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ORIGINAL ARTICLE

Oral health-related quality-of-life in patients to be treated with fixed or removable partial dental prostheses

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Abstract

Objectives. The aims of this study were to measure and describe the Oral Health-Related Quality-of-Life (OHRQoL) in a population about to receive removable dental prostheses (RDP) or fixed dental prostheses (FDP). ***Materials and methods.*** The Oral Health Impact Profile 49 (OHIP-49) was completed by 410 patients about to receive treatment with either RDP or FDP. Objective variables were: gender, age, number of teeth, type of replacement planned (FDP/RDP) and location (one jaw or both) and zone (aesthetic/masticatory/both) of missing teeth to be replaced. ***Results.*** Women had a worse OHRQoL than men in the RDP group. Higher age was significantly correlated with a better OHRQoL independent of treatment modality. Participants about to receive FDP in one jaw in the masticatory zone only had a better OHRQoL than RDP participants in the same group. The most frequently reported problems in all groups concerned functional limitations, discomfort and physical disabilities. Little variance in reported items was seen between the sub-groups and social handicap was not frequently reported. ***Conclusions.*** The difference in OHRQoL between participants about to receive RDP and FDP was limited. The most frequently reported problems concerned functional limitations, discomfort and physical disabilities. Social handicap was not frequently reported.

Key Words: *indication, OHIP, OHRQoL, oral rehabilitation, prosthodontics*

Introduction

A discrepancy between patient-based and normative need exist in oral prosthodontics [1]; patient-based need is evident in fewer cases than normative need [2,3]. Replacement of teeth is therefore not always indicated and the replacement is based on impaired functions, thus diagnoses and decisions can be made only by including the patient's individual problems and wishes [4].

It has been proposed that measures of oral health-related quality-of-life (OHRQoL) could potentially be used to predict treatment needs and select therapies [5,6]. One of the most used and best validated measures of OHRQoL is the Oral Health Impact Profile 49 (OHIP-49) [7]. This questionnaire has been proven to be valid in different populations including patients with tooth loss and removable dental prostheses (RDP) [8,9] and patients treated with fixed dental prostheses (FDP) and RDPs [10]. The OHIP-49 is therefore regarded as a suitable measure in OHRQoL studies in prosthodontic populations.

In an OHRQoL study in patients about to receive treatment with FDP or RDP, a broad range of issues were reported by the patients. The most frequently reported problems were related to aesthetics, a wish to keep one's own teeth and mastication [11]. The same issues were prominent in a study comparing a group of RDP and non-RDP wearers seeking treatment. The study also concluded that aesthetics was one of the most important domains in patients' needs and wishes [12]. In another study, including a group of patients with loose, ill-fitting or broken RDPs, a higher percentage of patients were disturbed by impaired chewing function than by the appearance of the teeth [13]. There seems, however, to be a lack of systematic studies measuring and describing OHRQoL pre-treatment and relating it to objective oral variables for prosthodontic treatment. By doing this, a better knowledge of the impaired functions and their

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impact on patients would be obtained. This could in turn help the clinician in making informed decisions and more evidence-based treatment planning and it could help the patient understand risks and prognoses [14,15].

The purpose of this study was therefore to measure the OHRQoL by means of the OHIP-49 in a population about to receive prosthodontic treatment with FDP or RDP and relate the OHRQoL with objective variables for prosthodontic treatment. Additionally, the purpose was to identify important aspects of OHRQoL in the patient group.

Materials and methods

Participants

Patients who were signed in for—i.e. about to receive—treatment with FDP or RDP at the Department of Oral Rehabilitation at Copenhagen Dental School in the period from September 2006 to September 2009 were participants in the study. All participants were missing at least one tooth and had sought treatment themselves. Before any prosthetic treatment was performed, the participants' histories were taken, an oral examination performed and the participants completed the OHIP-49 questionnaire. The questionnaire was filled in by hand at the clinic without any assistance. Exclusion criteria were: acute pain, need of periodontal or cariologic treatment, temporomandibular joint disorders, incapability to read Danish and indication for complete dentures or implant-based treatments. In the 3-year period, 448 patients about to receive oral rehabilitation completed the OHIP-49 questionnaire. Of these, 410 (90%) fulfilled the inclusion criteria and 38 were excluded: 21 were found to have more than just prosthetic needs, it was not possible to retrieve the results from the histories and oral examinations for 10 of the patients and seven patients could not be included because of lack of information regarding different variables.

