted or track changes enabled. This should be uploaded as a supplemental file.**
4. Figures and tables should be resubmitted with revised manuscripts, even if they were not revised.

REVIEW PROCESS

Peer Review

The *Journal of Periodontology* is a peer-reviewed publication. All manuscripts, including Reviews, Commentaries, and Case Series are submitted to a minimum of two reviewers and, when appropriate, to a statistical reviewer. Authors are given reviewer comments and additional information or observations as the Editor believes would be helpful. Revised manuscripts are due within 30 days of receipt of the Editor's communication.

Checking the Status of a Manuscript

During the peer-review process, the current status of a manuscript can be found in the Author Center (click "Submitted Manuscripts" or "Manuscripts I Have Co-Authored"). Once a decision has been made, all authors are notified by e-mail. No hard copy letters will be mailed.

MANUSCRIPT ACCEPTANCE

All manuscripts accepted for publication become the property of the American Academy of Periodontology. All authors are required to sign a copyright form. An e-mail with a link to this electronic form will be sent to all authors upon acceptance. Once all forms are received by the editorial office, an unedited version of the accepted manuscript will appear online ahead of print at <http://www.joponline.org/toc/jop/0/0>. Once a manuscript is online ahead of print, it is fully citable based on the Digital Object Identifier (DOI) assigned to the manuscript. Manuscripts will be copyedited, published online, and printed (unless online-only) in an issue of the *Journal* approximately 4 to 5 months after acceptance. Authors will be notified about a final publication date by the Editorial Office.

Reprints Corresponding authors may purchase reprints at the time pages are received for proofreading. Reprints can be purchased in 4-color or black and white. Electronic reprints are also available.

Online-Only Publication: Accepted manuscripts that are classified by the Editors as "Discovery Science" will be placed on an accelerated schedule for online-only publication. They will be assigned

to an issue, copyedited, and published in the online *Journal*. Online-only manuscripts will be listed in the printed table of contents of the assigned issue but will not appear in the printed issue. Manuscripts are classified as “Discovery Science” if: a) the study is conducted in isolated cells or tissues to explore mechanisms relative to periodontitis/periodontal tissues; or b) the research is not within one step of clinical application.

Funding Agency Requirements

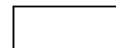
Consistent with current policies, authors who have papers based on funded research accepted for publication in the *Journal of Periodontology* may make their final accepted paper or published article available to agency depositories. However, authors should indicate that the paper may not be released publicly until 12 months following final publication in an issue. Authors are responsible for complying with all funding agency requirements.

QUESTIONS

Inquiries regarding current submissions should be sent to: Editorial Specialist, Journal of Periodontology, 737 North Michigan Avenue, Suite 800, Chicago, IL 60611-6660. Telephone: 312/573-3255; e-mail:jerry@perio.org.

APÊNDICE A – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO (ESTUDO TRANSVERSAL)

Universidade Federal do Rio Grande do Sul
Faculdade de Odontologia



TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Estudo da prevalência de cárie dentária, gengivite e fluorose dentária
em escolares de Porto Alegre, RS: em 1998 e 2009

1. **Objetivo do estudo:** Estudar a ocorrência de gengivite (inflamação na gengiva), cárie, fluorose (manchas nos dentes ocasionadas pela ingestão de flúor em excesso durante o seu período de formação), erosão (desgastes nos dentes) e traumatismos dentários (fratura) em estudantes de 12 anos de idade residentes em Porto Alegre-RS;
2. **Seleção dos indivíduos:** As escolas e os estudantes foram sorteados aleatoriamente;
3. **Duração:** A participação na pesquisa consiste no preenchimento de um questionário pelos pais ou responsáveis e um pelo estudante e exame odontológico da criança, a ser realizado em um único dia, com duração prevista de aproximadamente dez minutos.
4. **Procedimentos:** Os indivíduos terão seus dentes limpos com escova, fio e pasta dental, fornecidos pela equipe da pesquisa e examinados pela cirurgiã-dentista Luana Severo Alves (CRO-RS 16588) (estudante de doutorado da UFRGS).
5. **Importância do estudo:** Este levantamento epidemiológico será muito importante para avaliação do estado atual de saúde bucal das crianças de nossa cidade.
6. **Danos:** Não existem danos previstos. Todo o instrumental (espelho, pinça e sonda) utilizado estará devidamente esterilizado. Somente participarão dos exames os estudantes que assim concordarem e assinarem este termo, juntamente com a assinatura dos pais ou responsáveis.
7. **Benefícios:** Os pais ou responsáveis conhecerão as condições de saúde bucal de seu filho e receberão, posteriormente, um relatório do exame realizado, assim como a indicação de lugares que ofereçam atendimento odontológico gratuito. O estudante receberá uma escova dental.
8. **Confidencialidade:** As informações contidas nos questionários e a identidade dos estudantes ficarão sob o poder restrito dos pesquisadores e não serão divulgadas nos trabalhos resultantes desta pesquisa.

