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Impact of dental caries on quality of life of adolescents according to access to oral health services: a cross sectional study

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Abstract

Aim: This study presents the prevalence of dental caries and its relation to the quality of life of adolescents according to the access to dental health services. **Methods:** Two hundred and fifty-six adolescents between 15 and 19 years of age participated in the study; they were all enrolled in public schools in a countryside municipality of the São Paulo State. Data related to dental caries were evaluated by the DMFT Index, and OHIP-14 was used for evaluating the quality of life. Mann Whitney and Spearmann correlation tests were also used ($p<0.05$). **Results:** A DMFT of 3.09 (±3.30) was found with a higher prevalence among the adolescents who used public dental services (3.43±3.34) compared with those who used private services (2.94±3.28). A statistically significant relationship between the decay component of DMFT with physical pain (0.020), physical disability (0.002) and quality of life (0.017) was verified. **Conclusions:** A low prevalence of dental caries was observed, and it was higher in adolescents who used public oral health services rather than private ones, evidencing the low influence of oral health on the quality of life of the participants.

Keywords: Dental Caries. Adolescent. Quality of Life. Health Services Accessibility.

Introduction

Adolescents are recognized as important part of the global public health. An approach associated to the quality of life can increase the understanding and knowledge of the adolescents' health and help to establish policies that promote their health and well being[1]. The discussion about the relationship between health and quality of life demonstrates that this is a social representation based on subjective parameters, such as well being, happiness and objectives based on the needs of a certain population[2]. In this sense, oral health-related quality of life describes how an individual's day-to-day living is disrupted by oral disorders. It is a multidimensional concept that involves different health domains, and it is increasingly recognized as an integral part of general health, with an important role for understanding subjective patient evaluations and the experience with oral health care and determining the assessment of needs[3,4]. The impact of oral health problems on society is defined as the outcomes related to the limitations of functional capabilities and performance of expected roles. Oral health problems such as dental caries have been associated with absenteeism and decrease in children's and adolescent's school performance[5]. Dental caries still remains one of the most prevalent oral diseases in our country. In a nationwide survey conducted in 2010 in Brazil, a mean decayed,

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missing and filled teeth (DMFT) index of 4.25 was established for adolescents aged 15 to 19 years, with the highest mean found in the Midwest region (5.94) and the lowest mean found in the Southeastern region (3.83)[6]. In addition, a higher percentage of DMFT in this age group remains untreated and it is associated with a negative impact on general health, development, productivity, school performance and oral health-related quality of life[7].

In order to improve oral health indicators, one of the required factors is the access to dental health services; however, there are difficulties concerning such access for a substantial part of the population. This can be explained by several factors, like the socioeconomic and educational levels, the high cost of private services and the deficiencies in the availability of oral health services in primary health care. The demand for public dental services is still high and the private sector accounts for a significant coverage of these services[8]. Results from the National Epidemiologic Survey conducted in Brazil in 2010 showed an overview of access to oral health services of adolescents between 15 and 19 years old. It is still unsatisfactory: 13.60% have never been to the dentist, with the lowest prevalence of teenagers that have never been to the dentist in the Southern region of the country (5.00%) and the highest values in the Midwest region (19.40%)[6]. Based on these considerations, this study aimed to evaluate the prevalence of dental caries and its relation to the quality of life of adolescents aged between 15 and 19 years, according to the access to oral health services in a countryside municipality of São Paulo State, Brazil.

Material and methods

This study was approved by the Ethics Committee of Bauru Dental School, University of São Paulo (Process number 174 / 2011), in accordance with the resolution 196/96 of the Brazilian National Health Council. This research was conducted in full accordance with the World Medical Association Declaration of Helsinki. All participants or their legal guardians signed the informed consent form before participating in any part of the research.

This cross-sectional study was conducted in the city of Agudos, located in the Midwest region of the São Paulo State and according to the latest census it has 35,000 inhabitants (IBGE, 2010). The city had 6 Basic Health Units and 3 Family Health Units and a number of 3,091 adolescents between 15 to 19 years old. The municipality has 5 public schools with high school in the urban region, and 3 of them were randomly selected for the study, with a total of 716 adolescents aged 15 to 19 years old. All participants provided an informed consent form signed by them or their legal representative, for those under 18 years of age, as required by the Brazilian law[9]. The sample size was calculated using the correlation coefficient, based on the total adolescent population of the city (n = 3,091) with a 0.05 error level and a correlation coefficient (R) of 0.20, resulting in study population of 256 adolescents to be examined.

