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Does oral health matter in people's daily life? Oral health-related quality of life in adults 35–47 years of age in Norway

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Dahl KE, Wang NJ, Öhrn K. Does oral health matter in people's daily life? Oral health-related quality of life in adults 35–47 years of age in Norway.

Abstract: *Objective:* The aim of this study was to assess the effect of oral health on aspects of daily life measured by the Dental Impact Profile (DIP) in 35- to 47-year-old individuals in Norway, and to study associations between reported effects and demographic variables, subjectively assessed oral health, general health, oral health behaviour and clinical oral health. *Material and methods:* A stratified randomized sample of 249 individuals received a questionnaire regarding demographic questions, dental visits, oral hygiene behaviour, self-rated oral health and general health and satisfaction with oral health. The DIP measured the effects of oral health on daily life. Teeth present and caries experience were registered by clinical examination. Bi- and multivariate analyses and factor analysis were used. *Results:* Items most frequently reported to be positively or negatively influenced by oral health were chewing and biting, eating, smiling and laughing, feeling comfortable and appearance. Only 1% reported no effects of oral health. Individuals with fewer than two decayed teeth, individuals who rated their oral health as good or practised good oral health habits reported more positive effects than others on oral quality of life ($P \leq 0.05$). When the variables were included in multivariate analysis, none was statistically significant. The subscales of the DIP were somewhat different from the originally suggested subscales. *Conclusions:* This study showed that most adults reported oral health to be important for masticatory functions and confirmed that oral health also had impacts on other aspects of life.

Key words: adult; Dental Impact Profile; epidemiology; oral health–related quality of life; self-rated oral health

Introduction

The use of only clinical measures to assess oral health of individuals has been criticized because they fail to consider functional and psychosocial aspects of health and do not adequately reflect the functioning, concerns and perceived needs of individuals (1–4). It is hereby of interest also to include patients' assessment of their wellbeing in the term oral health. In addition, there is growing interest in dentistry also to assess the influence of oral health on daily life, often labelled oral health–related quality of life (OHRQoL) (5–10).

In Norway, it has been shown, using the Oral Health Impact Profile (OHIP-14), that younger individuals, women, those with few teeth, those who rated their oral health as poor and those who visited dentists less often reported more problems than others (11). The OHIP-14, like many

other OHRQoL questionnaires, focuses primarily on oral problems and seeks to clarify how people believe their oral conditions may result in functional limitations and problems. It is further of interest to assess possible positive influence of oral health on people's daily life.

The Dental Impact Profile (DIP) measures the effects of oral health on life in general and covers physical, psychological and social dimensions (12). It was constructed to indicate how life quality is affected, diminished or enhanced by oral health and oral structures. The DIP was intended to serve as an indicator of the importance or salience of oral health to an individual or a population. The concept behind the DIP is that oral health has measurable positive and negative impacts on peoples' lives. It is a simple questionnaire to answer, but not well known, nor frequently used in studies. Strauss and Hunt (12), who developed the DIP, were of the opinion that understanding the value of oral health is important in marketing dental services and motivating patients to seek oral health care. They found, in a population of older adults in North Carolina, that the most positive effects of oral health were on appearance to others and on eating (12).

The prevalence of dental caries has decreased in Norway as in several other countries (13–18), but it is not known whether this has an impact on individuals' daily life. There is a paucity of studies on the relationship between clinical oral health and OHRQoL in Norway. Both Åstrøm *et al.* and Dahl *et al.* found that there was association between number of teeth and oral health–related quality of life (11, 19), but Dahl *et al.* (10) showed that the number of teeth with decay was not associated with OHRQoL assessed with OHIP-14 in a population of older adults. In contrast, Acharya and co-workers reported in an Indian population that dental caries experience, DMFT was associated with OHIP-14 scores. However, the association was based mainly on missing teeth, supporting the findings that the number of teeth is of importance for OHRQoL (20). The aim of this study was to assess the effect of oral health on aspects of daily life measured by the DIP in 35- to 47-year-old individuals in Norway, and to study associations between reported effects and demographic variables, subjectively assessed oral health, general health, oral health behaviour and clinical oral health. A further aim was to analyse whether the original subscales of the DIP were similar to the subscales found in a Norwegian population 35–47 years of age.

