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Oral impacts on daily performances: Associations with self-reported general health and medication

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Abstract

Objective. The aim of the present study was to examine the impact of general diseases and medication on oral health-related quality of life (OHRQoL) in a Swedish adult population using the Swedish version of Oral Impacts on Daily Performances (OIDP). ***Material and methods.*** A three-site sample of 200 adults (20–86 years; participation rate 70%) was interviewed using the OIDP, and a medical anamnesis was performed in 2006–7. A self-reported questionnaire provided complementary socio-economic data. ***Results.*** The burden of medical diagnoses and medications was greatest among the older participants in the study. The mean number of medicines in regular users was: $\geq$60 years, 3.6 (SD 2.6); 40–59 years, 1.9 (SD 1.5); and 20–40 years, 1.9 (SD 1.8) ($p = 0.013$). There were no gender differences in general health or medication variables. Self-reported health, medical diagnoses and medication were significantly and consistently associated with the OIDP score: subjects with $\geq$1 diagnosis, OR 2.22 (95% CI 1.19–4.14) and subjects with $\geq$1 medicines, OR 1.85 (95% CI 1.01–3.40) versus those without diagnoses or medication. However, there was a clear gradient: OIDP scores increased with increasing numbers of diagnoses and medicines. ***Conclusion.*** The Swedish version of the OIDP was found useful for measuring impacts of general health and medication on OHRQoL. Dental care should pay special attention to patients with medical conditions or who are on medication, because these patients are more likely to experience oral impacts on daily performances.

Key Words: *General health, OIDP, oral health-related quality of life, pharmacotherapy*

Introduction

Evidence of the interrelations between general and oral health has increased in recent years, with several studies confirming the links between oral health and diabetes [1,2] and cardiovascular diseases [3]. Obesity, in addition, has been shown to be associated with poorer oral health [4,5].

The impact of medication on oral health is well documented, with effects on oral mucosa, taste, and alveolar bone [6]. The most common and most studied side effect of medicines, however, is reduced salivary flow and xerostomia [7–12]. Although medication is prevalent among old people in Western countries [6,9], recent studies indicate that medication is also frequent in younger age groups [13,14]. The number of medicines taken has been shown to be important, as salivary flow rate diminishes correspondingly [9]. For an individual, the total stress of poor health and medication might be considerable.

General health and oral health have been addressed as significant for the quality of life of a person [15]. Medically compromised old people have been shown to experience lower oral health-related quality of life (OHRQoL) [16], as have cancer patients [17]. Oral health problems, such as xerostomia, have negative effects on the OHRQoL in both old and young subjects [18,19]. However, as reports on the direct effect of general health and medication on the patient's OHRQoL are few, there is a need to further explore these associations, while considering the influence of possible confounders such as gender, age, and socio-economic status [20–22]. OHRQoL is often assessed using an index or instrument [23–25]. The aim of the present study was to examine the impact of general diseases and medication on OHRQoL in an adult population in Sweden using the Swedish version of Oral Impacts on Daily Performances, the OIDP [26].

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Material and methods

Participants and procedure

The sample comprised 205 individuals (295 invited; 70% participation rate) in three age strata (20–39 years, 40–59 years, ≥60 years) sampled from three clinics in general dentistry in different socio-economic (SE) areas in Sweden: one city suburb (low SE, $n = 90$), one mid-size town (medium SE, $n = 65$), and one small town (high SE, $n = 50$). Recruitment was approximately proportional to the size of the populations at the various study sites. Socio-economic level was defined according to official statistics on education, employment, ethnicity, and social allowances. Between November 2006 and June 2007, the participants were recruited consecutively at each of the clinics in connection with their routine dental examination. The sample is identical to the one used in the validation paper for the Swedish version of OIDP [26], where the sample size was determined according to Kline [27] for the testing of validity and reliability. This was estimated as sufficient for testing the possible associations explored in the present article [28,29].

