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A multivariable analysis of patient dental satisfaction and oral health-related quality-of-life. A cross-sectional study based on DVSS and OHIP-14

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Abstract

Objective. The aim of this paper was to study the association between dental satisfaction and oral health-related quality-of-life (OHRQoL) when controlling for individual, clinical and psychological factors. ***Materials.*** Secondary analysis was conducted using data from a large study carried out in the Swedish region of Värmland in 2004. The questionnaire included demographic variables, clinical assessment and the following instruments: the Dental Visit Satisfaction Scale (DVSS), the short version of Oral Health Impact Profile (OHIP-14) and a modified version of the revised helping alliance questionnaire. Internal consistency analysis was undertaken on the instruments to assess reliability; bivariate comparisons were assessed to compare DVSS scores with individual factors (age, gender and education). In addition, a three step hierarchical multiple regression analysis was performed with DVSS as a dependent variable. ***Results.*** Data were completed for 485 randomly selected patients. The mean age of participants was 43.5 years, 54.6% were women,and 41.2% had high education. The median DVSS score was 48 (range 10–50) and the median OHIP was 3.0 (range 0–56). All the instruments showed good reliability. Bivariate analysis showed that females were more satisfied than males ($p \leq 0.01$) and patients of 50 years or older were more satisfied than the younger ones ($p \leq 0.05$). Finally, the following variables explained 31% of the variance of being very satisfied with dental visit: a good OHRQoL and patients' positive perceptions of the relationship with their care provider. ***Conclusion.*** This study showed positive associations between dental satisfaction and OHRQoL when controlling for related factors. The result suggests that care providers should take into account the various dimensions of OHRQoL rather than use only clinical measurements when they evaluate patient satisfaction.

Key Words: *dentist–patient relations, patient satisfaction, public health dentistry, quality-of-life, regression analysis*

Introduction

Since the 1970s, the oral health situation in Sweden has improved, at least partly as a result of the introduction of the dental care reform in 1974. Thus, the proportion of adults without teeth reveals a decrease from 23% in 1965 to less than 3% in 2005 [1]. However, in 2009, more than 40% of those who were edentulous or had removable prostheses reported having difficulty in chewing hard food, such as bread or apples, a situation commonly related to dissatisfaction with oral health [1]. According to a self-assessed dental health survey in Sweden [1], 11% of men and 10% of women reported poor or very poor self-rated dental health. These numbers have remained at the same level since 2004. Usually, it is women and men aged 45–64 years who report poor self-rated dental health. Moreover, dental health is worse among economically vulnerable groups and immigrants [1]. Still, Swedish national statistics have shown an important improvement in the oral health of the population; but there are still people who are neither satisfied with their oral health nor with their dental appearance [2].

Clinical assessment is not sufficient for a comprehensive evaluation of the oral health of a patient. Discrepancies have been observed in dentists' and patients' evaluation of oral health, either with dentists

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tending to judge patients' oral health significantly more positively than patient self-ratings [3] or, on the contrary, with health providers judging oral health worse than patients [4]. The reason for such discrepancies may be found in the fact that patients' perception of oral health is based not only on the clinical aspects, but also on its impact on their OHRQoL. This is important to be understood by care providers in order to ensure a positive relationship with their patients [4,5]. While dental satisfaction has no strict definition, there is a common consensus that is multidimensional [6]. It is known to be affected by many factors such as the dentist–patient relationship [4,5,7], compliance and treatment outcome [8], among other factors [9]. Furthermore, sociodemographic factors such as age [6,10,11], gender [10,12] and education [11] have also been found to influence patient satisfaction.

For that reason, oral health needs to be understood in a broad perspective that involves quality-of-life, where the patients' own perceptions of their oral health and patients' perceptions of their relationship with their caregiver play an important role. The aim of this paper was therefore to study the association between dental satisfaction and OHRQoL in a large group of Swedish patients when controlling for individual, clinical and psychological factors. This will be investigated by inquiring into the whole web of associations by means of hierarchical regression analysis.

Materials and methods

This paper will report findings from a secondary analysis of data collected in 2004 within the framework of a large study carried out in the region of Värmland, Sweden. Reports from a different study within the same framework have been reported by Johansson et al. [13,14].

Data were collected for 485 patients from four randomly selected clinics [4]. Patients had to write and speak Swedish, aged 19 years or more and having at least two previous visits to the caregiver. Information was collected about demographic variables (gender, age and education), clinical variables (number of teeth and risk classification) and using three self-administered questionnaires: the Dental Visit Satisfaction Scale (DVSS) [15], the short version of Oral Health Impact Profile (OHIP-14) [16] and a modified version of the revised helping alliance questionnaire.

