

Original

Impact of the severity of chronic periodontal disease on quality of life

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Abstract: We examined the impact of the severity of periodontal disease on quality of life in adults with chronic periodontitis. One hundred patients (age, 30-58 years) who were assisted at the Basic Health Care Unit in the city of Passo Fundo, RS, Brazil underwent clinical examination of all standing teeth, including gingival bleeding on probing, probing depth, and clinical attachment level, and were divided into those with mild/moderate ($n = 49$; group G1) and severe ($n = 51$; group G2) chronic periodontitis. The participants were then interviewed, using a structured questionnaire. The Brazilian Oral Health Impact Profile (OHIP-14Br) questionnaire was used to assess oral health-related quality of life. Associations were investigated, and those with a P value of less than 0.2 were tested using multiple logistic regression models. Those with a P value of 0.05 or less were considered significant. There was a significant association between G2 and education level ($P = 0.00051$). OHIP-14Br score was higher for G2 (24.1) than for G1 (18.2) ($P = 0.0455$). Severe chronic periodontitis was associated with low education level (≤ 8 years) (odds ratio [OR], 3.0; 95% confidence interval

[CI], 1.2-7.3) and pronunciation difficulties (OR, 3.1; 95% CI, 1.0-9.3). In conclusion, periodontal disease severity was inversely associated with quality of life among Brazilian adults. (J Oral Sci 57, 87-94, 2015)

Keywords: diagnosis; epidemiology; health services research; periodontitis.

Introduction

Chronic periodontitis is an infection caused by microorganisms on the tooth surface, which form supra- and subgingival biofilm and can lead to irreversible loss of tooth-bearing structures and eventually tooth loss (1).

Recent epidemiologic data from Brazil show that 28.6% of adults aged 35-44 years have calculus, 19.4% have periodontal pockets—15.2% of which are shallow and 4.2% of which are deep—and only 17% had no periodontal disease (2). In the Southern States of Brazil, where this study was performed, 65% of adults had loss of attachment greater than 5 mm (3-6) and 25.5% reported dissatisfaction with their teeth and mouth (2).

Periodontal disease may compromise functional aspects of the stomatognathic system, such as mastication, swallowing, and speech, smile esthetics, and consequently self-esteem (7-9). As compared with healthy individuals, those with periodontal disease have a poorer perception of their oral health and worse quality of life (QoL) (10-15), which confirms previous findings

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that periodontal disease is not a “silent” problem in terms of QoL, as was once thought (16).

It is essential to understand how people perceive their oral health and the importance they attach to it, as these factors underlie the desire to seek adequate treatment, which can prevent adverse effects on QoL. Periodontitis-related factors such as tooth mobility and gingival recession may alter smile esthetics and thus negatively affect self-esteem and interpersonal relations, thereby lowering QoL (9,13,16). When self-perception develops, individuals cease to act only as patients and start diagnosing and actively maintaining their oral health (17-19).

Although important, self-perceived oral health is decidedly under-evaluated, especially in persons with chronic periodontal disease, who may experience no pain symptoms and thus are less likely to seek treatment (14,16,20,21). Information on patient values and beliefs may be important in planning effective interventions for oral health, which is closely linked to general health and thus affects QoL in individuals (12,14,22). Integration of self-perception and periodontal treatment should lead professionals to design health strategies that prevent decreases in QoL.

The purpose of this study was to measure the impact of chronic periodontal disease severity on QoL in Brazilian adults.

Materials and Methods

Ethical considerations

This study was conducted in accordance with Resolution 196/96 of the National Health Council of Brazil and was approved by the São Leopoldo Mandic Research Ethics Committee (Protocol 2010/0319). Written informed consent was obtained from all participants.

Study sample

The population sample included 100 volunteers (57 men, 43 women; age range, 30-58 years; mean [SD] age, 41.4 ± 7.6 years) recruited from a Basic Health Care Unit in the city of Passo Fundo (RS, Brazil) over a 16-month period in 2011-2012.