The examinations were conducted in 2012, between March and June. The adolescents were examined by a single calibrated examiner (kappa = 0.95) in order to ensure uniform interpretation, understanding, reproducibility and application of the WHO criteria. Examinations were performed in an outdoor setting under natural light, with the examiner and the adolescent sitting in chairs. The examiner used a dental mirror and a Community Periodontal Index (CPI) ballpoint probe.

The WHO criteria for decayed, missing and filled teeth (DMFT) were used to evaluate dental caries. These data provide the information to calculate the Significant Caries (SiC) Index[10] and the Care Index[10]. Percentages of DMFT and caries-free children were used to describe the dental caries distribution among the teenagers. Significant Caries Index (SiC Index) and Care Index were employed to assess the unequal distribution of dental caries and oral health care. SiC index was calculated by the mean DMFT of the one third of the individuals with the highest DMFT values in a given population, and was used to measure the polarization of the dental caries occurrence among schoolchildren. The Care Index was calculated using the DMFT means without the caries-free children. The component "F" (filled teeth) was divided by DMFT and multiplied by 100[11].

The Oral Health Services and Oral Health-Related Quality of Life Questionnaires were also used in the study. The questionnaire from the National Survey by Household Sampling[12], was used to evaluate access to oral health services. It contains 8 questions about access to oral health services, time since the last dental visit, reason for consultation and if the treatment was by public or private service.

The OHIP-14 was used to access the impact of oral health in the adolescent's quality of life. This instrument evaluates the experiences of the subject in the 12 months prior to the dental caries epidemiological examination[13]. The dimensions assessed by this instrument were functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. Two questions apply to each dimension. Possible responses were: 0 = never; 1 = rarely; 2 = sometimes; 3 = often, and 4 = always. The total maximum score ranged from 0 to 28.

Data were analyzed descriptively by absolute and relative frequencies. They were stratified according to the access to dental healthcare (access to private or public dental healthcare services) and according to ethnic groups. In this case, the ethnic groups were stratified into whites and non-whites and since there was no oriental or indigenous individuals, it was a sample composed by white, black or brown participants.

The Mann-Whitney test was used to compare findings in relation to ethnic and assistance groups on the DMFT index, its components and quality of life and its domains. Spearman's correlation was used to estimate the correlations between the DMFT, its components and the access to oral health service with OHIP 14 and its domains. All statistical procedures adopted a significance level of 0.05 and tests were performed using STATISTICA Version 9.1.

Results

The response rate was 35.75%, while the losses were especially due to parental refusal, incomplete or unanswered questionnaires, and adolescents who were not in school at the examination times.

Regarding sample distribution, 40.87% of the adolescents used public dental services, 59.13% used private dental services and 4.93% of them had never been to the dentist. Concerning sex, 35.16% were male and 64.84% were female (Table 1).

A DMFT mean of 3.09 was found, with a higher expressivity of the filled component and a statistically significant difference between the white and non-white ethnic groups in the decayed component ($p = 0.03$). A higher DMFT mean was observed in the public assistance group compared with the private assistance group, but without statistically significant difference between them (Table 2). In addition, a SiC Index twice as high the value of DMFT was found for the overall sample, ethnic groups and type of assistance, showing a polarization of dental caries in the group.

When the influence of oral health on adolescents' quality of life was assessed, a mean of 6.62 (+4.41) was observed, showing a low impact of oral health conditions on quality of life, with a minimum score of 0.00 and a maximum score of 18.40. According to the different responses to the domains questionnaire, a higher mean in the psychological discomfort and a lower mean in the domain deficiency was verified in the overall sample, the ethnic group and the type of assistance. No difference was found in the oral health related to the quality of life between white and non-white ethnic groups and between the private and the public access to oral health service groups, due to the higher expression of the filled component in both groups, as shown in Table 3.

The Spearman correlation test assessed the relationship among the independent variables (dental caries, its components and access to oral health services) under the influence of oral health on quality of life and its domains. However, this study did not verify the causal relationship among the assessed variables due to its cross-sectional design. The results of the correlation test are in Table 4, in which a statistically significant correlation can be observed among the decay component, the physical pain, physical disability and the final score of quality of life. A relationship was verified between the missing component with psychological discomfort, psychological disability, deficiency and final score of the quality of life. In relation to the access to oral health services, a statistically significant correlation was verified with the physical pain and physical disability domains and this relation was weak.

Table 1 - Sample distribution according to the access to oral health services, Agudos, SP, 2012.