History taking and oral examination

The history taking and oral examination of the participants were performed before treatment by students supervised by clinical teachers, using a written guideline used in the department. The objective variables included in the study were: gender, age, number of teeth, type of planned replacement (FDP/RDP), location of missing teeth to be replaced (one jaw or both) and zone of missing teeth to be replaced (aesthetic, masticatory or both). The aesthetic zone was defined as incisors, canines and the first premolar in the upper jaw and incisors and canines in the lower [16]. The masticatory zone was defined as the second premolar and the first and second molar in the upper jaw and both premolars and the first and second molar in the lower jaw. Only one participant in the RDP group with missing teeth in the aesthetic zone only was identified. This participant was excluded from the analysis.

OHIP-49 questionnaire

A Danish version of the OHIP-49 was used [17]. The OHIP-49 consists of 49 questions related to problems in the oral region [7]. The participants answered how often each problem had occurred during the past month on a scale with six choices and corresponding scores: *very often* (4), *fairly often* (3), *occasionally* (2), *hardly ever* (1), *never* (0) or *don't know*. To calculate an overall OHIP-49 score (OHIP-Tot) for each patient, the scores from the 49 answers were added, thereby giving a score between 0–196. The subjective indication of aesthetics and mastication were evaluated by a selection of OHIP-49 questions (Table I). Six questions were selected to evaluate the subjective aesthetic indication (OHIP-Aes) [18] and four questions were selected to evaluate the subjective masticatory indication (OHIP-Mas) [19]. The OHIP-Aes score thus could range from 0–24 and OHIP-Mas from 0–16.

The 10 participants with the lowest and the 10 participants with the highest OHIP-Tot score were analysed and compared separately.

Experienced problems

To investigate the type of oral problems experienced by the participants, the frequency of answers to the OHIP-49 questions with a score 3 or 4 was calculated. The 10 most frequently reported oral problems indicated the most important aspects [20].

Table I. Aesthetic and masticatory selection of OHIP-49 questions.

Aesthetic questions
Q3: 'Noticed tooth'
Q4: 'Appearance affected'
Q20: 'Self-conscious'
Q22: 'Uncomfortable appearance'
Q31: 'Avoid smiling'
Q38: 'Embarrassed'
Masticatory questions
Q1: 'Difficulty chewing'
Q28: 'Avoid eating'
Q29: 'Diet unsatisfactory'
Q32: 'Interrupt meals'

Statistics

SAS® statistical software (version 9.2, SAS Institute Inc., Cary, NC) was used for all analyses. The level of significance was $p < 0.05$.

If five or more questions were not answered in the OHIP-49, the questionnaire was not seen as complete and the patient was omitted from the study.

Descriptive statistics were used to calculate means and distributions of age, gender, oral variables and OHIP-scores. Frequency analysis was used to calculate frequencies of reported problems. Goodness-of-fit tests (Kolmogorov-Smirnov), histograms and probability plots showed that the OHIP scores were not normally distributed. Therefore, non-parametric tests were used for all significant tests.

Non-parametric ANOVA tests were used to test differences in OHIP scores between genders and participants about to receive RDP or FDP treatment. Non-parametric ANOVA tests were also used to test differences in OHIP scores between participants with missing teeth in the masticatory and aesthetic zone and differences in OHIP scores between participants with missing teeth in one or both jaws.

The Spearman rank correlation [21] was used to test the correlation between age and OHIP scores and number of teeth and OHIP scores.

Results

Participants and oral variables

The distribution of the objective variables in the participants is presented in Table II.

Table II. Distribution of the objective variables in the participants.