Materials and methods

Participants

A random sample was drawn from four municipalities comprising 129 000 inhabitants in the county of Nord-Trøndelag, Norway (21). The selection procedure was computerized, and the sample was randomly selected from the birth cohorts for the periods 1971–1962 and 1960–1959 using the birth register. Participants were offered an oral health examination free of charge at dental clinics in the Public Dental Service. Invitations to participate and information about the study were sent to 400 individuals.

Overall, 249 individuals (62%) accepted to participate in the study. All non-participants were contacted over the phone; 53 had moved from the area, 49 stated that they did not have time to participate, 27 were not interested and 22 were impossible to contact. No statistically significant differences could be found between participants and non-participants regarding age or gender. Of the 249 participants, six individuals did not answer all questions in the DIP and one individual was edentulous. These individuals were excluded from the analyses. The final number of 242 individuals was thus included in the analyses. Written informed consent was obtained from all participants. The study was approved by the Regional Ethical Committee Mid-Norway (ref 4.2006. 250 – date 06.04.06) and approved by the Norwegian Research Council.

Data collection

Data were collected in October and November 2006 and comprised clinical examination and self-administered questionnaire. The participants completed the questionnaire in the dental clinic before the oral examination.

Questionnaire

The questionnaire included questions regarding demographic questions (age, gender and length of education), oral health behaviour (dental visits, oral hygiene behaviour), subjectively assessed oral health (self-rated oral health and satisfaction with oral health) and self-rated general health. Education was measured by the number of years in school and dichotomized into 12 years or less and more than 12 years.

Frequency of dental visits was assessed with the question: 'Have you visited the dentist/dental hygienist at least once per year during the last 5 years?' The responses were 'yes' or 'no' and labelled regularly or irregularly. Oral hygiene behaviour was assessed with the questions: 'How often do you brush your teeth, and do you use dental floss, tooth picks, inter-dental brush, fluoride tablets and/or oral rinse?' The responses were monthly or more often (daily, weekly or monthly) and less often than monthly (less often or never). The responses regarding dental floss, toothpicks and inter-dental brush were condensed into one variable: inter-proximal cleaning.

Subjectively assessed oral health was assessed with the two questions: 'How do you rate your oral health' and 'how satisfied are you with your oral health?' The responses were given on a 5-point Likert scale ranging from very poor/dissatisfied to very good/satisfied. The responses were dichotomized into good (very good, good, neither nor, satisfied, very satisfied) and poor (poor, very poor, dissatisfied, very dissatisfied).

Self-rated general health was assessed with the question: 'How do you rate your general health?' The responses were given on a five-point Likert scale ranging from very poor to very good. The responses were dichotomized into good (very good, good, neither, nor) and poor (poor, very poor).

The impact of oral health on quality of life was assessed using the DIP. This is a 25-item questionnaire with three response alternatives; positive, negative or no effect. The time frame was the previous 12 months. The original Dental Impact profile was divided into four subscales: eating, health/wellbeing, social relations and romance, with five to nine items in each subscale.

The Dental Impact profile was translated into Norwegian by an experienced researcher and was back-translated independently by two dental researchers with English as their first language. The translations were very similar to the original DIP.

Clinical examination

The clinical examinations were performed by one dentist and one dental hygienist in a fully equipped dental clinic using mirror and a probe. A calibration session was performed prior to the study in which three patients were examined independently and the results were identical. The number of teeth present in the mouth and number of teeth with dental caries were recorded. The number of teeth was dichotomized into 1–22 and 23–28 teeth. Dental caries experience was registered using the DMFT-index according to the WHO criteria (22). A tooth was registered as decayed when caries extended into the dentin. The third molar was not included to enable comparison with previous studies.

