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ABSTRACT

Epidemiological studies indicate that the prevalence of both caries and periodontitis remain high in underdeveloped countries worldwide, even though the prevalence of these diseases is showing a general tendency to decline. In many underdeveloped countries, the treatment for advanced periodontitis and caries is tooth removal. The aim of the present study was to determine the prevalence of missing teeth in an adolescent and young adult population. The study population comprised 321 socioeconomically disadvantaged individuals, presenting for general dental treatment at the University of Taubaté Dental Clinics, Taubaté, São Paulo. Study participants were 15-25 years-old (19.51 ± 3.21 years), and belonged to 3 ethnic groups: Black, White and Mestizo. Interviews were conducted with each individual to determine their medical health and smoking habits. Individuals with uncontrolled systemic diseases were excluded from this study. A complete dental examination was conducted by a single examiner, and tooth loss data was recorded for each study participant according to WHO (1997). Third molar teeth were excluded from this study. Seventy percent of females and 65% of males were found to be missing one or more teeth. The number of missing teeth ranged from 1 to 21. The average number of missing teeth for the study group was 2.4. Tooth loss was positively correlated with age (r = 0.88). The most frequently missing teeth were the mandibular first molars (42%), and the least frequently missing teeth were the mandibular canines (<1%). These results suggest that tooth loss is a significant dental health problem in the study population.

UNITERMS

RESUMO

Estudos epidemiológicos têm demonstrado que a prevalência de cárie e doença periodontal ainda é elevada em alguns países em desenvolvimento, embora mostre uma tendência geral de declínio. Nestes países o tratamento para doença periodontal avançada e cárie dental é ainda a extração do dente O objetivo do presente estudo foi determinar a prevalência de dentes ausentes em uma população de adolescentes e adultos jovens.. A população estudada compreendeu 321 indivíduos que procuraram tratamento dentário na Clínica Odontológica da Universidade de Taubaté, em Taubaté, estado de São Paulo. Os participantes do estudo tinham entre 15 e 25 anos de idade (19.51 ± 3.21 anos), e pertenciam a 3 grupos étnicos: Negro, Branco e Pardo. Foram conduzidas entrevistas afim de se determinar a história média e hábito de fumar dos participantes. Indivíduos com problemas sistêmicos sem acompanhamento médico regular foram excluídos deste estudo. O exame bucal completo foi conduzido por um único examinador, e a perda dentária foi registrada para cada participante,

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de acordo com os critérios propostos pela Organização Mundial de Saúde/WHO (1997) excluindo-se os terceiros molares. Setenta porcento das mulheres e 65% dos homens haviam perdido um ou mais dentes. O número de dentes perdidos variou de 1 a 21. A média de dentes ausentes para o grupo estudado foi 2.4. A perda dentária mostrou correlação positiva com a idade (r = 0.88). Os primeiros molares inferiores apresentaram a maior freqüência de perda (42%), e os caninos inferiores a menor freqüência (<1%). Estes resultados sugerem que na população estudada a perda dentária representa um problema de saúde bucal significativo.

UNITERMOS

Perda de dente, prevalência, adolescentes, adultos jovens.

INTRODUCTION

Epidemiological studies have shown that the prevalence of both caries and periodontitis is still high in some underdeveloped countries in the world, even though a general tendency of decline has been reported in some areas (Normando & Araújo[21], 1990; Freire et al.[7], 1996; Papapanou[24], 1996). The prevalence of these diseases may be highly correlated with a cariogenic diet and access to dental care (Witt[32], 1992; Kalsbeek et al.[13], 1996; Vargas et al.[27], 1998; Antoft et al.[2], 1999). Caries and periodontitis are believed to be the two leading causes of tooth loss in both developed and developing countries and in both young and older populations (Agerholm & Sidi[1], 1988; Ong[22], 1998; Hamasha et al.[10], 2000). The strongest predictors of tooth loss are periodontal attachment loss, severe tooth mobility, and dental caries (Gilbert et al.[8], 1999) A number of other factors have also been identified which may provide a smaller contribution to the variation in tooth loss. Differences in diet (e.g. sugar consumption), age, sex, education and dental health habits (oral hygiene practices and the use of fluorides) and access to professional care can explain the difference in the incidence of caries and periodontal disease in different social groups (Witt[32], 1992; Irigoyen et al.[12], 1999; Suomine-Taipale et al.[26], 1999; Blay et al.[3], 2000). The prevalence rate of dental caries in Brazilian children has been reported to be among the highest recorded worldwide (Leclerq et al.[16], *1987*), comparable to the 90% caries prevalence reported in Malaysia (Ministry of Health- Malaysia[6], 1977). Although there has been a significant decrease in the preva-

