

Relationship between periodontal status and degree of visual impairment in institutionalized individuals

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ABSTRACT

Objective: Periodontal disease is a set of inflammatory infections that affect the supporting structures of the dentition. Patients with visual impairment (VI) may have more difficulty in cleaning and maintaining oral health. The purpose of this study was to investigate the possible relationship between periodontal status and degree of VI in institutionalized individuals. **Materials and Methods:** Fifty-two visually impaired individuals were included in this cross-sectional study. The periodontal parameters assessed were clinical attachment level (CAL), probing depth (PD), and visible plaque index. The degree of VI was established as: Group 1 (mild or moderate VI), Group 2 (severe or profound VI), and Group 3 (completely blind); and the types of VI were considered as congenital and acquired. Fisher's exact, Kruskal–Wallis, Mann–Whitney, and Spearman correlation coefficient test were used. The level of significance was set at 5%. **Result:** Only plaque index was higher on proximal surfaces of subjects with mild/moderate VI when compared to the other degrees of VI ($P = 0.01$). Furthermore, we observed higher values for interproximal CAL ($P = 0.01$), total PD ($P = 0.04$), and interproximal PD in subjects with acquired VI when compared to subjects with congenital VI ($P = 0.01$). **Conclusions:** These findings suggest that periodontal status may be more related to the type of disability than with the degree of VI. Acquired VI people presented a worse periodontal health than the group with congenital VI.

Key words: Blindness, oral hygiene, periodontal diseases, visually impaired persons

INTRODUCTION

Periodontal disease is an inflammatory process resulting from the imbalance of the interaction between dental biofilm microorganisms and components of the immune response in susceptible individuals and may lead to irreversible damage to the periodontal supporting tissues.^[1] The common signs of periodontal disease include gingival bleeding, alveolar bone resorption, periodontal pocket formation, halitosis, tooth mobility, and spontaneous tooth loss in advanced cases.^[2] Epidemiological studies have shown significant variations in the estimation of disease among different population groups suggesting that demographic, socioeconomic, environmental, nutritional, and behavioral factors may explain, at least in part, the differences observed.^[3–6]

The periodontal status of individuals with disabilities depends on several factors such as the type of disability, parents' level of education, socioeconomic status, age, and oral health knowledge.^[7] Individuals with visual impairment (VI), whose impaired vision restricts normal activities, have difficulty taking care of their oral health.^[8] Proper dental hygiene

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can become a challenge, particularly for individuals who in addition to VI have impaired motor skills, which may lead to the accumulation of dental biofilm, gingival inflammation, and/or caries disease.^[9]

According to estimates of the World Health Organization (WHO)^[10] for the year 2002, over 162 million people worldwide were visually impaired, 37 million were completely blind, and approximately 90% of these lived in developing countries. In Brazil, according to the Census 2010,^[11] 45.6 million people have at least one of the deficiencies investigated (visual, auditory, motor, and mental), representing 23.9% of the population. VI was the most frequent deficiency affecting 35.8 million people (18.8%). Severe VI affects 6.6 million people, of which 506.3 thousand are completely blind (0.3%).

Despite the high prevalence of visually impaired people in Brazil, there is a little information about oral health in this population. In addition, the poor oral hygiene contributes to the development of periodontal disease that can possibly provide systemic effects. In this sense, the aim of this study was to investigate the possible relationship between the periodontal condition and degree of VI in institutionalized individuals.

MATERIALS AND METHODS

Study design and population

We conducted an observational, analytic, cross-sectional study. The study was approved by the Research Ethics Committee of the Federal University of Maranhão under report No. 6888/2009-36. The participants and/or their guardians were informed of the objectives of the study and signed an informed consent statement, which briefly describes the study. After data collection, all participants received information on prevention and treatment of periodontal disease and instructions of oral hygiene procedures.

The study population consisted of individuals of both genders institutionalized in two leading institutions specialized in education, rehabilitation, and socialization of visually impaired people in the city of São Luís, Maranhão. Subjects who had visual acuity better than or equal to 20/70 in the better corrected eye, who had <20 teeth erupted were smokers, or pregnant women with health impairment that prevented oral examination were excluded from the study.

