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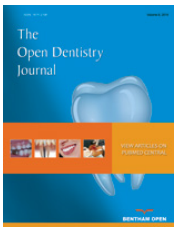

RESEARCH ARTICLE

Oral Health Impact Profile Scale Applied to Periodontal Disease: Relationship with Sociodemographic Variables in General Population and Clinic Samples from Monterrey, Mexico

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Abstract:

Background:

The Oral Health Impact Profile applied to Periodontal Disease (OHIP-14-PD) shows good metric properties and great potential for its application in research and clinical practice.

Objective:

To evaluate OHIP-14-PD capability to detect associations with sociodemographic variables, to verify whether the OHIP-14-PD can differentiate between a General Population Sample (GPS) and a Dental Clinic Sample (DCS), and to establish whether there are interaction effects between the two samples and sociodemographic variables.

Methods:

The OHIP-14-PD was applied to two non-probability samples of 249 dental patients and 256 general adult population from Monterrey, Mexico. A validation study was done with a non-experimental cross-sectional design.

Results:

Occupation and age were related to OHIP-14-PD, although this last variable was redundant with the first one. In the GPS, the subjective socioeconomic status had a negative correlation with the OHIP-14-PD, but not in the DCS. The marital status showed significant association in DCS and significant interaction with the samples. Being married acted as a risk factor in the DCS, but as a protective factor in the GPS. Sex and education level were independent of the OHIP-14-PD. The expectation of discriminant validity of the OHIP-14-PD between the two samples was confirmed.

Conclusion:

We conclude that the OHIP-14-PD presented evidence of discriminant validity. Its relation to sociodemographic variables was limited, being more related to occupation and marital status.

Keywords: Quality of life, Periodontal disease, Demographic factors, Population surveillance, Dental clinic, OHIP-14-PD.

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1. INTRODUCTION

Periodontal diseases detection in epidemiological research has proposed alternative methods of detection. These methods include reporting the number of teeth lost, gingival bleeding, self-report questionnaire of periodontal condition, the inclusion of a general medical assessment, and non invasive tests of the gingiva. Precisely, Ansahí *et al*., [1] suggested that the elimination of periodontal probing is an urgent issue in dental medicine.

Taking into account this suggestion, an approach that complements the clinical examination of a patient with periodontitis is the self-report of the Oral Health-Related Quality of Life (OHRQoL), since a more negative impact is observed with the extent and severity of periodontal disease [2, 3]. The evaluation of the OHRQoL is usually performed at a functional, physical, and psychosocial level [4].

It was found that the sociodemographic factors most clearly associated with perceived negative impact on the OHRQoL were: being a woman, low education level, low income, low Subjective Socioeconomic Status (SES), not having dental care service or not being able to pay for dental care, and being an immigrant or belonging to ethnic minority groups. The age was independent [5].

Another significant finding is the association between the extent and severity of periodontitis and OHRQoL assessed through the scale named Oral Health Impact Profile (OHIP-14) [6, 7]. Furthermore, worse periodontal health status and need for prosthetic rehabilitation were associated with a negative impact on OHRQoL [8].

In a study using OHIP-14, it was observed that women, over 40 years of age, with lower social support, poor eating habits, smoking habits, and low income presented higher odds of having poor self-perception of oral health [9]. Besides, in another research, a significant linear association between the difficulty in pronouncing words (item of the functional limiting factor) and the education level was found among patients with severe periodontitis [10].

Several researchers [4, 7 - 11] have evaluated the impact of periodontitis on OHRQoL through OHIP-49 [12] and OHIP-14 [6]. These instruments were elaborated according to the theoretical model of the World Health Organization adapted for oral health by Locker [13]. The OHIP-14 has been adapted in Mexico with the purpose of evaluating the impact of periodontal disease in the OHRQoL and to be used in clinical setting and research [14]. This new version of OHIP-14 was named OHIP-14 for Periodontal Disease (OHIP-14-PD). The content validity of the OHIP14-PD has been established [14]. The generic instrument OHIP-14 was transformed into OHIP-14-PD with the aim of avoiding positive responses as a consequence of a pathology different to periodontitis that could be present at the time of answering the questionnaire, and this way to obtain a more specific score related to the impact of periodontitis on OHRQoL [14].

