Oral Health Related Quality of Life and its Association with Sociodemographic and Clinical Findings in 3 Northern Outreach Clinics

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ABSTRACT

Objective: Aspects of oral health related quality of life (OHQOL) are attracting increased attention in dentistry. Knowledge in this field is limited, especially in terms of significant indicators and predictors of impaired OHQOL. The aim of this cross-sectional study was to examine the influence of various sociodemographic and clinical variables on OHQOL in the setting of outreach clinics in northern Alberta, Canada.

Methods: OHQOL was measured with the 49-item Oral Health Impact Profile questionnaire (OHIP-49), administered to adult patients attending 3 dental outreach clinics managed by the University of Alberta. Sociodemographic and clinical data were also collected. Data were analyzed using descriptive and multivariable methods.

Results: The OHIP-49 scores were comparatively low for a patient sample. After multivariable stepwise logistic regression analysis, only gender, missing anterior teeth and need for endodontic treatment remained as significant variables in the final model for impaired OHQOL. Missing anterior teeth (regardless of replacement) had the strongest effect. Subjects with this feature had an approximately 21-fold greater risk of impaired OHQOL relative to those who retained all of their anterior teeth.

Conclusions: The clientele of these outreach clinics was generally young but had high treatment needs. OHQOL results can be useful in considering treatment strategies in similar rural environments, but the complexity of this indicator necessitates an individual patient-centred approach in clinical decision-making.

MeSH Key Words: Alberta; oral health; rural health services; socioeconomic factors

Quality-of-life research in medicine and dentistry has attracted considerable attention over the past decade. **A shift to** a more patient-centred approach was the primary reason the profession adopted this paradigm. There is no doubt that oral health related quality of life (OHQOL) plays a major role in patients' perception of need and/or their demand for dental treatment. However, numerous individual factors influence OHQOL. Several papers have shown considerable discrepancy between professional and subjective (patient) views of dental treatment,[1] and the associations between clinical variables and OHQOL in an elderly Canadian population were weak.[2]

As part of the dental students' clinical program, the department of dentistry of the

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Age ≥ 18 years Functional command of English	Most recent dental visit < 3 months ago Poor health, such that participation in the study appeared to be an unacceptable burden Cognitive impairment Behaviour suggestive of psychological disorders Known drug addiction

University of Alberta provides dental outreach services to 3 rural communities in northern Alberta.[3] The on-site satellite clinics represent a practice setting that differs from the typical dental environment. The aim of this study was to identify explanatory variables for OHQOL, with special focus on sociodemographic characteristics, dental status and professionally assessed treatment need, among patients attending these outreach clinics.

Materials and Methods

Sampling

The study, approved by the University of Alberta Research Ethics Board, was conducted at the 3 dental outreach clinics managed by the University of Alberta in the rural communities of High Level, La Crete and McLennan in 2003 and 2004. All incoming patients were eligible to participate.

To avoid bias related to a subject's recent experiences associated with ongoing treatment, patients whose most recent dental visit had been less than 3 months ago were excluded; other inclusion and exclusion criteria are listed in **Table 1**.

Data Collection

The subjects, who had been given all necessary information about the study and who had provided informed consent, were asked by nonprofessional staff to complete the Oral Health Impact Profile (OHIP-49) questionnaire[4,5] before any treatment or dental advice was provided. This instrument consists of 49 questions organized into 7 dimensions: functional limitation (9 questions), physical pain (9 questions), psychological discomfort (5 questions), physical disability (9 questions), psychological disability (6 questions), social disability (5 questions), and handicap (6 questions). Each question had 5 response categories ranging from "never" to "very often." The questions referred to the subject's experience in the previous 12 months. The questionnaire was pretested in the outreach clinic setting. All independent variables are listed in **Table 2**. The OHIP questionnaire was supplemented by 2 additional items related to the highest level of education completed and the date of the most recent dental visit. Following completion of the questionnaire, a con-

ventional screening examination was carried out. During this procedure, data pertaining to a set of clinical variables were collected. The examiners were dental students under the supervision of a dentist. Detailed instructions, consisting of a comprehensive clinical protocol and an instructional video on compact disk, were available to the students at the examination sites. Except for those related to treatment need, the clinical variables were simple, with no requirement for sophisticated diagnostic criteria. The assessment of treatment need followed routine protocol at the outreach clinics and was based on the student's and the supervising dentist's judgement.