The study sample consisted of 52 visually impaired individuals. The participants were divided

in accordance with the type of VI (congenital or acquired) and into three groups according to the degree of disability based on the WHO classification of the severity of VI:^[12] Group with mild or moderate VI (visual acuity between 20/60 and 20/400), group with severe or profound VI (acuity from 20/500 to light perception), and completely blind group (no light perception). The visual acuity was diagnosed by the medical staff of the educational institution on the basis of the Snellen chart.

Data collection and periodontal examination

The initial interview consisted of questions asked verbally based on a questionnaire covering the following topics: Sociodemographic profile, medical history, and questions related to oral health knowledge. The clinical periodontal assessment was performed under artificial light by a single examiner previously trained by an expert periodontist, with a clinical mirror and a North Carolina periodontal probe were used (Trinity, São Paulo, Brazil) to examine sulcus/pockets as parallel as possible to the long axis of the tooth with light pressure, and the highest probing values obtained in each following regions were recorded: Disto-buccal, mid-buccal, mesio-buccal, disto-lingual, mid-lingual, and mesio-lingual regions of all teeth present, except third molars.

The probing depth (PD) was recorded as the distance (in mm) from the gingival margin to the most apical point at the bottom of the sulcus or pocket. The clinical attachment level (CAL) for each site was calculated as the distance (in mm) from the cementum-enamel junction to the bottom of the gingival sulcus or pocket. Furthermore, visible plaque index (VPI)^[13] was collected and recorded for each individual as the percentage of tooth surfaces with visible biofilm at an oral examination. The three clinical periodontal parameters were analyzed as total (all six dental surfaces measured) and interproximal surfaces (disto-buccal, mesio-buccal, disto-lingual, and mesio-lingual surfaces).

Statistical analysis

Data were tabulated in an Excel spreadsheet (Microsoft Excel 2011, Redmond, WA, USA) and analyzed by the SPSS statistical software (version 17.0, IBM SPSS Inc., Chicago, IL, USA). Descriptive statistics of the data using absolute and relative frequency means and standard deviation were initially performed. To analyze the relationship between periodontal status and VI the Shapiro-Wilk test was used to assess the normality of the data, followed by the nonparametric

Kruskal–Wallis test with Dunn’s *post-hoc* test, Mann–Whitney, and Spearman correlation coefficient tests. The categorical variables were compared using Fisher’s exact test. The level of significance adopted was 5% ($P < 0.05$).

It was estimated that a minimum sample of 21 people per group (congenital or acquired) would have power of 80%, at least, to estimate statistically significant differences in interproximal CAL, considering a significance level of 5% in bilateral *t*-test.

RESULTS

A total of 52 visually impaired people (29 men and 23 women) with mean age 25.6 ± 7.9 years composed the sample in this study. The individuals were divided into three groups according to the degree of VI: Fifty-eight percentage of individuals was completely blind (Group 3), 27% had severe or profound disability (Group 2), and 15% mild or moderate disability (Group 1). Regarding the type of VI, the majority of participants (75%) had congenital deficiency [Table 1].

Table 2 shows the relationship between the periodontal status and VI. The mean value of visible plaque on the interproximal surfaces was higher in patients

with mild or moderate VI when compared with the patients with the worst VIs ($P = 0.01$). The remaining variables did not show statistically significant differences ($P > 0.05$). A moderate positive correlation was found between the CAL for all surfaces and interproximal surfaces and the degree of VI in the assessed individuals ($r = 0.65$ and 0.62 .)

In addition, we tested the differences in the periodontal parameters in visually impaired groups with congenital or acquired VI. We found statistically significant differences for the interproximal CAL ($P = 0.01$), total PD ($P = 0.04$), and interproximal PD variables ($P = 0.01$) with higher mean values in the group with acquired VI [Table 3].

With regard to the questions about oral health knowledge, the majority of the individuals responded poorly to the importance of using fluoride (67.3%), had no understanding of the concepts of dental biofilm (96.2%) and dental calculus (94.2%). There were no significant variations in the answers between the groups [Table 4].