lence of caries in Brazilian children, the figures are still high in some parts of the country (Ministério da Saúde[19], 1996). As a result caries and periodontal pathology are the main cause of tooth extraction in Brazil. (Vargas et al.[27], 1998; Narvai & Fernandez[20], 1999). Studies indicate that preventive oral health programs are effective in resolving gingivitis and arresting progression of caries and periodontitis. Fluoridation of drinking water is correlated with significant caries reduction (48% an average), and the caries prevalence may continue to decrease even after reduction of fluoride concentrations in the water in some populations, if other preventive measures such as fluoridated salt, fluoridated toothpaste, fissure sealants and supervised brushing have been implement (Kunzel & Fischer[14], 2000; Künzel et al.[15], 2000; Vrbic[29], 2000). While oral health care is available to the population of São Paulo state through public and private institutions, the main preventive measure for caries is provided by fluoridation of drinking water. According to Calvo[5], in 1996, 79.3% of the total population of the state, distributed in 431 of the 625 counties had fluoridated water, suggesting the necessity of complementary measures decrease the prevalence of oral disease. Socio-economically disadvantaged individuals, with less access to dental care or appropriated preventive programs, are generally still reported to have a higher incidence of tooth loss (Irigoyen et al.[12], 1999; Suomine-Taipale et al.[26], 1999; Blay et al.[3], 2000; Hamasha et al.[10], 2000). Access to dental care varies greatly among different social classes in Brazil and previous studies have suggested that tooth loss is a significant health problem among Brazilian adolescents, despite the fact of the number of dentists per 10.000 inhabitants is reported to be adequate (Gjermo et al.[9], 1983; Ministério da Saúde[18], 1988; Normando & Araújo[21], 1990; Freire et al.[7], 1996; Vargas et al.[27], 1998; Narvai & Fernandez[20], 1999). In order to develop better treatment intervention strategies to reduce the incidence of oral disease and consequently to reduce the number of tooth extractions, it is important to develop epidemiological profiles of the populations at risk. The purpose of this study was to determine the prevalence of missing teeth in a population of young individuals (15- 25 years- old) with limited access to and utilization of dental care.

MATERIALS AND METHODS

The study population comprised 321 individuals, consecutively presenting for general dental treatment at the University of Taubaté Dental Clinics, Taubaté, São Paulo. The study was approved by the University of Taubaté Ethics Council. The individuals studied were 15-25 years-old and were classified according to three ethnic groups, Black, White and Mestizo (IBGE[11], 1996). All individuals studied were socioeconomically disadvantaged and had minimal exposure to prior dental care. Socio-economic status was evaluated through questionnaire. Study participants were examined over a two years period (1997-1999). Interviews were conducted with each individual to determine their medical health and smoking habits. Individuals with uncontrolled systemic diseases (e.g. diabetes) were excluded from the study. Each individuals oral hygiene habits including brushing technique, flossing and frequency of mouthwash utilization were also evaluated. All study participants were clinical examined by a single examiner (JRC) who recorded missing teeth according to World Health Organization criteria - WHO[31] (1997). All participants also received professional oral hygiene instruction and motivation and were referred for dental treatment according to their individual necessities.

STATISTICAL METHODS

The mean ages (years) and standard deviations were calculated for sex and ethnic specific groups. The students t-test and one-way analysis of variance was calculated to evaluate significance of differences between the means of the groups. The correlation between age and the number of missing teeth was determined by regression analysis. The frequency distribution for the mean number of missing teeth was also determined. Third molars were not included in the present analysis.

RESULTS

A total of 321 individuals (188 females and 133 males) were examined for this study. The age and sex distribution of the study participants are shown in Table 1.