Data Analysis

The statistical analysis comprised descriptive statistics and multivariable analyses. For the OHIP evaluations, total and subscale scores were determined by addition. The 5 response categories were assigned values of 0 to 4, and all 49 item values were summed to generate the OHIP-ADD score. Thus, the maximum total score was 196. The maximum subscale scores ranged from 20 to 36 depending on the number of questions within the dimension (see above). Within the OHIP questionnaire, missing values were replaced with the mean for the purposes of the statistical analysis.

A multivariable stepwise logistic regression analysis using Fischer's scoring as an optimizing technique was used to identify an optimum binary logit model and thus to find significant indicators of impaired OHQOL. The target variable was the total OHIP-ADD score. The OHIP-ADD scores were dichotomized to identify a target group with inferior OHQOL, defined as subjects with total OHIP-ADD scores at or above the 75th percentile (i.e., the 25% of subjects with the most impaired OHQOL). The 75th percentile and cut-off point was an OHIP-ADD score of 50. Belonging or not belonging to the target group was the dependent variable. Initially, 15 independent variables were included, comprising all but 2 of the variables in **Table 2**; there were no subjects with an implant overdenture and only one subject with a fixed implant restoration (the latter of which was counted with fixed partial dentures). Subjects with missing values for any of these 15 variables were

Table 2 Independent variables

Variable	Comments	Category	Relative frequency (%)
Highest level of education completed	Questionnaire item	Less than high school High school College or trade school University Missing data	22 34 22 10 12
Last dental visit	Questionnaire item	< 1 year ago 1–2 years ago > 2 years ago Missing data	31 34 26 9
Age (years)		18–24 25–34 35–44 45–54 55–64 65–74 75–84	24 31 25 11 5 4 1
Gender		Male Female	36 64
No. of natural teeth	Including erupted third molars	0 1–8 9–16 17–24 25–32	1 4 6 20 69
One or more natural anterior teeth missing	Dichotomous; refers to cuspids and incisors in both jaws, regardless of replacement	Yes No	20 80
One or more natural posterior teeth missing	Dichotomous; refers to premolars and first and second molars in both jaws, regardless of replacement	Yes No	66 34
Fixed partial dentures	Dichotomous; applies to any fixed partial denture but not counting implant-borne restorations	Present	6
Removable dentures	Dichotomous; applies to any removable partial or full denture and any denture the patient owns, regardless of whether it is being worn	Present	15
Implant-borne fixed crowns or partial dentures	Dichotomous; applies to any implant-borne crown or fixed partial denture	Present	1[a]
Implant-supported overdentures	Dichotomous	Present	0
Treatment needs Periodontics Operatives Endodontics Surgery Orthodontics Prosthetics	Dichotomous Crowns were counted with prosthetics	Present	 39 62 14 27 6 41

[a]*Counted with fixed partial dentures in the multivariable analyses.*

Table 3 Variables in the final model for the target group (with inferior oral health related quality of life)

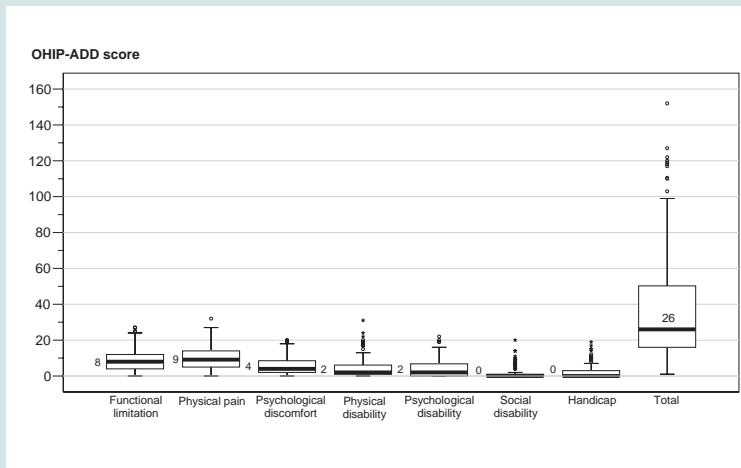| Variable and effect	Odds ratio	95% confidence limits		p value
Gender (male vs. female)	0.330	0.103	0.945	0.048
Anterior teeth missing (yes vs. no)	21.478	7.088	75.700	< 0.001
Treatment need in endodontics (present vs. absent)	11.588	3.393	43.599	< 0.001

