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# The impacts of oral health on quality of life in working adults

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**Abstract:** This study investigated the impacts of oral health-related quality of life (OHRQoL) on daily activities and work productivity in adults. A cross-sectional study was conducted in a supermarket chain in the state of São Paulo, which included 386 workers, age-range 20 – 64 years. Participants were examined for oral disease following WHO recommendations, and the oral health impact profile (OHIP) assessment was used to determine OHRQoL. Demographic, socio-economic, use of dental services, and OHRQoL data were obtained. Answers to the OHIP were dichotomized into no impact and some impact, and the relationship to OHRQoL was determined. Poisson regression with robust variance was performed using SPSS version 17.0. Dimensions with highest OHIP scores were physical pain and psychological discomfort. Sex (male: PR = 0.55, 95% CI 0.38 – 0.80), lower family income (PR = 1.49, 95% CI 1.04 – 2.12), visiting a dentist due to pain (PR = 2.14, 95% CI 1.57 – 3.43), tooth loss (PR = 1.59, 95% CI 1.09 – 2.32), and needing treatment for caries (PR = 1.59, 95% CI 1.09 – 2.32) were most likely to impact OHRQoL. Therefore, socioeconomic and demographic status and use of dental services impacted OHRQoL. These results indicate that oral health promotion strategies should be included in work environments.

**Keywords:** Adult; Quality of Life; Oral Health.

**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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## Introduction

Oral diseases, such as untreated caries, severe periodontitis, and severe tooth loss, were listed among the top 100 Global Burden Diseases in 2010.<sup>1</sup> The clinical aspects of oral health have been thoroughly investigated in epidemiological surveys. However, less is known about the impacts of oral health on quality of life. Recent results reveal that poor oral health may limit daily activities,<sup>2,3,4,5</sup> and loss of work due to oral disease has been documented.<sup>6</sup> To capture the subjective aspects of oral conditions on the welfare of individuals, oral health related quality of life (OHRQoL) measures have been increasingly used in epidemiological investigations.<sup>3,4,5</sup>

According to the World Health Organization (WHO), the definition of quality of life (QL) is “individuals’ perception of their position in life within the culture context and value system they live in, considering their goals, expectations, standards, and concerns.”<sup>7</sup> One of the instruments most frequently used to measure the impact of OHRQoL is the oral health impact profile (OHIP).<sup>5</sup> The OHIP, developed to assess impacts on OHRQoL, is based on a conceptual model by Locker<sup>4</sup> that considers

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seven dimensions: functional limitation, physical pain, psychological discomfort, physical discomfort, social disability, psychological disability, and handicap.<sup>8</sup> The short version of the OHIP, validated in Brazil<sup>9</sup> and considered a reliable tool,<sup>10</sup> was chosen to assess OHRQoL in this study.

Subjectivity and multidimensionality are aspects to consider in QL studies.<sup>11</sup> Findings have shown that individuals with low incomes report higher psychosocial impacts<sup>4,12</sup> and that there are gender<sup>4,13,14</sup> and age<sup>4,13,14,15</sup> differences in perception of OHRQoL even when results are adjusted for oral conditions.

Good health enables people to participate in all the physical, social, and psychological dimensions of their daily activities, including work.<sup>6</sup> Therefore, knowledge of the impacts of OHRQoL on workers, information which is currently lacking in the field, is needed. Discovering risk indicators of oral health on QL may enable the development of interventions that could reduce the economic impact of reduced QL in the workforce. Thus, the objective of this study was to assess the impacts of OHRQoL on economically active adults.

## Methodology

This cross-sectional study used secondary data obtained from a study conducted in a supermarket chain in the Metropolitan Region of São Paulo in the State of São Paulo (19,889,559 inhabitants).<sup>16</sup> The subjects' ages ranged from 20 to 64 years. Sample size, calculated adopting prevalence for impact on OHRQoL of 50%, confidence interval (CI) of 95%, error 10%, *z* value of 1.96, and design effect of 2, resulted in a total of 273 adults. The primary study was based on data from caries experiments,<sup>17,18</sup> resulting in 376 individuals, which comprised the minimum value for the present study.

The company that conducted the original study was contacted in advance to clarify the research procedures. Twenty-five site visits were conducted and 16 employees were randomly selected during each visit, resulting in the selection of 400 adults. All company employees were informed about the study, and the following inclusion criteria were applied: subjects had to be within the stipulated age, have the cognitive ability to answer the questionnaire, and agree

to participate in the research. Data was collected between July 2008 and August 2009.