Table 1 – Distribution of the study participants by age and gender.

Age (years)	Gender		
	Female	Male	Total
15	18	15	33
16	20	25	45
17	24	17	41
18	18	8	26
19	18	6	24
20	14	10	24
21	13	15	28
22	16	8	24
23	22	12	34
24	13	9	22
25	12	8	20
Mean age ± sd	19.67 ± 3.17	19.28 ± 3.25	19.51 ± 3.21

sd = standard deviation

Study participants were classified as Black, White and Mestizo (IBGE[11], 1996). Thirty-nine Blacks were studied, 18 females (mean age 20.0 ± 2.89 years) and 21 males (mean age 17.90 ± 3.16 years). Eighty-nine individuals were classified as Mestizos, 43 females (mean age 19.37 ± 3.14 years) and 46 males (mean age 19.20 ± 3.32 years). One hundred and ninety-three Whites were studied, 127 females (mean age 19.64 ± 3.27 years) and 66 males (mean age 19.64 ± 3.22 years). The differences in the mean ages within each group were not significantly different ($p<0.05$), and similarly the differences in the mean ages between the different groups was not significant ($p<0.05$). Twenty percent of individuals examined reported flossing regularly and 100% brushing their teeth an average of three times a day using a fluoride toothpaste.

The mean number of missing teeth for each of the 11 age groups is shown in Figure 1. There is a significant correlation between age and the mean number of missing teeth ($r = 0.88$). Table 2 shows gender and Table 3 shows racial distributions of subjects with missing teeth, the percentage of individuals in each of these groups and the mean number of missing teeth.
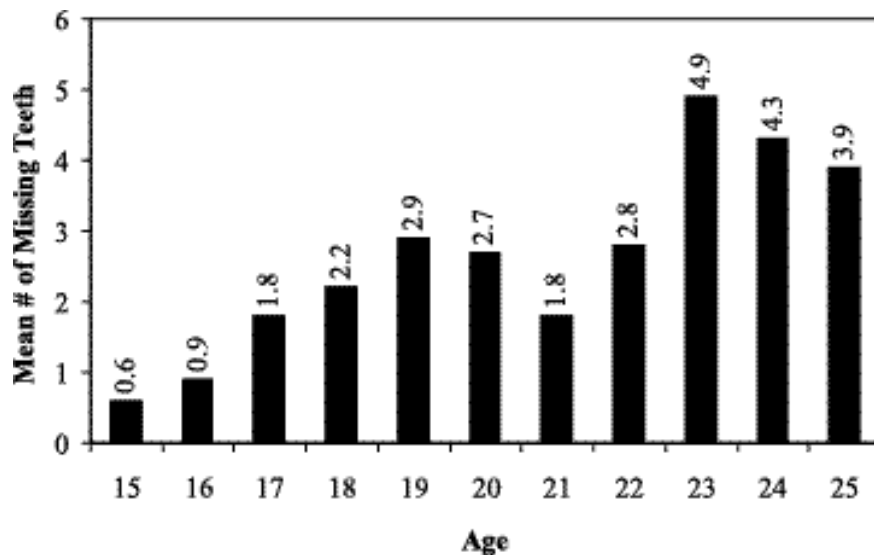

FIGURE 1 - Total of missing teeth by age, excluding third molars; r = 0.88; # - number.

Table 2 - **Distribution of subjects with missing teeth by gender; percentage of individuals in each group and the mean number of missing teeth.**

Gender (number studied)	Number of individuals with missing teeth (%)	Number of missing teeth/ total number of teeth possible (%)	Mean number of missing teeth/ affected individual
Female	133 (70%)	493/ 5.264 (9.3%)	3.7
(188)			
Male	87 (65%)	295/ 3.724 (7.9%)	3.3
(133)			

Table 3 - **Distribution of subjects with missing teeth by race; percentage of individuals in each group and the mean number of missing teeth.**

Race (Number examined)	Number of individuals missing teeth/ with missing teeth (%)	Number of missing teeth/total number of teeth possible (%)	Mean number of affected individual
Black (39)	28 (71%)	82 / 1.092 (7.5%)	2.9
White (193)	130 (68%)	488 / 5.404 (9.0%)	3.7
Mestizo (89)	65 (73%)	218 / 2.492 (8.7%)	3.5

