Social, economic, and behavioral variables associated with oral health-related quality of life among Brazilian adults

Variáveis sociais, econômicas e comportamentais associadas à saúde bucal relacionada à qualidade de vida em adultos brasileiros

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Abstract *The aim of this study was to investigate the association between sociodemographic, socioeconomic, psychosocial, and behavioral variables and oral health as assessed using the 14-question short version of the Oral Health Impact Profile (OHIP-14). A cross-sectional study was performed with 1095 adult residents from 38 census tracts in the municipality of São Leopoldo, State of Rio Grande do Sul, Brazil. Responses to the OHIP-14 were dichotomized, and bivariate (Chi-square) and multivariate analysis (logistic regression and Wald's test) were performed. In the bivariate analysis, the worse effects were reported by female individuals, the elderly, those with low family income, less schooling, those reporting a lower quality of life and social support, and smokers. In the multivariate analysis the following variables maintained their statistical significance: gender (female), age (50-59 years), family income (low), quality of life (low), social support (low, moderate), and smoking (smokers). Individuals' self-perception of their oral health was related to sociodemographic, socioeconomic, psychosocial, and behavioral variables, thus confirming that emphasis should be placed on social factors when addressing oral health problems.*

Key words *Epidemiology, Quality of life, Oral health*

Resumo *O objetivo deste estudo foi investigar a associação entre as variáveis sociodemográficas, socioeconômicas, psicossociais e comportamentais e a saúde bucal por meio da versão abreviada do Perfil de Impacto em Saúde Oral, Oral Health Impact Profile (OHIP-14). Estudo transversal que contou com 1095 adultos residentes nos 38 setores censitários do município de São Leopoldo, RS, Brasil. As respostas ao OHIP-14 foram dicotomizadas e a análise bivariada (Qui-quadrado) e multivariada (regressão logística e teste de Wald) foram realizadas. Na análise bivariada, os piores efeitos foram relatados por mulheres, indivíduos com idade mais avançada, com baixa renda familiar e menor escolaridade, por aqueles com relato de menor qualidade de vida e apoio social e por fumantes. Na análise multivariada as seguintes variáveis mantiveram significância estatística: gênero (mulheres), idade (50-59 anos), renda familiar (baixa), qualidade de vida (baixa), apoio social (baixo e moderado) e hábito de fumar (fumantes). A autopercepção individual da saúde bucal foi relacionada às variáveis pesquisadas, confirmando que deve ser dada ênfase aos fatores sociais ao se tratar de problemas de saúde bucal.*

Palavras-chave *Epidemiologia, Qualidade de vida, Saúde bucal*

Introduction

Clinical and epidemiological measurements, such as indices of dental caries and periodontal disease, are traditionally used to analyze oral health condition sat both the individual and population level[1]. This approach is based on the dichotomous determination of either the presence or absence of disease, in which only the professional makes the diagnostic and therapeutic decisions. This biomedical model is still commonly used by dental professionals[2]. However, a transition away from this practice of unilateral oral health evaluation has prompted discussion about the issue of oral health concerns that are more associated with sociodemographic, socioeconomic, psychosocial, and behavioral variables, and which can better incorporate individuals' subjective and self-perceived factors[3,4].

In addition, the literature has increasingly provided evidence that increased rates of oral diseases and disorders are related to higher levels of social inequities, thereby demonstrating the deleterious effect social factors can have on health[5-8]. While the findings of these previous studies are revealing, they also bring up new hypotheses that seek to establish how subjective factors and quality of life are associated with both the general and oral health condition of individuals and populations[9].

In the case of general health, self-rated health appears to be affected by sociodemographic factors and the environmental conditions in which individuals live[10]. In the case of oral health, it is important to understand the associations between oral health disorders and people's performance of daily activities, including the possible impact this has on their quality of life. Clinical measures of oral health, perceptions of oral and general health conditions, as well as reported physical, social, and psychological functions, are regarded as independent but potentially correlated variables that together comprise the oral health-related quality of life (OHRQoL)[11]. Key concerns are related to subjective experiences, such as self-image, comprehension of personal needs, and the seeking of oral care[12]. The way in which individuals perceive their oral condition appears to be linked to a series of factors relating to social inequities, such as social class, schooling, and income[13-15].

