Oral health of frail and sick older people - Effect of systematic use of the mouth assessment instrument ROAG-J

Isabelle Johansson

Masters Programme in Oral Health Science
Thesis, 15 hp
Jönköping, 2014

Abstract

Objective: The oral health of older people is often poor, and worse among frail and sick elders than among healthy elders. The validated standardized mouth assessment instrument Revised Oral Assessment Guide – Jönköping (ROAG-J) is a tool for health professionals to examine and detect problems or illnesses in the mouth.

Aim: To investigate the effect of systematically using a mouth measurement instrument i.e. ROAG-J, in order to improve frail and sick older people's oral health. Method: A quantitative longitudinal study with empirical design using the ROAG-J was performed. The sample consisted of the Swedish Senior Alert register data, based on 667 individuals in a major municipality in the central part of Sweden, who had received two or more ROAG-J assessments between November 2011 and March 2014. The first and the last performed ROAG-J assessment were used for statistical analyses. Result: At both assessments, less than one third of the population was considered to have oral problems or illnesses. No significant difference was found between the first and the second assessments in any of the oral parameters. However, significant differences in prevalence of oral health deviations in women and men were found. Conclusion: Less than one third of the population was considered to have, or to be at risk, for oral health problems. Systematic usage of ROAG-J did not show to improve the oral health of institutionalized elders in this study. There was a discrepancy between prevalence of oral health deviations between this study and other studies.

Key words: Dental Care for Aged, Elderly Care, Nursing Staff, Preventive Dentistry.

Oral hälsa hos svaga och sjuka äldre – Effekten av systematisk användning av munbedömningsinstrumentet ROAG-J

Sammanfattning

Bakgrund: Den orala hälsan hos äldre är ofta dålig och sämre bland svaga och sjuka äldre än bland friska äldre. Det validerade och standardiserade munbedömningsinstrumentet Revised Oral Assessment Guide - Jönköping (ROAG-J) är ett verktyg med vilket vårdpersonal vid systematisk användning kan undersöka och upptäcka problem eller sjukdomar i munnen. Syfte: Att undersöka effekten av systematisk användning av munbedömningsinstrumentet ROAG-J på svaga och sjuka äldre med avseende att förbättra oral hälsa. Metod: En kvantitativ longitudinell studie med empirisk design med munbedömningsinstrumentet ROAG-J utfördes. Urvalet bestod av registerdata från det svenska kvalitetsregistret Senior Alert. Populationen utgjordes av 667 äldre personer i en större kommun i mellansverige och som hade fått två eller fler ROAG-J bedömningar mellan november 2011 och mars 2014. Den första och den sista utförda bedömningen användes för statistisk analys. Resultat: I båda bedömningarna ansågs mindre än en tredjedel av populationen ha orala problem eller sjukdomar. Ingen signifikant skillnad förelåg mellan den första och den andra bedömningen av någon av de orala parametrar som mättes. En signifikant skillnad hittades i förekomsten av avvikelser i munhälsan mellan kvinnor och män. Slutsats: Mindre än en tredjedel av befolkningen ansågs ha eller ha risk för problem med munhälsa. Systematisk användning av ROAG-J visade sig inte förbättra den orala hälsan hos institutionaliserade äldre i denna studie. Det fanns en diskrepans avseende prevalens av avvikelser i munhälsa mellan denna studie och andra studier.

Nyckelord: Förebyggande tandvård, Vårdpersonal, Äldreomsorg, Äldretandvård.

Introduction

The mean age in Sweden is increasing (1) and an increasing number of elders have more teeth left, often with advanced prosthetic constructions (2, 3). In October 2011, approximately 14% of all individuals in the age group of people over the age of 65 were granted home service (9%) or lived permanently in retirement homes (5%). Of those who were older than 80 years, 23% were granted home service and 14% lived in retirement homes (4). Maintaining oral health is usually more difficult in the context of the physical changes caused by aging, and therefore leads to an increased risk of caries, gingivitis, periodontitis and oral candidosis (5). Oral health has a major impact on quality of life of elderly by including appearance, communication and freedom from pain and discomfort (6, 7).