DVSS measured patient satisfaction with the dentist directly following treatment. Thus, DVSS was not intended to assess general attitudes about the dentist but rather to assess satisfaction with a specific dental encounter [15].

DVSS includes 10 items scored on a Likert scale from 1–5 (strongly disagree, disagree, uncertain, agree and strongly agree). An overall satisfaction score is obtained by summing the scores of all 10 items, with total scores ranging from 10–50. Item 8 has to be reversed [15]. The Swedish version of this instrument has been validated by Hakeberg et al. [17].

The modified version of the revised helping alliance questionnaire was constructed based on the revised helping alliance questionnaire (HAq-II), a widely used 19-item questionnaire [18], to assess patients' perception of their relationship with their caregiver. HAq-II was shortened and modified to suit the dental care situation. The modified version used seven items scored on a Likert scale from 1–5 (absolutely not agree, disagree, uncertain, agree and agree completely). An overall alliance score is obtained by summing scores of all seven items, with total scores ranging from 7–35 and higher values denoting a more close relationship between caregiver and patient based on patients' perception.

Caregivers assessed the patients' oral condition on the basis of the visit and the patient records. They determined the patient's oral status including periodontal condition, the caries status and previous fillings and the number of remaining teeth. Patients were categorized according to their risk to develop oral diseases. The total number of risk classes was 16, ranging from 0–15 [13], clearly an ordinal scale and possibly approximating an interval scale.

In order to assess the internal consistency of the items, Cronbach's alpha coefficient was calculated for DVSS, OHIP-14 and the modified version of the revised helping alliance questionnaire. An independent-sample *t*-test was conducted to compare the DVSS scores according to individual factors (gender, age and education). The modified version of the revised helping alliance questionnaire was used to measure the patient's perception of the relationship with the caregiver. The questionnaire was subjected to a principal component analysis (PCA) [19]. Prior to this analysis, the suitability of data for analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above ranging from 0.27–0.76. The Kaiser-Meyer-Olkin value was 0.82, exceeding the recommended value of 0.6 and Bartlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix. Principal component analysis revealed one principal component with an eigenvalue of 3.6 that accounted for 51.6% of the variance and the other components had eigenvalues ranging from 0.21–0.93. The result of this analysis supports the use of the modified version of the revised helping alliance questionnaire as one scale.

In order to investigate the association between dental satisfaction and OHRQoL, data were analysed with ordinary least squares (OLS) multiple linear regression, with a hierarchical block method in three steps. Every block of independent variables was added manually, based on theoretical considerations, with individual

Table I. Descriptive statistics and reliability analysis (Cronbach's α) for instruments.

Variable	*n*	Median/mean (SD)	%	Range	α
DVSS	472	48.0	—	10–50	0.76
Individual factors					
Gender	476	—	—	—	—
Male	216	—	45.4	—	—
Female	260	—	54.6	—	—
Age (years)	475	43.5 (13.1)	—	19–81	—
<50	321	—	67.6	—	—
50+	154	—	32.4	—	—
Education	476	—	—	—	—
Primary school	103	—	21.6	—	—
Secondary school	177	—	37.2	—	—
College/University	196	—	41.2	—	—
Clinical factors					
Number of teeth	484	28.0	—	0–32	—
Risk classification	467	6.4 (2.4)	—	0–15	—
Psychological factors					
OHIP-14	474	3.0	—	0–56	0.87
Helping alliance index	451	33.0	—	7–35	0.82

factors (gender, age, education) at first stage, clinical factors (number of teeth and risk) at second stage and psychological factors (OHIP-14 and the modified version of the revised helping alliance questionnaire) at third stage. The dependent variable was the DVSS score. Preliminary analyses were conducted to detect possible violations of the assumptions of the model: serial correlation (Durbin-Watson coefficient = 1.99), multicollinearity (maximum VIF value = 2.05) and heteroskedasticity (non-systematic pattern of the residuals). Influential outliers were assessed through Cook's distances (0.63). The statistical package used was PASW Statistics 18 for Windows.

Results

Data were collected from 485 patients [4]. Among them, more than half were women, the mean age (SD) was 43.5 (13.1) years, with two thirds of patients younger than 50 years and less than half had high education (university studies). Besides, the questionnaires DVSS, OHIP-14 and the modified version of the revised helping alliance questionnaire showed a good reliability based on a high internal consistency (Cronbach's coefficient alpha). The descriptive statistics for the study population and the reliability analysis for instruments are presented in Table I.

An independent sample *t*-test was conducted to compare the DVSS scores with individual factors categories (gender, age and education). Females were more satisfied ($p \leq 0.01$) and patients of 50 years or older were more satisfied than the younger ones ($p \leq 0.05$) (Table II).