A participação na pesquisa é totalmente voluntária e o indivíduo tem a liberdade de se recusar a participar ou retirar seu consentimento em qualquer momento do estudo sem nenhum tipo de penalidade.

No caso de dúvidas ou acontecimentos associados à pesquisa, o participante poderá entrar em contato com a pesquisadora Luana Severo Alves, através do telefone 3308 5193 ou com a orientadora deste projeto, prof. Dr.ª Marisa Maltz (3308 5247), e terá a garantia de resposta a qualquer pergunta ou informação extra.

Confirmo que entendi a natureza da pesquisa e autorizo a participação do estudante

Assinatura dos pais ou responsável: _____

Confirmo que entendi a natureza da pesquisa e me disponho a participar voluntariamente.

Assinatura do estudante: _____

Pesquisadora Luana Severo Alves: _____

Porto Alegre, ____ de _____ de 20 ____

Comitê de Ética em Pesquisa da Faculdade de Odontologia da UFRGS: 3308 5187
Comitê de Ética em Pesquisa da Secretaria Municipal de Saúde de Porto Alegre-RS: 3212 4623



APÊNDICE B – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO (ESTUDO LONGITUDINAL)

Universidade Federal do Rio Grande do Sul
Faculdade de Odontologia

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Condições de saúde bucal de adolescentes de Porto Alegre e fatores associados: estudo de coorte

1. **Objetivo do estudo:** Estudar a incidência e a progressão da cárie, gengivite, fluorose e erosão (desgaste nos dentes) em estudantes residentes em Porto Alegre- RS.
2. **Seleção dos indivíduos:** Os estudantes foram examinados anteriormente, em 2009/2010, sendo escolhidos por sorteio aleatório.
3. **Duração:** A participação na pesquisa consiste em exame odontológico do estudante, a ser realizado em um único dia, na própria escola, com duração prevista de aproximadamente dez minutos.
4. **Procedimentos:** Os indivíduos terão seus dentes limpos com escova, fio e pasta dental, fornecidos pela equipe da pesquisa e examinados pelas cirurgiãs-dentistas Carolina Doege (CRO-RS 17.892) e Luana Severo Alves (CRO-RS 16.588) (estudantes de Pós-Graduação da UFRGS).
5. **Importância do estudo:** Este levantamento epidemiológico será muito importante para avaliação da incidência e da progressão de problemas bucais dos estudantes de nossa cidade.
6. **Danos:** Não existem danos previstos. Todo o instrumental (espelho, pinça e sonda) utilizado estará devidamente esterilizado. Somente participarão dos exames os estudantes que assim concordarem e assinarem este termo, juntamente com a assinatura dos pais ou responsáveis.
7. **Benefícios:** Os adolescentes e os pais conhecerão as condições de saúde bucal do estudante e receberão, posteriormente, um relatório do exame realizado, assim como a indicação de lugares que ofereçam atendimento odontológico gratuito. O estudante receberá uma escova dental.
8. **Confidencialidade:** As informações contidas nos questionários e a identidade dos estudantes ficarão sob o poder restrito dos pesquisadores e não serão divulgadas nos trabalhos resultantes desta pesquisa.

A participação na pesquisa é totalmente voluntária e o indivíduo tem a liberdade de se recusar a participar ou retirar seu consentimento em qualquer momento do estudo sem nenhum tipo de penalidade.

No caso de dúvidas ou acontecimentos associados à pesquisa, o participante poderá entrar em contato com a pesquisadora Carolina Doege, através do telefone 3308 5193 ou com a orientadora deste projeto, prof. Dr^a. Marisa Maltz (3308 5247), e terá a garantia de resposta a qualquer pergunta ou informação extra.

Confirmo que entendi a natureza da pesquisa e autorizo a participação do estudante chamado: _____

Assinatura dos pais ou responsável: _____

Confirmo que entendi a natureza da pesquisa e me disponho a participar voluntariamente.

Assinatura do estudante: _____

Pesquisadora Carolina Doege: _____

Porto Alegre, ____ de _____ de 20 ____

APÊNDICE C – QUESTIONÁRIO SOCIOECONÔMICO



Universidade Federal do Rio Grande do Sul – Faculdade de Odontologia
Questionário para pais ou responsáveis

Nome do aluno: _____ Data de Nascimento: ____/____/____
Endereço: _____ Bairro: _____
Telefones: _____ Escola: _____ Sexo do aluno: (1) Fem (2) Masc

O preenchimento completo deste questionário é muito importante para a conclusão deste trabalho!

