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ORIGINAL ARTICLE

Impact of Oral Health Conditions on the Quality of Life of Adolescents

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ABSTRACT

Objective: To evaluate oral conditions' impact on school adolescents' quality of life. **Material and Methods:** This is a cross-sectional, school-based, descriptive, and analytical study. The study's final sample comprised 1,010 adolescents aged between 14 and 19. The dependent variable of oral health-related quality of life (OHRQoL) was measured using the OHIP-14 questionnaire. The independent variables were oral conditions assessed through clinical examination and a questionnaire for the socioeconomic indicators. Descriptive analyses, chi-square, and binary logistic regression were performed, and the significance level adopted was 5%. **Results:** The impact of oral conditions on OHRQoL was reported by approximately 34% of adolescents. The prevalence of dental caries was 26.2%, periodontal disease 45.8%, dental trauma 38%, and malocclusion was 29.7%. Of the variables analyzed, only sex ($p<0.001$) and caries experience ($p=0.012$) were associated with OHRQoL, showing that females are 1.87 times more likely to affect their quality of life than males, and those with caries were 1.46 times more likely to have an impact on the OHRQoL. **Conclusion:** The sex and experience of caries might be associated with decreasing the quality of life.

Keywords: Epidemiology; Pediatric Dentistry; Oral Health.

Introduction

Normative assessments that classify the health status of individuals based only on the presence of clinical signs of illness seem limited because the understanding of health encompasses several dimensions, such as physical, mental, and social well-being. In order to reduce the gaps left by evaluations based on the biomedical model, evaluations centered on the individual have been proposed, considering their impressions concerning the consequences of the injuries to which they are exposed [1].

In this perspective, the concept of oral health-related quality of life (OHRQoL) corresponds to the impact of oral conditions on individuals' daily practices and well-being [2]. Oral health, as an integral part of general health, is essential for quality of life since it is directly related to basic needs such as talking, chewing, recognizing food taste, smiling, and relating to other people without embarrassment [3-5].

Although there has been a growing interest from researchers about OHRQoL over the past decades, few studies have assessed the OHRQoL among adolescents. Besides, the majority of investigations target specific adolescent groups, such as those diagnosed with chronic diseases or hospitalized [6]. Further, it is noteworthy that adolescents, even those with good general health, are often included in risk groups. This results from a higher prevalence of main oral diseases, such as caries and periodontal diseases, and the absence of preventive self-care practices [7-11].

Epidemiological studies with representative samples in different countries demonstrate that the prevalence of oral diseases in adolescents still inspires concerns for health agencies [12-16]. The latest oral health survey in Brazil revealed that the percentage of adolescents free of caries aged 15 is 50% less than those registered in children aged five and adolescents aged 12 [13]. Besides, periodontal disease in more advanced stages, one of the leading causes of tooth loss, currently affects 33.8% of adolescents in Brazil [9,13].

Malocclusion and dental trauma are conditions that compromise the standard of facial aesthetics, which is an essential factor for well-being in adolescence. These have already been related to school absenteeism and psychological damage due to bullying [17,18]. Furthermore, adolescents might be more sensitive to oral disorders than individuals of other age groups due to the complex life moments in which they experience intense physical and psychosocial development [19-21].

The present study aimed to assess the impact of oral conditions on the quality of life of school adolescents and the associated socioeconomic factors.

Material and Methods

Study Design

This is a cross-sectional, school-based, descriptive, and analytical study. The target population comprised students aged 14 to 19 from public high schools in Camaragibe, Brazil.

Sample Size Calculation

For the sample calculation, the following parameters were adopted: an estimated population of 4,784 students, 95% confidence interval, maximum tolerable error of 5%, and sample design effect of 1.3. The estimated prevalence was 50% because the present study covers the analysis of multiple conditions with different frequencies of occurrence; the minimum representative sample size was 462 students.

It was decided to submit the study's objectives to the direction of the 15 eligible schools in the city to ensure greater representativeness, of which 11 were accepted to carry out the research. Further, a list of all high

school classes for the morning and afternoon shifts was requested, and in each participating school, three classes were drawn (one from each year of high school).