All participants had at least 20 remaining teeth, a minimum of four sites with probing depths (PD) greater than 3 mm, bleeding on probing (BOP) (23), and clinical attachment loss (CAL) greater than 1 mm (7). None of the patients had completed a course of periodontal treatment during the 6 months before enrolling in this study (23). Patients who were unable to answer the questionnaire or undergo clinical examination were excluded.

Clinical periodontal examination was performed by a dental surgeon specializing in periodontology (DRDZM)

who was appropriately trained and calibrated. Six-point manual periodontal probing was performed for every remaining tooth (5) to evaluate PD, CAL, and BOP. In accordance with findings from the periodontal examination, the participants were classified as having mild/moderate chronic periodontitis (CAL, 1-4 mm; group G1; $n = 49$) (24) or severe chronic periodontitis (CAL, ≥ 5 mm; group G2; $n = 51$) (24).

OHRQoL and self-perception

After periodontal examination, all volunteers were interviewed by a blinded trained assistant, using two instruments. The first included items related to gender, age, marital status, socioeconomic status, current medications, number of cigarettes smoked per day, and number of years smoked (3,4,6). Items on education level, oral health morbidity, use of dental services, and oral hygiene habits adhered to the model used by the National Survey of Oral Health 2010 (2).

For analysis of QoL, the Oral Health Impact Profile (OHIP) questionnaire was used to measure perceptions of the social impact of the oral disorder on well-being. This questionnaire is an abbreviated version by Slade and Spencer (25). Drumond-Santana et al. (26) developed an abbreviated OHIP version for the Brazilian population, the OHIP-14Br.

The present study used the OHIP-14Br questionnaire, which comprises 14 questions divided into seven categories, as follows: 1: functional limitation (questions 1 and 2), 2: physical pain (questions 3 and 4), 3: psychological discomfort (questions 5 and 6), 4: physical disability (questions 7 and 8), 5: psychological disability (questions 9 and 10), 6: social disability (questions 11 and 12), and 7: handicap (questions 13 and 14). The answers were recorded on a Likert scale, with values ranging from 0 to 4. A lower Likert scale value indicates higher QoL (15,16).

Statistical analyses

The Mann-Whitney test was used to compare total scores on the OHIP-14Br between study groups. Bivariate analysis with the chi-square test or Fisher's exact test (for categories with fewer than five participants) was used to evaluate the impact of periodontal disease on QoL in relation to independent variables such as gender, age, marital status, family income, smoking, education level, treatment need, use of dental services, oral hygiene habits, and level of satisfaction with one's teeth. Variables with a significance level of 0.2 or less in bivariate analysis were tested using a multiple logistic regression model, to identify those with a P value ≤ 0.05 . Adjusted

Table 1 Bivariate analysis of periodontal disease severity according to sociodemographic variables

Variable	Categories	Mild/moderate periodontitis		Severe periodontitis		Total sample		P value
		n	% ^{&}	n	% ^{&}	n	% [#]	
Gender	Male	27	47.4	30	52.6	57	57.0	0.7071
	Female	22	51.2	21	48.8	43	43.0	
Age	≤41* years	30	57.7	22	42.3	52	52.0	0.0703
	>41 years	19	39.6	29	60.4	48	48.0	
Number of teeth	20-24*	22	39.3	34	60.7	56	56.0	0.0284
	>24	27	61.4	17	38.6	44	44.0	
Marital status	Single	9	52.9	8	47.1	17	17.0	0.1756
	Married	29	43.3	38	56.7	67	67.0	
	Separated	11	68.8	5	31.2	16	16.0	
Monthly family income**	No income	1	33.3	2	66.7	3	3.0	0.6668
	≤1 minimum wage unit	2	45.8	26	54.2	48	48.0	
	>1 minimum wage unit	26	53.1	23	46.9	49	49.0	
Smoker	No	15	48.4	16	51.6	31	31.0	0.3007
	Yes	28	45.9	33	54.1	61	61.0	
	Ex-smoker	6	75.0	2	25.0	8	8.0	
Number of cigarettes/day [§]	≤15*	12	54.6	10	45.4	22	56.4	0.9206
	>15	9	52.9	8	47.1	17	43.6	
Medication	Yes	12	42.9	16	57.1	28	28.0	0.4435
	No	37	51.4	35	48.6	72	72.0	
Number of school years	≤8 years*	21	36.8	36	63.2	57	57.0	0.00051
	>8 years	28	65.1	15	34.9	43	43.0	