The so-called socio-dental indicators were designed to analyze the impact of oral health problems on individuals' quality of life[16]. Examples of these indicators include the Geriatric Oral Health Assessment Index (GOHAI)[17], Dental Impact on Daily Living (DIDL)[18], Oral Impacts on Daily Performances (OIDP)[19], the Oral Health Impact Profile (OHIP)[3], and its short version, the OHIP-14[20].

The OHIP-14 is preferred among these indicators because it can be easily applied[20]. This indicator has been used in diverse locations, and adaptations have been made to take into account cultural differences among population groups regarding perceptions of health[21-23]. This has been used in studies involving age groups ranging from children[24] to the elderly[25]. It has also been used to research the impact of other variables on oral health, including gender[26-29], schooling[15,26-30], age[15,26,28-30], and income[15,27-29,31], as well as behavioral factors such as smoking[15,27,30], the consumption of alcohol and other drugs[15,30], and oral hygiene habits[32].

In Brazil, the OHIP-14 has undergone trans-cultural validation[33], and its psychometric capacity has also been evaluated[24,34].

Based on the assumption that many variables can influence subjective oral health (which affects quality of life), and given that exploration of this field is still needed, this study aimed to investigate the association between OHIP-14 and sociodemographic, socioeconomic, psychosocial, and behavioral variables in adults in the municipality of São Leopoldo, state of Rio Grande do Sul (RS), Brazil.

Methods

This cross-sectional, quantitative, population-based study included a random sample of 1095 subjects aged 18 years and older in the municipality of São Leopoldo, RS, Brazil. Its location is in the Rio dos Sinos Valley, a metropolitan area of the state capital, Porto Alegre. In 2000, the reference year for demographic data used in this study, the city's population was 194,000. The city's public service network includes one general hospital and 28 primary health care units.

The sample size used in this study was calculated based on a pilot study and statistical procedures. The number of households in the sample size was increased by 20% to compensate for losses due to follow-up and to control for confounders. A total of 1,512 households that were distributed among 40 census tracts (randomly chosen) were selected. Blocks within the census tracts were also randomly selected, and

all households within a block were visited until the target number of 38 participating households was reached. If the resident was not present at the time of the visit, the interviewers would return up to three times for data collection[10].

A structured, standardized, previously tested questionnaire was administered to obtain data for this study[10].The outcome variable of interest was the OHIP-14, which was obtained using questions from a measure that had previously been validated for use in Brazil[33]. This short version of the questionnaire consisted of the same seven dimensions that are used in the original OHIP-49: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap[20]. The OHIP-49 provides a self-reported measure of oral health[20] and is based on Locker's theoretical model of oral health[35], capturing the various influences of oral health in a hierarchical order.

To obtain this outcome variable, the following guiding question was used in the questionnaire: "How frequently has the following happened to you in the last six months because of problems with your teeth, mouth, or denture?" For example, "How frequently have you had difficulty pronouncing any word in the last six months because of problems with your teeth, mouth, or denture?" Possible responses were never, hardly ever, occasionally, often, and very often. Corresponding values were given to the above answers, ranging from 0 to 4.

The outcome variable was dichotomized, such that the individuals who answered "often" or "very often" at least once were classified into OHIP-1 (bad oral health condition), while the remaining individuals (who answered "never", "hardly ever", and "occasionally") were classified into OHIP-0 (good oral health condition). This classification enabled the quantitative depiction of functional and psychosocial impacts relating to poor oral health that were experienced during a set time period[36,37].

The independent variables were also collected using the same questionnaire. Sociodemographic variables included gender (male/female), observed skin color (white/non-white), and age (stratified into10-year intervals). The socioeconomic variables were family income (in Real, the Brazilian currency) and schooling (years of study). These variables were categorized in quartiles as follows: high (top 25% of scores), moderate (middle 50%), and low (bottom 25%). The same means of categorization were adopted for the psychosocial variables (i.e., quality of life and social support), based on participants' scores.