Variables Analyzed

To assess the perception of the impact of oral conditions on OHRQoL, the Oral Health Impact Profile (OHIP) questionnaire in its reduced version (OHIP-14), created in 1997 by Slade [20], was used. That detects social consequences due to oral problems and according to the perception of the affected individuals [20]. OHIP-14 is a widely used instrument, including a sample of adolescents, and has a version validated in Brazil [22].

The OHIP-14 contemplates seven dimensions of the impact to be measured: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap [20].

The adolescents responded to the frequency of their negative experiences using a 5-point Likert scale: 0- never, 1- rarely, 2-occasionally, 3- often, and 4- very often. The OHRQoL, assessed as a dependent variable, was analyzed as a dichotomous variable which at least one answer such as: "sometimes = 2", "constantly = 3" or "always = 4", was coded as having an impact on OHRQoL; also, only answers such as: "never = 0" and "rarely = 1", were coded as having no impact on OHRQoL [6,23].

The experience of dental caries was assessed using the Index of Decayed, Missing, and Filled Teeth (DMFT), which considers the sum of decayed, filled, and missing teeth due to caries following WHO [13] criteria. In this case, at least one tooth decayed, lost, or filled was considered a caries history.

The DAI (Dental Aesthetic Index) was used to assess the severity of malocclusion and the need for orthodontic treatment. That index analyzes ten different criteria: loss of incisor, canine or premolar teeth (weight six), crowding or tooth spacing in the incisal follow-up (weight one each), diastema (weight three), irregularity of the maxilla or mandible in the anterior segment (weight one each), overjet maxillary (weight two) or mandibular (weight four), open bite (weight four), and anteroposterior molar relationship (weight three). Those adolescents diagnosed with malocclusion were classified into severe, very severe, or disabling malocclusion [24].

For the diagnosis of dental trauma, only the upper and lower incisors were examined and classified according to the parameters of Andreasen e Andreasen [25]. Traumas in enamel, enamel, dentin, and crown root were also reported [26].

The periodontal condition was assessed according to the Classification of Periodontal and Peri-implant Diseases and Conditions 2018, which considers a healthy condition: probing depth up to 3 mm and bleeding on probing less than 10% of sites. Therefore, the unhealthy conditions were gingivitis (probing depth less than or equal to 3 mm, and 10% or more of sites with bleeding on probing), periodontitis (loss of insertion of 3 mm or more in the buccal or lingual/palate site, and in at least two teeth) [26].

The race/skin color variable followed the classification proposed by IBGE [27]: white, black, yellow, brown, and indigenous. Maternal schooling was collected based on the Brazilian Economic Classification Criterion [28] and categorized according to the number of studied years at school: up to four years of study, between five and eight years, and nine years or more. Family income was categorized as the current Brazilian minimum wage (MW), which corresponded to R$ 937,00 Brazilian reals, and the possible responses were up to 1 MW, between 1 and 2 MW, and above 3 MW. The use of dental services was assessed through the question: "How long was the last dental appointment?" the possible answers were: less than six months, between six months and one year, more than a year, and never went to the dentist. These variables were obtained through the adolescents' self-declarations.

Calibration

Two training sessions were held to guarantee the data reliability and reproducibility. First, a theoretical step involved the discussion of diagnostic criteria for oral conditions. Second was a practical step where two examiners and a specialist, considered the gold standard, examined 20 adolescents. Thus, the following classification was established to verify the agreement between examiners: insignificant (less than zero), weak (0.0 to 0.20), reasonable (0.21 to 0.40), moderate (0.41 to 0.60), strong (0.61 to 0.8), and almost perfect (0.81 to 1.00) [29].

After statistical analysis, there was a minimum inter- and intra-examiner agreement of 0.9 (dental caries), 0.85 (periodontal disease), 0.83 (dental trauma), and 0.89 (malocclusion). Therefore, this is an excellent level of agreement for conducting the study.

Data Collection

The data were collected in a school environment by applying an individual questionnaire related to socioeconomic aspects and self-perception of the impact of oral health on quality of life (OHIP-14). After applying the questionnaires, an intra-oral clinical examination was performed in a separate classroom of the participating schools, under indirect natural and artificial light, with the adolescent and examiner sitting face to face. Data was collected by two examiners who had previously calibrated the diagnosis of oral conditions.

