DENTAL CARIES AND TOOTH LOSS IN ADULTS IN A BRAZILIAN SOUTHEASTERN STATE

Lilian Berta RIHS[1], Débora Dias da SILVA[1], Maria da Luz Rosário de SOUSA[2]

1- DDS, MSc, Graduate student, Department of Community Dentistry, Piracicaba Dental School, Piracicaba, SP, Brazil.
2- DDS, MSc, PhD, Graduate student, Department of Community Dentistry, Piracicaba Dental School, Piracicaba, SP, Brazil.

Corresponding address: Lilian Berta Rihs - Rua Aquilino Pacheco, 1370 – apto 114 Bairro Alto - 13419-150 - Piracicaba, SP - Brasil - Phone/Fax: +55-19-3301-2220 - e-mail: lilianberta@yahoo.com.br

ABSTRACT

*O*bjective: The purpose of this study was to analyze dental caries experience of adults living in the southeastern state of São Paulo, Brazil, according to some socio-demographic conditions of this population. Material and methods: The sample consisted of 1,159 school teachers and workers (35 to 44 years old) from 29 cities of the state of São Paulo, Brazil. Results: 92.3% were dentate and the DMFT index (number of decayed, missing and filled teeth) was 21.0 and the mean number of decayed teeth was 1.1, with no significant difference among adults from regions with and without fluoridation. Male subjects presented the highest mean values of "D" (decayed teeth) and "M" (missing teeth) components. The percentage of caries-free subjects was higher among white subjects, as well as the mean number of teeth present in the mouth. The mean values of the "F" component (filled teeth) [9.81] and present teeth [19.3] were higher for adults from fluoridated water regions. Conclusions: In this study, the worse condition observed was the early tooth loss in all groups. In addition, people with worse socio-demographic conditions had worse oral health conditions. It is expected that oral health programs targeted to this population could be established with the goal of improving the oral health conditions of this population and hence the maintenance of the teeth for a longer period in function.

Key words: Oral health. Adults. Dental caries. Tooth loss. Epidemiology.

INTRODUCTION

The oral health of adult population has generally not received adequate care in Brazil. There is a great demand for oral health services for this population, who reach advanced ages with loss of teeth in age groups over 50 years and consequent replacement of natural dentition by prosthetic devices[1,5,11]. This loss of teeth, according to Fure and Zickert[4] (1997), is mainly attributed to dental caries, including root caries. In the United States, the percentage of filled teeth, periodontal disease, age, alcohol and tobacco consumption and mean number of present teeth were considered predictors for tooth loss. In addition, smokers had higher risk of losing their teeth[2].

In the first epidemiological survey on oral health conducted in Brazil, in 1986, poor oral health conditions were found for the population aged 35 to 44 years as well as for people living in the southeastern region of the country. The DMFT index (number of decayed, missing and filled teeth) for the southeastern region population was 22.8, with an inverse association between caries experience and income levels, and 41.6% of the adult population examined showed need for total prosthesis. In the state of São Paulo, the DMFT index was equal to 22.6[5]. In the latest survey conducted in 1998 in the state of Sao Paulo, DMFT index equal to 22.4 was obtained, virtually unchanged after 12 years from the 1986 survey. Although the values are similar, the comparison of the components of the DMFT index indicated a reduction in the proportion of lost teeth, and revealed that in municipalities with fluoridated water, this component proved to be slightly lower[16]. Despite this improvement, the oral health condition among adults still remained very unsatisfactory.

Considering that the largest portion of the Brazilian population is composed of economically active adults[11], the knowledge of the oral conditions in this group is considered relevant, seeking to direct health and dental treatment actions, ensuring equity in the care of the needs of this population[10] and preventing tooth loss in this group.

Thus, the objective of this study was to analyze the dental caries experience of a population of adults - teachers and school officials – who live in the southeastern state of São Paulo, Brazil, according to some socio-demographic conditions. The hypothesis of the study is that individuals with the worst socio-demographic conditions have the worst oral health conditions.

MATERIAL AND METHODS

This was a cross-sectional study conducted in municipalities representing the in the southeastern state of São Paulo, Brazil. The age groups involved were: 5-12 years, 18 years, 35-44 years and 65-74 years. Specifically in this article, the focus was the 35-44-year-old age group, with an exploratory study for adults. The sample was composed of 1st grade teachers and officials working at to public and private schools.

