

ORIGINAL ARTICLE

Oral health-related quality-of-life in homebound elderly dependent on moderate and substantial supportive care for daily living

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Abstract

Objectives. To describe the oral health-related quality-of-life in homebound elderly dependent on moderate and substantial supportive care for daily living. **Materials and methods.** A total of 302 selected persons in three counties in Sweden over 65 years of age and in need of daily support from society participated in the study. Half of the participants had moderate needs of support, defined as supportive care of 15–50 h per month and half had substantial needs of supportive care, i.e. 3-times a day with a night overview. An oral examination was performed and structured questions were asked about general health and living conditions, medication, oral care routines and quality-of-life, using the instrument GOHAI (Geriatric Oral Health Assessment Instrument). **Results.** Cardiovascular disease was common and an average of seven prescription drugs was used. More than half of the participants had dentures. The strongest correlation with GOHAI was the total number of teeth. There was a significant difference between individuals with moderate and substantial needs according to GOHAI, irrespective of gender. More elderly people with substantial needs of support had low GOHAI values. Decayed teeth, DT/T, root remnants and dry mouth were negatively correlated to GOHAI among individuals with substantial needs. **Conclusions.** This study found that elderly homebound individuals with substantial needs of supportive care had a lower quality-of-life than elderly homebound individuals with moderate needs of supportive care, although both medical and odontological variables were similar in the groups.

Key Words: *chewing capacity, oral diseases, oral health, social conditions, quality-of-life*

Introduction

Oral health-related quality-of-life is a relatively new expression of increasing interest. It is originated in the quality-of-life concept and covers the idea that oral health has a special impact on the quality-of-life. Some reports describe oral health as a factor of great importance for general health and others describe generally poor health as negatively affecting oral health and oral health-related quality-of-life [1,2]. This is an important issue in relation to the elderly, and especially the dependent elderly. Reports describe an extensively decreasing proportion of edentulous elderly individuals in recent years [3], but at the same time there is a higher prevalence of dental problems in the medically compromised elderly [4,5]. In 1999, legislation came

into force in Sweden giving elderly people in need of extensive supportive care from the community the right to a free, in-home, oral health assessment [6]. Eligibility is based on the level of supportive care for daily living required by the individual and dental treatment following the oral health assessment is offered at a very low cost. The primary goals of this support are to increase the quality-of-life and the ability to chew for the dependent elderly. Improved chewing ability has the potential to increase the nutrition status [7], but we also want to ask: does this have a major oral health impact on the quality-of-life in this particular group of individuals who suffer from various diseases and functional limitations?

Locker et al. [8] reported, from a study in a long-term care centre, that oral disorders had significant

effects on the well-being and life satisfaction of the individuals, even when they had high rates of chronic physical and mental conditions and physical disabilities. It is a trend in Sweden that more dependent persons with wider disabilities are living at home, with support from relatives and community home-care assistants. They may have other experiences of oral health-related quality-of-life than dependent persons in institutions. The present paper deals with the results from a study where we collected data both from traditional oral health variables and patient-oriented variables concerning medical and social reports about healthcare and dental care visits and oral health-related quality-of-life. The first report from this study showed that elderly individuals with moderate and substantial needs of supportive daily care had similar general health. Individuals with substantial needs had more caries and more often bleeding gums, but other characteristics of oral health did not differ in relation to the need of daily support. In spite of the reported general increase of dentate elderly, this study group had lost many teeth and often had removable dentures [9]. Elderly people with moderate needs of support were more likely to maintain good oral hygiene and this acceptable level of self-care resulted in fewer oral diseases. One quarter of the elderly people with substantial needs of support received help with their oral hygiene, but this assistance did not decrease the prevalence of oral diseases [10]. The aim of the present paper was to describe the oral health-related quality-of-life, including the ability to chew, in homebound elderly individuals dependent on moderate and substantial supportive care for daily living.