Sealant/Batch number	Public Health Service	Private Health Service	Have never been to the dentist	Total
Age n (%)				
15	37 (14.68)	68 (26.98)	2 (0.79)	107 (41.79)
16	31 (12.30)	47 (18.65)	1 (0.40)	79 (30.86)
17	27 (10.71)	28 (11.11)	1 (0.40)	56 (21.88)
18	8 (3.17)	6 (2.38)	0 (0.00)	14 (5.47)
Sex n (%)				
Male	35 (13.89)	53 (21.03)	2 (0.79)	90 (35.16)
Female	68 (26.98)	96 (38.10)	2 (0.79)	166 (64.84)
Ethnic groups n (%)				
White	75 (29.76)	112 (44.44)	3 (1.19)	190 (74.22)
Non-White	28 (11.11)	37 (14.68)	1 (0.00)	66 (25.78)
Total	**103 (40.23)**	**149 (59. 13)**	**4 (1.59)**	**256 (100.00)**

Table 2 - Dental caries and components according to gender, ethnic groups and type of assistance, Agudos, SP, 2012.

	Decay (±sd)	Missing (±sd)	Filled (±sd)	DMFT (±sd)	Sic Index (±sd)	Caries Free (%)	Care Index (%)
Ethnic groups							
White	0.45 (0.90)	0.07 (0.38)	2.53 (3.20)	3.05 (3.50)	7.17 (2.85)	35.79	82.95
Non-White	0.80 (1.09)	0.18 (0.46)	2.24 (2.42)	3.23 (2.68)	5.68 (2.59)	22.73	69.35
p	0.03*	0.36	1.00	0.41	-	-	-
Access to Oral Health Service							
Public Health Service	0.68 (+1.13)	0.07 (+0.29)	2.68 (+3.09)	3.43 (+3.34)	7.21 (+2.82)	25.24	78.13
Private Health Service	0.46 (1.10)	0.12 (0.48)	2.36 (2.99)	2.94 (3.28)	6.68 (2.72)	36.24	80.27
Have never been to the dentist	0.25 (0.50)	0.00 (0.00)	0.00 (0.00)	0.25 (0.50)	0,50 (0.71)	75.00	0.00
p*	0.38	0.73	0.68	0.49	-	-	-
Total	**0.54 (+1.11)**	**0.10 (+0.41)**	**2.45 (+3.02)**	**3.09 (+3.30)**	**6.86 (+2.76)**	**32.42**	**79.29**

*Mann-Whitney Test.

Table 3 - Oral health-related quality of life and domains according to gender and ethnic groups, Agudos, SP, 2012.

	Functional limitations (±sd)	Physical pain (±sd)	Psychological discomfort (±sd)	Physical] disability (±sd)	Psychological disability (±sd)	Social disability (±sd)	Deficiency (±sd)	Quality of life (±sd)
Ethnic groups								
White	0.74 (0.71)	1.13 (0.81)	1.56 (1.12)	0.63 (0.78)	0.83 (0.79)	1.12 (0.89)	0.51 (0.80)	6.53 (4.15)
Non-White	0.77 (0.70)	1.39 (0.77)	1.51 (0.96)	0.73 (0.73)	0.89 (0.92)	1.07 (0.89)	0.55 (0.85)	6.90 (4.14)
p	0.79	0.49	0.75	0.87	0.71	0.96	0.58	0.48
Access to Oral Health Service								
Public Health Service	0.75 (±0.68)	1.13 (±0.80)	1.59 (±1.09)	0.53 (±0.69)	0.83 (±0.78)	1.03 (±0.91)	0.48 (±0.86)	6.35 (±3.98)
Private Health Service	0.74 (±0.71)	1.23 (±0.81)	1.49 (±1.06)	0.73 (±0.81)	0.85 (±0.85)	1.15 (±0.86)	0.54 (±0.77)	6.73 (±4.21)
Never	0.99 (0.91)	1.59 (0.99)	2.45 (1.29)	1.23 (0.87)	1.15 (1.01)	1.35 (1.26)	0.69 (0.82)	9.44 (5.28)
p*	1.00	0.79	0.30	0.75	0.70	0.62	1.00	1.00
Total	**0.75 (±0.70)**	**1.19 (±0.81)**	**1.55 (±1.08)**	**0.66 (±0.77)**	**0.85 (±0.83)**	**1.11 (±0.89)**	**0.52 (±0.81)**	**6.62 (±4.41)**

*Mann-Whitney Test.

Table 4 - Spearman correlation (r) between dental caries, its components and access to oral health services with quality of life and its domains, Agudos, SP, 2012.