The selection of the sample was conducted in stages. In the first stage, the municipalities were randomly selected according to the availability of fluoride in public water supply and number of inhabitants in each municipality (size of the municipality - small, intermediate and large). Altogether, 29 municipalities were randomly selected, 16 of these had fluoridated public water supply (the beginning of fluoridation ranged from 1972 to 1991, and most municipalities began fluoridation in the 1980s) and 13 did not have fluoridated water. In the second stage, the people who would be invited to participate in the study were randomly selected[17]. Then, the authorization for the examinations was obtained by the participants' signature on informed consent forms.

The sample size by age and municipality was calculated as recommended by the World Health Organization[17], in which 96 elements for each age or age group were obtained. This value was obtained by considering that 40 subjects by age would be sufficient to obtain reliable data, when the prevalence of dental caries is moderate or high. A design error of 2 and sample loss of 20% were admitted.

Clinical examinations were carried out using WHO criteria report on oral health surveys[18]. Dental caries experience was expressed as DMFT index (number of decayed, missing and filled teeth).

The training and calibration of dentists involved in this study were conducted in two steps. First, the Scientific Coordinators of this research conducted, in the city of São Paulo, a 16-h workshop for theoretical and methodological issues discussed with the regional coordinators so that they could train their field teams to develop their attributions. In the second step, the Regional Coordinators trained the field teams in their respective regions. It was decided that the calibration process would involves at least 5 periods of 4 h of work, including theoretical (4 h) and practical aspects (16 h) of indexes to be used. The calibration procedures were planned in order to anticipate (simulate) the conditions that investigators would find in the field, particularly in relation to different population groups. Regarding the calibration technique, it was recommended to adopt the "consensus without concern" approach, that is, with comparisons to a standard examiner. In order to ensure the consistency of examinations during data collection, it was recommended the performance of examinations in duplicate in approximately 10% of files and these would be used for calculating the intra-examiner error in each region.

To evaluate the data, the sample was stratified in relation to gender, age (35-39 and 40-44 years), ethnic group (white and non-white) and water fluoridation condition.

The calibration process was made along 40 h divided between theoretical discussions and practical activities. In the calibration step, the inter-examiner concordance percentage was 84.5% for dental caries. During the data collection, re-examination of 10% of the sample was performed to verify that intra-examiner concordance, which was higher than 98%.

The examinations were performed by 66 properly calibrated dentists and data collection took place from August to December 1998. The individuals were examined in their own workplaces.

The total number of valid exams was 1,159. For the statistical analysis, the Epi Info software was used. Chi-square and Mann-Whitney tests were also used for the statistical analysis with a significance level of 5% because the data did not show normal distribution.

This research was previously subjected to approval by the Research Ethics Committee of the Dental School of Piracicaba, State University of Campinas (COEP 017/2003) since it involved human beings as sample subjects.

RESULTS

General Sample

This study was designed to examine 1,392 (eligible) people and only 1,159 people participated, which provided a participation rate of 83.3%. From the 1,159 adults that were enrolled in the study, 101 (8.7%) were edentulous.

The distribution of adults according to some socio-demographic variables, such as gender, ethnic group, age group and fluoridation of public water supply, can be seen in Table 1.

In the general group, dental caries prevalence was 98.2%. Table 2 shows the dental caries index and its components,

TABLE 1- Number and percentage of subjects according to gender, age group, ethnic group and fluoridated water status. Southeastern state of São Paulo, Brazil

	N	%
General	1,159	100
Gender		
Male	270	23.3
Female	889	76.7
Age groups		
35-39 years old	613	52.9
40-44 years old	546	47.1
Ethnic group		
White subjects	825	71.2
Non-white subjects	334	28.8
Water Supply		
White fluoride	708	61.1
Without fluoride	451	38.9

TABLE 2- Mean number of present teeth and caries experience among subjects (general) and according to gender (men and women). Southeastern state of São Paulo, Brazil