Hierarchical multiple regression was used to establish the association between OHRQoL and dental satisfaction after controlling for individual, clinical and psychological factor. The dependent variable was DVSS.

Individual factors (gender, age and education) were entered at step 1, explaining 3% of the variance of dental satisfaction. After introducing clinical factors (number of teeth and risk) at step 2, the model explained 4% of the variance. After adding psychological factors (OHIP-14 and the modified version of the revised helping alliance questionnaire), the total variance explained by the model as a whole was 34.5% (Table III). In the final model, only two independent variables were statistically significant, OHRQoL and patient's perception on the relationship with caregiver.

In the final model, the DVSS scores increase if one has a close relationship with the caregiver. On the other hand, if the OHIP score increases, the oral health satisfaction decreases and, since high scores on the OHIP indicate worse OHRQoL, the relationship between dental satisfaction and OHRQoL is positive. Thus, a good OHRQoL was related to a higher satisfaction with dental care.

Discussion

In this study, the association between dental satisfaction and OHRQoL was analysed while simultaneously adjusting for confounders. The finding was that dental satisfaction had a positive association with OHRQoL. Thus, higher OHRQoL was related to

Table II. Associations between gender, age, education and dental satisfaction.

	DVSS							
							95% CI	
Variable	*n*	Mean	SD	*t*	df	Mean difference	Lower	Upper
Gender	470							
Male	214	45.9	3.89					
Female	256	46.9	3.51	2.93**	468	1.00	1.68	0.32
Age	469							
<50	318	46.2	3.79					
50 +	151	47.1	3.50			0.86	1.58	0.14
Education: secondary	472			2.36*	467			
No	297	46.5	3.75					
Yes	175	46.4	3.65			0.10	0.60	0.80
Education: university	472			0.28				
No	278	46.7	3.56		470			
Yes	194	46.1	3.90	1.71	470	0.60	0.09	1.28

DVSS, dental visit satisfaction scale; SD, standard deviation; CI, confidence interval.
* $p \leq 0.05$, ** $p \leq 0.01$.

patients being satisfied with their dental visit. A relationship between OHRQoL and the perception of the caregiver's humanistic qualities had also been found within a different part of the same large study framework. The more the caregiver was perceived as having a holistic view of the patient, as opposed to having a disease and mouth-centred view, the better the OHRQoL of the patient [14]. Similarly, Skaret et al. [12] found an association between low general well-being and being very dissatisfied with healthcare, asserting that negative self-reports may be influenced by quality-of-life aspects.

Table III. The regression models with DVSS ($n = 472$) as dependent variable. Reference categories in brackets.

Variable (Ref. Cat)	Model 1 b	Model 2 b	Model 3 b
Intercept	45.50***	48.38***	32.62***
Individual factors			
Gender: Female (male)	1.10**	1.07**	0.45
Age	0.02	0.03	0.003
Education: secondary (primary, university)	0.57	0.61	0.47
Education: university (primary, secondary)	0.97	1.05*	0.65
Clinical factors			
Number of teeth		0.07	0.07
Risk		0.18*	0.09
Psychological factors			
OHIP			0.10***
Helping alliance Index.			0.54***
Adj R^2	0.03	0.04	0.35
F	4.50	4.10	29.46
df 1/2	4/428	6/426	8/424
p	≤0.001	≤0.001	≤0.001
Durbin-Watson	—	—	1.99

b, regression coefficient.
* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Model 1 adjusted for individual factors, Model 2 adjusted for model 1+clinical factors, Model 3 adjusted for model 1+2+ psychological factors.

Patients in our study were generally satisfied with their dental visit, as in many other studies related to patient satisfaction [7,20,21]. However, when deeper analyses of the factors that may determine dental satisfaction were performed, the literature review showed contradictory outcomes. The most common variables related to patient satisfaction are the patient's demographic characteristics and, at the same time, these are the factors with more contradictory outcomes [22].

In our study, the same pattern of females being more satisfied was present in all the models, although it was statistically significant only in the first two models. This may be due to dental satisfaction being related to demographic factors and to clinical measurements. Once the subjective components of the model were entered into analysis, they took precedence over other explanatory factors. Our result is in accordance with other studies [23]. However, by using meta-analysis, Hall and Dornan [22] reached the conclusion of no difference between male and female in terms of dental satisfaction, because four studies showed women to be more satisfied, eight showed 'no difference' and five showed men to be more satisfied. For example, an American study reported that, in the context of routine consultations, male patients were less satisfied [23]; Khayat and Salter [21] reported that significantly more men were overall satisfied with their care provider; and Ståhlnacke et al. [24] found no gender difference in a Swedish cohort study.