	Dental Caries				Access to oral health services
	DMFT r(p)	Decay r(p)	Filled r(p)	Missing r(p)	r(p)
Functional limitations	0.021 (0.733)	0.050 (0,427)	-0.014 (0.814)	0.074 (0.239)	0.013 (0.837)
Physical pain	0.102 (0.102)	0.145 (0.020)*	0.039 (0.529)	0.112 (0.073)	0.167 (0.008)*
Psychological discomfort	0.021 (0.737)	0.116 (0.065)	-0.035 (0.572)	0.159 (0,011)*	0.026 (0.676)
Physical disability	0.114 (0.069)	0.185 (0.002)*	0.020 (0.747)	0.110 (0.079)	0.159 (0.011)*
Psychological disability	0.028 (0.650)	0.077 (0.216)	-0.014 (0.821)	0.183 (0,003)*	0.020 (0.753)
Social disability	-.005 (0.941)	0.019 (0.760)	-0.028 (0.652)	0.113 (0.070)	0.012 (0.851)
Deficiency	0.085 (0,177)	0.066 (0.294)	0.046 (0.459)	0.183 (0.003)*	0.026 (0.677)
Quality of life	0.066 (0,291)	0.149(0.017)*	-0.010(0.870)	0.192(0.002)*	0.069(0.274)

*statistically significant correlation (p<0.05).

Discussion

Adolescence is a period of growth and development, with strong internal and external changes in the intellectual and emotional area and in the sexual maturation; therefore, it is a period of great changes[14]. During this period young people develop behavioral patterns and lifestyle that may influence their morbidity pattern and health care. The pattern of health services use is considered an important factor in the health conditions study, since this pattern is related to the treatment needs, concerns and self-care.

The present study found that 59.13% of the adolescents sought private oral health care. On the other hand, Gomes et al.[15] (2014) in a study carried out in the State of Maranhão, found a very lower dental visit rate in the population: among children, only 9.0% used oral health services being that 61.2% used public oral health service; among adults, 28% used dental services being that 55.6% used private dental services[15].

These results show that a large part of the population sought treatment in the private clinics; therefore, this sector still represents a significant part of the provision of oral health services to the studied group. The reasons for this fact is the population disbelief' concerning the public oral health services and the difficulty to access them. Such results were similar to other studies carried out in the country[16-18].

The Unified Health System provides universal access to health services to all individuals and there are advances in the public policies regarding the oral health, by the inclusion of oral health teams in the Family Health Program and implementation of specialized dental clinics. Even so, wider public policies are still necessary to increase the access of the whole population to the oral health care, as the private sector still represents a significant part of the service coverage in this country[19,20].

There are few studies regarding this specific period of the human development relative to the oral health conditions. Concerning dental caries, this study found a DMFT mean of 3.09 (±3.30), lower than the ones found in other studies[21-24], and higher than the research by Cangussu et al.[25] (2001). Compared with a national survey carried out in 2010, the DMFT found in this study

is lower than the national average (4.25) and lower than the mean of the Southeast region (3.83)[6]. Moreover, a higher expressivity in the filled component was verified, according to several studies[6,24-26], except for the research by Rebelo et al.[22] (2009), who found a higher expression in the decayed component of DMFT. The low values of DMFT found in this study may be explained by the high access to private dental services by the studied population (59.13%). Furthermore, the city had six basic health units and three family health units.

In this study, the main expression in the filled component was the Care Index, which showed that the adolescents had regular access to oral health care[23,25,26]. A difference was found in the decay component between white and non-white ethnic groups ($p = 0.03$). This difference could be observed in other studies in the country associated to lower socioeconomic conditions, in which non-white ethnic groups (black and brown) have similar socioeconomic status compared to the white ones and it was not due to biological differences[26,27]. A higher mean DMFT was found in the public oral health services group (3.43±3.34) compared to the private oral health services group (2.94±3.28), but there was no statistically significant difference between private and public groups.

According to Narvai et al.[28] (2006) there is an agreement on the existence of a polarization when, in one pole, there is absence of the disease in a large number of people and there is another large proportion of cases concentrated in a small group of individuals. According to the author, the polarization is a phenomenon that possibly reflects the effectiveness of preventive measures and disease control, based on population strategy. It evolves from a high prevalence of the disease to a panorama of a large percentage of caries-free individuals[28]. In this study, it was recorded a SiC Index of 6.86, a value twice as high as the DMFT, with a higher concentration of the disease in a lower percentage of the population; this was also observed in other studies[29]. The identification of polarized groups is important to guide oral health practices in the public health service and reduce inequalities in oral health conditions.