Statistical analyses

Data analyses were performed using SPSS for Windows, version 16.0. (SPSS Inc., Chicago, IL, USA) Associations between categorical variables were tested using Pearson's Chi-square. Differences in numbers of positive effects were analysed with Student's *t*-test. The variables (decayed teeth, self-rated oral health, inter-proximal cleaning) that bivariately had significant associations with numbers of positive effects reported in the DIP were entered into multivariate regression analysis with the DIP score as dependent variable. The internal consistency reliability between the 25 items and within each of the four subscales was assessed using Cronbach's alpha. An explorative factor analysis was applied using principal component analyses (PCA) with oblique varimax rotation to identify underlying factors that explain patterns of correlations between the 25 items in the DIP. *P*-values <0.05 were considered statistically significant.

Results

The mean age of the respondents was 42.3 (SD = 3.9) years, mean number of teeth was 27 (SD 2.4), and mean DMFT was 14.9 (SD 5.5) (range 0–28). The sample included 49% women and 51% men. A total of 64% had 12 years or fewer of education. Most individuals had 23 teeth (95%) or more and fewer than two decayed teeth (84%). Most individuals (69%) visited a dental clinic regularly, and 97% brushed their teeth on a daily basis. Inter-proximal cleaning was performed monthly or more often by 89% and oral rinse was used monthly or more often by 31%. The majority (96%) of the individuals rated their general health as good, 95% rated their oral health as good and 83% were satisfied with their oral health (Table 1).

The mean number of items on the DIP reported to have positive effect on daily life was 19 of 25 items. Table 1 shows the number of positive effects reported on the DIP according to the independent variables. The individuals with fewer than two decayed teeth reported positive effects on more items of the DIP (19.6 items) than individuals with two or more decayed teeth (17.3 items) ($P = 0.03$). Individuals who rated their oral health as good reported more items to be positively affected (19.5 items) than those who rated their oral health as poor (14.7 items) ($P < 0.01$). Individuals who reported inter-proximally cleaning monthly or more often reported more items to have positive effects on daily life (19.5 items) than

Table 1. **Number (mean and SD) of positive effects reported on the Dental Impact Profile. Proportion of individuals reporting positive effects on all 25 items according to the independent variables (*n* = 242)**

		Number of positive effects			Individuals with 25 positive effects	
	n (%)	Mean	SD	*P*-value	%	*P*-value
Gender						
Female	118 (49)	19.5	6.4	0.46	25	0.07
Male	124 (51)	18.9	5.5		16	
Education						
≤12 years	154 (64)	18.9	6.1	0.26	20	0.55
>12 years	88 (36)	19.8	5.7		23	
Number of teeth						
1–22 teeth	11 (5)	17.9	7.8	0.46	27	0.58
23–28 teeth	231 (95)	19.3	5.9		20	
Decayed teeth						
0–1	204 (84)	19.6	5.8	0.03	22	0.39
>1	38 (16)	17.3	6.4		28	
Dental visits						
Regular	168 (69)	19.0	6.0	0.45	19	0.20
Irregular	74 (31)	19.7	5.8		26	
Satisfaction with oral health						
Satisfied	201 (83)	19.5	5.3	0.91	19	0.14
Dissatisfied	41 (17)	17.8	8.4		29	
Self-rated oral health						
Good	229 (95)	19.5	5.8	<0.01	21	0.98
Poor	13 (5)	14.7	7.2		21	
Self-rated general health						
Good	233 (96)	19.3	5.9	0.88	22	0.12
Poor	9 (4)	15.9	6.8		0	
Inter-proximal cleaning						
Monthly or more often	215 (89)	19.5	5.7	0.04	21	0.77
More seldom than monthly	27 (11)	17.0	7.7		19	
Oral rinsing						
Monthly or more often	74 (31)	19.5	6.1	0.58	24	0.39
More seldom than monthly	168 (69)	19.1	5.9		19	

those who reported inter-proximal cleaning less often (17.0 items) ($P = 0.04$).