Data were collected orally using the OIDP and a self-reported questionnaire, after which an anamnestic interview was conducted followed by a clinical examination. All data were collected by calibrated personnel. Subjects lacking anamnestic data ($n = 5$) were excluded. A total of 200 individuals were therefore included in the analyses. Results from the clinical examination are to be reported elsewhere. Informed consent was obtained from all participants, and the Research Ethics Committee of Karlstad University, Sweden, approved the study (25 October 2006).

Variables

The critical endpoint in all analyses was the Swedish version of the OIDP index [26]. Nine physical, psychological, and social aspects of daily performances were examined. The original version of the OIDP contained eight items; however, later articles used more items [30–32]. During the cultural adaptation process to the Swedish context, including pilot interviews with lay persons in two stages, the item "going out" appeared to be important and relevant. Thus, a decision was made to include it in the Swedish version of the OIDP. The participants were asked whether they had experienced any difficulties due to problems with their mouth or teeth (or dentures) during the previous six months: eating and enjoying food; speaking and pronouncing clearly; going out (e.g. to shop or visit someone); cleaning the teeth (or dentures); sleeping and relaxing; smiling, laughing and showing the teeth without embarrassment; maintaining emotional state (e.g. becoming more easily upset than usual); carrying out a major work or social role; and enjoying the contact with other people. For those experiencing difficulties regularly, the frequency was rated on a 5-point scale: 'less than once a month' (1); '1–2 times a month' (2); '1–2 times a week' (3); '3–4 times a week' (4); or 'every day/nearly every day' (5). For those affected for only part of the period: '5 days or less' (1); 'more than 5 days, up to a month' (2); 'more than 1, up to 2 months (3); 'more than 2, up to 3 months' (4); or 'more than 3 months' (5). The severity of the effect on everyday life was then rated: 'no effect' (0); 'a very minor effect (1); 'a fairly minor effect' (2); 'a moderate effect' (3); 'a fairly severe effect' (4); or 'a very severe effect' (5). Multiplying the frequency and severity scores for each item provided nine performance scores. The OIDP score (OIDPsc) was obtained by adding the nine scores, dividing by the maximum possible score and multiplying by 100 to provide a percentage score. The OIDPsc was then dichotomized for the analyses: having 'at least one daily performance affected' versus 'no daily performance affected'. The median value of the OIDPsc was used as an alternative dichotomization: '< median value' versus '≥ median value'.

Information on the main independent variables was collected by means of the anamnestic interview. General health status (healthy/not healthy) and medication (yes/no) were investigated. When appropriate, the diseases and medications were subsequently enquired about. Specific diagnoses of diseases were categorized according to the WHO International Classifications of Diseases, the ICD-10 [33]. The number of ICD-10 diagnoses for each subject was further categorized as: 'no diagnosis'; '1 diagnosis'; '≥2 diagnoses'. Likewise, medications were categorized according to the Anatomical Therapeutic Chemical (ATC) classification system [34]. Medication usage was further categorized as: 'unmedicated' (excluding sporadic use); '1–3 medicines' (regular use); '≥4 medicines' (regular use) [9]. Regular use was defined as medication on a regular schedule, such as every day or every week. The correspondence between stated diagnoses and medicines was further scrutinized to ensure reasonable concordance. Tobacco habits were chosen to illustrate each participant's lifestyle: smoking (yes or party-smoking/no) and taking snuff (yes/no).

Self-reported socio-economic data in the questionnaire were used as covariates in the analyses. This included marital status (unmarried/not cohabitant versus married/cohabitant), ethnic origin (born abroad versus born in Sweden), and education (≤9 years of education versus >9 years), to represent social and economic support [35].

Statistical analysis

The statistical analyses were done using the SPSS software package, PC version 15.0. Descriptive and analytical statistical methods were used. The

associations between the OIDPsc and other variables were examined using the chi-squared test and the Mann-Whitney U-test. Differences in means of quantitative data were analyzed with Student's *t*-test and ANOVA. Multivariate logistic regressions estimated the impact of possible confounders on the association between self-reported diseases and use of medications in relation to the OIDPsc. Statistical significance was assumed when $p < 0.05$ or when the 95% confidence interval excluded 1.0.