Variables	General	Men	Women	p value
Mean number of present teeth (SD)	19.3 (9.9)	19.1 (9.8)	19.3 (10.0)	0.564**
Caries-free (%)	21　(1.8)	4　(1.5)	17　(1.9)	0.642*
DMFT – mean (SD)	21.0 (7.4)	20.6 (7.7)	21.1 (7.3)	0.355**
DT - mean (SD)	1.1 (2.3)	1.6 (2.6)	1.0 (2.2)	<0.001**
MT – mean (SD)	10.0 (10.1)	11.2 (10.1)	9.7 (10.0)	0.005**
FT – mean (SD)	9.8 (7.7)	7.9 (7.4)	10.4 (7.7)	<0.001**

Chi-Square (*) and Mann-Whitney (**) tests. DMFT- number of decayed, missing and filled teeth. DT – Mean number of decayed teeth. MT – Mean number of missing teeth. FT – Mean number of filled teeth - SD - standard deviation.

TABLE 3- Mean number of present teeth and caries experience according to age groups. Southeastern state of São Paulo, Brazil

Variables	35 to 39 years old	40 to 44 years old	p value
Average of present teeth (SD)	22.0 (8.4)	16.2 (10.6)	<0.001**
Caries-free (%)	9　(1.5)	12　(2.2)	0.352*
DMFT (SD)	20.2 (6.8)	21.9 (8.0)	<0.001**
DT (SD)	1.2 (2.5)	1.0 (2.1)	0.111**
MT (SD)	7.5 (8.2)	12.9 (11.2)	<0.001**
FT (SD)	11.4 (7.5)	8.0 (7.5)	<0.001**

Chi-Square (*) and Mann-Whitney (**) tests. DMFT- number of decayed, missing and filled teeth. DT – Mean number of decayed teeth. MT – Mean number of missing teeth. FT – Mean number of filled teeth- SD - standard deviation.

the number of caries-free adults (DMFT = 0), as well as the mean number of present teeth. The most prevalent component of the DMFT index was "M" (missing teeth), followed by "F" (filled teeth). Subjects with 20 or more present teeth corresponded to 61.7% of the sample (n = 715).

Sociodemographic Variables and Water Fluoridation Status

Table 3 presents results for dental caries experience and the mean number of present teeth according to gender. This table also shows that, although the DMFT index was not different between men and women, men had all components of this index worse than women.

The mean number of present teeth was higher in the age group from 35 to 39 years (p<0.05). In addition, the group with the highest mean age had more missing teeth (p<0.05), as can be seen in Table 3.

When the sample was stratified for white and non-white subjects, it was observed that the white group presented more caries-free subjects and higher mean number of present teeth (p<0.05), as can be seen in Table 4.

The number of edentulous subjects living in fluoridated water regions was 61 (8.6%) and those living in non-fluoridated water regions were 40 (8.9%) (p> 0.05),

that is, there were more edentulous individuals in regions without fluoride. The same behavior was verified when the missing component of the DMFT index is evaluated. Regarding the needs of dental procedures, which were not investigated in this study, it seems that in the regions with fluoridated water, subjects presented a greater need for extractions (29.3%) compared to those from non-fluoridated water regions (19.7%) (p<0.001).

When the sample was stratified according to the fluoridation of water supply, it was verified that the regions with fluoridated water presented a higher percentage of people with 20 or more present teeth (64.8%), compared to the regions without fluoridated water (56.8%) (p=0006).

It was observed that the caries experience was related to the fluoridated water availability, and it could be verified that people living in regions with fluoridated water supply presented a higher mean number of present teeth, and a lower mean number of missing teeth (p<0.05), as shown in Table 5.

TABLE 4- Mean number of present teeth and caries experience according to the ethnic group. Southeastern state of São Paulo, Brazil

Variables	White subjects	Non-White subjects	P value
Mean numebr of present teeth (SD)	19.6 (10.2)	18.4 (9.4)	<0.001**
Caries-free (%)	17 (2.1)	4 (1.2)	<0.001*
DMFT (SD)	21.0 (7.4)	20.8 (7.4)	0.663**
DT (SD)	0.9 (2.0)	1.8 (2.8)	<0.001**
MT (SD)	9.4 (10.2)	11.6 (9.6)	<0.001**
FT (SD)	10.8 (7.8)	7.5 (6.8)	<0.001**

Chi-Square (*) and Mann-Whitney (**) tests. DMFT- number of decayed, missing and filled teeth. DT – Mean number of decayed teeth. MT – Mean number of missing teeth. FT – Mean number of filled teeth- SD - standard deviation.

