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Oral Health Literacy and Periodontal Disease in Primary Health Care Users



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ABSTRACT

Background: Oral health literacy (OHL) is a key factor for reducing inequalities in oral health and promoting better health outcomes, including those related to periodontal health. This study aimed to evaluate associations between OHL and periodontal disease amongst users of primary health care services.

Methods: This cross-sectional study was carried out with a sample of 250 adult users of primary health care services in Brazil. OHL was measured using the Oral Health Literacy Instrument-Brazilian (OHLA-B). Participants also answered a structured questionnaire addressing sociodemographic and behavioural data. Clinical oral examination was performed using the Community Periodontal Index. Analyses of the crude associations were performed by simple logistic regression models, and estimates were reported as odds ratios (ORs) and corresponding 95% confidence intervals (CIs). Variables associated with a significance level <0.20 in bivariate analyses were included in hierarchical multiple logistic regression models.

Results: Amongst participants, 62% were female with an average age of 37.2 years. Adults aged 37 years or older (OR, 5.48; 95% CI, 2.68-11.21), with fewer years of study (OR, 3.34; 95% CI, 1.66-6.71), with low OHL levels (OR, 5.91; 95% CI, 1.71-20.49), and who smoked (OR, 3.29; 95% CI, 1.34-8.09) were more likely to have periodontal pockets compared to their counterparts.

Conclusions: Primary health care users with low OHL levels presented with more severe periodontal diseases.

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Introduction

Oral health literacy (OHL) was defined by the National Institute of Dental and Craniofacial Research as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate oral health decisions.”¹ Over the last decades, OHL has been recognised as an important factor in reducing oral health inequalities and promoting oral health, including periodontal health. This construct is part of the

myriad of factors that affect an individual’s ability to make judgments and decisions regarding their oral health.^{2,3}

Studies have shown that subjects with low levels of OHL are associated with worse dental behaviours such as a greater number of absences at dental appointments, increased number of urgent dental visits, smoking habits, and less frequent dental brushing.⁴⁻⁷ In addition, people with low levels of OHL present less knowledge about their oral health care, worse self-report of oral health, and less demand for health information.⁸⁻¹⁰ Concerning clinical oral conditions, individuals with weak OHL competencies have been shown to present worse oral health with a higher number of decayed, missing, and filled teeth,^{5,6,10} but few studies had investigated the associations between OHL and prevalence of periodontal disease conditions.^{8,10-12}

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In light of the evidence demonstrating that periodontal health is an important element of the quality of life and well-being of individuals,¹³ it is vital for researchers, clinicians, and health managers to have a greater understanding of all the factors that are associated with the disease, including OHL. However, few studies to date have evaluated these associations, and many of them were carried out in university settings or in developed countries, which limits the validity of the findings to other contexts.^{10-11,14} Thus, the aim of this study was to evaluate the association between OHL and periodontal conditions amongst users of primary health care services in Brazil.

Methods

This study was approved by the Research Ethics Committee of the University of Campinas, Piracicaba Dental School, under protocol 140/2014, in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants. The paper is reported following the STROBE statement.

This cross-sectional study was carried out with a convenience sample of 250 adults aged 18 years or older, randomly selected, living in the vicinities of 2 Family Health Units in the city of Piracicaba, São Paulo, Brazil.

A sample size calculation was performed to determine the minimum sample needed to detect an odds ratio (OR) of at least 2.6 considering a statistical power of 95% ($\beta < 0.05$) with a significance level of 5% ($\alpha = 0.05$). A sample size comprising 250 participants was required for the study. Previous studies with OHL established that a minimum sample of 102 participants provides sufficient power for the 5% significance level.^{10,11}

To be considered eligible for the study, individuals should conform to the following criteria: self-reported ability to read and speak Brazilian Portuguese; absence of a diagnosis of dementia, visual or hearing impairment; and not having used alcohol or drugs at the time of the interview. Data were collected at the participants' homes by a researcher with expertise in epidemiologic surveys accompanied by a local community health agent.

Data on the independent variables were obtained through a structured questionnaire containing information about sex (male/female), age (dichotomised by the median), ethnic group (White/Asian or Black/mixed), monthly household income based on Brazilian minimum wages (BMW ≤ 3 BMW and > 3 BMW), and educational level (less than high school/high school or more). Self-rated oral health was measured through a single-item global rating: "How do you consider your oral health?" Response options were recorded using a 5-point Likert scale ranging from "poor" to "excellent." Oral health-related behaviours such as tooth-brushing frequency (≤ 1 time a day or > 1 times a day), smoking status (yes/no), and reason for the last dental appointment (caries/pain or other) were also measured.