When the variables decayed teeth, self-rated oral health, and inter-proximal cleaning, the variables bivariately associated with number of positive effects reported on the DIP, were included in multivariate analysis, none of the variables was statistically significantly associated with the number of positive effects reported (results not shown).

The numbers and proportions of individuals reporting positive, negative or no effect for each item on the DIP are shown in Table 2. In all items in the questionnaire, more than 50% of the individuals reported that oral health had effect with the exception of the item 'weight', which only 37% considered to be affected by oral health (Table 2). A total of 230 individuals (95%) reported positive effects on at least one item, while only 3% of the individuals reported that one or more items were negatively affected. Only three individuals, 1%, reported no effects at all of oral health on the items in the DIP.

The items most frequently reported to be influenced, either positively or negatively, by oral health were the following: chewing and biting, eating, smiling and laughing, feeling comfortable and appearance to other people (Table 2). The same items were most frequently reported to be positively influenced by oral health. However, feeling comfortable was the item most individuals (3%) reported to be negatively affected by oral health.

The internal consistency of reliability within the subscales ranged from 0.78 to 0.83 measured by Cronbach's alpha (Table 2). The mean proportion of individuals who reported positive, negative or no effects of oral health according to the original subscales is shown in Table 2. In the subscale eating, on average, 59% of the individuals reported positive effects on all items, while in the other subscales, on average, 28% to 56% reported positive effects on each items in the subscale. The greatest variation in the proportion of individuals (range 37–95%) reporting positive effects on all items within one subscale was in the subscales health/wellbeing. The greatest variations in the proportion of individuals reporting negative effects within one subscale were in the subscale health/wellbeing (range 0–3%) (Table 2).

The factor analysis resulted in four subscales with partly different items included compared with the original subscales (Table 3). The fourth subscale was labelled life in general, and items from the original subscale romance were mostly

Table 2. **Number and proportions of individuals reporting, positive, negative and no effects according to item in the Dental Impact Profile item. Mean proportion of individuals reporting positive effects on each item in the subscale and Cronbach's alpha for each original subscales ($n = 242$)**

	Individuals reporting effect				
	Mean positive effects on items in the subscale (%)	Positive	Negative	No	
Items		*n* (%)	*n* (%)	*n* (%)	Cronbach's alpha
Eating					
1 Eating	59	228 (94)	2 (1)	12 (5)	0.78
2 Chewing and biting		230 (95)	5 (2)	7 (3)	
3 Enjoyment of eating		194 (80)	2 (1)	46 (19)	
4 Food you chose to eat		18 184 (76)	5 (2)	53 (22)	
5 Tasting		194 (80)	2 (1)	46 (19)	
Health/wellbeing					
6 Feeling comfortable	28	220 (91)	7 (3)	15 (6)	0.80
7 Enjoyment of life		179 (74)	0 (0)	63 (26)	
8 General happiness		213 (88)	2 (1)	27 (11)	
9 General health		191 (79)	3 (1)	48 (20)	
10 Appetite		157 (65)	3 (1)	82 (34)	
11 Weight		90 (37)	2 (1)	150 (62)	
12 Living a long life		155 (64)	0 (0)	87 (36)	
Social relation					
13 Appearance to others	35	218 (90)	2 (1)	22 (9)	0.83
14 Facial appearance		211 (87)	2 (1)	29 (12)	
15 Smiling and laughing		225 (93)	2 (1)	15 (6)	
16 Moods		191 (79)	2 (1)	49 (20)	
17 Speech		198 (82)	0 (0)	44 (18)	
18 Breath		198 (82)	0 (0)	44 (18)	
19 Attendance at activities		126 (52)	2 (1)	114 (47)	
20 Success at work		121 (50)	0 (0)	121 (50)	
21 Having confidence around others		191 (79)	3 (1)	48 (20)	
Romance					
22 Social life	56	184 (76)	0 (0)	58 (24)	0.79
23 Romantic relationships		184 (76)	0 (0)	58 (24)	
24 Having sex appeal		170 (70)	2 (1)	70 (29)	
25 Kissing		198 (82)	0 (0)	44 (18)	

