

# Reasons related to tooth loss among adolescents in São Paulo, Brazil

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## Abstract

**Aim:** To estimate tooth loss prevalence among adolescents in São Paulo, considering socioeconomic and demographic factors, dental service use and pain. **Methods:** Data were obtained from the São Paulo Oral Health Survey 2008. The sample comprised 2858 adolescents from 15 to 19 years old from public and private schools, who underwent through an oral examination. In addition, a questionnaire was applied regarding the characterization of factors related to socioeconomics, demographics, use of dental services and pain in the last six months. At least one tooth lost was the outcome. The independent variables included gender, ethnicity, parents' schooling, type of school, number of rooms, people and cars per home, family income, dental service use, decayed teeth, toothache. A multivariate logistic regression model was used. **Results:** The prevalence of tooth loss was 7%. The independent variables decayed tooth (RP=1.71), toothache (RP=2.04), father's schooling - elementary (RP=1.40) and per capita family income - less than 1/2 a minimum salary (RP=1.45) were associated with the outcome. **Conclusions:** The results suggest that socioeconomic factors may contribute to the increase of early tooth loss among adolescents.

**Keywords:** tooth loss; adolescent; income.

## Introduction

Adolescence is the period of life comprised between the ages of 10 and 19 years, according to the World Health Organization<sup>1</sup> (1995), and is divided into two stages: the first from 10 to 14 years, and the second from 15 to 19 years of age. According to data from the Brazilian Institute of Geography and Statistics (IBGE)<sup>2</sup> (2007), the young population from 15 to 19 years of age in the São Paulo State comprised 1,174,920 adolescents. At this stage the youngsters are in a state of constant biopsychosocial development, and therefore, it is common for them to present behaviors that place them at risk for their health<sup>3</sup>.

Caries is a disease that affects a large sector of the population, in spite of the advancements of dentistry in scientific and structural terms. Nevertheless, the majority of researches have focused on children at the schooling age, and there are insufficient data in the literature about the prevalence of dental caries among adolescents<sup>4</sup>.

The rights of adolescents are preserved by the Brazilian Statute of the Child and Adolescent ("Estatuto da Criança e do Adolescente - ECA")<sup>5</sup>, issued in 1990. In addition, there is the Health Program for the Adolescent ("Programa Saúde do Adolescente - PROSAD")<sup>6</sup> (1996), created by the Ministry of Health in 1989, which addresses STD/AIDS, drug addiction, traffic accidents and premature

Received for publication: December 01, 2013

Accepted: March 17, 2014

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pregnancy, but as far as we know, there is no specific program that includes oral health directed towards this age group.

On the other hand, the Federal Government developed a national oral health policy within the National Health System (“Sistema Único de Saúde – SUS”), known as “*Brasil Sorridente*”. By means of a set of actions like reorganization of basic care and creation of Dental Specialty Centers (“Centros de Especialidades Odontológicas - CEOs”), this strategy widened the access to dental treatment and specialized treatment by the population in the public network. Among youngsters aged between 15 and 19 years, only 55% have all their teeth<sup>7</sup>, according to statistical data.

In the Project “SB Brasil 2003”, the age group from 15 to 19 years was evaluated in a nation-wide epidemiologic survey for the first time<sup>8</sup>. In this survey, the component “lost” was approximately 15% of the DMFT index in the 15-19-year-old group. The study of Barbato and Peres<sup>9</sup> (2009) observed a prevalence of tooth loss of 38.9% in adolescents, based on secondary data from the Project “SB Brasil 2003”. In the São Paulo State in 2002, it was observed that 6.51% of the DMFT corresponded to the component M (number of missing teeth) in this age group<sup>10</sup>.

In order to study the oral health of the adolescent, it is fundamental to reflect on the particular history of each family, considering the social context in which it lives. The study of Cimões et al.<sup>11</sup> (2007) showed that social class influenced the ratio of tooth losses among adults, with the number of losses due to caries being higher in the groups of lower social class.

Tooth loss is considered a relevant theme to be evaluated by public health authorities, since it is considered a result of the most prevalent oral diseases<sup>12</sup>, among them dental caries (Costa et al, 2013)<sup>13</sup>. In the qualitative study of Silva, Magalhães and Ferreira (2010)<sup>14</sup>, in the analysis of content, the main causes pointed out for tooth loss were found to be the lack of knowledge, methods for maintenance, difficult access to dental services, lack of financial resources for treatment, iatrogenic experiences and fear of pain. Nevertheless, according to Costa et al.<sup>13</sup>, it seems that there is no lack of resources nor access to dental service for tooth extraction in comparison with other dental treatments it does not seem to lack neither resources nor access to dental service.