Materials and methods

The study was approved by the Ethics Committee, Faculty of Medicine, Uppsala University, Sweden. Informed consent was obtained from all participants before the examination and data collection were performed.

Population

A total of 302 individuals from three counties in Sweden, over 65 years of age and in need of daily support from society, participated in the study. Half of the participants had moderate needs of support, defined as supportive care of 15–50 h per month and half had substantial needs of supportive care, i.e. 3-times a day and with night monitoring. An equal number of participants were included from each of the counties: Gävleborg, Uppsala and Västmanland. The sample consisted of both urban and rural populations. The municipality provided the researchers with lists of all the people with supportive care for daily living.

Birth dates were used for selection by drawing lots and people on the lists who were born on the selected dates were offered the opportunity to take part in the study.

The inclusion criteria were:

- 65 years of age or older,
- residing in ordinary accommodations with supportive daily care of either (a) moderate needs defined as supportive care of 15–50 h per month or (b) substantial needs, i.e. 3-times a day and with night monitoring,
- birth date on one of the randomized days selected, and
- possible to contact the person, relative or proxy.

Exclusion criteria were:

- limited knowledge of Swedish (needed an interpreter), and
- cognitive limitations which made communication impossible.

Interview and examination

All participants were offered an appointment at a dental clinic, with the alternative of a home visit from dental personnel. The interviews and examinations were performed by three dentists and dental hygienists, one team in each county. The dental hygienists were trained to carry out a patient interview before the examination and the dentists were calibrated with respect to the examination procedure to ensure equivalent assessment of clinical variables. Structured questions were asked orally about general health and medication, social and physical conditions, oral hygiene routines and quality-of-life. Mostly the participants answered the questions themselves, but when necessary relatives or care personnel completed the answers. Medication was validated by registrations in the medical record. The oral examination was performed with a mirror, probes and light from a flashlight or surgical lighting and, if it was performed at a dental clinic, appropriate X-rays were taken with the purpose of diagnosing dental caries. During the study examinations the dentists did not know the patient's level of supportive needs. For description in details of the clinical examination, we refer to the first report from the study [9].

Medical anamnesis

Presence of heart disease, diabetes and pneumonia were registered in addition to medication. Drugs with systemic impacts were included, while vitamins and minerals were excluded (ATC classification A11 and A12) [11]. Functional limitations concerning mobility in hands and oro-facial muscles and the need of walking aids were registered.

Variables for patient perspective

Oral health-related quality-of-life. The instrument GOHAI (Geriatric Oral Health Assessment Instrument or General Oral Health assessment) was used to describe the patient's experienced oral health-related quality-of-life. GOHAI is a 12 item questionnaire with negatively and positively worded items evaluating three dimensions of oral health-related quality-of-life:

- Physical function, representing the pattern of speech, eating and swallowing.
- Pain or discomfort, representing the use of medication to relieve pain or discomfort.
- Psycho-social function, representing the concern about oral health, dissatisfaction with appearance, self-consciousness about oral health and avoidance of social contacts because of oral problems.

The GOHAI has been translated to many languages and we used the Swedish version that has shown acceptable reliability and validity [12].

The instrument was used as an interview formula, by a dental hygienist, supplemented with questions to the relative or nursing personnel, to compensate for limitations in visual and cognitive function.

Social anamnesis

The following data was collected concerning:

- Whether the living conditions impacted on the possibility of attending a dental clinic,
- Living alone or with a partner,
- Whether the individual prepared food or received meals on wheels, and
- Help and support from relatives.

Consumption of care

The following data was collected concerning:

- How often the individual visited a dental clinic.
- Whether the individual were registered at a special dental clinic.
- Whether the cost, dental fear or something else were obstacles for dental care.
- How often the individual visited the primary care facility or a hospital.