	FDP (n = 273)	RDP (n = 137)
Gender		
Women	165	69
Men	108	68
Age		
Mean	56.5	64
Number of teeth		
Median	26	17
Location of missing teeth		
One jaw	269	115
Both jaws	4	22
Zone of missing teeth		
Masticatory	187	42
Aesthetic	75	1
Both	11	94

The mean age for the entire population was 59 (range 22–90) years and the median number of teeth was 24 (range 3–31).

OHIP-scores

A significantly higher OHIP-Aes (p = 0.02) and OHIP-Tot (p = 0.01) score was found for women compared to men in the RDP group. A significant negative correlation between age and all OHIP scores was found ($p < 0.01$) in both the FDP and RDP group. A significant negative correlation was found between number of teeth and all OHIP scores ($p < 0.05$). When divided into FDP and RDP groups, the correlation was, however, not significant.

Table III shows the mean OHIP-scores distributed by the objective oral variables. When the oral variables were all included in the analysis, a significantly higher OHIP-Tot ($p = 0.02$) and OHIP-Mas ($p < 0.01$) score remained in the RDP group compared to the FDP group with missing teeth in one jaw in the masticatory zone only.

The distribution of the 10 participants with the lowest OHIP-Tot score (score 0–2) and the 10 participants with the highest OHIP-Tot score (score 114–138) is shown in Table IV. Compared to the participants with the highest scores, the participants with lowest scores were older, had more teeth and were about to receive FDP in one jaw only, most frequently in the masticatory zone.

Experienced problems

The 10 most frequently reported problems by RDP and FDP participants separately are shown in Table V and the 10 most frequently reported problems by

Table III. Mean OHIP scores for groups of oral variables.

Oral variable	Mean OHIP-Tot	Mean OHIP-Aes	Mean OHIP-Mas
Type of replacement planned			
FDP	35.30	6.28	3.02
RDP	50.19*	7.99*	4.74*
Location of missing teeth			
One jaw	39.38	6.60	3.48
Both jaws	53.54*	10.54*	5.27*
Zone of missing teeth			
Masticatory	37.33	6.14	3.29
Aesthetic	36.66	7.24	2.96
Both	49.31*	8.11[A]	4.72*

*Denotes significant difference compared to other groups. [A]Denotes significant difference to masticatory group only.

Table IV. Distribution of the 10 participants with the lowest and 10 participants with the highest OHIP-Tot score.

Variable	No.
Lowest OHIP-Tot score (score 0–2)	
Mean age	59.5
Mean no. of teeth	26.6
Gender	
Women	5
Men	5
Type of treatment	
RDP	0
FDP	10
Location	
One jaw	10
Both jaws	0
Zone	
Masticatory	7
Aesthetic	3
Both	0
Highest OHIP-Tot score (score 114–138)	
Mean age	53.7
Mean no. of teeth	17.3
Gender	
Women	8
Men	2
Type of treatment	
RDP	7
FDP	3
Location	
One jaw	8
Both jaws	2
Zone	
Masticatory	6
Aesthetic	1
Both	3

Table V. Ten most frequently reported problems for RDP and FDP participants separately.

Group/rank	OHIP-49 item	Frequency
RDP (n = 137)		
1	'Food catching' (Q7)	77
2	'Difficulty chewing' (Q1)	55
3	'Worried' (Q19)	49
4	'Dentures not fitting' (Q9)	46
5	'Appearance affected' (Q4)	44
6	'Self-conscious' (Q20)	41
7	'Uncomfortable dentures' (Q18)	40
8	'Uncomfortable appearance' (Q22)	39
9	'Avoid smiling' (Q31)	36
10	'Miserable' (Q21)	34
FDP (n = 273)		
1	'Food catching' (Q7)	119
2	'Worried' (Q19)	85
3	'Appearance affected' (Q4)	68
4	'Noticed tooth' (Q3)	60
5	'Sensitive teeth' (Q13)	58
6	'Self-conscious' (Q20)	57
7	'Miserable' (Q21)	57
8	'Difficulty chewing' (Q1)	56
9	'Uncomfortable appearance' (Q22)	46
10	'Avoid eating' (Q28)	40

participants who were missing teeth in the masticatory and aesthetic zone only are shown in Table VI.