Although validation studies of instruments aimed to assess OHRQoL have been performed to test construct validity, no research has been done to stablish the relation between these instruments and sociodemographic variables [5]. Thus, the objectives of the present research were: 1) to assess the capability of the OHIP-14-PD total score to detect differences or associations with the socio-demographic variables sex, age, education level, SES, occupation, and marital status both in a General Population Sample (GPS) and in a Dental Clinic Sample (DCS); 2) to test whether this instrument of assessment can differentiate between GPS and DCS in order to verify its discriminant validity, and 3) to establish if there are interaction effects on the OHIP-14-PD total score between these two samples and the six sociodemographic variables previously mentioned.

2. MATERIALS AND METHODS

2.1. Participants

Two non-probabilistic samples were collected. The GPS was composed of 256 participants and the DCS was composed of 249 participants. Inclusion criteria for GPS were to know how to read and write, to provide written informed consent, to be 18 years or older, and to reside in Monterrey and its metropolitan area; and for DCS another criterion was added to request periodontal care or prophylactic dental treatment in a university clinic. The exclusion criteria for both samples were to be illiteracy or underage, and to have clinical cognitive problems related to attention and comprehension. The elimination criteria for both samples was to leave at least one incomplete item on the OHIP-14-PD.

2.2. Instrument

OHIP-14-PD was applied along with closed questions about sociodemographic data. OHIP-14-PD was adapted from OHIP-14 [6], focusing questions on periodontal disease [14]. OHIP-14-PD is composed of 14 five-point, Likert-

type items (from 0 to 4). Its content validity has been established by expert judgment [14]. A higher score indicates poorer OHRQoL (Table **1**).

Table 1. Oral Health Impact Profile Scale applied to Periodontal Disease (OHIP-14-PD).

Frequency with which it happens: Answer each of the following questions, pointing to the option that corresponds to the 0 = Never 1 = Almost never 2 = Occasionally 3 = Frequently 4 = Very frequently					
Questions	**Answers**				
1. Have you noticed your gums are swollen and do not look good?	0	1	2	3	4
2. Have you had difficulty chewing because of mobility and change of position of your teeth?	0	1	2	3	4
3. Have you felt pain in your gums?	0	1	2	3	4
4. Have you had sensitive teeth when chewing or due to cold, hot, sweet foods or drinks?	0	1	2	3	4
5. Have you been worried because of bad taste in your mouth?	0	1	2	3	4
6. Have you felt uncomfortable because of bad mouth odor?	0	1	2	3	4
7. Has your oral hygiene been inadequate because of gum bleeding when brushing?	0	1	2	3	4
8. Have you avoided chewing with all your teeth because of any absence of dental pieces or accumulation and/or food residue between the teeth?	0	1	2	3	4
9. Have you felt sad about the health condition of your teeth and gums?	0	1	2	3	4
10. Have you felt embarrassed by the appearance of your teeth and gums?	0	1	2	3	4
11. Have you had difficulty doing any daily activities because of the state of your teeth or your gum disease?	0	1	2	3	4
12. Have you avoided any contact with other people because of the state of your teeth or your gum disease?	0	1	2	3	4
13. Has your general health been affected as a result of your oral health?	0	1	2	3	4
14. Has your financial situation been affected by the state of your oral health?	0	1	2	3	4

The internal consistency of the OHIP-14-PD was very high (α ordinal = 0.92 in GPS and 0.93 in DCS). Its distribution showed positive skewness and leptokurtosis in both samples, and did not fit to a normal distribution. A single-factor model was supported by Horn's parallel analysis in both samples. The fit to the data for the one-factor model ranged from good (GFI = 0.98, AGFI = 0.97, NFI = 0.97, and RFI = 0.96) to adequate (χ^2/df = 2.34 and SRMR = 0.08) in the GPS, and also varied from good (GFI = 0.97, GFI = 0.96, NFI = 0.96, and RFI = 0.96) to adequate (χ^2/df = 2.66 and SRMR = 0.09) in the DCS.