Data Processing

Data were entered using EpiData (version 3.1), following a double-entry process to check for errors in data entry that, when identified, were corrected based on the original values of the variables. The results obtained were presented by describing the absolute and relative frequencies. Statistical significance was assessed using the Chi-square test. The variables that showed significance in the bivariate analysis of up to 20% were taken into the multivariate analysis (binary logistic regression). Using the Omnibus test, the models were tested to find a good fit, and the model determination coefficient was calculated based on the Nagelkerke R^2. The Hosmer-Lemeshow test compared the observed values with the expected values. Odds Ratio (OR) was also calculated. The level of significance adopted was 5%. Statistical analyses were performed using the Statistical Package for the Social Sciences (IBM Corp., Armonk, NY, USA) version 22.0 for Windows.

Ethical Guidelines

The Human Research Ethics Committee of the Federal University of Pernambuco approved the present study through protocol number 1.903.921. In addition, Pernambuco's regional education management approved this research.

Results

The final study sample consisted of 1,010 adolescents aged between 14 and 19, 61.9% of whom were up to 16 years old, 51.2% female, and 56.6% declared a monthly family income of a maximum of 2 MW. Most of the mothers of the investigated adolescents (82,3%) completed a maximum of 8 years of study, and 42.2% attended the dental office at least once in the past six months (Table 1).

Table 1. Absolute and relative frequency of quality of life (OHIP-14) according to adolescents' socioeconomic variables.

Variables	Total		OHRQoL				p-value
	N	%	Without Impact		With Impact		
			N	%	N	%	
Sex							
Male	492	48.8	361	54.0	131	38.4	<0.001*
Female	517	51.2	307	46.0	210	61.6	
Total	1009	100.0	668	100.0	341	100.0	
Age							
Up to 16 years old	622	61.9	421	63.4	201	58.9	0.190
17 years old or more	383	38.1	243	36.6	140	41.1	
Total	1005	100.0	664	100.0	341	100.0	
Race/Skin Color							
White	210	21.3	133	20.4	77	23.1	0.309
Black	180	18.3	128	19.6	52	15.6	
Yellow	58	5.9	34	5.2	24	7.2	
Brown	486	49.3	325	49.8	161	48.2	
Indigenous	52	5.3	32	4.9	20	6.0	
Total	986	100.0	652	100.0	334	100.0	
Family Income							
Up to 1 MW	80	10.3	46	9.2	34	12.5	0.148
Between 1 to 2 MW	439	56.6	280	55.8	159	58.2	
Above 3 MW	256	33.0	176	35.1	80	29.3	
Total	775	100.0	502	100.0	273	100.0	
Maternal Schooling in Years							
0-4	35	3.7	22	3.5	13	4.0	0.104
5-8	779	82.3	520	83.2	259	80.4	
9 or more	133	14.0	83	13.3	50	15.5	
Total	947	100.0	625	100.0	322	100.0	
Time of the Last Dental Appointment							
Less than 6 months	419	42.2	261	39.9	158	46.7	0.041*
Between 6 months and 1 year	181	18.2	114	17.4	67	19.8	
More than 1 year	312	31.5	220	33.6	92	27.2	
Never went to a dentist	80	8.1	59	9.0	21	6.2	
Total	992	100.0	654	100.0	338	100.0	

*Statistically Significant.

Approximately 34% of the adolescents evaluated reported the impact of oral conditions on quality of life. Psychological discomfort was the most affected dimension, in which 23.4% of adolescents expressed concern or stress due to oral conditions, as shown in Figure 1.