Results

Descriptive data on the study population are presented in Table I. The sample comprised 87 men (43.5%) and 113 women (56.5%), with a mean age of 47.3 years (SD 16.9). One-fourth of the participants perceived that they were not healthy (M 27.9%, F 27.4%). The proportions of subjects using medication were 33.3% men and 38.9% women. The only statistically significant difference between genders in socio-demographic and health characteristics concerned snuff usage ($p < 0.001$).

Prevalence of medical diagnoses and medication

The most common ICD-10 diagnoses referred to the circulatory system (14.5% of all respondents), followed by respiratory (7.5%), endocrine, nutritional, and metabolic (7.5%), and musculoskeletal diseases (6.5%). According to the ATC system, the most frequently used medicines were classified for the cardiovascular system (13% of all respondents), the blood and blood-forming organs (11%), the respiratory (10.5%) and the nervous (10%) systems, the alimentary tract and metabolism (6.5%), hormones (6%), and the musculoskeletal system (5.5%).

As indicated in Table II, both medical diagnoses and medication were significantly more prevalent in the oldest age group (both $p < 0.001$). In the total group, 28.5% had one or more medical diagnoses, whereas this proportion was 65.4% in those who were 60 years or above. Medication was reported by 31.5% in the total group, but by 69.2% in those 60 years or above. Among those who regularly consumed medication, the mean number of medicines was also higher among older regular users: 3.6 (SD 2.6) medicines among subjects $\geq$60 years versus 1.9 (SD 1.8) in subjects 20–39 years and 1.9 (SD 1.5) medicines in subjects 40–59 years ($p = 0.013$). Self-reported general health was significantly associated with medication ($p < 0.001$).

OIDP scores

Of all 200 participants, 90 reported having one or more problems with their mouth or teeth during the previous 6 months. Eighty-one of these (40.5% of all subjects) were affected in their daily lives. The OIDPsc scores ranged from 0 to 24.4 with a highly positively skewed distribution (mean 4.5, median 2.7).

The proportions of subjects having at least one oral impact differed in subgroups of various numbers of medical diagnoses and medication. The higher the numbers of ICD-10 diagnoses (no diagnosis 35%, 1 diagnosis 51%, $\geq$2 diagnoses 59%, Mann-Whitney $p = 0.010$) and ATC medications (unmedicated 36%, regular use of 1–3 medicines 48%, regular use of $\geq$4 medicines 59%, Mann-Whitney $p = 0.035$), the higher the proportions of subjects with oral impacts.

Subjects with smoking and snuff-taking habits did not report more oral impacts than non-smokers and non-snuff takers, respectively.

Table I. Characteristics of the study population by gender in independent variables and covariates.

Variable		Men ($n = 87$)	Women ($n = 113$)
Age	Years, mean (SD)	47.6 (15.5)	46.7 (17.8)
Age strata	20–39 years	32 (36.8)	40 (35.4)
	40–59 years	33 (37.9)	43 (38.1)
	60– years	22 (25.3)	30 (26.5)
Marital status	Married/cohabitant	56 (64.4)	73 (64.6)
	Unmarried/not cohabitant	31 (35.6)	40 (35.4)
Ethnic origin	Born in Sweden	83 (95.4)	106 (93.8)
	Born abroad	4 (4.6)	7 (6.2)
Education	>9 years	74 (85.1)	86 (76.8)
	≤9 years	13 (14.9)	26 (23.2)
General health (self-reported)	Healthy	62 (72.1)	82 (72.6)
	Not healthy	24 (27.9)	31 (27.4)
Medication (self-reported)	Unmedicated	58 (66.7)	69 (61.1)
	Medicated	29 (33.3)	44 (38.9)
Smoking	No	79 (91.8)	96 (85.0)
	Yes	7 (8.2)	17 (15.0)
Snuff user	No	69 (80.2)	110 (97.3)
	Yes	17 (19.7)	3 (2.7)

Data are numbers and percentages if nothing else is indicated.