In addition, the OHL levels were measured using the Oral Health Literacy Assessment-Brazilian (OHLA-B) instrument, an adapted and validated psychometric questionnaire for the Brazilian population.¹⁵ OHLA-B is an instrument for

measuring OHL that comprises a word recognition section and a comprehension section. It consists of 15 words in the dental vocabulary with an increasing level of difficulty. In the pronunciation test, the participant was shown a card containing a dental vocabulary word that he/she had to read out aloud. At that time, the researcher checked whether the pronunciation was correct. Subsequently, the researcher applied the word comprehension test, in which the participant had to choose between two other words, one that was meaningfully associated with the OHLA-B word initially pronounced. For the evaluation of the individual OHL score, the pronunciation and understanding of the words were considered, adding a point for each item when the pronunciation and the association were both correct. If one of the tests was incorrect, the score of the corresponding item would be zero. The total score ranged from 0 to 15 points, with higher scores indicating better OHL. The variable OHL was categorised as low (0-5), moderate (6-10), and high (11-15).

The outcome variable was the degree of periodontal diseases measured by the Community Periodontal Index (CPI).¹⁶ A sextant was only examined when it had two or more teeth present. Each index tooth was probed with a World Health Organisation periodontal probe and assessed according to the following criteria: healthy (score 0), bleeding after probing (score 1), calculus (score 2), shallow periodontal pocket of 4 to 5 mm (score 3), deep periodontal pocket of 6 mm or more (score 4), sextant excluded (score 5). Participants with at least one sextant presenting codes 3 and 4 were considered as having periodontal pockets. Oral examinations were conducted by a single examiner previously trained. Good intra-examiner reproducibility was obtained (kappa > 0.82).

Statistical analysis

Initially, the distribution of the variable periodontal pocket, dichotomised as "no periodontal pocket" (codes 0, 1, 2) and "periodontal pocket" (codes 3 and 4), was stratified by the independent variables.

Analysis of the crude associations between periodontal status and OHL was performed by simple logistic regression models and reported as crude odds ratios (ORs) with 95% confidence intervals (CIs). Variables associated with outcomes with a significance level $< .20$ were included in the hierarchical multiple logistic regression models. ORs adjusted with 95% CIs were estimated from the multiple models based on Andersen's behavioural model.¹⁷

In the multiple logistic regression analysis, first level—individual predisposing variables (age, sex, and skin color); second level—enabling individual variables (income, educational level, OHL); third level—individual need variables (self-rated of oral health); and fourth level—health behaviours variables (brushing frequency, smoking status, and reason for the last visit to dentist) were considered. The variables were included in the models from the first level to the fourth level, with adjustment for the variables of the same level and the previous levels. The adjustments of the models were analysed by the statistical significance of the estimates and by the -2 log-likelihood statistics. Variables with a significance level $\leq .05$ remained in the final model. All analyses were performed using R statistical software.¹⁸

Results

Descriptive analyses showed that the majority of the participants were female (64%), self-identified as White/Asian (70.4%), had a family monthly income equal to or higher than 3 BWM (62%), had a formal education equal or higher than high school (65.6%), and had an average age of 37.2 ± 13 years (Table 1).

Regarding health-related factors, approximately one-third (30.4%) of the participants considered their oral health poor or regular, 94.6% brush their teeth more than once a day, 84.9% are not current smokers, and 38.2% last visited a dentist due to pain or caries. Regarding periodontal disease, 9.2% of participants had a CPI code of 0; 28.0% a CPI code of 1; 36% a CPI code of 2; 1.2% a CPI code of 3, and 26.8% a CPI code of 4. The mean OHLA-B score was 8.1 ± 2.7 . Approximately 19% of the participants presented high OHL, 66% presented moderate OHL, whereas 14% had low OHL.

Table 2 shows crude and adjusted ORs for the associations between periodontal condition and the independent variables. In the bivariate analysis, participants with periodontal pockets were significantly more likely to be older than 36 years (OR, 8.17; 95% CI, 4.30-15.51), be from families with lower monthly income (OR, 1.77; 95% CI, 1.01-3.09), have lower educational attainment (OR, 7.92; 95% CI, 4.38-14.32), report a poor/regular self-rated oral health (OR, 2.53; 95% CI, 1.16-5.51), brush their teeth once a day or less (OR, 4.27; 95% CI, 1.41-12.92), be smokers (OR, 4.00; 95% CI, 1.69-7.66), and have low OHL level (OR, 11.36; 95% CI, 4.02-32.11).