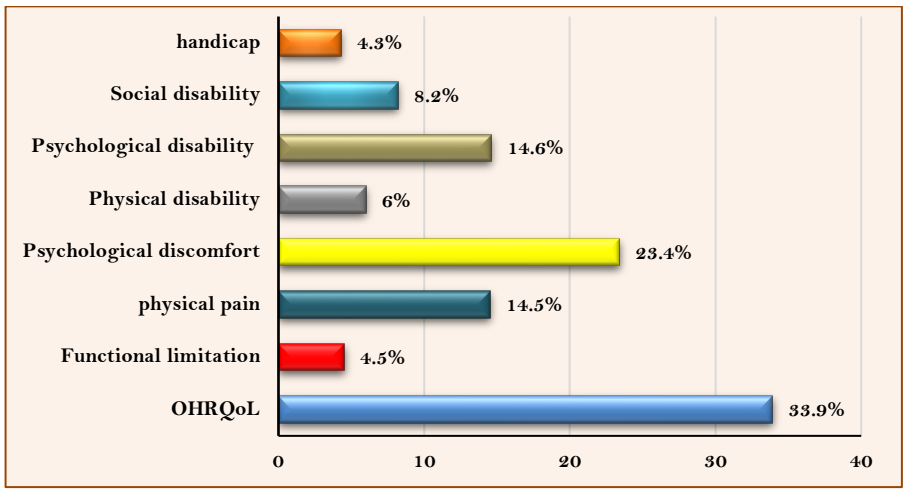

Figure 1. Impact on quality of life according to OHIP (general and dimension) of adolescents.

For adolescents' oral conditions, the prevalence of dental caries was 26.2%, periodontal disease was 45.8%, dental trauma was 38%, and malocclusion was 29.7% (Table 2). The bivariate analysis between the impact on OHRQoL and socioeconomic variables revealed the association between the impact on OHRQoL and the female sex (p<0.001); likewise, with the time of the last dental appointment (p=0.041), where adolescents who sought dental services over the previous six months were associated with a worse perception of OHRQoL (Table 1). Regarding oral conditions, only the variable caries experience was statistically significant (p=0.006).

Table 2. Absolute and relative frequency of quality of life (OHIP-14) according to adolescents' oral conditions.

Variables	Total		OHRQoL				p-value
	N	%	Without Impact		With Impact		
			N	%	N	%	
Dental Caries							
Absence	745	73.8	511	76.5	234	68.4	0.006*
Presence	265	26.2	157	23.5	108	32.6	
Total	1010	100.0	668	100.0	342	100.0	
Periodontal Disease							
Absence	431	54.2	302	55.7	129	51	0.212
Presence	364	45.8	240	44.3	124	49	
Total	795	100.0	542	100.0	253	100.0	
Dental trauma							
Without Trauma	626	62.0	415	62.1	211	61.7	0.948
Trauma	384	38.0	253	37.9	131	38.3	
Total	1010	100.0	668	100.0	342	100.0	
Malocclusion							
Normal	710	70.3	467	69.9	243	71.1	0.762
Presence	300	29.7	201	30.1	99	28.9	
Total	1010	100.0	668	100.0	342	100.0	

*Statistically Significant.

In addition to the variables that presented p ≤ 0,20 (caries experience, sex, and time of the last dentist appointment), the variables age, family income, and mother's schooling were also tested in logistic regression. Thus, the variables that remained significant were sex (p<0,001) and caries (p=0.012), showing that females are 1.87 times more likely to affect their quality of life than males, and those with caries were 1.46 times more likely to have an impact on the OHRQoL (Table 3). The test power was later calculated using the G*Power software version 3.1.9.2; thus, it was high for the variable sex (Power=0.90) and caries (Power=0.99) through exact tests of proportions.

Table 3. Logistic regression of the impact on adolescents' quality of life.

Variables	Coef.	S.E.	$\chi 2$	p-value	OR1	CI 95%	
						Minimum	Maximum
Sex (female)	0.62	0.14	20.93	<0.001	1.87	1.43	2.44
Carie (presence)	0.38	0.15	6.27	0.012	1.46	1.10	2.00
Constant	-1.11	0.11	101.63	<0.001	0.33		
Hosmer-Lemeshow test	p-value		Omnibus test		p-value	Nagelkerke R^2	
0.029	0.986		28.419		0.000	0.038	

Discussion

The present study analyzed the prevalence of the impact on OHRQoL of adolescents regularly enrolled in public high schools, as well as their association with socioeconomic factors and main oral conditions.

The prevalence of impact on OHRQoL found in this study was an expressive value of 34%. However, this result was lower than those found in other studies with similar samples, both international (54.6% [15], 66.8% [30]) and national (39.4% [31]), including those conducted in northeastern Brazil (66.1% [32]). The OHRQoL, as a multidimensional and subjective instrument, seeks to understand how an individual perceives his oral condition by considering the different domains of his life. Thus, singularities of perceptions are expected and acceptable even in groups with similarities.