Age was not found to be a significant predictor of dental satisfaction. However, there was a bivariate difference ($p \leq 0.05$) in the dental satisfaction of patient younger than 50 years and patients aged 50 or older, whereby older patients were slightly more satisfied (Table II). Most of the studies suggest that older patients tend to be more satisfied with their care provider [21,22]. According to Hall and Dornan [22], there are two possible reasons; first, older patients tend to be less inquisitive, accepting negative judgement on their care in comparison with young patients; second, care providers are prone to treat elderly people better among their patients. Still, the association was spurious in a multivariable analysis.

Educational characteristics have been identified in previous studies as having a significant influence on dental satisfaction [6,11,22]. Only in the second model, patients with high education were significantly less satisfied. The negative association of patients' level of education and patient satisfaction has been documented in other studies [22,25]. An explanation of this trend is related to patient's expectations. Thus, a more educated patient may have high expectations or firmer standards in their evaluation of care and, as a consequence, is more likely to be dissatisfied compared to those less educated [22]. Patients with 'lower expectations' tend to be more satisfied [6,11]. Still, the association was spurious in a multivariable analysis.

Clinical risk had a negative significant association in the second model, thus higher clinical risk was related to lower level of satisfaction. Accordingly, Ståhlnacke et al. [24] found that patients with mouth or teeth troubles experienced increased dissatisfaction. However, Skaret et al. [12] found an unexpected association between caries experience and satisfaction, where high caries experience was associated with being very satisfied. The authors concluded that patient satisfaction has to be determined by quality-of-life issues rather than by clinical measurements, which is confirmed here by its multivariable spuriousity.

Finally, patients' positive perceptions of the relationship with their dentist were strongly related to being satisfied with their care provider. Yamalik [5] found that the dentist's attitude toward his patients was closely related to their satisfaction with the care received by care provider. Thus, the author concluded that the interpersonal factors are fundamental components of a good dentist–patient relation. Skaret et al. [12] found that aspects of a negative interpersonal relationship between the patient and the care provider are some of the major factors for young patients to be very dissatisfied with dental care. In Schouten et al.'s [7] study, patient's satisfaction with emergency consultations was determined by the communicative behaviour of the dentist. A good patient–caregiver relationship has also been related to compliance and treatment outcomes. A positive relationship enables the patient's involvement and commitment to their treatment, meeting expectations and understanding of their illness and treatment; and from caregiver, understanding and sensitivity of patient concerns. Therefore, a positive patient–caregiver relationship has an important influence on adherence, outcome and dental satisfaction [26].

In this study, well-known instruments with good reliability were used, although the instrument used to measure OHRQoL (OHIP-14) has some limitations. First, it has been shown that the original short form of OHIP-49 developed by Slade [16] has significant 'floor' effects, i.e. many questions are answered as no impact (score = 0) or very low. For that reason, it should not be used to evaluate changes as a result of healthcare interventions [27], which was not the case here. Since our study was performed using a general population sample with patients' ages ranging from 19–81, the use of the Slade's version of OHIP-14 was convenient for its discriminative property. Second, the conceptual basis of the OHIP-49 and OHIP-14 has been questioned as to whether OHIP should be used as a measure of Locker's conceptual model of oral health, because it has been demonstrated as lacking adequate construct validity. For that reason, it has been

suggested that studies based on these instruments should not report sub-scale interpretations [28]. Therefore, in our study, the sub-scales of OHIP-14 were not considered. Another weakness is in relation to the possible similarities between the questions to measure OHRQoL, dental satisfaction and even with patients' perceptions of their relationship with their caregiver. It should also be noted that the helping alliance questionnaire is a measurement developed for the therapeutic situation. For this purpose, the measurement in the present study was shortened and modified to suit the dental care situation.

In relation to the final model with the DVSS as the dependent variable, we observed that the variance was mostly determined by the psychological factors (OHRQoL and patients' perceptions of their relationship with their caregivers). A final adjusted multiple correlation coefficient (R^2) of 0.35 is an indicator of additional confounding factors affecting the findings which were not controlled for in the study. However, it is not uncommon to have this size of R^2 in variance explanations in social science studies and 'there is no simple method of determining how high R^2 must be for the fit to be considered satisfactory' ([29], p. 49). Model fit was indeed deemed as satisfactory from other aspects, such as absence of patterns in residual plots, no serial correlation and no particular multicollinearity. Finally, there was a positive association between dental satisfaction and OHRQoL when controlling for confounding factors. Moreover, patients' perceptions of the relationship with their dentist had a strong correlation with dental satisfaction.

Our result suggests indirectly that care providers should take into account OHRQoL rather than only normative clinical measurements when they evaluate patients' oral health. This may increase patient satisfaction with their care provider and result in a better care situation.

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