The data on quality of life were obtained by asking questions relating to personal satisfaction with health, relationships, and housing, among other variables[38]. Answers varied from "very satisfied" to "very unsatisfied" on a five-point scale ranging from 0 to 4. Total minimum and maximum possible scores were 0 and 32, respectively, with higher scores indicating higher quality of life. Data on social support were obtained by following the methodology proposed by the Medical Outcomes Study (MOS)[39] and were collected using a 19-item questionnaire regarding materialism, affective and emotional dimensions, positive social interaction, and information. Item scores ranged from 0 to 4, and the total possible scores were between 0 and 76. Again, higher scores signified a higher level of reported social support.

The behavioral variable of eating habits (e.g., consumption of fruits and vegetables) was categorized as follows: low consumption = no servings of fruits or vegetables; moderate consumption = 1-2 fruits/day and 1-4 servings of vegetables/day; high consumption = $\geq$ 3 fruits/day and $\geq$ 5 servings of vegetables/day. Information on smoking status (nonsmoker, former smoker, and smoker) and alcohol intake (none/moderate < 8mg ♀ and < 15mg ♂/day; yes/excessive $\geq$ 8mg ♀ and $\geq$ 15mg ♂/day) were also collected[40].

In the bivariate analysis, the Chi-square test with significance set at $P < .05$ was used to identify significant associations between the explanatory variables and their ability to predict the outcome of interest, namely OHIP-14. Finally, to perform a joint evaluation of the oral health related variables that were considered in the study, the logistic regression model was used. Because the design effect for OHIP was 2.29 and because de cluster sample, sampling weights and control for complex sampling were used. Multivariable models included only variables with $P < .20$ in the bivariable analysis. Wald's test was also used to evaluate the importance of each variable in the presence of the other variables. Values of $P < .05$ and their respective confidence intervals indicated statistical significance.

The analysis was performed using Stata version 12 (StataCorp, College Station, Texas, USA). This study was approved by the Vale do Rio dos Sinos University - UNISINOS Research Ethics Committee.

Results

Among the 38 census tracts in São Leopoldo, interviews were conducted in 1,100 households. After exclusion of missing data, a final sample of 1,095 subjects was analyzed. In this, 71.8% of participants were females, while white respondents accounted for 83.8% of the sample. The average age was 44.2 years (SD = 15.8), with the minimum age being 18 years and the maximum age being 90 years. The average number of years of schooling was 8.2 years (SD = 4.1). The prevalence of the worst outcome, OHIP-1, was 15.9%, with a frequency of 174 cases. The results of distribution, prevalence, and unadjusted and adjusted odds ratios are presented in Table 1.

A significant difference was found between men and women in terms of oral health, using both bivariate (P < .001) and multivariate analyses (P = .001). In the latter analysis, being female increased the chances of self-reporting poor oral health by almost 2.6 times [OR 2.63 (CI 95%: 1.50-4.59)].

After multivariate analysis, the age 50-59 years was the only category that maintained statistical significance (P = .004).

No significant differences were found in either type of analysis with respect to skin color (P = .498).

With respect to family income and schooling, significant differences arose in OHIP-14 scores with bivariate analysis, with P values of .042 and .002, respectively. However, this significance did not survive multivariate analysis.

Regarding the psychosocial variables, the lowest scores were associated with a higher probability of reporting poor oral health. For example, low quality of life increased the probability of self-reporting poor oral health by approximately four times [OR 3.78 (95% CI: 1.86-7.66)]. Also, low and moderate social support showed the same behavior [OR 1.80 (95% CI: 1.17-2.78); OR 2.05 (95% CI: 1.22-3.46)].

With respect to the behavioral variables, eating habits (P = .344) and alcohol intake (P = .856) were not significantly related to oral health outcome. This result was contrary to that of smoking, which (smoker) maintained its significance in both bivariate and multivariate analyses; thus, in the logistic regression, smokers reported a higher impact on oral health scores [OR 2.73 (95% CI: 1.59-4.71)].