2.3. Procedure

A validation study was performed with a non-experimental, cross-sectional design. The participants of the GPS answered the questionnaire at home or workplace. They were chosen for convenience or proximity. The participants of the DCS answered the questionnaire at the dental clinic during their appointment. They were chosen in order of arrival at the university clinic; 54.2% had signs and symptoms of periodontal disease, and 45.8% were under prophylactic dental treatment. Data were collected from October 2015 to March 2016.

The periodontal condition in the DCS was described through the presence of gingival inflammation, bleeding gums, dental mobility, presence of dental calculus, and halitosis. Patients with periodontitis and gingivitis were diagnosed through measurements of probing depth, clinical attachment level, and periapical radiographs according to the Classification of Periodontal Diseases [15]. The clinical results of periodontal parameters in DCS corresponded to the diagnosis of 100 patients with gingivitis and 149 patients with periodontitis. In the GPS, the periodontal conditions of the participants were not clinically evaluated.

2.4. Ethical Aspects

The participants were explained about the aim of the study, written informed consent was requested, and the information was kept strictly confidential. The research was performed in compliance with the ethical principles of the Helsinki Declaration [16], and was approved by the Research Ethics Committee of the Psychiatric Rehabilitation Unit (CONBIOÉTICA 19CEI01720130828) with internal control key URP-SSNL-16-003 and registration number DEISC-19 01 16 16 of the Directorate of Education, Health and Quality Research of the State Health Services.

2.5. Analysis of data

In relation to the first objective of detecting differences or associations between OHIP-14-PD total score and sociodemographic variables, central tendency differences were verified by Mann-Whitney U test (sex) and Kruskal-Wallis test (occupation and marital status). In the first case, the effect size was estimated by the transformation of the

standardized U-value to a linear correlation: $r = Z_U/(N)^{1/2}$. In the second case, it was estimated using eta squared (η^2) [17]. Pairwise multiple (a posteriori) comparisons were carried out through non-parametric Dunn-Bonferroni test with the correction for ties [18] and the effect size was calculated by transforming the Z value into a linear correlation ($r = Z/(N)^{1/2}$. The linear correlations between the OHIP-14-PD total score and age, SES, and education level were calculated through the Spearman´s rank correlation coefficient (r_s). A r or r_s value less than 0.10 was interpreted as a trivial effect size or strength of association, between 0.10 and 0.29 small or weak, between 0.30 and 0.49 medium or moderate, between 0.50 and 0.69 large or strong and ≥ 0.70 very large or very strong. A value of η^2 between 0.01 and 0.059 was interpreted as a small effect size, from 0.06 to 0.139 medium, and ≥ 0.14 large [19].

In relation to the second objective, the central tendency between GPS and DCS was compared using Mann-Whitney U test. The effect size was calculated by transforming the standardized U-value to a linear correlation.

In relation to the third objective, the significance of the sample-sociodemographic variable interaction effect was tested by the multivariate aligned range test [20]. The effect size was calculated by partial eta-squared (η^2).

Non-parametric statistics were chosen because the normal distribution assumption was not satisfied. However, a quadratic relationship between the OHIP-14-PD scores and age was demonstrated using simple linear regression and nonlinear regression under a quadratic model. A significance level at 0.05 and two-tailed tests were used. Calculations were performed with *SPSS* 21 and Excel 2007 programs.

3. RESULTS

3.1. Description of Samples

Table **2** describes the sociodemographic characteristics of GPS and DCS. In the comparison between samples and the analysis of the interaction between sample-sociodemographic variable, the numerical variable age was transformed into an ordinal variable with six ordered categories: 18 and 19 (late adolescents), 20 to 29 (first decade of youth), 30 to 39 (second decade of youth), 40 to 49 (first decade of middle adulthood), 50 to 59 (second decade of middle adulthood), and 60 or more (older adults). The first and last category represent one-tenth of the distribution (approximately one-fifth), and the remaining four represent one-fifth of the distribution each, resulting in a fairly uniform distribution.