It is seen that the most frequently reported problem in all groups was 'food catching' and that the RDP group frequently reported problems with their current dentures. All items from the two lists are functional problems, discomforts or physical disabilities. No items concerning psychological or social disability or handicap are seen. It is further seen that seven out of 10 items on the RDP and FDP lists are the same. The participants who were missing teeth in the masticatory zone only have 'digestion worsened' on their list and the participants who were missing teeth in the aesthetic zone only have 'upset', otherwise the aesthetic and masticatory lists consist of the same items, which are the same as the items as on the RDP and FDP lists.

Discussion

Even though the size of the study population was seen as a strength of the study, some of the sub-groups were small when dividing the population according to type of treatment planned and location and zone of missing teeth. This made it hard to find significant differences when the analyses were done. Additionally, the OHIP-scores were not normally distributed. This is not surprising, however, as quality-of-life measures often yield abnormally distributed outcomes [22]. Although it was not possible to perform a multiple regression analysis, the non-parametric analyses gave sufficient results to investigate differences and relationships. The large population size also made the results with the non-parametric tests more valid.

A variable of interest not included in the study were if the teeth to be replaced were still *in situ* and if RDP participants were wearing an RDP prior to treatment. Some of the teeth registered as missing could have been covered by natural teeth or existing RDPs, thereby leading to fewer aesthetic problems, and

Table VI. Ten most frequently reported problems for participants missing teeth in the aesthetic or masticatory zone.

Zone/rank	OHIP-49 item	Frequency
Aesthetic ($n = 76$)		
1	'Food catching' (Q7)	36
2	'Worried' (Q19)	28
3	'Self-conscious' (Q20)	24
4	'Appearance affected' (Q4)	21
5	'Miserable' (Q21)	21
6	'Noticed tooth' (Q3)	18
7	'Uncomfortable appearance' (Q22)	18
8	'Difficulty chewing' (Q1)	16
9	'Upset' (Q34)	16
10	'Sensitive teeth' (Q13)	15
Masticatory ($n = 229$)		
1	'Food catching' (Q7)	98
2	'Worried' (Q19)	70
3	'Appearance affected' (Q4)	55
4	'Difficulty chewing' (Q1)	54
5	'Noticed tooth' (Q3)	49
6	'Sensitive teeth' (Q13)	46
7	'Self-conscious' (Q20)	44
8	'Miserable' (Q21)	41
9	'Digestion worsened' (Q8)	38
10	'Uncomfortable appearance' (Q22)	36

ill-fitting dentures could lead to more functional problems [13]. The reason for seeking treatment at the Dental School and socioeconomic variables including employment and income were not obtained. Because of a potential difference in socioeconomic status between the test population and patients from general practice, generalizations to private practice must be done with caution.

Most participants reported some impairment and it is therefore thought that the questions were relevant for this population and the results therefore valid and relevant as well. The validity and reliability of the OHIP-49 was, however, not specifically evaluated in this population. The measure has been used in a similar population before [9,10] and has been validated in Danish [17]. As the purpose of this study was to investigate the OHRQoL in the population, it was thought that the OHIP-49 was the best suited already validated measure.

From the analysis of the 10 participants with the lowest score it is seen that some participants reported no or a low level of impairment. Some of the explanation could be that other impairments/problems than the ones stated in the OHIP-49 were the indication for treatment [23]. It has been shown that items other than the ones in the OHIP-49 are found in a similar population when performing interviews [9,10]. It is also possible that no indication for treatment in fact was evident; some participants may have simply asked for treatment because they were told that it would be a good idea by a dentist. One study investigated the difference between professionally evaluated prosthodontic need and need evaluated by the OHRQoL measure Oral Impact on Daily Performance (OIDP). It was found that 74–80% of the patients evaluated as having a treatment need by professionals did not have any impairment measured by the OIDP [3]. This shows that when dealing with individual indication and treatment-planning, individual investigations must be performed.

Women about to receive RDP were found to be more impaired, especially aesthetically, than men in this study. Women may have a harder time coping with missing teeth and the fact that they are to be replaced by an RDP. It has been found that oral health was perceived as being of higher importance both in positive and negative aspects by women than men, including the impact on their appearance and quality-of-life [24]. Doyal and Naidoo [25] pointed out that knowledge of gender differences in oral health is lacking and further studies investigating the gender differences is highly indicated.