Discussion

This study investigated the association between individual and contextual variables and the self-perception of oral health quality of life in adults.

There are critical considerations that should be made regarding the methodological choices that were used in this study. The instrument that was chosen as the dependent variable, OHIP-14, was found to be useful for the measurement of oral health-related quality of life. These findings confirm its value in international surveys, which is supported by earlier studies that have used this measure[26,27,29,31]. In Brazil, recent investigations have also used the OHIP-14[15,29] and have confirmed its psychometric capabilities[24,34]. Although this instrument is a short version of the original 49-item questionnaire, the aims of OHIP-14 are the same, with the added advantage of reduced application time[20].

Responses to the OHIP-14 were dichotomized in order to identify the prevalence of negative impacts more clearly, i.e., the percentage of individuals who answered "often" and "very often." This strategy has been employed previously in other studies with the OHIP-14[36,37]. Similar rates of the worst outcome, OHIP-1, have also been found in prior investigations, with values ranging from 16.2% to 19.5%[25,31].

The percentage of women who reported poorer oral health self-perceptions in the current study was similar to rates reported in previous studies[26,29,31,32]. This may reflect the higher participation of females in the samples that were examined; however, the significance of these findings has not yet been discussed in the literature[12]. It is important to emphasize that the interviews were conducted during working hours, which could explain the high number of female respondents, a typical situation found in Brazilian domiciliary studies. Consequently, as reported in a previous study that used the same database, these women are possibly more influenced by their poor surroundings, as they spend most of their time in these neighborhoods, potentially suffering from a lack of public services and amenities[10]. These gender differences are particularly significant, considering women tend to take better care of their health and seek health services when needed. Thus, there is a greater impact on them when no public services are available[41,42].

In the current study, individuals aged 40 and over perceived a greater impact of oral health on their quality of life. Old age and less education

Table 1. Distribution, prevalence, and *odds ratio* (OR) of OHIP-14 according to the individual explanatory variables in adults from the municipality of São Leopoldo, RS, Brazil, 2007 (n = 1,095).

Variable	n	OHIP-0 n (%)	OHIP-1 n (%)	P[a] value	Non-adjusted OR (95% CI)	P[b] value	Adjusted OR (95% CI)
Gender							
Male	309	283 (91.6)	26 (8.4)		1		1
Female	786	638 (81.2)	148 (18.8)	< .001	**2.52 (1.63-3.92)**	.001	**2.63 (1.50-4.59)**
Skin color							
White	910	776 (84.4)	143 (15.6)		1		
Non-white	174	143 (82.2)	31 (17.8)	.498	1.18 (0.77-1.80)		
Age (years)							
18-29	247	227 (91.9)	20 (8.1)		1		1
30-39	181	158 (87.3)	23 (12.7)		1.65 (0.88-3.11)	.776	1.09 (0.57-2.06)
40-49	257	211 (82.1)	46 (17.9)	< .001	2.47 (1.42-4.32)	.085	1.89 (0.91-3.92)
50-59	217	169 (77.9)	48 (22.1)		**3.22 (1.84-5.63)**	.004	**2.46 (1.36-4.47)**
≥ 60	193	156 (80.8)	37 (19.2)		**2.69 (1.50-4.81)**	.110	2.01 (0.84-4.77)
Family income (R$)[c]							
High (≥ 3185)	282	246 (87.2)	36 (12.8)		1		1
Moderate (1049.01-3184.99)	588	497 (84.5)	91 (15.5)	.042	1.25 (0.83-1.89)	.992	1.00 (0.54-1.83)
Low (≤ 1049)	225	178 (79.1)	47 (20.9)		**1.80 (1.12-2.90)**	.974	.989 (0.52-1.86)
Schooling (years)							
High (≥ 12)	166	150 (90.4)	16 (9.6)		1		1
Moderate (5-11)	695	590 (84.9)	105 (15.1)	.002	1.67 (0.96-2.90)	.922	1.04 (0.46-2.33)
Low (≤ 4)	204	158 (77.5)	46 (22.5)		**2.73 (1.48-5.03)**	.682	1.21 (0.47-3.12)
Quality of life							
High (≥ 30)	238	217 (91.2)	21 (8.8)		1		1
Moderate (27-32)	625	547 (87.5)	78 (12.5)	<.001	1.47 (0.89-2.44)	.561	1.17 (0.67-2.05)
Low (≤ 26)	232	157 (67.7)	75 (32.3)		**4.94 (2.92-8.35)**	< .001	**3.78 (1.86-7.66)**
Social support							
High (≥ 95)	380	338 (88.9)	42 (11.1)		**1**		**1**
Moderate (75-94)	436	363 (83.3)	73 (16.7)	.001	**1.62 (1.08-2.43)**	.008	**1.80 (1.17-2.78)**
Low (≤ 74)	276	217 (78.6)	59 (21.4)		**2.19 (1.42-3.37)**	.008	**2.05 (1.22-3.46)**