In GPS, age ranged from 18 to 77 with an arithmetic mean of 40.87, 95% CI (39.01, 42.33), and a median of 40 (Q_1 = 20 and Q_3 = 60); and in the DCS, their mean ranged from 18 to 76 with an arithmetic mean of 39.92, 95% CI (37.98, 41.87), and a median of 42 (Q_1 = 23 and Q_3 = 53). The age distribution presented a flattened profile in both samples (more in the DCS) and skewness in the GPS, and did not fit to a normal distribution. The central tendencies of age (Z_U = -0.59, p = 0.555 with six ordered categories, and Z_U = -0.67, p = 0.503 with five ordered categories upon grouping together the first and last category), education level (Z_U = -1.70, p = 0.089), and SES (Z_U = -0.16, p = 0.874) were statistically equivalent between the two samples. Also, the distributions of the two sex categories (χ^2[1, N = 505] = 0.33, p = 0.563 with the Yates correction) and five marital status categories (χ^2[4, N = 505] = 8.702, p = 0.069) were statistically equivalent between the two samples. However, the seven occupation categories had a differential distribution (χ^2 [6, N = 505] = 74.65, $p < 0.001$). The percentage of the category "employees" was significantly higher in GPS, 61.7%, 95% CI (50.9, 72.5), than in DCS, 32.1%, 95% CI (21.6, 42.6); conversely, the category of "students" was significantly lower in DCS, 26.5%, 95% CI (16.6, 36.4), than in GPS, 5.5%, 95% CI (0.4, 10.5) (Table **2**).

Table 2. Distribution of sociodemographic variables.

Sociodemographic Variables		GPS (n = 256)		DCS (n = 249)		Comparison between both Samples				
						Chi-square test			M-W U test	
		f	%	*f*	%	χ^2	df	*p*	Z_U	*p*
Sex	Woman	132	51.6	121	48.6	0.33	1	0.563	-	-
	Man	124	48.4	128	51.4					
Age groups*	18 and 19	7	2.7	30	12.0	-	-	-	-0.67 -0.59*	0.503 0.555*
	20 to 29	52	20.3	56	22.5					
	30 to 39	68	26.6	27	10.8					
	40 to 49	59	23.0	48	19.3					
	50 to 59	39	15.2	67	26.9					
	60 or more	31	12.1	21	8.4					

(Table 2) contd.....

Sociodemographic Variables		GPS (*n* = 256)		DCS (*n* = 249)		Comparison between both Samples				
						Chi-square test			M-W U test	
		f	%	*f*	%	χ^2	df	*p*	Z_U	*p*
Education level	Primary	14	5.5	20	8.0	-	-	-	-1.70	0.089
	Secondary	40	15.6	39	15.7					
	High School	41	16.0	56	22.5					
	Technical career	35	13.7	30	12.0					
	Bachelor degree	120	46.9	97	39.0					
	Postgraduate	6	2.3	7	2.8					
Marital status	Single	78	30.5	103	41.4	8.70	4	0.069	-	-
	Married	147	57.4	127	51.0					
	Divorced	16	6.3	7	2.8					
	Widow	8	3.1	6	2.4					
	Living partner	7	2.7	6	2.4					
Occupation	Housewife	31	12.1	63	25.3	74.65	6	<0.001	-	-
	Laborer	18	7.0	12	4.8					
	Employee	158	61.7	80	32.1					
	Business owner	13	5.1	13	5.2					
	Student	14	5.5	66	26.5					
	Unemployed	2	0.8	4	1.6					
	Retiree	20	7.8	11	4.4					
Subjective socioeconomic status	Low	12	4.7	13	5.2	-	-	-	-0.16	0.874
	Medium-low	68	26.6	66	26.5					
	Medium-middle	156	60.9	151	60.6					
	Medium-high	20	7.8	19	7.6					

GPS = General Population Sample. DCS = Dental Clinic Sample. * Comparison without grouping together the first and last categories of age.