DISCUSSION

The findings of this study that evaluated the relationship between periodontal clinical parameters and the degree of VI in institutionalized individuals suggest that the periodontal status may be more related to the type of disability than with the degree of VI.

In the present study, although the mean value of VPI on the proximal surface was paradoxically, higher in the group with mild or moderate VI (66.8 ± 28.3) in comparison with the completely blind group (32.7 ± 31.1), no associations were found

Table 1: Distribution of individuals assessed in accordance with the type and degree of VI

Degree of VI	Individuals with VI (n=52) (n (%))		
	Congenital	Acquired	Total
Group 1 (mild and moderate)	6 (75.0)	2 (25.0)	8 (15.0)
Group 2 (severe and profound)	10 (71.4)	4 (28.6)	14 (27.0)
Group 3 (completely blind)	14 (46.7)	16 (53.3)	30 (58.0)
Total	30 (57.7)	22 (42.3)	52 (100)

VI: Visual impairment

Table 2: Mean and SD of periodontal variables assessed in accordance with the degree of VI

Periodontal parameters	Degree of VI (n=52)			P	r
	Mean±SD				
	Group 1 Mild/moderate (n=8, 15%)	Group 2 Severe/profound (n=14, 27%)	Group 3 Completely blind (n=30, 58%)		
Total VPI (%)	56.7±23.7	55.1±24.8	44.1±30.5	0.30	-0.11
Interproximal VPI (%)	66.8±28.3 ^a	43.2±23.3 ^{a,b}	32.7±31.1 ^b	0.01*	-0.17
Total CAL (mm)	1.61±0.64	1.62±0.35	1.88±0.51	0.14	0.65
Interproximal CAL (mm)	1.48±0.77	1.41±0.58	1.74±0.62	0.06	0.62
Total PD (mm)	1.59±0.65	1.61±0.34	1.83±0.52	0.22	0.16
Interproximal PD (mm)	1.48±0.77	1.39±0.54	1.75±0.61	0.05	0.18
Number of teeth	26.4±5.2	27.3±2.4	27.1±4.5	0.76	-0.06

P value calculated by use of Kruskal–Wallis test followed by Dunn’s *post-hoc* test, different lower-case letters mean statistical differences ($P < 0.05$). *r*=Spearman correlation coefficient. *Statistically significant differences ($P < 0.05$). ±DP=SD, VPI: Visible plaque index, CAL: Clinical attachment level, PD: Probing depth, SD: Standard deviation, VI: Visual impairment

Table 3: Mean and SD of periodontal variables assessed in accordance with the type of VI, congenital or acquired

Periodontal parameters	Type of VI (n=52)		P
	Mean±SD		
	Congenital (n=30, 57.7%)	Acquired (n=22, 42.3%)	
Total VPI (%)	47.3±27.8	51.4±29.2	0.69
Interproximal VPI (%)	43.1±31.9	37.9±29.2	0.60
Total CAL (mm)	1.67±0.48	1.90±0.50	0.07
Interproximal CAL (mm)	1.42±0.33	1.88±0.68	0.01*
Total PD (mm)	1.62±0.47	1.88±0.51	0.04*
Interproximal PD (mm)	1.43±0.53	1.86±0.68	0.01*
Number of teeth	27.5±3.8	26.3±4.4	0.33

The P value calculated by use of Mann–Whitney test. *Statistical significance (P<0.05). ±DP=SD, VPI: Visible plaque index, CAL: Clinical attachment level, PD: Probing depth, SD: Standard deviation, VI: Visual impairment

Table 4: Absolute and relative frequencies related to oral health knowledge among the individuals assessed with VI

Variables	Individuals with VI (n (%))			P
	General (n=52)	Congenital (n=30)	Acquired (n=22)	
Importance of using fluoride				
No	35 (67.3)	21 (70.0)	14 (63.6)	0.42
Yes	17 (32.7)	9 (30.0)	8 (36.4)	
Knowledge of dental biofilm (bacterial plaque)				
No	50 (96.2)	29 (96.7)	21 (95.5)	0.67
Yes	2 (3.8)	1 (3.3)	1 (4.5)	
Knowledge of dental calculus (tartar)				
No	49 (94.2)	29 (96.7)	20 (90.9)	0.38
Yes	3 (5.8)	1 (3.3)	2 (9.1)	