Table 3. **Subscales adjusted according to the factor analysis with number and proportion of individuals reporting positive, negative and no effects according to item in the Dental Impact Profile. Mean proportion of individuals reporting positive effects on each item within the subscale and Cronbach's alpha for the new subscales (*n* = 242)**

		Individuals reporting effect			
Number of items	Mean positive effects on items in the subscale (%)	Positive *n* (%)	Negative *n* (%)	No *n* (%)	Cronbach's alpha
Eating					
1 Eating	77	228 (94)	2 (1)	12 (5)	0.75
5 Tasting		194 (80)	2 (1)	46 (19)	
2 Chewing and biting		230 (95)	5 (2)	7 (3)	
Health/wellbeing					
9 General health	50	191 (79)	3 (1)	48 (20)	0.86
3 Enjoyment of eating		194 (80)	2 (1)	46 (19)	
17 Speech		198 (82)	0 (0)	44 (18)	
18 Breath		198 (82)	0 (0)	44 (18)	
4 Food you chose to eat		184 (76)	5 (2)	53 (22)	
7 Enjoyment of life		179 (74)	0 (0)	63 (26)	
23 Romantic relationship		184 (76)	0 (0)	58 (24)	
Social relation					
6 Feeling comfortable	46	220 (91)	7 (3)	15 (6)	0.90
21 Having confidence in others		191 (79)	3 (1)	48 (20)	
13 Appearance to other people		218 (90)	2 (1)	22 (9)	
16 Moods		191 (79)	2 (1)	49 (20)	
25 Kissing		198 (82)	0 (0)	44 (18)	
15 Smiling and laughing		225 (93)	2 (1)	15 (6)	
24 Having sex appeal		170 (70)	2 (1)	70 (29)	
14 Facial appearance		211 (87)	2 (1)	29 (12)	
22 Social life		184 (76)	0 (0)	58 (24)	
8 General happiness		213 (88)	2 (1)	27 (11)	
Life in general					
12 Living a long life	26	155 (64)	0 (0)	87 (36)	0.80
19 Attendance at activities		126 (52)	2 (1)	144 (47)	
20 Success at work		121 (50)	0 (0)	121 (50)	
10 Appetite		157 (65)	3 (1)	82 (34)	
11 Weight		90 (37)	2 (1)	150 (62)	

included in the new subscale social relations (Table 3). The internal consistency of reliability, assessed by Cronbach's alpha, was higher in these new subscales (0.75 – 0.90). On average, 77% of the respondents reported that oral health had a positive effect on the items included in the subscale eating, 50% in the subscale health and wellbeing, and 46% in the subscale social relation, while on average, only 26% of the individuals reported that oral health had positive effect on the items in the subscale life in general (Table 3). The variations within the subscales were smaller in the new subscales compared with the original subscales except for the subscale life in general.

Discussion

This is the first comprehensive epidemiological study measuring the impact of oral health on life in general assessed with the DIP among individuals in Norway. The main finding from the present study was that the great majority of individuals 35–47 years of age reported that oral health had an influence on daily life, indicating that they consider oral health to be important for quality of life in general. All items included in the DIP with the exception of weight were considered to be influenced by oral health by at least 50% of the respondents.

The study used the DIP to measure both positive and negative impacts of oral health on quality of life. This instrument was constructed for use in the elderly and has not previously been used in younger adults. The results of this study indicate that, used in 35- to 47-year-olds, the instrument showed acceptable validity and reliability. Individuals who rated their oral health as good and those who had fewer decayed teeth reported more positive effects of oral health on daily life, which strengthen the validity. The internal consistency reliability for all items in the instrument and within the subscales was in the range 0.78–0.83, measured by Cronbach's alpha, which is similar to the results reported by Strauss and Hunt (12).