* sample median; [§] among smokers only; ** 1 minimum wage unit = US\$31,100

[&] Row percentage; [#] Column percentage

Table 2 OHIP-14 score according to periodontal disease severity

Periodontal disease severity	Mean ± SD	P value
Mild/moderate	18.2 ± 12.9	P = 0.0455
Severe	24.1 ± 14.8	

odds ratios and 95% confidence intervals were estimated (multiple logistic regression). All data were analyzed using statistical software (SAS; Release 8.2, 2001; SAS Institute Inc., Cary, NC, USA).

Results

The results of bivariate analysis of the associations of periodontal disease severity with sociodemographic variables are shown in Table 1. Disease severity was significantly associated with number of years spent at school ($P = 0.00051$), i.e., severe periodontitis was more prevalent among participants with less education (<8 years). Tooth loss was greater in those with severe periodontitis ($P = 0.0284$). The remaining variables were not significantly associated with severity of periodontal disease ($P > 0.05$).

Overall OHIP-14Br score significantly differed between patient groups (Table 2); the impact of oral health on QoL was greater in patients with severe

periodontitis ($P = 0.0455$). Table 3 shows the OHIP-14 items organized by domain. Low impact was defined as responses of “never”, “rarely,” and “sometimes”; high impact was defined as responses of “frequently” and “always”. The domains functional limitation, physical pain, physical incapacity, and psychological incapacity significantly differed in relation to periodontitis severity.

Disease severity and speech impairment were significantly associated ($P = 0.0355$); 24% of interviewees reported “functional limitation”, 65.6% of whom had severe periodontitis. Regarding physical incapacity, 17% of interviewees reported needing to interrupt their meals, among whom 58.3% had severe periodontitis ($P = 0.0370$).

Overall, physical pain was reported by 46% of participants (56% of whom had severe periodontitis), and 53% of patients reported psychological incapacity, namely being embarrassed about their teeth ($P = 0.0322$), 63% of whom had severe periodontitis, which represented a significant difference in relation to disease severity.

The results of multiple logistic regression analysis are shown in Table 4. Participants with less education (≤8 years) were 3 times as likely as those with more education to have severe periodontitis ($P < 0.0161$), and those with speech difficulties were 3.1 times as likely as those without speech difficulties to have severe periodontitis.

Table 3 Results of bivariate analysis of periodontitis according to number of teeth and OHIP items