Oral examination

The number of teeth with a natural root and functioning root remnants was registered. The presence of full and partial dentures in upper and lower jaw was noted as well as whether dentures were supported by implants. By Eichners's index we registered the occlusal contacts in different zones, posterior and anterior [13]. Caries affecting the dentine was registered with the tooth as unit, DT (decayed tooth). Teeth previously restored were registered using the

DFT index (decayed-filled tooth). Periodontal status was described by measuring the number of teeth with gingival pockets deeper than 5 mm together with the number of mobile teeth. Bleeding on probing was measured using the Modified Sulcus Bleeding Index [14] with four levels. Level 1 was used when no bleeding was registered when probing with slight pressure along the marginal gingival. Level 4 corresponded to profuse bleeding at probing. The amount of saliva was measured by moving a dry dental mirror over the buccal mucosa. When the mirror was stuck to the mucosa the mouth was considered to be dry [15]. A plaque and mucosa score index was registered in four levels. Values for plaque were used for both teeth and dentures. The scores for plaque and mucosa were added and constituted three levels:

- 2–4 = acceptable;
- 5–6 = unacceptable; and
- 7–8 = bad.
- A description of oral hygiene routines was made by considering:
 - Whether the individual received help with oral hygiene;
 - How often the individual cleaned teeth and dentures, including approximal cleaning; and
 - Whether the individual used tooth paste with fluoride and/or other fluoride products.

Statistics

A power assessment showed that a number of 150 individuals with moderate and substantial needs of supportive care, respectively, would make it possible to detect mean differences of $\geq 7\%$ between the groups, calculated on the variable remaining teeth. All results in the study were transferred to a database and logical checks were made on individual and group levels. The quality controls of the transfer process showed a margin of error of 0.003. Descriptive analyses of the answers to the questionnaires were shown in frequency tables, split into needs of supportive levels. Quantitative variables were analysed with *t*-test or Mann-Whitney test when an uneven distribution was present and the Chi square test was used for qualitative variables. Correlations were tested with Spearman Rank correlation. The association between high GOHAI-scores and several variables registered in the study was analysed using a stepwise logistic regression analysis. The logistic model was adjusted for age, sex, number of teeth and need of supportive care. A *p*-value < 0.05 was considered statistically significant.

Results

A total of 302 people participated in the study. The dropout rate was 30.6% for people with moderate needs of supportive care and 20.4% for those with

Table I. Age (years) and gender among dropouts with moderate and substantial need of supportive care.

	Moderate	Substantial
Age, median	87	85
Age, range	70–101	65–101
Men, %	30.3	25.0

substantial needs. Reasons for refusing to participate were insufficient strength, no experienced need for dental care or already having a dentist. The age and sex of dropouts and participants are shown in Tables I and II. Twelve per cent of the participants with moderate support needs and 13% of those with substantial needs chose to be examined at the dental clinic.

The people with substantial needs had more functional limitations and were more often wheelchair-bound, while the group with moderate needs did more of their own cooking and were more often single (Table III). According to dental visits, dentate participants more often had regular dental care ($p < 0.001$). Some participants named the cost and fear but, for the majority, there were no clearly-defined obstacles to dental care.

The participants with moderate needs of support had similar numbers of teeth to those with substantial needs (mean 11.7 (10.1–13.3) and 9.8 (8.3–11.4), respectively). Neither was there a significant difference between individuals with moderate and substantial needs of supportive care as regards being edentulous or having removable dentures. More than half of the participants in both groups wore dentures. About 20% of the participants, irrespective of support needs, had occlusal contacts in all four occluding zones according to Eichner's index. Participants with substantial needs of supportive care had more teeth with active caries lesions and higher levels of bleeding on probing than those with moderate needs (Figure 1). Full details about clinical findings in the study can be shown in previous reports [9,10].

There was a significant difference between individuals with moderate and substantial needs according to GOHAI, irrespective of sex. More of the participants with substantial needs of support showed low GOHAI values (Figure 2), although the median values only differed by one unit between the groups (56 and 57, respectively).