The aim of this study was to estimate the tooth loss prevalence of the population in the age-range between 15 and 19 years, considering socioeconomics, demographics, use of services and pain factors in the municipality of São Paulo, SP, Brazil, in 2008, and thereby contribute to the process of planning and actions on oral health directed towards this group.

## Material and methods

This study was performed using secondary data collected in the Epidemiological Survey on Oral Health in the City of São Paulo in the year 2008. The sample comprised 2858 adolescents aged from 15 to 19 years.

The data were collected by clinical oral examination; the index used for dental caries was the DMFT (in accordance

with WHO criteria)<sup>15</sup>, and a questionnaire, all applied in previously drawn public and private schools. The questionnaire contained questions to enable the characterization of factors related to socioeconomics, demographics, use of dental services and pain in the last six months.

The study was conducted in two stages with probability proportional to size (PPS) in the conglomerates (schools) of the adolescent population. In the second stage the draw was systematic, pondered by the number of pupils. The goal was to guarantee the ponderability of the draw in both stages, draw of the school and draw of the adolescent in the school<sup>16</sup>.

In this survey, 75 Oral Health Teams (OHTs) participated, being a dentist, an oral health assistant and a municipal health service officer<sup>16</sup>.

In the calibration process, agreement on the results between examiners was evaluated, using the Kappa coefficient as instrument of agreement (dental caries Kappa 0.954 IC 0.95-0.96) and General Percentage of Agreement (GPA) in addition to the parameters of observation consistency proposed previously<sup>17-18</sup>.

In this cross-sectional study, the outcome was loss of at least one tooth and its analyzed independent variables were the socioeconomic factors (family income, schooling of the father and mother, number of rooms, number of persons living in the same house, car, type of school), demographics (age, gender and ethnicity), use of services (visit to the dentist in the last six months), toothache in the last six months and tooth with caries.

The independent variables were grouped into categories and re-coded. The variable *school* was dichotomized into public (public and contracted schools), and *ethnicity* into non-white (yellow, Indian, mulatto and black) and white. *Schooling* was dichotomized into primary schooling and middle, aggregated to higher learning. *Family income* was dichotomized into less than four minimum wages and four or more minimum wages, whereas *family income per house inhabitant* into less than half a minimum wage per person and higher than or equal to half a minimum wage per inhabitant. The variable *visit to the dentist*, into never and at least one consultation in the last six months. For the variable *age*, the ages from 15 to 16 years and 17 to 19 years were grouped. The variables *number of rooms* and *persons in the house*, from 1 to 4 and more than 4. The variable *car* was categorized as none, one and two or more cars.

As regards caries experience the mean DMFT in the sample was 2.41 in this age group, and the component “missing” accounted for 7% in this index.

To evaluate whether there was association between the variable *outcome* (tooth loss) and the other independent variables, bivariate analysis was performed. All the independent variables that showed association with  $p < 0.25$  were subjected to multivariate analysis. The variables that did not contribute with the model were discarded and a new model was constructed.

The data were entered in the EPI-INFO6 software and Stata 10 was used to analyze the data for the bivariate and multivariate analyses.

Parents or legal guardians of the adolescents were asked to sign an informed consent form, according to the report approved by the Research Ethics Committee of the Municipal Secretary of Health of São Paulo (048/08) on March 18, 2008.

## Results

Tooth loss prevalence with at least 1 lost tooth was 7% (5.93 - 7.82) among the adolescents. Between the ages of 15 and 16 years it was 6.2% and between 17 and 19 years it rose to 9.1%, representing the accumulation of need in the course of time. The sample was almost equally distributed according to the gender (females 50.7%).

Table 1 contains the data of the association between lost teeth and the independent variables (untreated tooth with caries, toothache, type of school, father and mother educational level, family income, crowding in the home and family income per person in the house) in adolescents from 15 to 19 years of age in the municipality of São Paulo in 2008. It was observed that adolescents with an untreated carious tooth had a 1.71 times higher prevalence of tooth loss than those without a tooth with untreated caries. All these variables in Table 1 showed strong association with

tooth loss ( $p < 0.01$ ).

Table 2 presents the multivariate data analysis of the factors associated with lost teeth in adolescents in the municipality of São Paulo in 2008. Tooth with caries, toothache, father's schooling (basic schooling) and family income lower than half a minimum wage per inhabitant in the house were statistically significant with regards to the outcome tooth loss, different from age ( $p > 0.05$ ).

Age was placed in the model for the adjustment of variables in the multivariate model.

## Discussion

Even in a young age group the social and economic disparities might already reflect in the oral condition of the adolescents in the city of São Paulo. This emphasizes the need for oral health promotion and preventive measures in the early stages to prevent the continuous tooth losses that lead to edentulism, so common in adults and the elderly.