The oral health of elderly is often poor, and worse among frail and sick elders than among fit and active elders (8). It is a part of the nursing staffs' tasks to help residents with oral hygiene. Despite this a large proportion of residents in care homes today do not have adequate oral hygiene (9). A common opinion among nursing staff is that oral hygiene is a difficult task (10).

Systematic examinations of oral health to detect illness have rarely been carried out by the nursing staff in retirement homes. A standardized measurement instrument for health professionals has been developed to help to examine and detect problems and illnesses in the mouth and to determine if there is a need for improved oral hygiene or dental care (11). Senior Alert is a web-based quality register developed to improve and develop older people's care in Sweden. The measurement contains five instruments for prevention of fall, pressure sores, mal-nourishment, bladder dysfunction and oral health (12). The included standardized measurement instrument used for measuring oral health, Revised Oral Assessment Guide – Jönköping (ROAG-J), is an adapted version of ROAG (13) with added recommended care (14). ROAG has been shown to be effective in reducing problems with oral health during hospitalizations (15) and to be a useful tool for health professionals to identify the elderly patient's problems with oral health (16).

Very little research has been performed to investigate the effect on oral health among frail and sick elders using the systematic use of ROAG. Moreover, longitudinal studies investigating the effect of the systematic use of ROAG-J are missing. ROAG-J is now used in a greater extent in Sweden and it is important to investigate and evaluate its effect on elders' oral health over a longer period of time. The results will be important to evaluate if the usage of the instrument is beneficial to oral health for frail and sick elders or not.

Aim

The aim of this study was to investigate the effect of using a systemically mouth measurement instrument i.e. ROAG-J, in order to improve frail and sick older people's oral health. The following questions were to be answered:
• Which oral health problems are identified?
• Are there relationships between different aspects concerning oral health?
• Have identification of the number and type of discrepancies concerning oral health changed over time?

Hypothesis:

Systematic use of a mouth measurement instrument on frail and sick older people leads to good effects on their oral health.

Method and material

Design: A quantitative longitudinal study with empirical design (17) using the mouth measurement instrument ROAG-J was performed.

Study sample: The sample consisted of the Swedish Senior Alert register data based on all frail and sick older people in the elderly care in one major municipality in the central part of Sweden. Data from private homes as well as homes owned by the municipality were included. The patients lived in four different settings; short-term accommodation, home care teams, retirement homes (which also included special housings for people with dementia) and activities according to LSS (Swedish law about special care to long-termed disabled) (18). The elderly care in the municipality has systematically performed ROAG-J assessments since 2011 and had sufficient large amount of data over time to analyse.

Selection

Inclusion criteria was data based on individuals older than 65 years enrolled in the elderly care in the selected municipality and who had received two or more ROAG-J assessments between November 2011 and March 2014. During that period of time, 1 904 ROAG-J assessments were performed on the participants. The first and the last performed ROAG-J assessment were used for this analysis. The first ROAG-J assessments were carried out between November 2011 and March 2014, the second assessments were carried out between January 2012 and March 2014. In total the register data were based on 667 elders and formed the basis for the analysis.

Data Collection Instrument: Data was collected with the mouth measurement instrument ROAG –J. ROAG-J evaluate oral health by an assessment of the condition of the following parameters: voice, lips, oral mucosa, tongue, gums, teeth, saliva, swallowing and any prostheses/implants. The performer of the examination grades the parameter by using: 0 = not relevant to assess, 1 = healthy or normal condition, 2 = moderate changes/deviations, 3 = severe changes/deviations. Deviations of grade 2 are to be treated by the nursing staff on the unit with recommended preventive care actions. The recommendation at deviations of grade 3 is to contact a dentist or physician for treatment (14). The grades are described in Table 1. The deviations were identified by the nursing staff on each care unit, and the identifications were based on the nursing staff's knowledge in oral health, gained for example through instruction by staff working within Senior Alert. Previous studies have shown that the instrument has good validity (19) and reliability (20). At each ROAG-J assessment, the parameters were assessed and given a score. A deviation grade two gave two points, grade three gave three points. Where no deviations were found (grade 0-1) no scores were given. The points from every parameter were summarized into a total ROAG-J score for each assessment. Minimum and maximum scores range between 0 and 27 points.