Table II. Age (years) and gender among participants with moderate and substantial need of supportive care. Difference between groups analysed with Chi-square test.

	Moderate	Substantial	<i>p</i> -value
Age, median	86	84	0.018
Age, range	66–98	66–100	
Men, %	25.3	46.4	< 0.001

When we considered upon the correlation between traditional oral health variables and GOHAI, we noticed that DT/T ($p < 0.05$), root remnants/GOHAI ($p < 0.05$) and dry mouth/GOHAI ($p < 0.05$) were negatively correlated to GOHAI among individuals with substantial support needs. Eichner's index was correlated to GOHAI question number 2: 'How often do you have problems with biting or chewing solid food?' The fewer occluding zones an individual had, the greater the difficulties in chewing ($p < 0.05$). When we only included the answers from those questions in GOHAI dealing specifically with the ability to chew, numbers 1, 2 and 11, we also noticed the most statistically significant correlations between oral health variables and GOHAI among the participants with substantial support needs. Negative correlations dominated, but for the variables number of teeth and no bleeding on probing, the correlation with GOHAI was positive.

The strongest correlation with GOHAI was for the total number of teeth (Table IV). In a logistic regression test GOHAI was transferred to a dichotomous variable that separated ~ 25% of the individuals with the highest scores from those with lowest values (total GOHAI < 57 and ≥ 58 , respectively). Totally 17 variables were tested in the initial model. The tested variables were collected from the areas: background factors (age, gender, level of supportive care), social conditions (having a permanent partner, obstacles for dental visits, having an own dentist, oral functional limitations), general health (number of medicines), oral health (number of teeth, xerostomia, at least one edentulous jaw, having removable prosthetics, prevalence of caries, gingival bleeding) and oral

Table III. Description of general health and social conditions (percentage of individuals). Medicines shown as median and range. Quantitative variables were analysed by Mann-Whitney test and qualitative variables with Chi-square test.

	Moderate (<i>n</i> = 151)	Substantial (<i>n</i> = 151)	<i>p</i> -value
Heart disease	74.8	74.2	NS
Diabetes	25.2	17.2	NS
Recent pneumonia	9.9	12.6	NS
Number of medicines (median)	6	7	NS
Number of medicines (range)	0–22	0–27	NS
Oral functional limitations	4.0	15.2	0.001
Manual functional limitations	27.2	44.4	0.003
Use of wheelchair	7.9	41.7	< 0.001
Obstacles for dental visits	24.5	29.1	NS
Being married or permanent partner	15.2	29.1	0.005
Preparing food	35.1	4.6	< 0.001
Help from relatives	80.1	78.8	NS
Having own dentist	59.6	59.6	NS