Adolescents with impaired oral health are more likely to feel worried and unhappy about their oral condition [33]. Consequently, as in other studies with representative samples of adolescents, psychological discomfort was the most affected dimension by oral conditions [30,34,35]. These results suggest that psychological characteristics are more closely related to OHRQoL than clinical factors.

Among adolescents who reported an impact on OHRQoL, females had almost twice the perception of impact on OHRQoL than males. This result confirms the findings of the literature relating females to a greater perception of oral health problems and more comfort in reporting their concerns about oral health [31,36,37].

Unlike other studies, worse socioeconomic conditions were not associated with worse OHRQoL [19,31,38]. One reason might be that the present study was conducted with adolescents exclusively from public schools, who are homogeneous regarding socioeconomic factors.

Although it has not remained associated in the multivariate analysis, the relationship between the time of the last dental appointment and the impact on OHRQoL draws attention. As reported by Kozmhinsky [32] and Bulgareli [39], a higher frequency of dental consultations is expected to decrease the impact of oral conditions on quality of life. However, some studies report that the presence of adolescents in health services is closely related to pain, which is a characteristic of disease exacerbation processes where experiences are not always positive [39-42]. Furthermore, there are still pronounced differences in Brazil between the indicators of the first consultation and that of completed treatment; almost half of the users cannot complete their treatments [43], so the recent presence of the service may not guarantee the resolution of problems.

In the present study, individuals identified with a significant prevalence of periodontal disease, dental trauma, and malocclusion did not perceive the impact of these problems on OHRQoL. Besides, the authors agree that expectations, individual experiences, and the general health situation can greatly impact the perception of oral health [3,44,45]. General concerns related to health or other aspects can mitigate the perception of the negative impacts caused by impaired oral health [2].

Regarding periodontal disease, its initial stage and a lack of evident signs can momentarily minimize its consequences in adolescence, making it difficult for adolescents to self-perceive [46]. Nevertheless, in studies with samples of adult individuals and similar methodologies, periodontal disease was strongly associated with the impact on OHRQoL [19,23].

Malocclusion and dental trauma have an aesthetic component that could make these problems expressive in adolescents' perceptions. However, as demonstrated in systematic reviews [6,47], moderating factors, such as positive social relationships, higher coherence census, and expectations regarding life projects, can minimize the effect of stressors generated by situations that would contribute to unfavorable results [39].

The results of the present study reinforce the importance of subjective assessments before planning oral treatment. When added to technical planning, the subjective approach can enhance patient bonding and cooperation because patients do not always notice their actual oral conditions [48-50].

In recent years, the Brazilian population has experienced improvements in oral health indicators, especially in the prevalence of caries. In northeastern Brazil, there was a 50% increase in the number of

adolescents aged 15 to 19 free of caries. Despite this positive indicator, approximately 80% of adolescents in that same age group are still diagnosed with caries [42].

In the present study, adolescents diagnosed with caries were more likely to have an impact on OHRQoL. This correlation corroborates studies previously conducted on adolescents of different socio-cultural characteristics, including longitudinal studies [16,30,51-53]. Dental caries can cause several losses to basic daily activities, such as talking or eating, causing increased school abstention and decreased performance. Besides, generalized psychological losses related to pain, anxiety, and restricted social contact can lead to a significant reduction in quality of life [51,53,54].

When interpreting this study's results, it is essential to consider its limitations. Since it is a cross-sectional study in conception, it is impossible to establish causal relationships, leading to difficulties in determining whether the factors precede or follow the associated results. For this reason, future longitudinal studies and qualitative assessments could further explain the relationship between OHRQoL and oral and socioeconomic conditions.

Conclusion

Oral conditions can impact OHRQoL. Although a significant prevalence of periodontal disease, trauma, and malocclusion was found, only caries experience was associated with the impact on OHRQoL. Besides, psychological discomfort was the dimension that most affected the patient's quality of life. Further, among the socioeconomic factors investigated, female sex was the risk factor related to the impact of oral conditions on quality of life.

Authors' Contributions

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BCFV	https://orcid.org/0000-0002-2756-0767	Validation and Data Curation.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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