Data collection: Nursing staff completed ROAG -J forms in Senior Alerts computer programs at the mouth assessment. The first assessment was carried out at the first contact with the health and social care. Risk assessment is to be done two times/year or in association with changes in health or changed eating habits. Follow-up assessments were performed continuously in cases where discrepancies were found during the previous assessment, or when patients were considered to have a risk for developing problems or illnesses. Follow-up assessments were used to evaluate the inserted prevention care (14). For this study, only the first and the last performed assessments were included. The data was anonymous when it was given to the author.

Data processing: The material was processed in the statistical program IBM SPSS Statistics 21. The material was not normally distributed why non-parametric tests were made. Descriptive data is presented in tables and figures where number, percentage and range are reported. Different tests were done to compare if the number of deviations has changed over

Hälsohögskolan
Avdelningen för Naturvetenskap och Biomedicin
Box 1026, SE-551 11 JÖNKÖPING

time and thus verify or reject the hypothesis. To compare any change in the parameters between the first and the second assessment, Wilcoxon Signed Ranks Test was performed. Chi-Square tests were performed to test for differences between women and men between the parameters and KruskaWallis´ test to determine between which grades the differences were. To study possible relationships and strengths between the parameters, Spearman's test was performed and correlations were compared. To determine the strength of the relationship, Pallants (21) guidelines were used. The values were interpreted as weak (r= .10-.29), medium (r=.30-.49) and strong (r=.50-1.0). The level of significance was 5% (p <0.05) to ensure statistical differences.

Ethical aspects: Jönköping University's ethical self- examination has been conducted. At study preparations such as definition of the purpose and method, as well as during the work, The Declaration of Helsinki (22) has been taken into account. The nursing homes, staff and participants were all anonymous to the author. The participation in Senior Alert is voluntary and the choice to participate or not should not affect the care. Each individual had information about legal rights with the registered data (23).

The strategic selection has been made in consultation with officers of Senior Alert, and the study has been approved by the responsible registrar. The nursing staff that carried out the assessments had been informed about the purpose with the registration and that the material was to be available for research. Anonymised descriptive data from the municipality is open to the public. The results have been presented as fair, value-free and accurate as possible, and neither do the addition or omit important information (24), regardless of whether it benefits Senior Alert or not. The results were analyzed and processed based on the literature and accepted practices (25).

Results

Of the 667 participants, 444 (66. 8%) were women and 223 (33.4%) were men. The participants were between 65 and 104 years of age (mean 86.2yrs ± SD 7.7) and lived in four different types of units. Of the first assessment, 22 (3.3%) were made by home care teams, and 84 (12.6%) in short-term accommodations, which on the second assessment had decreased to 17 (2.5%) and 17 (2.5%). The number of assessments made in retirement accommodations increased from 551 (82.6%) to 623 (93.4%). The figures for assessments made in activities according to LSS were 10 (1.5%) and did not change. The total number of individual ROAG assessments during the study period varied between 2 and 9. The number of months between the assessments varied between 0.5-27 months.

On the first assessment, 190 (28.5%) individuals were considered to have, or be at risk for, oral problems or illness, at the second assessment the figure was 192 (28.8%), most of which were rated as score 1. The scores of all parameters and distribution between women and men are shown in Table 2. No statistical significant difference was found between the first and the second assessment in any of the parameters.

A statistical significant difference between women and men was found. In the first assessment women had more deviations than men in the oral parameters tongue (p=0.014). In the second assessment women had more deviations than men in the oral parameters voice (p=0.047), oral mucosa (p=0.003), tongue (p=0.013) and saliva (p=0.006).