3.2. Relation between OHIP-14-PD and Sociodemographic Variables

In the GPS, there was difference of central tendency among the seven groups of occupation (Kruskall-Wallis test: χ^2 [6] = 21.59, p = 0.001), and the effect size was medium (η^2 = 0.06). The average range of retirees (AR = 76.70) compared to that of housewives (AR = 161.95) and laborers (AR = 150.89) was significantly lower, $|D|$ = 85.25, 99.9% IC (20.73, 149.77) > Minimum Significant Difference (MSD) = 64.52 and $|D|$ = 74.19, 99.9% IC (1.10, 147.28) > MSD = 73.09, respectively. OHIP-14-PD had weak and negative correlation with SES (r_S = -0.19, p = 0.003). There was no difference of central tendency in OHIP-14-PD between the sexes (Z_U = -1.22, p = 0.222; r = 0.08), or among the five groups of marital status (Kruskall-Wallis test: χ^2 [4] = 2.88, p = 0.577; η^2 < 0.01). OHIP-14-PD was independent of age (r_S = 0.05, p = 0.418) and education level (r_S = -11, p = 0.075) (Table **3**).

Table 3. Correlation between OHIP-14-PD and sociodemographic variables.

Variables	GPS (n = 256)			DCS (n = 249)			Interaction with Samples	
	η^2	r	r_S	η^2	r	r_S	η	η^2
Sex	-	0.076	-	-	0.052	-	0.009	< 0.001
Age	-	-	0.051^{ns}	-	-	0.168**	0.122	0.015
Education level	-	-	-0.111^{ns}	-	-	-0.115^{ns}	0.109	0.012
SES	-	-	-0.186**	-	-	-0.117^{ns}	0.088	0.008
Occupation	0.063	-	-	0.070	-	-	0.033	0.001
Marital Status	0.004	-	-	0.036	-	-	0.153	0.023

SES = Subjective Socioeconomic Status. η = Partial eta, η^2 = Partial eta squared, r = Transformation of the standardized U-value in a linear correlation, r_s= Spearman's rank correlation coefficient. Two-tailed p-value: ns (not significant) $p > 0.05$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

In DCS, there was difference of central tendency in OHIP-14-PD among the five groups of marital status (Kruskall-Wallis test: χ^2 [4] = 21.09, $p < 0.001$), and the effect size was medium (η2 = 0.07). The average range of married people (AR = 145.21) was significantly higher, $|D|$ = 42.53, 99.7% CI (15.73, 69.33) > MSD = 26.80, than that of single people (AR = 102.68). There was also a difference of central tendency among occupation groups (Kruskall-Wallis test: χ^2 [6] = 14.75, $p < 0.022$), and the effect size was small (η^2 = 0.04). The average range of the housewives (AR = 139.75)

was significantly lower, $|D| = 39.55$, 99.9% CI (1.01, 78.09) > MSD = 38.54, than the students (AR = 100.2). Age correlated with OHIP-14-PD, and the strength of the association was weak ($r_S = 0.17$, $p = 0.008$). There was no difference of central tendency in OHIP-14-PD between the sexes ($Z_U = -0.82$, $p = 0.415$). At the same time, OHIP-14-PD was independent of education level ($r_S = -0.12$, $p = 0.070$) and SES ($r_S = -0.12$, $p = 0.065$) (Table **3**).

The relation between OHIP-14-PD and age seems to follow a quadratic (inverted U-shape) rather than a linear model. In the GPS, the simple linear regression model was not significant (R = 0.06, $R^2 < 0.01$, F [1, 254] = 0.66, $p = 0.418$), when the quadratic regression model did be (R = 0.22, $R^2 = .05$, F [2, 253] = 6.25, $p = 0.002$). In the DCS, the quadratic model (R = 0.29, $R^2 = 0.09$, F [2, 246] = 11.38, $p < 0.001$) had a larger effect size than the linear one (R = 0.17, $R^2 = 0.03$, F [1, 247] = 7.18, $p = 0.008$), both models were significant. Oral health impact averages were lower at the extremes of age distribution (late adolescents and older adults) and reached their highest value in the first decade of middle adulthood in both samples. Thus, there was a nonlinear tendency in the scores, reaching the maximum value in the first decade of middle adulthood, and from this maximum point the scores decrease as they become closer to the two extremes of age (Table **4**).