Table II. Proportion of subjects in diagnoses of diseases and related health problems (ICD-10) and in medications (ATC classification) by gender and age.

	Gender		Age group			
	Men *n* (%)	Women *n* (%)	20–39 years *n* (%)	40–59 years *n* (%)	≥60 years *n* (%)	Total group *n* (%)
Diagnoses						
No diagnosis	61 (70.1)	82 (72.6)	62 (86.1)	63 (82.9)	18 (34.6)	143 (71.5)
1 diagnosis	20 (23.0)	15 (13.3)	9 (12.5)	13 (17.1)	13 (25.0)	35 (17.5)
≥2 diagnoses	6 (6.9)	16 (14.2)	1 (1.4)	0	21 (40.4)	22 (11.0)
		$p = 0.080$			$p < 0.001$	
Medication						
Unmedicated (excluding sporadic use)	62 (71.3)	75 (66.4)	61 (84.7)	60 (78.9)	16 (30.8)	137 (68.5)
Regular use 1–3 medicines	20 (23.0)	26 (23.0)	10 (13.9)	15 (19.7)	21 (40.4)	46 (23.0)
Regular use ≥4 medicines	5 (5.7)	12 (10.6)	1 (1.4)	1 (1.3)	15 (28.8)	17 (8.5)
		$p = 0.462$			$p < 0.001$	
Mean no. of medicines in regular users (SD)	2.5 (2.1)	3.2 (2.5)	1.9 (1.8)	1.9 (1.5)	3.6 (2.6)	2.9 (2.4)
		$p = 0.272$			$p = 0.013$	

Regression analyses

The discrimination ability of the OIDP for general health and medication was further explored in bi- and multivariate analyses (Table III). Bivariate analyses showed consistent associations between health, expressed as perceptions of not being healthy, having at least one ICD-10 diagnosis, reporting the use of medicine, or having at least one regular ATC medication, versus the OIDPsc, expressed as having at least one oral impact (Table III). These associations were further strengthened for self-perceived general health, medical diagnosis, and self-reported medication when adjusted in multivariate models for possible confounders: age, gender, and SES (educational level, ethnic origin, marital status). Analyses entering these covariates separately provided similar results. For regular ATC medication, however, the association with having at least one oral impact was weakened to borderline statistical significance. Regression models testing each confounder separately did not distinguish any of them as more important than any other. The full model fit provided Nagelkerke's values of 0.03–0.05.

Regression analyses revealed that individuals with ≥2 diagnoses did not report significantly more oral impacts than subjects with merely 1 diagnosis (OR 1.36, 95% CI 0.46–4.01). Likewise, subjects with ≥4 medicines did not have oral impacts significantly more often than subjects with 1–3 medicines (OR 1.56, 95% CI 0.51–4.81).

Bivariate analysis showed that age and educational level were significantly related to general health and medication, but not to the OIDPsc. Gender, ethnicity, and marital status were not associated with

Table III. Discrimination ability of the OIDP instrument between subjects with different health status and medication. Statistical significance, odds ratios (OR), and 95% confidence intervals (CI) for having at least one oral impact on daily performances.

Independent		*n* (%)	Having at least one oral impact *n* (%)	Mann-Whitney Z	Mann-Whitney *P*	OR	CI
Self-perceived general health	Healthy	144 (72.4)	52 (36.1)			1	
	Not healthy	55 (27.6)	29 (52.7)	−2.128	0.033	1.97*	1.05 – 3.70
						2.07†	1.02 – 4.22
Medical diagnosis (ICD-10)	No diagnosis	143 (71.5)	50 (35.0)			1	
	≥1 diagnosis	57 (28.5)	31 (54.4)	−2.519	0.012	2.22*	1.19 – 4.14
						2.41†	1.18 – 4.93
Self-reported medication	No medication	127 (63.5)	43 (33.9)			1	
	On medication	73 (36.5)	38 (52.1)	−2.517	0.012	2.12*	1.18 – 3.82
						2.27†	1.17 – 4.40
Regular medication (ATC)	No regular use	137 (68.5)	49 (35.8)			1	
	Regular use	63 (31.5)	32 (50.8)	−2.006	0.045	1.85*	1.01 – 3.40
						1.91†	0.95 – 3.83

*Crude association.
†Association adjusted for age, gender, SES (educational level, ethnic origin, marital status).

general health, medication, or with the OIDPsc. Finally, all explanatory variables and potential confounders were entered in one full model with OIDPsc as the dependent variable. No significant associations could be recognized.