it continues

are factors commonly associated with psychosocial problems related to poor oral health[26,29,43]. However, other studies have shown no association between these variables and OHIP-14, or significance has been lost when using multivariate models, most likely due to the inclusion of other variables that exert a greater influence[12,25].

With respect to family income and education, evidence from the literature shows that low family income is linked to a worse perception of oral

Table 1. continuation

Variable	n	OHIP-0 n (%)	OHIP-1 n (%)	P[a] value	Non-adjusted OR (95% CI)	P[b] value	Adjusted OR (95% CI)
Eating habits							
High (≥ 3 fruits/day; ≥ 5 spoonfuls of legumes/day)	128	102 (79.7)	26 (20.3)		1		
Moderate (1-2 fruits/day; 1-4 spoonfuls of legumes/day)	904	766 (84.7)	138 (15.3)	.344	0.71 (0.44-1.13)		
Low (no consumption)	63	53 (84.1)	10 (15.9)		0.74 (0.33-1.65)		
Smoking							
Nonsmoker	603	527 (87.4)	76 (12.6)		1		1
Former smoker	230	196 (85.2)	34 (14.8)	**< .001**	1.20 (0.78-1.87)	.687	1.12 (0.62-2.00)
Smoker	262	198 (75.6)	64 (24.4)		**2.24 (1.56-3.25)**	**.001**	**2.73 (1.59-4.71)**
Alcohol intake							
None/moderate (< 8mg ♀ and < 15mg ♂/day)	1032	868 (84.1)	164 (15.9)	.856	1		
Yes/excessive (≥ 8mg ♀ and ≥ 15mg ♂/day)	60	50 (83.3)	10 (16.7)		1,06 (0.53-2.13)		

Bold values are statistically significant, P < .05. [a] Chi-square test. [b] Logistic Regression and Wald's Test. [c] USD 1 = R$ 2 (in 2006).

health[15,31,44]. However, in the current study, income lost explanatory power in the multivariate analysis; this may be because other variables were stronger determinants of oral health self-perception.

The lack of significance between skin color and oral health was in accordance with the findings of previous studies[43]. However, there are some examples in the literature of non-whites reporting oral symptoms more often than whites[15,44].

Regarding the psychosocial variables, this study showed a clear relationship between better living conditions and a more favorable perception of oral health, as has been observed in previous studies[11].

The perception of quality of life is largely subjective, and the manner in which individuals perceive their quality of life can vary according to their social, cultural, and political conditions[45]. As such, the debate on this issue may be inconclusive, as these results are an estimation of accounts that are permeated by a multidimensional complexity[46].

It must also be taken into consideration that the attitudes of the individuals are not constant, and they can change over time and according to their experiences. A problem that was considered to be important at one given time point may become relatively unimportant at another. This phenomenon is referred to as "dynamic construct"[47]. Taking into account these possible individual variations in responses, the variables related to quality of life are interpreted with caution.