Table 4. Arithmetic means in the OHIP-14-PD by age groups in GPS and DCS.

Age groups	GPS			DCS		
	N	***M***	***SD***	***N***	***M***	***SD***
18 and 19	7	10.00	5.00	30	14.60	10.43
20 to 29	52	9.60	6.18	56	13.86	10.52
30 to 39	68	13.68	7.86	27	20.67	8.93
40 to 49	59	13.98	9.97	48	21.69	10.54
50 to 59	39	12.46	9.14	67	20.21	11.74
60 or more	31	11.06	7.81	21	15.14	11.23
Total	256	12.32	8.35	249	18.01	11.15

N = Sample size. M = Arithmetic Mean, SD = Standard Deviation.

There was a significant difference of central tendency in OHIP-14_PD between the two samples ($Z_U = -6.24$, $p < 0.001$), and the effect size was small (r = 0.28). The median of OHIP-14_PD among the 249 patients of the DCS (Mdn =17, Q1 = 9 and Q3 = 24) was higher than among the 256 participants of the GPS (Mdn = 10.5, Q1 = 6 and Q3 = 17). When comparing to the 256 GPS participants (without diagnosis), the 100 patients with gingivitis (Mdn = 12.5, $Q_1 = 7$ and $Q_3 = 21$), and 149 with periodontitis (Mdn = 19, $Q_1 = 13$ and $Q_3 = 26$), the difference among three groups was also significant (Kruskall-Wallis test: χ^2 [2] = 60.11, $p < 0.001$), and the effect size was medium ($\eta^2 = 0.12$). There were significant differences of mean ranks in the three pairwise comparisons. The effect size of the sample on the OHIP-14-PD was small in the comparison between GPS and patients with gingivitis (r = 0.20), large in the comparison between patients with gingivitis and periodontitis (r = 0.58), and very large in the comparison between GPS and patients with periodontitis (r = 0.78) (Table **5**).

Table 5. Comparisons a posteriori between the groups by diagnosed condition.

Group	n	MR	Group	n	MR	|D| [98.3%CI]	Z	r
GPS	256	212.54	Ging	100	244	31.46 [11.19, 51.73]	3.72***	0.20
GPS	256	212.54	Periodo.	149	328.56	116.02 [98.31, 133.73]	15.68***	0.78
Ging	100	244	Periodo.	149	328.56	84.56 [62.34, 106.78]	9.11***	0.58

Groups by clinical condition: GPS = General Population Sample (without diagnosis). Ging. = dental clinic sample with gingivitis, Period. = Dental Clinic Sample with a diagnosis of periodontitis. MR = Mean Range, D = Difference of ranks with a confidence interval of 95%, Z = test statistic, two-tailed *p*-value for Z-test *** $p < 0.001$, r = effect size calculated by transforming the Z-value to a linear correlation coefficient $r = Z/N^{1/2}$.

3.3. Effect of Sample-sociodemographic Variable Interaction on OHIP-14-PD

There was a significant interaction effect between the two samples and the five marital status groups on OHIP-14-PD (F[4,495] = 2.98, $p = 0.019$), and the effect size was small ($\eta = 0.15$, $\eta^2 = 0.02$). After calculating the 45 possible pairwise comparisons, there was only one significant difference in related to married marital status, $|D| = 71.42$, 99.9% CI (13.77, 129.06) > SMD = 57.64, and effect size in this comparison was also small (r = 0.24). The mean range in OHIP-14-PD among married persons of the DCS (MR = 292.06) was significantly lower than the one among married persons of the GPS (MR = 220.64). The interactions between the sample (GPS and DCS) and the two groups of sex (F [1,501] = 0.04, $p = 0.844$), the six groups of age (F [5,493] = 1.50, $p = 0.189$), the six groups of education level

(F[5.493] = 1.19, p = 0.314), the four groups of SES (F[3, 497] = 1.30, p = 0.274), or the seven groups of occupation (F [6,491] = 0.09, p =0.997) did not have a significant effect on OHIP-14-PD.