After adjustment by other relevant factors in the final model, the strength of the association between periodontal

condition and low OHL level was attenuated (OR, 5.91; 95% CI, 1.71-20.49). Furthermore, adults older than 63 years (OR, 5.48; 95% CI, 2.68-11.21), those with fewer years of study (OR, 3.34; 95% CI, 1.66-6.71), and smokers (OR, 3.29; 95% CI, 1.34-8.09) were more likely to present at least one sextant with periodontal pockets compared to their counterparts.

Discussion

The present study demonstrated that low levels of OHL in adults were associated with poor periodontal health status amongst users of primary health care services after adjusting for demographic, socioeconomic, self-rated, and behavioural variables.

Our results are in accordance with other studies that investigated associations between OHL levels and the presence of periodontal pockets,^{10,11,19} but contradictory to findings of Batista et al. (2017) and Blizniuk et al. (2015).^{20,21} In this study, participants with low OHL were 5.9 times more likely to present at least one site with periodontal pockets than participants with high OHL. Similar to our findings, Wehmeyer et al. (2014) also observed a significant association between higher OHL scores and periodontal status after controlling for contextual factors.¹¹ A significantly higher prevalence of severe periodontitis amongst participants with low OHL was reported by Baskarados (2018).¹¹ Periodontal disease has also been associated with lower scores of general health literacy.¹⁴

Table 1 – Descriptive statistics of independent variables stratified by presence of periodontal pocket.

Variable	Category	N (%)	CPI	
			¹ No periodontal pocket	² Periodontal pocket
First level (predisposing factors)				
Age	≤36 years	120 (48.0%)	105 (87.5%)	15 (12.5%)
	>36 years	130 (52.0%)	60 (46.2%)	70 (53.8%)
Sex	Female	160 (64.0%)	112 (70.0%)	48 (30.0%)
	Male	90 (36.0%)	53 (58.9%)	37 (41.1%)
Skin colour	White/Asian	176 (70.4%)	117 (66.5%)	59 (33.5%)
	Black/mixed	74 (29.6%)	48 (64.9%)	26 (35.1%)
Second level (enabling factors)				
Income	≤3 BWM [§]	155 (62.0%)	95 (61.3%)	60 (38.7%)
	>3 BWM	95 (38.0%)	70 (73.7%)	25 (26.3%)
Educational level	Less than high school	86 (34.4%)	31 (36.0%)	55 (64.0%)
	High school or more	164 (65.6%)	134 (81.7%)	30 (18.3%)
OHLA-B	≤5	36 (14.4%)	11 (30.6%)	25 (69.4%)
	6 to 10	166 (66.4%)	114 (68.7%)	52 (31.3%)
	11 to 15	48 (19.2%)	40 (83.3%)	8 (16.7%)
Third Level (need)				
Self-rated oral health	Poor/regular	47 (10.4%)	38 (80.9%)	9 (19.1%)
	Good/very good/excellent	203 (45.1%)	127 (62.6%)	76 (37.4%)
Fourth level (personal health practices)				
Tooth-brushing	≤1 time a day	15 (3.3%)	5 (33.3%)	10 (66.7%)
	>1 time a day	235 (52.2%)	160 (68.1%)	75 (31.9%)
Smoker	No	217 (48.2%)	152 (70.0%)	65 (30.0%)
	Yes	33 (7.3%)	13 (39.4%)	20 (60.6%)
Reason for the last visit to dentist	Pain/caries	82 (18.2%)	45 (54.9%)	37 (45.1%)
	Other	168 (37.3%)	120 (71.4%)	48 (28.6%)

BWM, Brazilian minimum wages; CPI, Community Periodontal Index; OHLA-B, Oral Health Literacy Instrument-Brazilian.

¹ (codes 0+1+2).

² (codes 3+4).

[§] Brazilian Minimum Wage (1BWM ≈ US\$ 3.20).

Table 2 – Crude and adjusted odds ratios (ORs) for the associations between the Community Periodontal Index (CPI) and the variables analysed.