With respect to social support, Berkman et al.[48] discuss the impact of social network on people's social and interpersonal behavior. The relationships people develop in their early life may result in positive or negative behaviors that can affect the presence or absence of diseases as adults. Macro-factors – such as socio-structural conditions – influence social network, which influences the psychosocial mechanisms that affect people's choices and lifestyles, such as smoking, alcohol intake, physical exercise, psychological alterations, and changes to the body in general. This finding appears to be in agreement with the results of this study, as low social support and smoking increased the likelihood of bad oral health self-perception. Other findings confirm this result, showing that harmful behavioral habits were associated with worse OHRQoL[30]. Oral hygiene habits also follow this pattern[32], and in a study of European workers from 28 countries, social support and social exclusion helped to ex-

plain the social differences in men and women's self-perception of health[49].

On this same topic, a prospective study with 1,043 pregnant and post-partum women conducted by Lamarca et al.[15] demonstrated that women with an external work-based network have more social support and show better OHIP-14 scores than those with a home-based network who have no income or are unemployed.

A number of social conditions are associated with self-perception of the impact of oral health on quality of life. These are described in a review of 40 publications, which indicates the important role of social determinants as impact modulators and as having an effect on the quality of life. The results indicate that a negative impression is more frequently experienced by women, individuals with low education and income, and by immigrants or people belonging to minority ethnic groups[14]. Results from the literature strengthen the hypothesis that both individual determinants and contextual determinants are capable of influencing the manner in which the subjects perceive themselves in terms of general health[10] and oral health[15,26-32].

It is important to highlight that greater exposure to risk factors, such as material deprivation, unemployment, discrimination, problems with transportation or housing, and poor access to resources and services, results in the social production of diseases and disorders[50-52]. In these conditions, the emergence of health inequities is almost unavoidable.

These findings suggest the need for further studies, including longitudinal research, to elucidate the associations that were found in this study. The current study design has some limitations, and therefore only the examination of associations could be performed at present. An assessment of variability along a time scale may reveal oral health conditions that were once considered bad, but are now perceived positively by the individual. For example, wearing dentures at present would be considered good, meaning the predating toothache, tooth loss, and oral rehabilitation with the prosthesis may have actually led to a stronger self-perception. However, the situation may still be more complex. For example, a previous cohort study about self-perception of health indicated that after five years, 47.4% of those who were interviewed a second time did not report any alterations in their health, despite the occurrence of many significant changes[53].

Another limitation of this study is the lack of aggregation of clinical variables in the analysis. This may be directly associated with the variation in the perception of impacts and, consequently, in quality of life, independent of sociodemographic and socioeconomic factors[29]. It is recognized that the generic measures of health are not sensitive to oral health outcomes. Disease-specific measures are more likely to detect the subtle changes in specific conditions, and thus show better responsiveness. It is ideal, then, to use evaluations in which both types of measurements are applied[4]. Considering that general oral diseases usually develop slowly, there are some time-related difficulties in reaching a more precise convergence between a poor clinical condition and the patient's negative self-perception, except in the case of a specific problem, such as toothache.

Subjective health evaluations can be applied in policy, theory, and practice as follows: in policy, increasing the awareness of public policy-makers and decision-makers of these types of evaluations, so that they can integrate these issues into existing strategies focused on healthy living; in theory, by including them in the agenda of health service studies as well as medical, sociology, and psychology discussions and research; and in practice, by incorporating them in research focusing on public health, as well as using them in clinical practice[2].

Conclusions

The OHIP-14 is a subjective and relevant instrument that enables people to self-report the impact of oral health on quality of life. Diverse variables and factors that were included in this study appear to influence this perception in a favorable or unfavorable manner. Being female, being older in age, having lower family income and less schooling, having a low quality of life and low social support, and smoking were all associated with higher rates of bad oral health impact. These results can support clinical findings and also help in designing more specific strategies to reduce oral health problems.

Collaborations

MCLG prepared the article and performed the data analysis; SJM oversaw the data analysis and the final version of the article; STM contributed to writing the article; MO assisted in data analysis; MTAO assisted in data analysis; MPP gave final approval of the version to be published.

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