Increasing age in this study was negatively correlated to the OHIP-scores, i.e. better OHRQoL. Older participants may have experience with lack of teeth and perhaps had an FDP or RDP done before, thereby making the process easier to cope with. It is also possible that age simply lowers expectations regarding oral health or that some generations have lower expectations than others because of differences in experience [26,27]. Using OIDP, OHIP-14 and OHIP-49, other studies have also found that older patients felt a smaller impact on OHRQoL than younger participants [27-29].

It was expected that the OHIP scores would be correlated with the number of teeth. This was indeed found, but the result was influenced by the fact that the RDP group had fewer teeth than the FDP group. Thus, no true effect of the number of teeth on OHRQoL was found. The correlation between number of teeth and OHRQoL has been investigated in several studies, most of them finding a worse OHRQoL with reduced number of teeth [11,27,28]. Åstrøm et al. [28] argued that the number of teeth accounts for some of the variance in OHRQoL, but inter-relations exist with other variables, making it difficult to test the influence exclusively.

Participants about to receive RDPs were more impaired than participants about to receive FDPs, which is in accordance with a study by John et al. [30]. Influence of the location and zone of missing teeth had, however, an effect on the result: only participants about to receive RDP had a worse OHRQoL compared to participants about to receive FDP,

when teeth were missing in one jaw in the masticatory zone only. This reflects that loss of a single tooth in the posterior zone, as most participants about to receive FDP had, probably does not affect quality-of-life that much. In these cases, the indication for treatment could be questioned, as most likely these participants were able to eat, talk and smile without any impairment. However, as mentioned earlier, other problems could be evident that were not included in the OHIP-49 [9,10,23].

The distribution of the experienced problems showed that 'food catching' was a major problem for all participants, and ill-fitting RDPs were a frequent concern for the RDP group. The frequency distribution of the items did not show any major differences between either participants about to receive RDP or FDP or participants missing teeth in the aesthetic or masticatory zone: the most frequently reported items were all concerning functional problems, discomfort and disabilities and no items concerning psychological and social disability or handicap were seen. In Locker's [31] conceptual model for measuring oral health it is described how functional limitations and physical disabilities can lead to social disabilities and handicap. Our results indicate that, even though impaired, the participants did not often feel that the impairment was a handicap in a social setting. Szentpétery et al. [20] also ranked the most frequently reported problems from the OHIP-49 in patients about to receive FDP or RDP. Some differences were found between the groups: 'food catching' was mostly a problem in the FDP group, whereas the RDP group were more concerned with psychological issues. However, many of the problems reported were the same in the two groups, and it could be argued that the number of patients in the study was too low for detailed comparisons. The items reported most frequently from that study was also concerning functional limitations and physical disabilities and not social handicap.

Based on both the quantitative and qualitative findings, it was seen that patients were not easily labelled. We expected a difference between participants about to receive RDP and FDP and found it in some aspects. We expected, but did not find, difference between participants with missing teeth in the aesthetic zone or masticatory zone only, especially as we had specific subjective aesthetic and masticatory measures. One possibility is that the OHIP-49 is not valid for measuring the difference between the participants. Even though studies have described the limitations of the OHIP-49 and its relationship with oral variables [32,33], it has, however, been found to be valid in several population studies [6-8,34].

This study has investigated the impairment of patients about to receive FDP or RDP by measuring, analysing and describing the problems reported from the OHIP-49 questionnaire. In summary, the difference between participants about to receive RDP and FDP and the difference between participants with missing teeth in the aesthetic zone and masticatory zone only was limited. Women about to receive RDP had a worse OHRQoL than men about to receive RDP and higher age was significantly correlated with a better OHRQoL independent of treatment modality. Participants about to receive FDP in one jaw in the masticatory zone only were less impaired than RDP participants in the same group. The most frequently reported problems concerned functional limitations, discomfort and physical disabilities. Social handicap was not reported frequently.

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