4. DISCUSSION

The first objective posed to evaluate the capability of the OHIP-14-PD to detect differences or associations with six sociodemographic variables in two samples, one of General Population Sample (GPS) and other of dental patients with gingivitis and periodontitis (DCS). Sex and education level were independent of the total OHIP-14-PD score in both samples, as in the research by Palma *et al.,* [8], and Meusel *et al.,* [10], which were performed among Brazilian adults with periodontitis. In contrast, both variables did present a significant relation with the OHIP in the systematic review made by Cohen-Carneiro *et al.,* [5], as well as only sex in the study performed by Gabardo *et al.,* [9], in Brazilian adult general population. We can be pointed out that the strengths of the association were weak in those studies in which a significant association was found, and this fact may explain the reason why in some research these two variables are significantly correlated and in others they were not. In turn, the relation between being a woman and the low education level is more defined with periodontitis than with the OHRQoL, so that they act as confounding factors [8, 10, 21]. Since the OHIP-14-PD is a scale that measures OHRQoL focused on periodontal disease, this is another possible reason to explain the independence of the two sociodemographic variables previously mentioned.

The occupation showed a significant association with the OHIP-14-PD in both samples. Low averages in OHIP-14-PD among students and retirees of the two samples reflected that there is probably less presence of periodontitis and more rooted oral hygiene culture among these persons, as indicated by a previous study [22]. The unemployed and self-employed individual also stood out for their low average in the DCS. It should be noted that the qualitative variable of the occupation is usually not contemplated. In the study by Palma *et al.,* [8], it was included and found independent of the OHRQoL. In contrast, effect size was significant and medium in the present study.

Cohen-Carneiro *et al.,* [5] pointed out that low income is related to lower OHRQoL. In the present study, the subjective aspect of socioeconomic status was used, The SES presented association only in GPS. According to the expectation, the lower SES there was more impact due to periodontal signs and symptoms. The fact that the clinical data came from a low-cost university clinic could subtract variability and prevent the significance of the variable in the DCS. The objective and SES are independent and this last variable is the most related to the negative effects on health [23].

Marital status had a significant relation with a medium effect size, but only in DCS. Married and cohabiting persons had the highest averages and the widowed and single persons the lowest. Thus, people in a stable relationship (marital or coexistence) seem to suffer more the impact of periodontal disease. Taking into account the significant interaction between marital status and the type of sample, the significant difference between married persons of the GPS and the married persons of the DCS could be interpreted as a possible indicator of somatization in the broad sense currently used, namely amplification of a physical disorder due to psychological factors [24]. This meaning does not imply the more restricted sense of conflict due to frustration of dependency needs (somatization of sadistic-oral impulses), used by psychoanalysis [25]. This is formulated as a hypothesis, since there is a lack of qualitative or quantitative data to support it.

Maeng *et al.,* [26], in Korean patients, reported a direct linear association between age and OHRQoL as well as Habashneh *et al.,* [7] in Jordanian patients. However, Cohen-Carneiro *et al.,* [5], in their systematic review, indicated independence between these two variables. In the present study, age showed linear relationship only in DCS. Older age the greater the impact due to the periodontal signs and symptoms. Nevertheless, when a non-linear relation (inverted U-shaped parabolic relation) was specified, the association was significant in the two samples. In parallel with the occupational data, the younger participants (students) and the elderly (retired) were the ones who suffered less impact due to periodontal signs and symptoms. On the other hand, people in the first decade of middle adulthood (housewives, laborers, and self-employed individuals) were the ones that suffered the most impact. It should be noted that age had a significant correlation with occupation in both samples. The interaction between age and occupation on the total OHIP-14-PD score was not significant, which is consistent with the observed parallel action. If the effect of age (as a continuous variable) on the OHIP-14-PD is statistically controlled using a covariance analysis, occupancy remains a significant factor, but not age. Therefore, age is redundant with occupation.