	Domains	Categories	Mild/moderate periodontitis		Severe periodontitis		Total sample		P value
			n	% [§]	n	% [§]	n	% [#]	
1) Have you had problems saying any words because of problems with your teeth, mouth, or gingiva?	Functional limitation	Never	39	60.0	26	40.0	65	65.0	0.0355
		Rarely	2	25.0	6	75.0	8	8.0	
		Sometimes	0	0.0	3	100.0	3	3.0	
		Frequently	5	31.2	11	68.8	16	16.0	
		Always	3	37.5	5	62.5	8	8.0	
2) Have you noticed that food tastes worse because of problems with your teeth, mouth, or gingiva?	Functional limitation	Never	19	57.6	14	42.4	33	33.0	0.3143
		Rarely	6	30.0	14	70.0	20	20.0	
		Sometimes	8	61.5	5	38.5	13	13.0	
		Frequently	11	47.8	12	52.2	23	23.0	
		Always	5	45.4	6	54.6	11	11.0	
3) Have you had pain in your mouth or teeth?	Physical pain	Never	3	30.0	7	70.0	10	10.0	0.0582
		Rarely	14	77.8	4	22.0	18	18.0	
		Sometimes	13	50.0	13	50.0	26	26.0	
		Frequently	12	37.5	20	62.5	32	32.0	
		Always	7	50.0	7	50.0	14	14.0	
4) Have you felt uncomfortable when eating particular foods because of problems with your teeth, mouth, or gingiva?	Physical pain	Never	8	57.1	6	42.9	14	14.0	0.7595
		Rarely	10	47.6	11	52.4	21	21.0	
		Sometimes	5	41.7	7	58.3	12	12.0	
		Frequently	20	54.0	17	46.0	37	37.0	
		Always	6	37.5	10	62.5	16	16.0	
5) Have you been worried because of problems with your teeth, mouth, or gingiva?	Psychological discomfort	Never	18	60.0	12	40.0	30	30.0	0.2970
		Rarely	14	53.8	12	46.2	26	26.0	
		Sometimes	3	42.9	4	57.1	7	7.0	
		Frequently	10	45.4	12	54.6	22	22.0	
		Always	4	26.7	11	73.3	15	15.0	
6) Have you felt stressed because of problems with your teeth, mouth, or gingiva?	Psychological discomfort	Never	18	60.0	12	40.0	30	30.0	0.2970
		Rarely	14	53.8	12	43.2	26	26.0	
		Sometimes	3	42.9	4	57.1	7	7.0	
		Frequently	10	45.4	12	54.6	22	22.0	
		Always	4	26.7	11	73.3	15	15.0	
7) Has your eating been compromised by problems with your teeth, mouth, or gingiva?	Physical incapacity	Never	19	57.6	14	42.4	33	33.0	0.2386
		Rarely	10	50.0	10	50.0	20	20.0	
		Sometimes	8	66.7	4	33.3	12	12.0	
		Frequently	10	34.5	19	65.5	29	29.0	
		Always	2	33.3	4	66.7	6	6.0	
8) Have you had to stop a meal because of problems with your teeth, mouth, or gingiva?	Physical incapacity	Never	25	51.0	24	49.0	49	49.0	0.0370
		Rarely	11	84.6	2	15.4	13	13.0	
		Sometimes	7	33.3	14	66.7	21	21.0	
		Frequently	5	33.3	10	66.7	15	15.0	
		Always	1	50.0	1	50.0	2	2.0	
9) Have you had difficulty relaxing because of problems with your teeth, mouth, or gingiva?	Psychological incapacity	Never	26	60.5	17	39.5	43	43.0	0.3486
		Rarely	9	40.9	13	59.1	22	22.0	
		Sometimes	6	46.2	7	53.8	13	13.0	
		Frequently	7	35.0	13	65.0	20	20.0	
		Always	1	50.0	1	50.0	2	2.0	
10) Have you felt embarrassed because of problems with your teeth, mouth, or gingiva?	Psychological incapacity	Never	20	66.7	10	33.3	30	30.0	0.0322
		Rarely	5	45.4	6	54.6	11	11.0	
		Sometimes	2	33.3	4	66.7	6	6.0	
		Frequently	18	52.9	16	47.1	34	34.0	
		Always	4	21.0	15	79.0	19	19.0	