The original subscales were constructed based on a factor analysis in an elderly population in North Carolina, USA, and the authors hypothesized that the impact of teeth and dentures on a person's life would be age-dependent and reflect values and experiences of various cultural groups. The factor analysis

showed that in a Norwegian group of adults, a somewhat different subclassification of items appeared. There was a greater difference in the proportion of positive effects between the new subscales (Table 3). In addition, the variation within the new subscales was smaller, indicating that the new subscales suited the present population better.

It seems reasonable that the great majority reported that oral health positively affected aspects of eating and that oral health was of less importance for life in general, including items such as weight, success at work and attendance at activities. This indicates that many individuals find that other factors than oral health is of more importance for these aspects of daily life.

The great majority of respondents reported that oral health had positive effects on many aspects of daily life in the separate items. The items related to eating were the functions that most of participants reported to be positively affected. This was an expected finding, as teeth are directly involved in chewing and biting, and thus enjoyment of eating. In addition and as expected, aesthetic aspects of oral health were considered important and were reported by more than 90% of the individuals to have impact on smiling and appearance. These findings indicate that, in the clinical setting, the perceived importance of oral health on function and aesthetics could be used to motivate patients to comply with oral advice and treatment plans.

An important finding in this study was that very few individuals (3%) reported negative effects of oral health on daily life. In eight of 25 aspects of daily life, no negative effects at all were reported, and in the remaining aspects of daily life, very few reported negative effects. This is in contrast to the results Strauss and Hunt (12) found in a study using a sample of older adults in which more than 10% of the respondents reported negative effects in 12 of 25 items in the DIP. This may indicate that individuals in the present age group (35–47 years of age) were more satisfied with their oral health and considered teeth to have more positive effects on quality of life than older people. The sample in the present study was fairly homogenous with regard to age, education, clinical oral health and use of dental services. This younger age group may not have experienced many oral problems. The majority had a complete dentition and few carious lesions, which may be the reason for reporting fewer negative effects of oral health than older people. However, in a recently published study on OHRQoL assessed with OHIP-14 in the age group 30–49 years, 38–44% reported problems in the oral cavity and 10–12% reported frequent problems (11). Still the majority in the present study considered that the oral health had a positive effect on their daily life. This supports the conclusion that oral health plays an important role in the daily life.

In this study, the individuals with fewer than two decayed teeth reported more positive effects on quality of daily life than those with more decayed teeth. The number of decayed teeth seemed in the present population to impact daily life in contrast to previous findings in an older age group in Norway (10). The results indicate that the documented decrease in dental caries prevalence in adults (13) has a positive effect on the quality of life experienced by the individuals.

In this study, individuals who rated their oral health as good reported positive effects on more aspects of daily life compared with other individuals. The individuals who reported that their oral health was good may be of the opinion that good oral health contributes positively to their health-related quality of life which emphasizes the value of good oral health.

In this study, individuals who reported that they cleaned their teeth inter-proximally often reported more positive effects on daily life compared with others. It is plausible that individuals who experience positive effects value their oral health more highly and consequently perform inter-dental cleaning more often than others.

Even though the bivariate associations did not reach statistical significance in the multivariate analysis in this study, these results showed that self-rated oral health, number of decayed teeth and oral hygiene habits had effects on daily life.

Knowledge about why and how oral health matters in daily life is useful to pinpoint the topics that motivate individuals to adopt optimal oral health behaviours. More research is needed regarding the frames of reference people use in constructing their responses to questions designed to assess oral health perceptions (23), and interviews, which permit qualitative analysis would be a suitable method. It is not possible to assess more complex and comprehensive perceptions using questionnaire.

In conclusion, this study showed that most adults reported oral health to be important for masticatory functions and confirmed that oral health also has an impact on other aspects of daily life. Those who rated their oral health as good had few teeth with dental caries and those who practised good oral hygiene behaviour reported more often that oral health had positive effects on daily life than did other individuals.

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