TABLE 5- Mean number of present teeth and caries experience according to fluoridated water status from public water supply. Southeastern state of São Paulo, Brazil

Variables	With fluoride	Without fluoride	p value
Mean numebr of present teeth (SD)	20.0 (9.8)	18.1 (10.0)	<0.001**
Caries-free (%)	13 (1.8)	8 (1.8)	0.938*
DMFT (SD)	20.8 (7.2)	21.3 (7.7)	0.089**
DT (SD)	1.1 (2.4)	1.2 (2.2)	0.241**
MT (SD)	9.2 (9.9)	11.3 (10.2)	<0.001**
FT (SD)	10.4 (7.7)	8.9 (7.6)	<0.001**

Chi-Square (*) and Mann-Whitney (**) tests. DMFT- number of decayed, missing and filled teeth. DT – Mean number of decayed teeth. MT – Mean number of missing teeth. FT – Mean number of filled teeth- SD - standard deviation.

DISCUSSION

Studies have pointed to dental caries and periodontal disease as determinants of the high incidence of dental mutilation and edentulism among adults, both internationally[2] and in Brazil[3,8]. Thus, epidemiological studies periodically performed could change the guidelines that would enable improving the oral health conditions of the adult population, resulting in the addressing of resources.

Regarding the caries experience of this specific population from southeastern state of São Paulo, it was observed high mean DMFT index. "M" component (missing teeth) presented the highest mean value, followed by the "F" component (filled teeth) (Table 2). The DMFT index was considered high because it was still close to that obtained in the national survey conducted in 1986. In that occasion, the DMFT index for the State of São Paulo was 22.6, and the missing teeth component had the highest prevalence[5], in the same way as observed in the present study.

Few studies have been conducted to assess the oral health condition of workers as in the present study. However, the oral health condition of the general population (Table 2) is worse than that found in another study assessing workers from the same age group[10]. In a more recent study that evaluated the oral health condition of industry workers from several localities, it was verified that adults from the same age group had similar oral health status, with high percentages of missing teeth[15].

It should be considered that this cross-sectional study worked with secondary data from the Survey on the Oral Health Conditions in the State of São Paulo, 1998, and the sample was composed of teachers and officials from public and private schools from southeastern Brazil, i.e., specific for workers. Therefore, extrapolating the present results to the adult population as a whole should be done with caution and further studies are needed for this age group.

As a result of the high prevalence of missing teeth (Table 2), the percentage of edentulism was high (8.7%), close to that found in a city from the state of São Paulo, Rio Claro (8.9%)[12], and far higher than that found in other locations for the same age group, such as China (0.2%)[6] and Lithuania (1%)[13].

In Brazil, each municipality established water fluoridation at the time considered appropriate and, thus, standardization of data was not possible. This is a limitation of this study because there is a gap of almost 20 years (from 1972 to 1991) in the implementation of water fluoridation, though most municipalities began water fluoridation in the 1980s. It is recommended that results presented for this condition are carefully observed.

The mean number of present teeth has been reported as a better tooth loss predictor than age[2]. Moreover, the number of teeth interferes directly in the individuals' quality of life, and it is considered to be a measure of great importance to oral health[14], and its verification is increasingly important in terms of public health. In this study, the mean number of present teeth was higher among younger and white individuals (35-39 years), who live in regions with fluoridated water (Tables 3-5). It was also verified that the percentage of adults with 20 or more present teeth was 61.7%, which is lower than the rate recommended by the WHO for the year of 2000[16].

The mean DMFT index was higher among older individuals (40-44 years) (Table 3). The decayed teeth component of the DMFT index was higher for men and non-white individuals (Tables 2 and 4). The missing teeth component was higher among men, older, non-white individuals, living in regions without water fluoridation (Tables 2, 3, 4 and 5). No differences were found in the mean DMFT index (Table 5) between areas with and without water fluoridation, unlike which was found in São Paulo, where people from regions with water fluoridation had lower DMFT indexes (on average, one tooth less with caries experience) and fewer missing teeth[3].