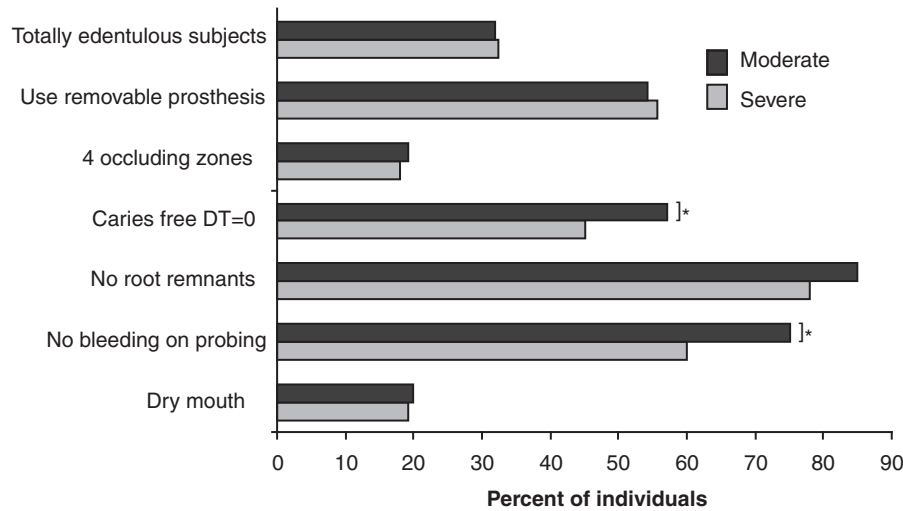


Figure 1. Proportion of subjects with varying oral status. Prevalence of caries, root remnants and gingival bleeding are shown for dentate subjects. *Statistically significant differences $p < 0.05$ (Mann-Whitney test).

hygiene (plaque index, mucosa index, oral hygiene habits). After adjustments a final model was calculated showing that the only variable with significant association with GOHAI-values ≥ 58 was the total number of teeth (OR = 1.06, 95% confidence interval = 1.02–1.10, $p < 0.01$).

Discussion

Oral health-related quality-of-life in homebound elderly dependent on moderate and substantial supportive care for daily living showed the strongest

correlation to the total number of teeth. More of the participants with substantial needs of support showed low GOHAI values. The presence of root remnants, dry mouth and few occlusal contacts appeared to have a greater negative impact on experienced oral health-related quality-of-life in participants with substantial than with moderate needs of support.

Our cut-off value for moderate need of support was 15–50 h in a month. This range includes a variety of support measures and perhaps we would have found even greater differences if we had defined the groups more narrowly. The main reason for which we were unable to do so was the different ways of organizing the home support system in the communities. However, the result still points out the importance of oral health when it comes to quality-of-life in the dependent elderly.

We chose to use GOHAI to measure oral health-related quality-of-life, although there are also other similar instruments validated for use in Sweden, such as the Oral Health Impact Profile (OHIP) [12] and Oral Impacts on Daily Performances (OIDP) [16]. We could have chosen the widespread OHIP, preferably in its short form, OHIP-14, but GOHAI has been suggested as an instrument that measures aspects of life which medically-compromised elderly people regard as being important, while OHIP-14 taps more severe problems [8]. The mean score of GOHAI was high in this study as compared with other investigations of the elderly in Western countries. Both a British and a German study of elderly individuals older than 75 had mean GOHAI scores of 54, as compared to 56–57 in our study [17,18]. One explanation given by a participant of 85 in the present study may apply more generally and had to do with expectations: ‘When you are as old as I am you can’t expect to be able to chew’ was a common answer. If

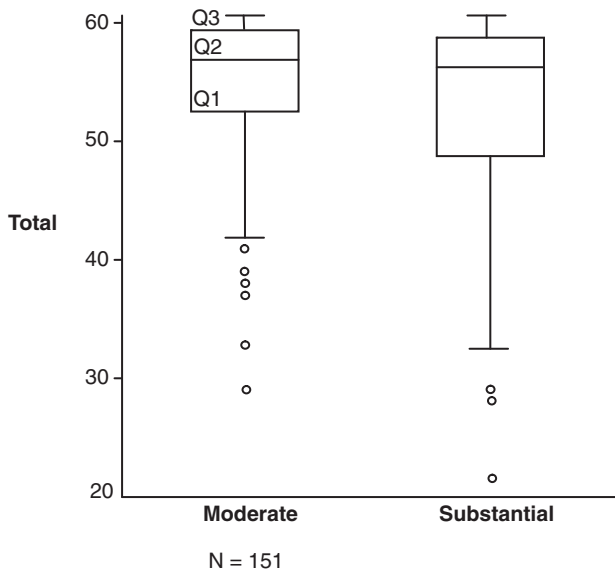


Figure 2. Distribution of GOHAI for individuals with moderate and substantial needs shown in a Box plot graph. The boxes are showing the lower quartile (Q1), median (Q2) and upper quartile (Q3). Significant differences moderate vs substantial (Wilcoxon test, $p < 0.01$).