Figure 1: Additive scores for responses to the 49-item Oral Health Impact Profile (OHIP-ADD), presented as box-and-whisker plots for subscores and total score. The figure shows the median (also as numeric value) and the 75th and 25th percentiles (box), values up to 1.5 box-lengths from the 75th and 25th percentiles (whiskers), outliers between 1.5 and 3 box-lengths from the 75th and 25th percentiles (dots), and extremes more than 3 box-lengths from the 75th and 25th percentiles (asterisks).

• Implausibilities in the clinical protocol (e.g., conflicting data in dental status) (2 cases)

A total of 140 data sets remained for analysis.

The results for the independent variables are presented in **Table 2**. The sample was dominated by younger age groups, female subjects and lower educational levels. The relatively high number of teeth was consistent with the low average age: more than two-thirds of subjects had 25 or more teeth, and only 2 patients were edentulous. Despite the high tooth numbers, there was a high prevalence (two-thirds) of missing premolars and/or molars. In spite of the high proportion of patients with missing teeth (86%), only 20% had at least partial replacements (dentures of any type). At least 6% had non-replaced missing anterior teeth (i.e., missing anterior teeth and no fixed or removable denture). At least 46% had non-replaced posterior teeth (i.e., missing posterior teeth and no fixed or removable denture). Treatment need was generally high, with the highest need rates for operative procedures and prosthetics. The total OHIP scores and the subscale scores were moderate (**Fig. 1**).

Table 3 shows the results of the multivariable regression analysis, the variables that remained in the final model, odds ratios and significance values. Of the 3 remaining variables, gender neared the limit of insignificance, whereas missing anterior teeth and need for endodontic treatment had a highly significant effect. The odds ratios indicate the influence of these variables on the risk of inferior OHQOL. For gender, the 95% confidence interval of the odds ratio almost reached 1.0 (i.e., the gender effect was weak although statistically significant). Male subjects had a lower risk of inferior OHQOL. The odds ratio for missing anterior teeth (21.478) suggests that subjects with missing anterior teeth, regardless of replacement, had an approximately 21-fold higher risk of inferior OHQOL than those who retained all of their natural anterior teeth. Assessed need for endodontic treatment increased the risk of belonging to the target

excluded. Stepwise selection led to an optimal model that included 3 variables. The analysis was repeated consecutively, excluding only those subjects with missing values for these 3 variables (remaining cases *n* = 134). The model fit was reviewed using the Hosmer–Lemeshow goodness-of-fit test. The *p* value of 0.97 indicated a very good fit of the final model (*p* values greater than 0.3 indicate a good fit). The analyses were performed using the SAS software package (version 8, SAS Institute Inc., Cary, N.C.).

Results

A total of 153 data sets were available, of which 13 were discarded for the following reasons:

• Breaches of the study protocol necessitating exclusion (e.g., patients less than 18 years of age) (8 cases)
• Subjects with missing values for age, gender or number of teeth or with more than 9 missing or invalid values in the 49 OHIP items (3 cases)

group 12-fold. The 95% confidence intervals for both of these odds ratios were wide.