There were no differences in low and high scores in OIDPsc (< median value and ≥ the median value, respectively) in subgroups with and without diagnoses and medications, respectively.

Discussion

The burden of medical diagnoses and medications was greatest among the older participants in the study. There were no gender differences in general health or medication variables. Self-reported health, medical diagnoses, and medication were significantly and consistently associated with the participants' OHRQoL, as measured with the OIDP scale.

The participants were consecutively sampled in general dentistry to represent a broad range of age, gender, and socio-economic status. Data collection at three sites ensured a variety of subjects, and the participation rate was concordant with similar studies [36,37]. The disease panorama reported by the participants corresponded with Swedish national reports [38], and in this sense the sample could be regarded as representative of the population. Other Scandinavian studies found a similar prevalence and mean number of medications among old people as in our study [7,9]. A study of young New Zealand people reported a higher prevalence of medication use than was evident in our findings. However, that study did not measure regular usage [13].

The patients' willingness to mention all diagnoses and medicines might be questioned [39]. However, the anamnestic interviews were done orally with special care taken to enhance the likelihood of truthful answers [40]. Recall bias, i.e. the ability to remember all medicines taken, has been reported, especially for drugs used only for a short period [41]. However, only regular medication was analyzed in the present study. Moreover, even if medicines are recommended or prescribed by a health professional, it can be difficult for the patient to adhere to a regimen [39]. The background includes a multitude of individual and environmental factors such as attitudes and social support [42].

Gift & Atchison overviewed and established the relations between health and quality of life [15], and more recent studies have confirmed this association [43,44]. Having medical diagnoses and being on medication emerged as important determinants for OHRQoL in the present study, verifying the findings in some earlier studies [16,17]. The impairing effects of diseases and medication in the oral cavity, with the most outstanding symptom xerostomia, might be the reason [6–12]. There was a clear gradient, with an increasing OIDP score corresponding to increasing numbers of diagnoses and medicines. However, the significant difference appeared to be between those who had a diagnosis or a medication and those who had none at all. The symptoms and treatment of diseases can entail problems for the patient [45], but the mere cognizance of having a disease diagnosis or being on medication might in itself affect quality of life. For instance, each time a medicine dose is to be taken, the patient is reminded of her or his impaired health.

Subjects on regular medication may have taken drugs from several subgroups of ATC medications. Likewise, several participants were diagnosed with more than one diagnosis. Therefore, it was not possible to analyze separate medications and diagnoses against the OIDP.

The associations found between the different health variables and the OIDP scores were stable with respect to the tested covariates in the multivariate model. The association between regular medication and OIDPsc was fully attenuated. However, the confidence interval was near 1 and could be considered marginal. The model fit indicates that there might be other important variables that were not included in the model. Age and sociodemographic factors have been found to influence oral impacts on daily performances [46], as has gender [26]. Self-perceived (subjective) health and professional registered (objective) health have been recognized to have weak associations [47]. That might be the reason for the poor model fit. Also, in this study, no clear associations between OIDP and demographic, socio-economic variables were found. Thus, our model may imply other structural relations, as opposed to some previous findings and models where SES, age, and gender were significantly correlated with oral and general health outcomes [20–22]. Our findings may be due to specific factors, such as sample selection or included covariates. Moreover, in the next step we will extend our analyses to include oral status variables; we hope that such a broader modelling may render a more distinct structure.

To conclude, the OIDP inventory was found useful for measuring impacts of general health and medication on the OHRQoL. The dental service should pay special attention to patients with medical conditions and medication because these people are more likely to experience oral impacts on their daily life.

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