The assessment of the oral health conditions by strictly clinical criteria does not consider socio-behavioral characteristics, that is, how changes in the oral health affect people's daily lives. The incorporation of perception measurements to the clinical indicators could help making decisions regarding the best type of treatment for individuals, considering the social and psychological factors previously ignored by the normative systems that determine such needs[30,31]. Instruments of oral health-related quality of life were developed in order to quantify the extent of oral health problems, which interferes in the well being of people's daily lives and assesses the impact of oral health on the physical and psychosocial development. The OHIP questionnaire was developed by Slade and Spencer in 1994, and subsequently, a simplified version was developed in 1997, the OHIP 14, which assesses the impact of oral health in different dimensions[30]. A study using the OHIP 14 showed good psychometric properties when administered to adolescents and could be a promising tool for the selection of the group care priority[32].

In this study, the psychological discomfort (1.55) and physical pain domains (1.19) were observed to have a higher influence on oral health status in adolescents' lives, both in the overall sample and in relation to ethnicity and access to oral health services. The physical pain domain aims to show how changes in oral health conditions may cause pain or discomfort when eating, and the psychological discomfort domain refers to concerns or nervousness regarding oral health conditions; the most expressive of these parameters shows that there is an evident concern of the adolescents regarding the oral health status and its possible consequences.

These results are similar to the ones found in the study by Paredes et al.[33] (2015), who found more expression of the physical pain domain. They are also similar to the ones found in the study by Silveira et al.[34] (2014), who found higher scores for the psychological discomfort dimension and also noted that the greater the need for treatment, the greater the perception of the severity of the physical and psychosocial dimensions impact. According to the authors, this association is due to the understanding that the dental caries can cause pain, functional limitations, disappointment or concerns regarding the oral health[34]. In the same way, these results are similar to the study by Bastos et al.35 (2012) with adolescents in the municipality of Bauru, SP, which found a correlation between the DMFT index and an OHIP-14 score in suburban area subjects in the physical pain and psychological disability dimensions. In addition, there was no difference in the Oral Health related Quality of Life (OHRQoL) in the young people who accessed public health services and the ones who accessed the private sector. In relation to the ethnic groups, difference was observed in the decay component between white and non-whites groups. This result may be related to the size of the municipality as, in cities with less than 100,000 inhabitants, health policies can be more available and better controlled.

An assessment of the correlations between the dimensions of the OHIP-14 and the dependent variables of the DMFT index showed a significant relation between the decay component of DMFT with the physical pain and physical disability domains on quality of life and among the missing component and the psychological discomfort, psychological disability and deficiency, but the relation was weak. This weak relation may be explained by the low prevalence of untreated dental caries in the studied group and by the low expression of the missing component in the DMFT observed in this research. Despite these facts, the present study demonstrates that both untreated dental caries and its clinical consequences have impact on the OHRQoL and require immediate treatment.

The evaluation of oral health-related quality of life consists in the psychosocial perception in a non-normative evaluation of the oral health condition. This suggests that there are difficulties in this population about the full knowledge of the problems they face, despite the importance of personal impressions of individuals; it also reinforces the importance of the professional examination. An important aspect of this study results refers to the psychological issues related to tooth loss and the consequences on the quality of life, evident in the psychological discomfort domain and its relation to the missing component of DMFT, which despite the low expressivity, showed dental mutilation at an early age. The DMFT index represents the intensity of the dental caries attack and its relation to the care needs of the population. The correlation

between the index and quality of life (QoL) indicator can help policymakers to better understand how to develop dental policy plans specifically designed to meet the needs of the people rather than fulfil the normative criteria of dentists.

A positive relation was found between the access to oral health services and the physical pain and physical disability domains; the more distant the period of the last dental visit, the greater the influence of the oral health conditions on physical pain and physical disability. The identification of the groups most affected by the psychosocial impacts caused by diseases may provide support for the selection of treatment priorities in regions or municipalities with limited financial resources and suppressed demand; therefore, self-reported measures can express the experiences of illness complementing clinical assessments28.

This study has some limitations, as the sample is not representative of the entire population and the correlation coefficient does not represent a cause and effect relationship because it is a cross-sectional study.

Despite these considerations, low prevalence of dental caries and low impact of oral health conditions were found on adolescents' quality of life, which may evidence that most subjects consider their oral health in a positive way. The adolescents showed regular access to dental services, with a higher use of private oral services than the public ones, but the results of this study showed that untreated dental caries and its consequences still cause impact on oral health and quality of life of the adolescents, demonstrating the need for greater attention to oral health of this group by health managers and professionals.

The results of this study were significant for re-directing the oral health attention towards the adolescents, based on the impact of oral health conditions in this population, seeking an articulation of the scientific knowledge and the practices with the implication of the oral health-disease process for this specific age group.

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