Variable	Category	Crude OR (95% CI)	P	Adjusted OR	P (95% CI)
First level (predisposing factors)					
Age	≤36 years	Ref.		Ref.	
	>36 years	8.17 (4.30-15.51)	<.001	5.48 (2.68-11.21)	<.001
Sex	Female	Ref.			
	Male	1.63 (0.95-2.79)	.076		
Skin colour	White/Asian	Ref.			
	Black/mixed	1.07 (0.61-1.90)	.805		
Second level (enabling factors)					
Income	≤3 BMW [§]	1.77 (1.01-3.09)	.045		
	>3 BMW	Ref.			
Educational level	Less than high school	7.92 (4.38-14.32)	<.001	3.34 (1.66-6.71)	<.001
	High school or more	Ref.		Ref.	
OHLA-B	≤5	11.36 (4.02-32.11)	<.001	5.91 (1.71-20.49)	.005
	6 to 10	2.28 (1.00-5.21)	.050	1.68 (0.66-4.29)	.278
	11 to 15	Ref.		Ref.	
Third level (need)					
Self-rated oral health	Poor/regular	Ref.			
	Good/very good/excellent	2.53 (1.16-5.51)	.019		
Fourth level (personal health practices)					
Tooth-brushing	≤1 time a day	4.27 (1.41-12.92)	.010		
	>1 time a day	Ref.			
Smoker	No	Ref.		Ref.	
	Yes	4.00 (1.69-7.66)	.001	3.29 (1.34-8.09)	.009
Reason for the last visit to dentist	Pain/caries	2.06 (1.19-3.56)	.156		
	Other	Ref.			

CI, confidence interval; OHLA-B, Oral Health Literacy Instrument-Brazilian; OR, odds ratio; Ref., reference category.

–2 Log L, empty model = 320.52; model 1 (first level) = 269.87; model 2 (first and second level) = 239.39; final model (first, second, and fourth level) = 234.24. The variables of the third level did not remain in the final model.

Conversely, Batista et al. (2018) conducted a study with Brazilian adults and reported an association between low OHL and presence of dental biofilm, but not with clinical attachment loss. The instrument employed by the authors was a 5-item questionnaire of critical health literacy adapted for the oral health context.²⁰ Blizniuk et al. (2015) found no association between levels of OHL and measures of periodontal health such as dental plaque index and deep periodontal pockets.²¹ These different findings are likely related to the instruments used to measure OHL and population characteristics.

Whilst we investigated the association of OHL with presence of periodontal pockets, other studies demonstrated that OHL levels were also associated with initial stages of periodontal disease such as bleeding sites.^{12,19} The study conducted by Holtzman et al. (2017) observed that associations between OHL scores obtained from different instruments (REAMLD-20 and CMOHK) and measures of periodontal status provide a level of moderate clinical relevancy.¹²

To our knowledge, there are few reports evaluating these associations with patients attending public health services in Latin America^{20,22} and worldwide.²¹ Considering that periodontal diseases, in particular periodontitis, have a great impact on general health for its close link with diverse systemic diseases/disorders such as cardiovascular diseases, stroke, and diabetes mellitus,²³ primary health care providers must consider the OHL as an important construct to be evaluated and improved in patients with periodontal problems.

In addition to OHL, age, educational level, and smoking status were associated with the presence of periodontal

pockets, corroborating the findings of other studies and highlighting the impact of demographic, social, and behavioural factors in the severity of the disease.^{23,24} As observed in the literature, our study demonstrated that there is evidence that aging can be associated with worse periodontal conditions throughout life, a factor that should be considered in public health planning to detect groups at greater risk for periodontal disease.^{25,26}

Considering educational level, the prevalence of worse periodontal conditions was significantly higher in subjects with lower educational levels, corroborating the findings of other studies that verified the importance of this important socioeconomic variable in the development of the disease.^{27,28} Regarding personal health practices, our results showed that the periodontal condition was worse in smokers, a fact also observed by several authors, which reinforces the role of this habit in several oral and systemic diseases.^{11,29,30}

In this study, most participants were female heads of the household. We are not able to assume, based on the available data, that family members have similar profiles of OHL and periodontal conditions. On the other hand, even though both outcomes are largely determined by factors such as age and educational level, which may vary substantially in multigenerational families, we can speculate that individuals living in the same household are, in general, affected by the same combination of health determinants. Thus, it is likely that OHL and periodontal status are influenced by the family living conditions. Future studies may explore how family characteristics influence the association between OHL and periodontal status.

This study has important practical implications. Primary health care users with low OHL levels presented more severe periodontal disease. The findings highlight the importance of dentists educating patients to improve OHL levels and periodontal health. Nevertheless, findings must be interpreted with caution due to the limitations of the study. The cross-sectional design of the study prevents the inference of causal relationships. Self-reported data may be sensitive to social desirability bias and memory bias. Findings may represent the Brazilian users of primary health care services in urban areas, yet they cannot be generalised to other groups.

Poor periodontal status amongst primary health care users in Brazil was associated with low levels of OHL. Findings highlight the need to adopt comprehensive treatment plans for periodontal disease in the primary health care system, which should include strategies to address low OHL levels.

Conflict of interest

None disclosed.

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