The increased prevalence of tooth loss between the ages of 15 and 16 (6.2%) and 17 to 19 (9.1%) may be justified mainly by the fact that preventive programs focus on younger schoolchildren, and when they conclude middle school terms,

**Table 1** – Association of the presence of lost teeth with demographic, socioeconomic variable and oral health conditions in adolescents (15 to 19 years), municipality of São Paulo, São Paulo, 2008.

Variables	n	Yes	No	PR*	IC 95%
Tooth with untreated Caries	2858				
Yes	1174	131	1043	1.71	1.53 — 1.91
No	1684	64	1620		
Toothache	2858				
Yes	799	104	695	2.04	1.76 — 2.36
No	2059	91	1968		
School	2858				
Public	2271	189	2082	1.23	1.20 — 1.28
Private	587	06	581		
Father's Schooling <sup>‡</sup>	2312				
Basic schooling	1328	119	1209	1.40	1.28 — 1.54
Middle - Higher education	984	32	952		
Mother's Schooling <sup>‡</sup>	2376				
Basic schooling	1314	107	1207	1.30	1.17 — 1.45
Middle - Higher education	1062	44	1018		
Family Income					
(minimum wage MW = R\$ 450,00) <sup>‡</sup>	2010				
Less than 4 MW	1559	119	1440	1.19	1.12—1.26
4 or more MW	451	11	440		
Crowding in the home <sup>‡</sup>	2279				
Fewer than 1 person/room	1481	114	1367	1.23	1.13—1.35
1 or more person/room	798	30	768		
Family income per person in the house (MW / person house) <sup>‡</sup>	1909				
Less than ½ MW/person	1110	101	1009	1.45	1.32—1.59
≥ ½ MW/person	799	22	777		

\*PR – Prevalence Ratio adjusted by the cluster sampling model and ponderation by population weight.

<sup>‡</sup>Data with missing cases.

**Table 2** – Multivariate analysis of the factors associated with the prevalence of lost teeth in adolescents (15 to 19 years), municipality of São Paulo, São Paulo, 2008.

Variables	PR*	Std. Error	IC 95%	p
Tooth with caries	2.63	0.71	1.54 — 4.49	0.000
Toothache	1.64	0.18	1.30 — 2.05	0.000
Father's schooling (basic schooling)	2.20	0.75	1.12 — 4.33	0.022
Family income lower than ½ a				
MW per person resident in house	2.81	0.83	1.56 — 5.05	0.001
Age	1.17	0.14	0.91 — 1.49	0.204

\*PR – Prevalence Ratio adjusted by the cluster sampling model and ponderation by population weight, adjusted for age.

they lose the follow-up by oral health teams who may be working in the schools on preventive and health promotion activities. This accumulation of need with age has previously been reported in a study that showed an increase in dental caries in each year from 15 to 19 years<sup>9</sup>. This demonstrates the need for intervention and inclusion and/or continuity of the health promotion measures in this age group. In a study conducted by Jovino-Silveira, et al.<sup>19</sup> (2005), caries and its sequelae were shown to be the main reason for tooth losses, particularly when comparing the individuals in the 18-39-year-old age range to those over 40 years of age.

There is a social gradient on tooth loss, the lower the income and schooling the higher the loss of teeth<sup>20</sup>. In the survey in the São Paulo State in 2002, the adolescents from 15 to 19 years of age with a family income between 1 and 3 minimum wages presented 0.48 as the mean of the M component of the DMFT, with the mean value of lost teeth diminishing as the family income increased. Furthermore, it was observed in this study that youngsters whose family income exceeded 10 minimum wages had approximately one tooth less affected by dental caries, thus diminishing the possibilities of tooth loss due to caries<sup>21</sup>. These findings resemble those of the present study since lower family income was associated with tooth loss. In addition, higher income inequality may result in more tooth loss possibly due to disinvestment in public resources, erosion of social cohesion, stress-induced oral-health-related behaviors and physiological effects<sup>22</sup>.

Gushi, et al.<sup>8</sup> (2005) worked with data from epidemiological surveys in the São Paulo State from 1998 and 2002 involving a population at the ages of 12 and 18 years. With regard to the treatment needs for those aged 18 years, the percentage of need for extractions increased from 5.9% in 1998 to 7.1% in 2002, however without statistical significance. The authors found a similar result when they evaluated a group of high and low dental caries experience in 1998 and 2002, presenting high values for the age, thus confirming the increase in early tooth loss. In 2010 another data collection took place in São Paulo State and within an 8 years period in adolescents aged 15-19 years, tooth extraction need maintained the same values over the years<sup>23</sup>.