Discussion

Although developed for use in elderly populations, the appropriateness of the OHIP-49 for younger adults has been shown.[6,7] For practical reasons, the sociodemographic variables in this study comprised only age, gender and educational status, all of which can be determined with high reliability. However, this might have limited the results because other variables, such as social status and available income, might be significant determinants of OHQOL. Despite the exploratory nature of the study, these results add some valuable information to the sparse knowledge base concerning the association between clinical and sociodemographic variables and OHQOL. Pooling the results for the 3 outreach clinics seemed acceptable because all of the communities are rural and all are located in northern Alberta. The assessment of treatment need was limited to routine protocol (a needs assessment based on highly standardized criteria would have been beyond the limits of practicability within this study environment). However, this information contributes considerably to the meaningfulness of the study. Because of the complexity of the influence of clinical and sociodemographic variables on OHQOL, the multivariable statistical approach appeared most appropriate. Logistic regression was chosen over linear regression because linearity of the covariables in the quantitative outcome (the OHIP score) could not be assumed, and the covariables were recorded in categorical scales.

The findings for age and educational level exemplified the sociodemographic structure of remote communities in northern Alberta. Given the relatively young clientele living in underserviced areas and exhibiting high mean at-risk tooth numbers, the high rate of need for operative procedures (basic restorative dentistry) is understandable. These results are consistent with an analysis of the dental procedures conducted by undergraduate students at these clinics.[3] The need for prosthetics was astonishingly high. From a professional point of view, the clinical findings identify the communities as underserviced.

The total OHIP scores were above the average values for a representative population sample in Germany.[7] They can, however, be considered relatively low for a patient sample, particularly if the high treatment need is taken into consideration. Comparisons of OHQOL data must be done with care because of potential problems related to the heterogeneity of samples and study populations. The total OHIP score and the subscores generally resembled those for a sample of Chinese residents 60–80 years of age examined with a Chinese version of the OHIP.[8] These subjects had been recruited in homes for the elderly and at social centres that had applied for outreach dental services. Our scores on the subscale "physical

pain" were higher, which could be expected for a patient sample. Our scores were lower than those for a sample of Swedish clinic patients with temporomandibular disorders, Sjögren syndrome, burning mouth sensations or malocclusion, but considerably higher than for healthy controls (determined with a Swedish version of the OHIP).[9] In contrast to the Swedish study, social disability and handicap did not play a major role in the rural Canadian sample reported here.

In a national survey conducted in Germany using the German version of the OHIP, wearing removable dentures was a stronger predictor of impaired OHQOL than demographic variables; age and education had almost negligible effects.[10] Among elderly Japanese people, age, gender and educational level were not significantly associated with OHIP scores (determined with a 14-item version of the questionnaire, OHIP-14).[11] In terms of the low or lacking influence of gender, age and education, our results are consistent with these previously reported studies and thus support recently reported trends.

The literature about the influence of clinical variables is heterogeneous. In older adults in Canada, only a weak association between OHIP scores and clinical indicators of oral disease has been reported.[2] A study in Sri Lanka using the OHIP-14 showed a weak positive correlation between the number of missing teeth and OHQOL and also showed that denture-wearing and halitosis were significant predictors of OHIP score in residents over 60 years of age.[12] Survey data from the United Kingdom and Australia revealed that age, number of teeth and cultural background were important variables influencing OHQOL.[13] In an Israeli general practice sample, scores on the OHIP-14 questionnaire correlated with the number of decayed teeth, number of missing teeth and need for prosthodontic treatment.[14] The extraordinarily strong effect of anterior missing teeth as an indicator of impaired OHQOL in our sample shows the importance of anterior teeth to esthetics from the patient's perspective. This finding strengthens the results of a study with Brazilian adults, among whom the presence of anterior teeth was the most significant predictor of patient satisfaction.[15] The significance of endodontic treatment need in the final model for impaired oral health related quality of life can be explained by a frequent clinical association with physical pain.

Conclusions

Overall, the clientele of these outreach clinics was young and had high treatment needs. In view of these findings, the impact of dental problems on OHQOL was relatively low. Missing anterior teeth, whether replaced or not, had a strong negative effect on OHQOL. Missing posterior teeth, although frequently not replaced, did not have a similar effect. These findings should be taken into account when defining treatment targets in the rural

environment of the outreach clinics. Except for need for endodontic treatment, all other clinical variables, including number of teeth and denture-wearing, were not significant indicators of impaired OHQOL. This study identifies the complexity of the OHQOL and the professional necessity to enact an individual patient-centred approach when considering quality-of-life aspects in clinical decision-making in dentistry. ✦

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