Table IV. Spearman Rank correlation between GOHAI, question 1, 2 and 11, and oral health variables according to all subjects and levels of needs of supportive care.

Oral health variable	All subjects			Moderate			Substantial		
	<i>n</i>	Corr	<i>p</i>	<i>n</i>	Corr	<i>p</i>	<i>n</i>	Corr	<i>p</i>
Edentulous lower jaw	302	-0.160	< 0.01	151	-0.080	NS	151	-0.209	< 0.01
Totally edentulous subjects	302	-0.108	0.006	151	-0.080	NS	151	-0.127	NS
Number of teeth	302	0.272	< 0.001	151	0.215	< 0.01	151	0.303	< 0.001
DFT/T	205	-0.175	< 0.05	103	-0.012	NS	102	-0.293	< 0.01
DT/T	205	-0.168	< 0.05	103	-0.101	NS	102	-0.181	NS
Root remnants	301	-0.162	< 0.01	150	-0.076	NS	151	-0.204	< 0.05
Removable prosthesis	302	-0.127	< 0.05	151	-0.172	< 0.05	151	-0.072	NS
Bleeding level 1	205	0.217	< 0.01	103	0.159	NS	102	0.211	< 0.05

this is a true explanation, the GOHAI instrument has limited validity among such old-dependent individuals. Locker et al. [8] showed that the main oral problems of a population in a long-term care centre were missing teeth, dry mouth and limited chewing ability. This finding is comparable with the findings in our study, since long-term care centres are for individuals with substantial needs of care. Other studies of community-dwelling elderly with disabilities have shown that few teeth and the need of dental care are negatively related to quality-of-life [19,20], but are these facts aspects of the ability to chew? Large studies often collect data about the number of teeth, but seldom their placement, i.e. occlusal contacts.

It has been stated that, in individuals with 10 or more missing teeth, the number of occluding pairs of teeth decreases and this impairs chewing ability and eating [21]. Andersson et al. [22] found that individuals with more than 10 missing teeth and a jaw opening < 40 mm had significantly increased oral impacts on daily life and that these conditions were more common among individuals ≥ 60 years. In addition, a Japanese study has found that chewing capacity in the elderly is more associated with high level functional capacity such as intellectual activity and social role than is number of teeth [23]. However, although the significant odds ratio shown in the logistic regression model was close to 1 (OR = 1.06), the number of teeth was the strongest variable associated with both total GOHAI score and the specific questions that dealt with chewing capacity.

Oral dryness has been showed to impact on oral health-related quality-of-life in patients receiving homecare nursing [24]. Oral dryness also impact on the ability to chew. Old people with subjective oral dryness are more likely to have problems with chewing and to experience problems with daily life such as eating [25]. Nutritional deficiencies and malnutrition may result in a weakened immune system and the development of general ill health [26]. The burden of medical diagnoses and medications has

been shown in previous studies to be greatest among the older participants and also to be significantly associated with oral health-related quality-of-life [27]. This scenario takes on additional significance with increasing age [28]. One recent study reports that oral health-related quality-of-life is significantly linked to the relationship between well-being and depression in early old age, while subjective health may contribute to mediating it [29]. Older individuals often report quality of life in terms of the ability to think clearly, to love, to make decisions for oneself, to live at home or to use one's mental abilities. Clinical symptoms need to be set in the context of the patient's lifestyle. Perhaps a better way of measuring oral health-related quality-of-life would be by asking: 'What does this problem stop you from doing?' [28].

Acknowledgements

We thank Mrs Lisa Wernroth for performing the statistical analysis and Mrs Linda Schenk for revising the English text. We also thank Dr Per Borvall for clinical assistance in the study. The Public Dental Health Services in Gävleborg, Uppsala and Västmanland County Council and King Gustaf V:s and Queen Victoria Foundation supported the study.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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