The summarized ROAG-J score at the first ROAG-J assessment varied between 2-18 scores, median 3, (N=187). At the second ROAG-J assessment the ROAG-J score also varied between 2-18 scores, median 3 (N=191). Comparison between first and second assessment of ROAG-J scores showed no statistical significance. The distribution is shown in Figure I.

Hälsohögskolan
Avdelningen för Naturvetenskap och Biomedicin
Box 1026, SE-551 11 JÖNKÖPING

Statistical significant relationships were found through comparisons of correlations between several of the parameters (Table 3). Strong correlation in the relationships were found between oral mucosa and tongue (first assessment: r=0.480, second assessment: r=0.567 respectively, significant at the 0.01 level); and oral mucosa and saliva (r=0.434, r=0.536 respectively, significant at the 0.01 level). Medium strength of the relationship were found between tongue and saliva (r=0.378, r=0.470 respectively, significant at the 0.01 level); gums and teeth (r=0.259, r=0.319 respectively, significant at the 0.01 level); teeth and prosthetics (r=-0.307, r=-0.410 respectively, significant at the 0.01 level); voice and saliva (r=0.333, r=0.297 respectively, significant at the 0.01 level). The statistical significant correlations could be seen in both assessments, but were slightly weaker in the first.

Discussion

The study aimed at investigating the effect of health professionals using ROAG-J in order to improve frail and sick older people's oral health. The mouth assessment instrument ROAG-J did not show to improve the oral heath of the participants. Less than one third of the participants were considered to have, or to be at risk for, oral problems or illness, both before and after interventions.

A study by Andersson, Hallberg and Renvert (2003) (15) showed that the use of ROAG improved the oral health of patients during hospitalization. That study took place in a hospital ward, where 69% of the patients were there due to a stroke. The ROAG assessments were performed by ten registered nurses that had been trained by a dental hygienist and calibrated. The oral health problems decreased from 86% of the participants having problems in 1-8 parameters at admission to 51% having problems in 1-5 parameters at discharge. The results in the present study showed that 28.5% of the study population was considered to have, or to be at risk for, oral health problems. The number of oral health problems that were identified differed a lot from those in the cross-sectional study by Andersson et al (15). At admission, their population showed oral health problems (grade 2-3) in lips (33%), voice (16%), oral mucosa (21%), tongue (39%), gums (24%), teeth/dentures (54%), saliva (11%) and swallowing (26%). The corresponding figures for the present study were lips (4.6%), voice (7.1%), oral mucosa (4.6%), tongue (3.2%), gums (3.9%), teeth (9.1%), prosthetics (3.7%), salivation (5.1%) and swallowing (8.0%). Earlier studies have shown that the prevalence of hyposalivation among a population +65years old is around 30% (26, 27), compared to 5.1% in the present study. The edentulousness in Sweden is decreasing. The proportion of edentulous 70 years old individuals in Gothenburg was 56% in 1983 and had been reduced to 7% in 2003 (28). The same tendency was seen in Jonkoping (3) where 16% of the individuals 40-70 years old were edentulous in 1973, 8% in 1993 and 1% in 2003. According to the ROAG-J assessments in the present study, 37.0% in the first assessment and 38.7% in the second assessment wore complete or partial prosthetics or implants. The percentage of those who had no gums, only oral mucosa was 4.9% in the first assessment and 7.5% in the second assessment.