The intraoral examinations were performed on site at the company using natural light, probes, and mouth mirrors as recommended by the WHO.<sup>19</sup> One examiner, trained and calibrated, performed all exams. Intra-observer agreement of 98.5% over 2 days was found for caries and periodontal disease, which was within the standards of reliability.<sup>20</sup> Caries were assessed using the decayed, missing, and filled teeth (DMFT) index. Periodontal disease status was verified by the community periodontal index (CPI). Treatment needs for caries were measured using WHO<sup>19</sup> criteria.

All volunteers answered a questionnaire<sup>9</sup> to verify demographic and socioeconomic factors, use of dental services, and OHRQoL. The OHRQoL was evaluated using the OHIP-14.<sup>9</sup> The questionnaire was self-applied, to ensure data confidentiality. Data were tabulated in SPSS® (Statistical Package for the Social Sciences, IBM, New York, USA), 17.0. The outcome determined in the study was highest impact on OHRQoL, described below.

The OHIP 14 responses, "never", "hardly ever", "occasionally", "fairly often", and "very often", were codified from 0 to 4, respectively. Each of the 14 questions was assigned a score of 0 if the response was "never," and a score of 1 if the response was "hardly ever", "occasionally", "fairly often," or "very often," dichotomizing responses into no impact versus some impact. The scores assigned to the responses to the 14 questions were added to obtain values between 0 and 14. Outcomes were obtained by separating participants according to quartiles of sample distribution. Those in the last quartile (75%) were regarded as having the highest impact on OHRQoL.

The independent variables studied were categorized. Age was divided into three groups: 20-34, 35-44, and 45-64 years old. The cutoff point for family income was the median (US \$588.24). Education was classified into three groups: "up to eight years," "nine to eleven years," and "over eleven years." Employees' occupations were also classified into three groups: qualified, partly skilled, and unskilled.<sup>21</sup> The type of service used in the last dental visit was categorized as public, private, or health insurance. The time since

the last appointment was categorized as less than 1 year, 1-2 years, or more than 3 years. The reason for going to the dentist was categorized as routine, pain, or other needs, including caries and bleeding gums. The clinical variables used in the analyses were clinical periodontal attachment loss (CAL) of 4mm or more (code 3 or 4 of the CPI index) in at least one sextant, presence of one or more untreated caries lesions, loss of up to 3 teeth or 4 or more teeth, and whether patient needed or did not need treatment for decay.

Bivariate analyses using the Qui-square test were performed and all independent variables with  $p < 0.25$  in bivariate analyses were included in the Poisson Regression Model analysis with robust variance, backward process. The exponential of coefficient  $\beta_1$  was interpreted as the prevalence ratio (PR). The study was approved by the research ethics committee, Piracicaba Dental School, *Universidade Estadual de Campinas* (Protocol No. 122/2005). All adults who participated in the study signed a free and informed consent form.

## Results

Among the 400 workers invited to participate in the study, 14 refused. Therefore, 386 adults were examined. The mean age of the study participants was  $32.65 \pm 9.71$  years, and the majority of subjects were 20 to 34 years old ( $n = 241$ ) (Table 1).

Mean DMFT was 14.56, and the proportion of decayed teeth in the caries experience index was 9.5%, 38.0% missing teeth, and 52.5% filled teeth. Fifty-three

percent ( $n = 206$ ) needed treatment for caries. With regard to periodontal condition, 46.4% ( $n = 179$ ) had clinical attachment loss  $>4$  mm, and 48.2% ( $n = 186$ ) of patients had lost 4 or more teeth. The total OHIP score ranged from 0 to 47. Physical pain and psychological discomfort were most commonly reported by study subjects (Table 2). Bivariate analyses showed associa-

**Table 1.** Sample characteristics, Sao Paulo, Brazil, 2009.

Sample Characteristics		n (%)	
Demographic	Sex	Male	175 (45.3)
		Female	211 ( 54.7)
	Age	20–34	241 ( 62.4)
		35–44	94 ( 24.4)
		45–64	51 ( 13.2)
Socioeconomic	Educational level (years)	up to 8	73 (18.9)
		9–11	274 (71)
		+ 11	39 (10.1)
	Occupation	Non-qualified	122 (31.6)
		Partially-qualified	152 (39.4)
		Qualified	112 (29.0)
	Family income	Lowest	89 (34.1)
		Highest	172 (65.9)
Use of dental services	Dental service used	Public	56 (15.1)
		Private	248 (66.8)
		Insurance	67 (18.1)
	Time since last visit (year)	<1	194 (51.7)
		1–2	98 (26.1)
		3+	83 (22.1)
	Reason for visit dentist	Routine	203 (54.0)
		Pain	96 (25.5)
		Others	77 (20.5)