Figure 2 shows the frequency distribution and mean numbers of missing teeth for all study participants. Sixty-eight percent of the individuals examined were found to be missing one or more teeth. The number of missing teeth ranged from 1 to 21. The 10% of the study population missing the most teeth were missing an average of 11.3 teeth, and all of these individuals were either Mestizo or White. The frequency with each tooth type is missing is presented in Figure 3. The most frequently missing teeth were the mandibular first molars (42%) and the least frequently missing teeth were the mandibular canines (£ 1%). The mandibular left canine was the only tooth present in all patients. A small difference in the mean number of missing teeth was found between smokers (3.4 missing teeth per individual) and nonsmokers (2.2 missing teeth per individual).
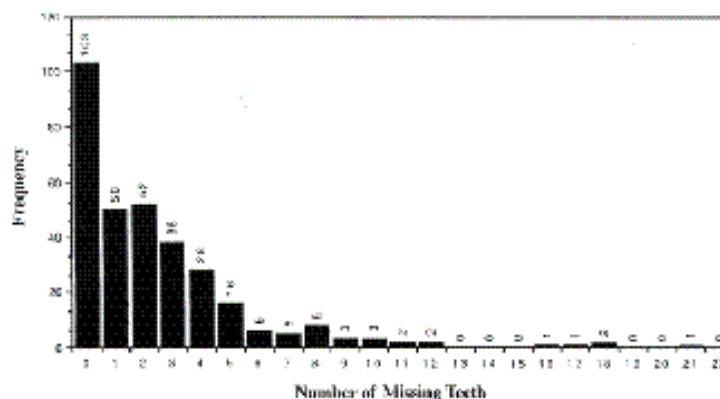

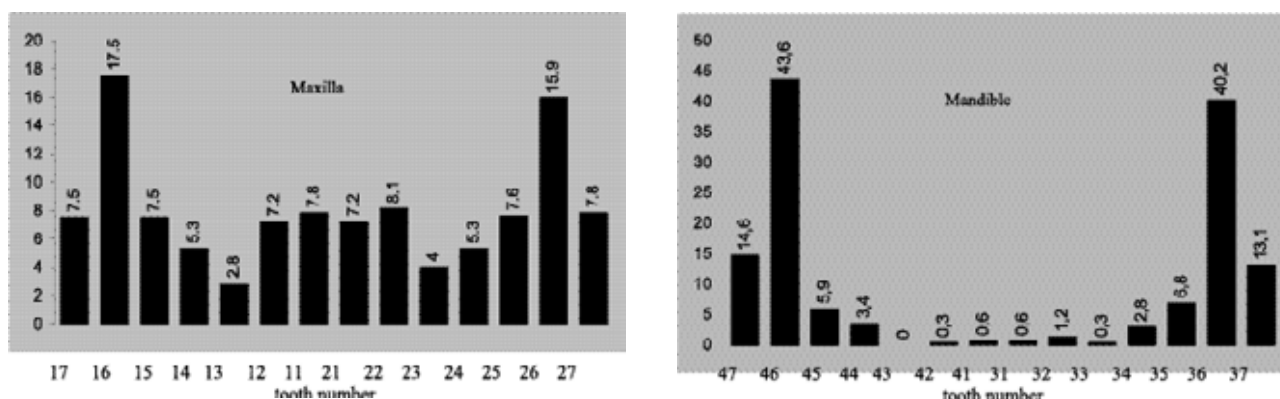**FIGURE 2** – Frequency distribution of the number of missing teeth for all 321 study participants.

FIGURE 3 – Frequency each tooth is missing for all 321 study participants.

DISCUSSION

The high prevalence of dental caries and periodontal diseases reported in Brazil may contribute to the high number of missing teeth in Brazilian adults (Ministério da Saúde[18], 1986; WHO[31], 1997). However, results of the present study suggest that significant dental problems begin at a relatively young age and the primary etiology appears to be dental caries. Although the mean age of individuals studied was less than twenty, only 30% of females and 35% of males had all their teeth. Given the significant correlation of missing teeth with age, it may be anticipated that the number of missing teeth in this group will increase with age. These prevalence of missing teeth in this young cohort exceeds the global goal for oral health in the year 2000 established by the World Health Organization in 1985 that proposed a goal of 85% of the population around the world not having missing teeth (Pinto[25], 1990). The WHO[30] (1993) global goal for oral health in the year 2010 proposed no missing teeth for 18 year old individuals. Clearly, if preventive oral health care measures are not instituted, the results of this study suggest that this population will fall far short of the WHO oral health goals.