The oral health of institutionalized frail and sick elderly in the present study did not improve by using the mouth assessment instrument ROAG-J, neither oral health in general or any of the oral health parameters. Investigation of weather the nursing staff followed the instructions of preventive actions that ROAG-J recommend or not were not performed. The discrepancy between the present and the previously mentioned study (15) can be due to several factors. By continue to use the instrument, the staff can become more skilled at finding anomalies over time. But since there were no significant differences between any of the parameters between the first and the second assessment, this can not be the reason. The participants were sick and frail, and their health is likely to impair during the time between the assessments which

affects the outcome. Perhaps the participants would have a further impaired oral health at the second assessment without assessments and recommended preventive actions. A part of the participants had previous experiences with the elderly care before the first assessment and therefore might already have got help with their oral health, and preventive actions had been performed or were performed at a regular basis. The ROAG-J assessments were performed by trained nursing staff in the elderly care in the chosen municipality, but the number of performers is unknown. In the study by Andersson et al (15), the ROAG assessments were performed by 10 trained and calibrated registered nurses. The calibration of the nurses, and the fact that they were much fewer, could have had an impact on the result. Another bias could be underreporting due to uncertainty in examining the mouths of the elders. An earlier study has shown that nursing staff find oral hygiene a difficult task (10). Why does this study show notable lower frequencies of all nine parameters of oral health compared to Andersson et al (15)? Did the nursing staff that performed the ROAG-J assessments have enough education for mastering their task? However, the results indicate good oral health for most of the elders already measured at the first assessment, which might also be explained by good strategies for oral health promotion and prevention within elderly care in the municipality studied. This might indicate that there may be regional differences in oral health strategies for frail and sick elders.

Comparisons between women and men in the oral parameters showed significant differences in the parameters: voice, oral mucosa, gums and saliva, where women had more deviations than men. Higher prevalence of xerostomia among women than among men has been shown in earlier studies (29) and can be due to physical reasons (30). Andersson et al (15) did not detect any gender differences in the prevalences of the parameters.

Relationships between some of the parameters were found. Occurrence of deviations in, for example, oral mucosa indicates a higher risk of deviations in the parameters tongue and saliva. Awareness of these relationships between parameters among nursing staff can lead to more reliable assessments where the performer is more meticulous in the examination.

Some of the relationships and some registered scores must be considered as methodological bias. Negative correlation between teeth and prosthetics should be of more clinical relevance if the negative correlation also had existed between gums and prosthetics. At the second assessment of the oral parameter "Gums", an increase of grade 0 (Have no gums, only oral mucosa) was registered. The same increase should have been visible in the parameter "Teeth" grade 0 (Have no natural teeth). This may indicate that all members of the nursing staff didn't have enough knowledge to perform ROAG-J assessments and fill in the form properly.

This study has aimed at investigating the effect of the usage of ROAG-J in the care for elders, and showed that the usage of ROAG-J had no effect on the oral health of institutionalized elders. However, ROAG-J can be an important qualitative tool to evaluate oral health for elders, both in the purpose to maintain functioning strategies and to improve oral health. More research is needed to determine the validity of the result and the reasons for it. Education of all nursing staff should continue, but is suggested to be supplemented with 1-2 nursing staff from every ward that receives a deeper education in oral health and ROAG-J, followed by calibration performed by dental personnel, and issuance of a license that ensure that the person has enough knowledge and ability to perform a ROAG-J assessment. This with the objective to ensuring the quality of the ROAG-J assessments.

This study shows that further research in the area, and continuous monitoring and evaluation of the usage of the ROAG-J instrument is needed. Evaluations of this type of programs are relevant when time, money and effort are utilized at different levels.

Conclusion: Less than one third of the participants were considered to have, or to be at risk for, oral health problems. Statistic significant differences were found between women and men in regard to the oral health parameters voice, oral mucosa, tongue, saliva and prostheses. Systematic usage of ROAG-J did not showed to improve the oral health of institutionalized elderly in this study. There was a discrepancy between prevalence of oral health deviations between this study and other studies. Therefore, more studies needs to be done to give a clearer view within this area.

Referenser

1). SCB. *The population pyramid for Sweden in 2010*. Stockholm: Statistics Sweden (SCB). (Reference in Swedish).

2). Ahlqwist M, Bengtsson C, Hakeberg M, Hägglin C. Dental status in women in a 24-year longitudinal and cross-sectional study. Results from a population study of women in Göteborg. *Acta Odontol Scand*. 1999; 57: 162-7.