**Table 2.** OHIP 14 Oral Health Impact Profile of workers.

Dimension		Never	Hardly ever	Occasionally n (%)	Fairly often	Very often
Functional limitation	Difficulty to speak	231 (60.0)	65 (16.9)	79 (20.5)	5 (1.3)	5 (1.3)
	Taste of food	262 (68.1)	57 (14.8)	60 (15.6)	2 (0.5)	4 (1.0)
Physical pain	Pain	119 (31)	86 (22.4)	152 (39.6)	14 (3.6)	13 (3.4)
	Discomfort when eating	134 (34.8)	63 (16.4)	145 (37.7)	17 (4.4)	26 (6.8)
Psychological discomfort	Worried	112 (29.2)	37 (9.6)	144 (37.5)	9 (2.3)	82 (21.4)
	Tense	164 (42.6)	45 (11.7)	128 (33.2)	15 (3.9)	33 (8.6)
Physical discomfort	Unsatisfactory diet	222 (57.7)	51 (13.2)	76 (19.7)	11 (2.9)	25 (6.5)
	Interrupted meals	283 (73.5)	38 (9.9)	46 (11.9)	9 (2.3)	9 (2.3)
Social disability	Stressed with people	256 (66.5)	47 (12.2)	66 (17.1)	3 (0.8)	13 (3.4)
	Difficulty in daily activities	284 (73.8)	30 (7.8)	57 (14.8)	6 (1.6)	8 (2.1)
Psychological disability	Difficulty to relax	224 (58.2)	50 (13.0)	92 (23.9)	8 (2.1)	11 (2.9)
	Embarrassed	213 (55.3)	44 (11.4)	85 (22.1)	8 (2.1)	35 (9.1)
Handicap	Unsatisfied with life	283 (73.5)	31 (8.1)	56 (14.5)	6 (1.6)	9 (2.3)
	Unable to do daily tasks	325 (84.4)	19 (4.9)	33 (8.6)	4 (1.0)	4 (1.0)

tions between outcomes and demographic, socioeconomic, and clinical variables (Table 3).

After adjustment, significant PRs of higher impact were found for women, lower family

income, and among individuals that visited the dentist due to pain. Loss of more than 4 teeth and the need for treatment were also associated with higher prevalence of impact on OHRQoL (Table 4).

**Table 3.** Bivariate analysis of impacts on OHRQoL.

Variables		Lower impact n (%)	Higher impact n (%)	PR	CI (95 %)	p
Sex	Male	139 (79.4)	36 (20.6)	0.65	0.46-0.92	0.02
	Female	144 (68.2)	67 (31.8)	1		
Age	45-64	39 (76.5)	12 (23.5)	1.01	0.59-1.75	0.96
	35-44	59 (62.8)	35 (37.2)	1.60	1.13-2.27	< 0.01
	20-34	185 (76.8)	56 (23.2)	1		
Family income	Lower	54 (60.7)	35 (39.3)	1.65	1.14-2.39	< 0.01
	Higher	131 (76.2)	41 (23.8)	1		
Educational level (year)	< 8	52 (71.2)	21 (28.2)	2.81	1.04-7.51	0.04
	9-11	196 (71.5)	78 (28.5)	2.78	1.08-7.16	0.03
	Over 9	35 (89.7)	4 (10.3)	1		
Occupation	Non-qualified	85 (69.7)	37 (30.3)	1.70	1.05-2.74	0.05
	Partly qualified	106 (69.7)	46 (30.3)	1.70	1.07-2.70	0.04
	Qualified	92 (82.1)	20 (17.9)	1		
Dental service used	Health insurance	49 (73.1)	18 (26.9)	0.79	0.42-1.35	0.39
	Private	184 (74.2)	64 (25.8)	0.76	0.50-1.16	0.20
	Public	37 (66.1)	19 (33.9)	1		
Reason for visiting dentist	Others	60 (77.9)	17 (22.1)	1.09	0.66-1.80	0.73
	Pain	52 (54.2)	44 (45.8)	2.27	1.60-3.22	< 0.01
	Routine	162 (79.8)	41 (20.2)	1		
Decayed teeth	Yes	135 (69.9)	58 (31.1)	1.29	0.92-1.80	0.14
	No	148 (76.7)	45 (23.3)	1		
CAL ≥ 4 mm	Yes	121 (67.6)	58 (32.4)	1.49	1.07-2.08	0.02
	No	162 (78.3)	45 (21.7)	1		
Lost 4+ teeth	Yes	125 (67.2)	61 (32.8)	1.56	1.11-2.19	0.01
	No	158 (79.0)	42 (21.0)	1		
Treatment need	Yes	141 (68.4)	65 (31.6)	1.50	1.01-2.23	0.04
	No	142 (78.9)	38 (21.1)	1		

Qui-Square test was used.