In developed countries, extractions are highly associated with orthodontic treatment (Agerholm & Sidi[1], 1988). In our study we did not find a single individual that had undergone orthodontic treatment, suggesting that orthodontic treatment was not a reason for extraction in this study group. All the individuals examined reported brushing their teeth with a fluoride toothpaste an average of three times a day. Additionally, twenty percent of these individuals studied reported flossing regularly. Furthermore, if we associate the areas where people live with the supply of fluoridated water, the prevalence of missing teeth found in this study suggests not only the use of inadequate brushing techniques by the examined individuals, but also the necessity of other complimentary preventive measures as fissure sealant are needed.

When study participants were asked why they had lost their teeth, most stated that missing teeth had been extracted secondary to caries, while none reported teeth lost due to periodontal disease. This finding is consistent with other reports suggesting that dental caries, not periodontal destruction, is the most significant cause of tooth loss in younger populations (Löe et al.[17], 1978; Agerholm & Sidi[1], 1988; Hamasha et al.[10], 2000). The individuals included in this study were socioeconomically disadvantaged, and all had very limited access to dental care and limited exposure to preventive oral health programs. These factors may have contributed to a general lack of both healthy dental habits and effective oral hygiene that may have contributed to a high caries rate and subsequent extractions (Witt[31], 1992; Kalsbeek et al.[13], 1996; Vargas et al.[27], 1998; Antoft et al.[2], 1999). While the individuals studied reported a lack of access to dental care and in general exhibited a general lack of understanding regarding caries and treatment alternatives, we must also consider how the treatment philosophies of the professionals who occasionally had contact with these individuals influenced their decision to choose extraction as a therapeutic option.

The mean number of lost teeth per person was 2.4 in the present study group. This number is comparable to the findings reported by Gjermo and co-workers who reported an average of 1.8 missing teeth in a population of 13-16 years-old Brazilians (Gjermo et al.[9], 1983). The results showed a positive correlation between age and the number of missing teeth (r = 0.88) (Figure 1). These data agree with several studies (Brown[4], 1994; Suomine – Taipale et al.[26], 1999) that reported a positive association between increasing age and greater numbers of missing teeth. In addition to socio-economic status, access to dental care, age, and smoking habits have already been reported as a possible risk factors for tooth loss (Ong[22], 1998; Suomine – Taipale et al.[26], 1999). In the present study, a difference was observed in the mean value of missing teeth in smokers and non-smokers (3.4 and 2.2 respectively).

The most frequently missing teeth were the mandibular first molars (42%). It is now acknowledged that caries experience differs from tooth to tooth and surface to surface and there is data concerning the caries susceptibility of the first permanent molar (Vehkalahti et al.[28], 1991). Oliver et al.[23], 1992 found that early loss of the first permanent molars, prior to the age of 15-16 years, is associated with a higher caries experience in adjacent teeth particularly in occlusal surfaces. This may lead to more tooth extractions. These studies also reported that the loss of the first molars was associated loss of the second

molar and second premolar. Our findings appear to support this relationship, particularly for the mandibular teeth (Figure 3). The similarities in findings, by independent studies conducted over a decade apart suggest that, little has been done in terms of effective preventive and treatment programs designed to address the significant oral health problems of young, socio-economically disadvantaged Brazilians.

Tooth loss is one of the most severe compromises of dental function and may represent the last sequel of caries and periodontal disease. Although risk factors for tooth loss include economic, educational, and socio-cultural variables, tooth loss itself may be an indicator of oral health in a particular population. While cross-sectional studies may provide valuable information regarding the prevalence of a disease in population, to more fully understand the etiology and health implications of tooth loss, it will be important to conduct longitudinal studies whereby the same groups are evaluated at different times.

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