3). Hugoson A, Koch G, Göthberg C, Nydell Helkimo A, Lundin SÅ, Norderyd O, Sjödin B Sondell K. Oral health of individuals aged 3-80 years in Jönköping, Sweden, during 30 years (1973-2003). II. Review of clinical and radiographic findings. *Swed Dent J,* 2005; 29: 139-55.

4). The National Board of Health and Welfare. *Elders - health and social care April 1, 2012 - Municipality efforts under the Social Services Act and the health care law*. ISBN: 978-91-87169-83-0. (Reference in Swedish).

5). Bondevik M & Nygaard H. *Geriatrics - from an interdisciplinary perspective*. Lund: University Press, 2005. (Reference in Swedish).

6). Kiyak HA. Successful aging: implications for oral health. *J Public Health Dent,* 2000; 60: 276–281.

7). Nitschke I & Müller F. The impact of oral health on the quality of life in the elderly. *Oral Health Prev Dent,* 2004; 2: 271-5.

8). Petersen PE & Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol,* 2005; 33: 81–92.

9). Andersson P, Hallberg I, Lorefält B, Unosson M, Renvert S. Oral health problems in elderly rehabilitation patients. *Int J of Dent Hyg*, 2004; 2: 70–77.

10). Wårdh I, Andersson L, Sörensen S. Staff attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides. *Gerodontology*. 1997; 14: 28-32.

11). Andersson P. (2002) Evaluation of oral health status using an oral assessment guide in geriatric rehabilitation patients and in patients with haematological malignancies. Thesis. Faculty of Odontology. Malmö University.

12). Senior Alert. About Senior Alert – for personnel. Retrieved February 2, 2014 from: http://www.lj.se/infopage.jsf?childId=13450&nodeId=39305 (Reference in Swedish)

13). Eilers J, Berger AM, Petersen, MC. Development, testing and application of the oral assessment guide. *Oncol Nurs Forum* 1988; 15: 325-330.

14). Senior Alert, (20121127). *Oral Health Risk Assessment, Revised Oral Assessment Guide – Jönköping (ROAG – J).* (Reference in Swedish).

15). Andersson P, Hallberg IR, Renvert S. Comparison of oral health status on admission and at discharge in a group of geriatric rehabilitation patients. *Preventive Dentistry* 2003; 1: 221-228.

16). Paulsson G, Wårdh I, Andersson P, Öhrn K. Comparison of oral health assessments between nursing staff and patients on medical wards. *European Journal of Cancer Care,* 2008; 17: 49–55.

17). Polit D & Beck C. *Nursing research – Generating and Assessing Evidence for Nursing Practice* (8th ed). Philadelphia: Lippincott Williams & Wilkins, 2008.

18). SFS 1993:387. The Act on Support and Service for Persons with certain Functional Impairments. Stockholm: Ministry of Health and Social Affairs.

19). Ribeiro MT, Ferreira RC, Vargas AM, Ferreira EF. Validity and reproducibility of the revised oral assessment guide applied by community health workers. *Gerodontology*, 2014; 31: 101–110.

20). Andersson P, Hallberg IR, Renvert S. Inter-rater reliability of an oral assessment guide for elderly patients residing in a rehabilitation ward. *Special Care in Dentistry* 2002; 22: 181-186.

21). Pallant J. SPSS Survival Manual (5th Ed.). Berkshire: McGraw, 2013.

22). World medical association. (1964). *Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects*.

23). Senior Alert. About Senior alert – for care recipients and relatives. Retrieved 20130320 from: http://www.lj.se/infopage.jsf?childId=13448&nodeId=39305 (Reference in Swedish).

24). Helgesson G. Research ethics for physicians and scientists. Lund: University Press, 2006. (Reference in Swedish).

25). Wahlgren L. *SPSS step by step*. Lund: University Press, 2008. (Reference in Swedish).

26). Turner MD & Ship JA. Dry mouth and its effect on the oral health of elderly people. *Journal of the American Dental Association*, 2007; 138: 15-20.