**Table 4.** Poisson regression model for impacts on OHRQoL.

Variables		PR	CI (95%)	P
Sex	Female	1.83	1.26-2.67	<0.01
	Male	1		
Family income	Lower	1.49	1.04-2.12	0.03
	Higher	1		
Reason for visiting dentist	Others	1.06	0.59-1.89	0.86
	Pain	2.32	1.57-3.43	<0.01
	Routine	1		
Tooth loss	4+	1.59	1.09-2.32	0.02
	Up to 3	1		
Treatment Needs	Yes	2.14	1.17-3.92	0.01
	No	1		

## Discussion

This study showed that two variables, the loss of four or more teeth and caries in need of treatment, impacted OHRQoL most dramatically. This knowledge could be an important tool to achieve one of the WHO goals for the year 2020 as regards oral health worldwide; which is to reduce the impact of oral health and psychosocial development.<sup>22</sup>

This study adopted OHIP as an OHRQoL instrument, because it is a sensitive tool to assess the impact of oral health on QL in adults.<sup>3,4,5</sup> The age range

included in this study was more extensive than that recommended by the WHO. Therefore the results of this study represent an understudied population.

Consistent with the results of Locker and Quiñonez,<sup>4</sup> physical pain and psychological discomfort were the dimensions that had most impact on OHRQoL. However, Lawrence *et al.*,<sup>3</sup> found more reports of physical disability in New Zealand. Different perceptions of OHRQoL among populations and individuals may be due to cultural influences.<sup>11</sup>

Although workers in this study did not show a high prevalence of disability, pain often caused discomfort<sup>8</sup> and, consequently, absenteeism from work<sup>3</sup> and disruption of social aspects of life.<sup>8</sup> Indeed, these burdens affected the daily activities of individuals, their intellectual and economic production, and influenced their work and social environments, which are important to health.

Women reported a greater impact on OHRQoL than men, although no statistical differences were observed between clinical conditions present in each gender (data not shown). These results were similar to findings from studies conducted in Sweden<sup>13</sup> and New Zealand.<sup>3</sup> Differences in the perception of OHRQoL between the genders may be caused by individual and subjective concepts related to beauty and personal esthetic standards, imposed by the social demands and personal needs.

Dental care use due to pain was associated with greater impact on OHRQoL. These data were consistent with the discoveries of Lawrence *et al.*,<sup>3</sup> which described a correlation between sporadic use of dental services and greater impact on OHRQoL. Therefore, pain can be a main reason for visiting a dentist.<sup>23</sup> Consistent with this study, Sanders *et al.*<sup>14</sup> reported more severe impacts were associated with tooth loss, perceived treatment need, visiting a dentist due to a dental problem, and low income.

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Several studies have reported an association between tooth loss and OHRQoL.<sup>3,4,13,14,15,24,25</sup> Tooth loss is one of the worst types of damage to oral health, which can cause both esthetic and functional problems. In addition to the biological causes of tooth loss, socioeconomic factors contribute to oral health associated with tooth loss.<sup>26,27</sup> Socioeconomic status is related to inequalities in health, and socioeconomically disadvantaged people have higher risks of disease and suffer more from health conditions.<sup>28</sup> These factors have been identified previously.<sup>3,12,13,14,28</sup> In this study, although all participants had a monthly income, the disparity in income levels produced some differences in OHRQoL.

This study revealed data on a population that is not

usually studied. We used secondary data from a study of oral health in workers.<sup>29</sup> The oral conditions we found suggest that further studies on the impacts of OHRQoL in this adult population are warranted. Indeed, our results reveal that oral health can interfere with individuals' daily activities and affect their productivity at work.

## Conclusions

Clinical conditions associated with impacts on OHRQoL, independent of sex, were lower family income and use of dental care facilities indicating that further epidemiological studies on OHRQoL should be conducted. Data from these studies may help produce tools to improve public health policies and strategies and create healthier work place environments.

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