Susin, et al.<sup>24</sup> (2006), evaluated tooth loss among individuals from 14 to 29 years of age in the metropolitan region of Porto Alegre, southern Brazil, and found a 26% prevalence of tooth loss in the group from 14 to 19 years of

age. They also observed that the group with the worse socioeconomic status presented the highest prevalence of tooth loss. Furthermore, according to the authors, individuals with a higher educational and economic level are more conscious for maintaining the teeth in the mouth and financing more conservative treatments. The present study also found a significant association between tooth loss and family income but among adolescents. This demonstrates the importance of socioeconomic factors in determining tooth loss as well as the need of adopting equitable measures of access to oral health services, qualification of the service provided (both curative and preventive) and health promotion, which are the demands and needs of this group.

Moreover, the importance of the health care of adolescents is linked to the fact that they may go into the adult stage with healthier dentition, preserving their quality of life, since tooth loss causes psychological discomfort, functional limitation, shame<sup>25</sup>, malposition of the teeth, facial asymmetry, alterations in the TMJ, esthetic problems, alteration in phonation<sup>10</sup> and in the selection of foods<sup>26</sup>.

According to Lisboa and Abegg<sup>27</sup> (2006), the adolescents were shown to be one of the most assiduous groups as regards visits to the dentist and did so in a time interval that ranged from six months to every 2 years. This fact may be explained by the importance youngsters place on esthetics. In the present study, it was observed that adolescents' visits to the dentist were linked to toothache, rather than esthetics.

In this study toothache was associated with tooth loss. However, there are other consequences of dental pain that affect adolescents and their families. Goes et al.<sup>28</sup> (2007) evaluated the impact of toothache on the daily activities of 1052 Brazilian adolescents from 14 to 15 years of age, and observed that the main impacts affected their concentration at school, in sports and home activities. In addition, the adolescents that had a lower income were those most frequently affected, with impacts of longer duration that extended also to the family. Peres, et al.<sup>29</sup> (2010) evaluated adolescents of 12 and 15 years of age by the data of the Epidemiological Survey of São Paulo (2008) and also observed greater prevalence of pain of dental origin among the adolescents that inhabited regions with a lower human development index, affecting approximately 25% of the sample.

In this study, the father's low schooling was associated with tooth loss. In a qualitative research conducted in

Sweden, 17 adolescents from 15 to 19 years of age, with high risk for caries and patients of a public dental clinic identified the parents and not the oral health professionals as the main source of information<sup>30</sup>. Although the study did not explain the degree of the parents' education, this demonstrates the importance of the parents' role in the construction of healthy habits.

Family crowding was a variable that drew attention, since the present results presented a higher number of individuals with tooth loss in homes with less than one person per room. However, the question could have been more specific by asking how many rooms were used as bedrooms, so that the variable might have been shown to be more sensitive.

In the study of Lisboa and Abegg<sup>27</sup> (2006), 2,627 individuals from 14 to 49 years of age were evaluated, and it was found that almost half of this population visited the dentist exclusively in a situation of pain. In the study of Pitanga Fernandes et al.<sup>31</sup> (2010), adolescents from 15 to 18 years of age with a higher concentration of caries (Caries Index – SiC) in a city in Southeastern Brazil, presented a relation with toothache reported in the six months before the study, which could be explained by the authors as being due to the progression of untreated caries disease itself; or due to the difficult access to dental services in this age group. For the adolescents there are differences in seeking public medical and dental services, as seeking dental assistance is directed towards the private sector. This may be explained by the fact that part of this age group is inserted in the work market, so they are at work during the hours when attendance is offered, which hampers the access to the public service. However, the authors pointed out that the solution to this is not the availability of dental treatment, but that the individual's knowledge of the factors associated with the experience of dental caries that contribute to the preparation of health actions that favor improvements in the oral health conditions in this age group.

This age group has not yet been widely studied, particularly on account of the history of providing oral health services in Brazil, where the actions planned and developed in the majority of the municipalities, were directed to the age group from 6 to 12 years; that is to say, schoolchildren, with emphasis on curative measures<sup>32</sup>.

Preventive and health promotion actions, as well as extending access to health services, when adopted in population strategies, contribute to the maintenance of health and to the development of healthy habits. Nevertheless, according to Silva et al.<sup>33</sup> (2006), it must be considered that the individual's perception of his/her oral health is the factor that determines whether or not he/she seeks attendance. In a study with children and young persons, youngsters with less than optimal oral health status may be those who do not seek care and might avoid dental visits, and to whom the lack of preventive care may contribute to their poor oral health status<sup>34</sup>.

In this way, socioeconomic and cultural conditions make the perception and appreciation of oral health difficult,

which is particularly true in persons with low income, due to the lack of knowledge about the maintenance of oral health<sup>16</sup>.

These results suggest that socioeconomic factors may contribute to the increase of early tooth loss among adolescents. The formulation of public policies directed towards this age group, especially oral health policies, must consider that this population is in the process of development, which requires full care, capable of stimulating awareness about the importance of oral health and self-care, developed in conjunction with preventive and curative actions.

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