27). Nederfors T, Isaksson R, Mörnstad H, Dahlöf C. Prevalence of percieved symptoms of dry mouth is an adult Swedish population – relation to age, sex and pharmacotherapy. *Community Dent Oral Epidemiol* 1997; 25: 211-6.

28). Österberg T, Carlsson GE. Dental state, prosthodontic treatment and chewing ability – a study of five cohorts of 70-year-old subjects. *J Oral Rehabil* 2007; 34: 553-9.

29). Flink H, Bergdahl M, Tegelberg Å, Rosenblad A, Lagerlöf F. Prevalence of hyposalivation in relation to general health, body mass index and remaining teeth in different age groups of adults. *Community Dentistry and Oral Epidemiology*, 2008; 36:523–531.

30). Inoue H, Ono K, Masuda W, Morimoto Y, Tanaka T, Yokota M, Inenaga K. Gender difference in unstimulated whole saliva flow rate and salivary gland sizes. *Archives of Oral Biology*, 2006; 51: 1055-1060.

Scores per Assessment
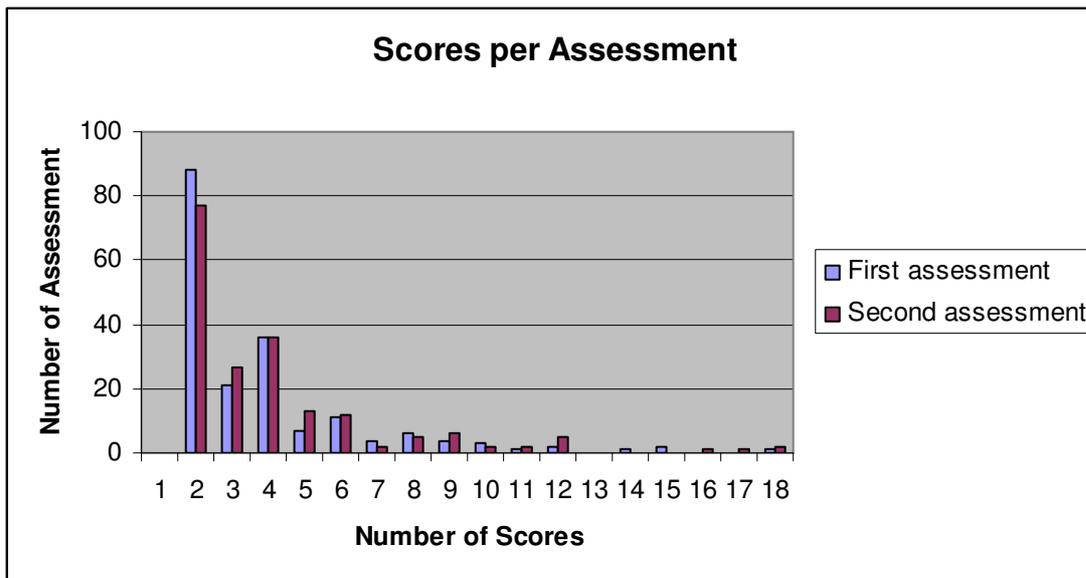
Figure I. Distributions of number of total ROAG-J scores per assessment (n=190 and 192 respectively).

Table I. Description of grades of the Oral Parameters

Parameter	Grade 0	Grade 1	Grade 2	Grade 3
Lips		Smooth, bright red, moist	Dry, cracked, sore corners of the mouth	Ulcerated, bleeding
Voice		Normal voice	Dry, hoarse, smacking	Hard to speak
Oral Mucosa		Bright red, moist	Red, dry or areas of discoloration, coating	Wounds, with or without bleeding, blisters
Tounge		Pink, moist with papillae	No papillae, red, dry coating	Ulcers with or without bleeding, blistering
Gums	Have no gum, only oral mucosa	Light red and solid	Swollen, reddened	Spontaneous bleeding
Teeth	Have no natural teeth	Clean, no visible coating or leftovers	Coating or leftovers local	Coating, leftovers generally or broken teeth
Prostheses	Have no prosthetic	Clean and works	Coating or leftovers	Not used or malfunctioning
Saliva		Easy to slip	Glider sluggish	Does not slide at all
Swallowing	Not relevant to assess	Unimpeded swallowing	Minor problems with swallowing	Pronounced swallowing problems

Table II. Number and percentage of identified oral health problems.