In the present study, it was found that people living in regions without fluoridation of the water supply had the worst components of the DMFT index when compared to people living in regions with water fluoridation (Table 5). Unlike what was observed for the group of children, few studies show comparisons between regions with and without water fluoridation for adults. However, in a work with 30-35-year-old Australian militaries exposed to fluoridated water during their whole life had better oral health conditions[7].

CONCLUSIONS

It may be concluded that the oral health condition in this population of adults was not satisfactory. Under the studied conditions, men had worse oral conditions, with more decayed and missing teeth. Older people had a higher mean number of missing teeth, which contributes to the increase in edentulism in advanced ages. People classified as non-white and residents of areas without water fluoridation showed worse oral health condition. It is expected that the findings of the present study may be useful for public health service managers be aware of this reality, and that dental programs aimed at groups that presented the worst oral health conditions can be implemented.

REFERENCES

1- Cangussu MCT, Coelho EO, Castellanos RA. Condições de saúde bucal em adultos e idosos em Itatiba/SP, Brasil, 2000. Rev Odontol UNESP. 2001;30:245-56.

2- Copeland LB, Krall EA, Brown LJ, Garcia RI, Streckfus CF. Predictors of tooth loss in two US adult populations. J Public Health Dent. 2004;64:31-7.

3- Frazão P, Antunes JLF, Narvai PC. Perda dentária precoce em adultos de 35 a 44 anos de idade. Estado de São Paulo, Brasil, 1998. Rev Bras Epidemiol. 2003;6:49-57.

4- Fure S, Zickert I. Incidence of tooth loss and dental caries in 60-, 70- and 80-year-old Swedish individuals. Community Dent Oral Epidemiol. 1997;25:137-42.

5- Brasil. Ministério da Saúde [Internet]. Levantamento epidemiológico em saúde bucal: Brasil, zona urbana, 1986 [cited 2009 jun 30]. Available from: http://dtr2004.saude.gov.br/dab/cnsb/vigilancia.php.

6- Hong Ying W, Petersen PE, Jin You B, Bo Xue Z. The second national survey of oral health status of children and adults in China. Int Dent J. 2002;52:283-90.

7- Hopcraft M, Morgan M. Dental caries experience in a young adult military population. Aust Dent J. 2003;48(2):125-9.

8- Mendonça TC. Dental mutilation: rural workers' concepts of responsibility for tooth loss. Cad Saude Publica. 2001;17:1545-7.

9- Petersen, PE, Tanase M. Oral health status of an industrial population in Romania. Int Dent J. 1997;47:194-8.

10- Petry KG, Victora CG, Santos IS. Adultos livres de cárie: estudo de casos e controles sobre conhecimentos, atitudes e práticas preventivas. Cad Saude Pública. 2000;16:145-53.

11- Pinto VG. Programação em saúde bucal: saúde bucal para adultos. In: Pinto VG, editor. Saúde bucal coletiva. 3. ed. São Paulo: Ed. Santos; 2000. p. 114-6.

12- Silva DD, Sousa MLR, Wada RS. Oral health in adults and the elderly in Rio Claro, São Paulo, Brazil. Cad Saude Publica. 2004;20:626-31.

13- Skudutyte R, Aleksejuniene J, Eriksen HM. Dental caries in adult Lithuanians. Acta Odontol Scand. 2000;58(4):143-7.

14- Steele JG, Sanders AE, Slade GD, Allen PF, Lahti S, Nuttall AJ, et al. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples. Community Dent Oral Epidemiol. 2004;32:107-14.

15- Pinto VG, Lima MOP. Epidemiologic study of oral health in industry workers: Brazil 2002-2003. Brasília: SESI/DN; 2006.

16- World Health Organization. Federatión Dentaire Internationale. Global goals for oral health in 2000. Int Dent J. 1982;32:74-7.

17- World Health Organization. Oral Health Surveys. Basic methods. 3rd ed. Geneva: WHO; 1987.

18- World Health Organization. Oral Health Surveys. Basic methods. 4rd ed. Geneva: WHO; 1997.