Table 3, continuation

Domains	Categories	Mild/moderate periodontitis		Severe periodontitis		Total sample		P value
		n	% ^{&}	n	% ^{&}	n	% [#]	
11) Have you mistreated others because of problems with your teeth, mouth, or gingiva?	Never	35	53.0	31	47.0	66	66.0	0.3791
	Rarely	6	37.5	10	62.5	16	16.0	
	Sometimes	5	62.5	3	37.5	8	8.0	
	Frequently	3	37.5	5	62.5	8	8.0	
	Always	0	0.0	2	100.0	2	2.0	
12) Have you had difficulties carrying out your daily routine because of problems with your teeth, mouth, or gingiva?	Never	28	51.8	26	48.2	54	54.0	0.1263
	Rarely	13	59.1	9	40.9	22	22.0	
	Sometimes	6	54.6	5	45.4	11	11.0	
	Frequently	2	16.7	10	83.3	12	12.0	
	Always	0	0.0	1	100.0	1	1.0	
13) Have you felt that life in general has become worse because of problems with your teeth, mouth, or gingiva?	Never	14	66.7	7	33.3	21	21.0	0.1141
	Rarely	8	38.1	13	61.9	21	21.0	
	Sometimes	8	61.5	5	38.5	13	13.0	
	Frequently	15	50.0	15	50.0	30	30.0	
	Always	4	26.7	11	73.3	15	15.0	
14) Have you felt completely incapable of performing your daily activities because of problems with your teeth, mouth, or gingiva?	Never	29	52.7	26	47.3	55	55.0	0.0847
	Rarely	13	59.1	9	40.9	22	22.0	
	Sometimes	5	55.6	4	44.4	9	9.0	
	Frequently	2	15.4	11	84.6	13	13.0	
	Always	0	0.0	1	100.0	1	1.0	

[&]Row percentage; [#]Column percentage

Table 4 Results of multiple regression analysis of the association of severe periodontitis with selected study variables

Variable	Categories	N	Severe Periodontitis		Adjusted analysis		
			n	%	OR	95% CI	P
Years of study	≤8 years*	57	36	63.2%	3.0	1.2 - 7.3	0.0161
	>8 years	43	15	34.9%	Reference		
Speech difficulty	No	73	30	41.1%	Reference		0.0461
	Yes	27	21	77.8%	3.1	1.0 - 9.3	

* Sample median; OR, Odds ratio; CI, Confidence interval

Discussion

The presence of periodontal disease is usually related to clinical parameters such as probing depth and attachment level. Little is known about patient perception of other signs such as redness, bleeding on brushing, loss of affected teeth, or persistent halitosis, which are not always recorded in dental records but are highly relevant to patients, as they may considerably reduce QoL (10,11,13,16,19,22,26-28). To identify patient-centered measures of treatment planning, we investigated the self-reported adverse effects of chronic periodontal disease, thereby broadening the concept of oral health to include both absence of disease and QoL.

The increasing availability of instruments for psychological assessment has enabled studies of the impact of

oral health on individual QoL. One such instrument, the Oral Health Impact Profile (OHIP-14), is very frequently used (8,9,12,13,15,19,22,26,29-32) and has adequate validity and sensitivity for health-related research. The OHIP-14 was selected for this study because it is a good indicator of self-perception and individual feelings about oral health and because it can assess the adverse aspects of the relation between oral health and QoL.

In the present study, only individuals aged 30 to 59 years with more than 20 remaining teeth were included, which allowed us to measure impacts exclusively among adults, the age group most affected by periodontal disease. These inclusion criteria have not been verified in other studies (13,14,16). Indeed, previous studies enrolled patients from a much wider age range, to facilitate

recruitment of groups of sufficient size. Earlier studies vary considerably in sample size, from 21 adults aged 24 to 82 years (33) to 3,122 participants older than 16 years (13), and in response rates, from 41% (16) to 82% (13). In the present study, the interview was conducted on the same day as the clinical examination by an interviewer blinded to the study goals; thus, a response rate of 100% was obtained.

Severe periodontitis was significantly associated with low education, which suggests that limited education results in decreased socioeconomic status and reduces access to information and oral health services (8,11,34).

With respect to gender, age, marital status, income, smoking habit, number of cigarettes smoked per day, and medication history, our findings confirm those of earlier studies (2-4). Namely, periodontitis was more severe in men than in women, and patients older than 41 years and smokers had greater CAL, i.e., more-severe disease (8,11,27,34), which suggests a need for targeted interventions in this group.