1. Você considera seu filho:

- (1) Branco (3) Mulato
(2) Negro (4) Outro (oriental, índio)

2. Seu filho mora em Porto Alegre desde quando?

- (1) Desde que nasceu
(2) Desde os _____ anos. Antes morou em _____

3. Seu filho mora com:

- (1) Pai e mãe (3) Só com a mãe
(2) Só com o pai (4) Outros

4. Quantos irmãos de sangue seu filho têm? _____

5. Quantas pessoas moram na sua casa? _____

6. Quantos cômodos têm a casa? _____

7. Sua casa é:

- (1) Própria (4) Cedida
(2) Financiada (5) Outro: _____
(3) Alugada

Qual destes itens você possui em sua casa? Qual a quantidade de cada um deles?

8. Televisão em cores ()	13. Aspirador ()
9. Rádio ()	14. Máquina de lavar roupa ()
10. Banheiro ()	15. Videocassete/DVD ()
11. Automóvel ()	16. Geladeira ()
12. Empregada/mensalista ()	17. Freezer ()

OBS.: Geladeira duplex/triplex: corresponde à geladeira e freezer

18. Grau de instrução do pai:

- (1) Não estudou (5) 2º grau completo
(2) 1º grau incompleto (6) 3º grau incompleto
(3) 1º grau completo (7) 3º grau completo
(4) 2º grau incompleto

19. Grau de instrução da mãe:

- (1) Não estudou (5) 2º grau completo
(2) 1º grau incompleto (6) 3º grau incompleto
(3) 1º grau completo (7) 3º grau completo
(4) 2º grau incompleto

20. Qual a água utilizada para beber/preparar alimentos?

- (1) Encanada (4) Caminhão pipa
(2) Poço artesiano (5) Outro: _____
(3) Bica

21. Seu filho usa escova dental?

- (1) Sim (2) Não

22. Se sim, quantas vezes seu filho usa escova dental?

- (1) Nem todos os dias (3) 2 vezes por dia
(2) 1 vez por dia (4) 3 vezes ou mais por dia

23. Cada membro da família possui escova própria ou vocês compartilham uma mesma escova?

- (1) Cada um possui sua própria escova
(2) Mais de uma pessoa usa a mesma escova

24. Seu filho usa fio dental?

- (1) Sim (2) Não

25. Se sim, quantas vezes seu filho usa fio dental?

- (1) De vez em quando (3) 1 vez a cada 2 dias
(2) 1 vez/semana (4) 1 vez/dia ou mais

26. Seu filho usa creme dental?

- (1) Sim (2) Não

27. Se sim, há quanto tempo seu filho usa creme dental?

- (1) Desde o nascimento dos dentes
(2) A partir de 1 ano de idade
(3) A partir de _____ anos de idade

28. Seu filho já foi ao dentista? Onde foi o atendimento?

- (1) Não, nunca foi
(2) Sim, na escola
(3) Sim, no posto de saúde. Qual? _____
(4) Sim, por convênio
(5) Sim, consultório particular

29. Qual a causa da última visita de seu filho ao dentista?

- (1) Ele nunca foi ao dentista
(2) Dor de dente
(3) Quebra/fratura/perda de dente em acidente
(4) Controle periódico (revisão)
(5) Outro: _____

30. Quando seu filho foi ao dentista pela última vez?

- (1) Ele nunca foi ao dentista
(2) Há _____ ano (s)
(3) Há menos de um ano

31. Seu filho já recebeu aplicação de flúor pelo dentista?

- (1) Sim (2) Não

32. Se sim, que idade seu filho tinha?

- (1) Menos de 3 anos (3) Mais de 6 anos
(2) Entre 3 e 6 anos (4) Ainda recebe

33. Seu filho usa medicamento para doenças respiratórias, como asma?

- (1) Sim. Qual? _____ (2) Não

34. Seu filho apresenta algum problema de estômago (azia, refluxo, engasgos, vômitos frequentes)?

- (1) Sim. Qual? _____ (2) Não

35. Seu filho costuma apertar os dentes ou fazer barulhos com os dentes enquanto dorme?

- (1) Sim (2) Não

36. Você possui alguma queixa com relação aos dentes do seu filho?

- (1) Sim: _____ (2) Não

37. Qual sua renda familiar (soma da renda de todos os membros da família)? R\$ _____