Regarding the second objective about discriminant validity of OHIP-14-PD, the significant difference in the OHIP-14-PD scores among three groups of participants (defined by the status clinical) was confirmed. The highest average appeared among patients with periodontitis (more serious disease), followed by the average of patients with

gingivitis, and the lowest average was found among participants of GPS (who are presumed without oral disease). Overall effect size of clinical status on OHRQoL, assessed by OHIP-14-PD, was medium, and this effect size varied from small to very large in the pairwise comparisons. Indeed, the deterioration of OHRQoL due to periodontitis is an established clinical fact [21]; in turn, gingivitis also has an impact on OHRQoL, although less than the one of periodontitis [27], as confirmed by the data of the present study.

Regarding the third objective, the existence of effects of sample-sociodemographic variable interaction on the OHIP-14-PD was studied in order to describe in more depth the differences between both populations. The sociodemographic variables studied acted on the OHIP-14-PD in parallel (in the same way) in both samples, except for the marital status. In contrast to the effect of age, which was redundant with occupation and did not present a differential effect in the two samples, the effect of the marital status on the OHRQoL (assessed by the OHIP-14-PD) was genuine and was differentiated by belonging to one or another sample. Being married acted as a risk factor of poor OHRQoL (high average in OHIP-14-PD) among patients when it was a protective factor among the general population participants (the lowest average in OHIP-14-PD), hence the possibility of the presence of a psychosomatic factor in the consultation of the first group. This interpretation is reinforced by the contrasting fact that being married has been verified as a protective factor on health in a meta-analysis study [28].

As a limitation of this study is the use of non-probabilistic sampling, so the results cannot be inferred as parameter estimates, but can be applied as guidance hypothesis within the same populations (general population persons and patients seen in a university clinic of an industrial city of Northern Mexico). In spite of using non-parametric statistics, as a consequence of the non-fulfillment of the assumption of normal distribution in the OHIP-14-PD scores, the hypothesis test counted on high power, since sample sizes were large. However, in testing the interactions between sample and marital status or sample and occupation, power was more compromised due to the large number of comparisons.

CONCLUSION

Among the participants of this research, the relations between OHIP-14-PD and sociodemographic variables were limited, but these relations were in agreement with the expectations. Occupation and marital status were the sociodemographic variables more related to OHIP-14-PD. Because of its medium effect size, occupation is likely to be a more replicable correlate in general population studies, and marital status in studies with dental patients. The expectations of discriminant validity were confirmed; the OHIP-14-PD can differentiate between GPS and patients with periodontitis with a medium size effect. The only sociodemographic variable with significant interaction with the type of sample (GPS and DCS) was marital status. Being married acted as a risk factor in DCS, but as a protective factor in GPS.

It is suggested to replicate the study by recruiting individuals from the general population who meet two additional inclusion criteria: not having received treatment for periodontal disease and not present any oral pathology at the time of evaluation (control group). In addition, it is advised to reduce the clinical sample to patients with periodontitis to obtain a greater effect size in the test of validity discriminant of OHIP-14-PD. It is suggested to inquire about the possible effect of a psychosomatic factor as a cause of the sample-marital status interaction. The hypothesis is that psychosomatic factor affects more the married patients in their consultation by periodontal symptoms, maybe as consequences of problems of couple and/or family [25].

ABBREVIATIONS

OHRQoL	=	Oral Health-Related Quality of Life
OHIP-14	=	Oral Health Impact Profile
OHIP-14-PD	=	Oral Health Impact Profile applied to Periodontal Disease
GPS	=	General Population Sample
DCS	=	Dental Clinic Sample
SES	=	Subjective Socioeconomic Status

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Research Ethics Committee of the Psychiatric Rehabilitation Unit (CONBIOÉTICA 19CEI01720130828) with internal control key URP-SSNL-16-003 and registration number DEISC- 19 01 16 16 of the

Directorate of Education, Health and Quality Research of the State Health Services.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2008.

CONSENT FOR PUBLICATION

All patients gave informed consent.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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