Patients with severe periodontitis had significantly higher OHIP-14 values than did those with mild/moderate periodontitis, which confirms that severe chronic periodontitis has a negative impact on individual QoL. Alessio et al. (8), Needleman et al. (10), Ng and Leung (11), Bernabé and Marcenes (13) and Lawrence et al. (34) also reported associations with severe periodontal disease, since attachment loss is more noticeable because of the signs and symptoms that compromise esthetics and function. In contrast, persons with mild/moderate periodontitis were not as aware of the initial signs of their periodontal disease.

Significant differences between groups were noted in the domains functional limitation, physical pain, physical incapacity, and psychological incapacity. Functional limitation, namely, speech impairment, was 3.1 times as likely in patients with severe periodontal disease as in those with milder disease. This is understandable, as progression of chronic periodontitis results in greater destruction of periodontal tissues and in symptoms noticeable by the patient, such as gingival recession, mobility, migration, and tooth loss (9, 13,15,27,35).

In the present patients with 20 to 24 teeth (56% of all patients), 60.7% had severe periodontitis. Borges et al. (9), Cunha-Cruz et al. (16), Dahl et al. (19), Ojofeitimi et al. (36), Araújo et al. (37) and found that a decreased number of teeth was associated with greater discomfort during chewing and worse QoL. Regarding physical incapacity, loss of function, such as compromised eating or need to interrupt a meal, was reported by 35% of the present participants and was also associated with disease

severity. Periodontal disease may result in clinical signs and symptoms, including bleeding, tooth mobility, gingival recession, and teeth loss, which explains the adverse impact on daily life (9,11,16,26,27,29,32).

Regarding physical pain, periodontal disease severity was closely associated with self-reported pain and discomfort during chewing, which was also reported by Guzeldemir et al. (30). Data from SB-Brasil (2) and Borges et al. (9) showed that eating difficulty was the most prevalent impact in all regions and age groups. This indicates a need to broaden dental care to address this important functional difficulty, which is vital for QoL in the Brazilian population.

Regarding psychological incapacity, periodontal disease severity was related to embarrassment, which could be associated with disease progression, considering the esthetic concerns caused by gingival recession and teeth migration. Some previous studies found that only CAL greater than 5 mm, as occurs in severe periodontitis, was associated with self-perception of oral disease (7,10,13,15,27,33,38). Bedos et al. (18) and Jansson et al. (32) described the great value people place on the appearance of their teeth and the potentially devastating impacts of oral disease on self-esteem, social interactions, and employability, which could result in multiple extractions and full dentures. One of the most important reported adverse impacts in Brazil (2) was reluctance to smile, which was confirmed in this study.

Our results corroborate those of Borges et al. (9), Bernabé and Marcenes (13), Habashneh et al. (15), Lopes et al. (27) and Jansson et al. (32), all of whom reported that periodontal disease severity was inversely associated with QoL.

Self-perception of health and disease should be regarded as an integral element in routine clinical evaluation of health and subsequent planning of health care. In practice, combining measures of self-perception with traditional measures may help in educating and informing individuals, particularly when planning public health services, interventions, oral health promotion, and community-based oral health strategies. Difficulties in developing effective strategies to motivate and promote health in patients with chronic diseases is not an issue exclusive to Brazil, as other parts of the world have reported similar deficiencies (14,18,19, 21,23,29,32,34,39).

Finally, it should be mentioned that the sample was highly selective and included volunteers, which might limit the generalizability of our results. Clearly, additional, similar studies in other settings would be helpful in addressing this issue. Considerable research and

development efforts, along with half-hearted attempts by government, have not yet been reflected in periodontal health. Thus, there is a need for future research, to form the basis of education efforts that could effectively affect individual habits.

In conclusion, periodontal disease severity was inversely associated with quality of life in Brazilian adults. Severe periodontitis had significant adverse impacts on functional limitation, physical pain, physical incapacity, and psychological incapacity.

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