The P value calculated by use of Fisher's exact test. VI: Visual impairment

between measurements (in mm) of periodontal probing (CAL and PD) and the degree of VI. It is noteworthy that the study population was composed, in large part, by young adults (mean 25.6 ± 7.9 years), so the clinically observable differences in the degree of periodontal tissues breakdown may not have been detected because several studies support the hypothesis that the progression of periodontal attachment loss increases with increasing age.^[4]

VI can have a negative effect on oral hygiene, lead to biofilm accumulation and dental calculus due to unsatisfactory oral hygiene^[9,14] and increase periodontal inflammation.^[15] Perhaps, the most interesting result observed for in the present study was the difference found between the periodontal parameters (PD on interproximal surfaces, total

CAL, and CAL on interproximal surfaces) for the group with acquired deficiency when compared to congenital blindness. To the authors' knowledge, there are no previous studies in the literature that analyzed the relationship between the type of VI and periodontal status. Most studies only evaluated caries disease and oral hygiene. This studies in VI people found low levels of oral hygiene and a high rate of caries compared with nondisabled individuals, but the prevalence of caries does not seem to be affected by the degree and type of VI.^[9,16] However, a recent study^[17] showed in the adjusted analysis that children with partial VI were 6.3 times more likely to be diagnosed with caries compared to children with complete VI. One possible explanation is that individuals with acquired VI have greater difficulty adapting to the new reality^[18] and accept that at the same level they will not be as independent as before of the visual deficiency. Therefore, they may neglect their oral hygiene measures allowing biofilm accumulation, which consequently, increases the risk for the development of caries lesions, gingivitis, and periodontitis.

Another finding in this study was the high prevalence of the lack of knowledge about oral health. A small percentage of participants reported knowing the importance of using fluoride for dental health, and tooth brushing to prevent dental biofilm and dental calculus formation. Therefore, adequate educational strategies for oral health including adapted guidelines using tactile sense, clear verbal communication, Braille texts, and macro models should be encouraged.^[19,20] Preventive care can have a positive impact on the control of oral health such as nutrition, digestion, facial esthetics, ability to chew, and speak.^[21]

Moreover, these procedures must be constantly motivated by caregivers, due to the fact that visually impaired people without motor limitations are potentially able to perform personal hygiene, provided they are stimulated.^[19] It is imperative that dentists, caregivers, and health professionals work together to offer adequate and individual services to this population by helping them develop other cognitive senses. These findings may be a useful guide for professionals and managers to develop and implement actions to educate and prevent the occurrence of oral health diseases, improving the quality of life of this population.

Finally, studies considering other age groups, noninstitutionalized individuals, and the use of

longitudinal designs are suggested to assess better the topic under discussion. The present study has some limitations. First, the sample size was small, which limited external validity and second, the cross-sectional design did not allow the assessment of causality. On the other hand, the findings of this study is an important contribution to the evaluation of the periodontal status of the visually impaired people, as most studies only assess the occurrence of caries,^[9,15] and those studies that included periodontal evaluation did not assess its relationship with the degree and type of VI.^[18,22] Thus, within the limitations of the study, the findings suggest that the periodontal status may be more related to the type of disability than with the degree of VI. Individuals with acquired VI showed poorer indicators of periodontal health than the group with congenital VI, which reinforces the importance of adopting oral hygiene procedures and providing dental care to this population.

CONCLUSIONS

Within the limits of the study, the findings suggest that periodontal condition may be more related to the type of disability than with the degree of VI. Acquired VI people had worse indicators of periodontal health than the group with congenital VI, reinforcing the importance of adopting oral hygiene preventive procedures and incorporation of dental care services aimed at this population.

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Conflicts of interest

There are no conflicts of interest.

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