Parameter	Score	Women (n= 444)		Men (n=223)		Total (n= 667)		Women vs Men p-value
		Assessment number		Assessment number		Assessment number		
		First (n,%)	Second (n,%)	First (n,%)	Second (n,%)	First (n,%)	Second (n,%)	
Lips	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 1	419 (94.7)	427 (96.8)	214 (96.0)	215 (96.4)	633 (94.9)	642 (96.3)	ns
	Grade 2	23 (5.2)	14 (3.2)	8 (3.6)	8 (3.6)	31 (4.6)	22 (3.3)	Second
	Grade 3	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.1)	ns
Voice	Missing	2 (0.5)	4 (0.9)	1 (0.4)	3 (1.3)	3 (0.4)	7 (1.0)	First
	Grade 1	407 (91.7)	408 (91.9)	209 (93.7)	211 (94.6)	616 (92.4)	619 (92.8)	ns
	Grade 2	24 (5.4)	18 (4.1)	11 (4.9)	9 (4.0)	35 (5.2)	27 (4.0)	Second
	Grade 3	11 (2.5)	14 (3.2)	2 (0.9)	0 (0)	13 (1.9)	14 (2.1)	**.047*[a]**
Oral Mucosa	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 1	417 (93.9)	406 (91.4)	216 (96.9)	218 (97.7)	633 (94.9)	624 (93.6)	ns
	Grade 2	23 (5.2)	32 (7.2)	6 (2.7)	5 (2.2)	29 (4.3)	37 (5.5)	Second
	Grade 3	2 (0.5)	4 (0.9)	0 (0)	0 (0)	2 (0.3)	4 (0.6)	**.003*[b]**
Tongue	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 1	422 (95.0)	415 (93.5)	220 (98.6)	219 (98.2)	642 (96.3)	634 (95.1)	**.014*[c]**
	Grade 2	17 (3.8)	25 (5.6)	2 (0.9)	4 (1.8)	19 (2.8)	29 (4.3)	Second
	Grade 3	3 (0.7)	2 (0.5)	0 (0)	0 (0)	3 (0.4)	2 (0.3)	**.013*[d]**
Gums	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 0	23 (5.2)	38 (8.6)	10 (4,5)	12 (5.4)	33 (4.9)	50 (7.5)	ns
	Grade 1	405 (91.2)	388 (87.4)	200 (89.7)	201 (90.1)	605 (90.7)	589 (88.3)	Second
	Grade 2	14 (3.2)	13 (2.9)	10 (4.5)	7 (3.1)	24 (3.6)	20 (3.0)	ns
	Grade 3	0 (0)	3 (0.7)	2 (0.9)	3 (1.3)	2 (0.3)	6 (0.9)	
Teeth	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 0	96 (21.6)	106 (23.9)	50 (22.4)	48 (21.5)	146 (21.9)	154 (23.1)	ns
	Grade 1	309 (69.6)	295 (66.4)	148 (66.4)	148 (66.4)	457 (68.5)	443 (66.4)	Second
	Grade 2	33 (7.4)	30 (6.7)	18 (8.1)	22 (9.9)	51 (7.6)	52 (7.8)	ns
	Grade 3	4 (0.9)	11 (2.5)	6 (2.7)	5 (2.2)	10 (1.5)	16 (2.4)	
Prostheses	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 0	267 (60.1)	261 (58.8)	150 (67.3)	146 (65.5)	417 (62.5)	407 (61.0)	ns
	Grade 1	165 (37.2)	167 (37.6)	57 (25.6)	66 (29.6)	222 (33.3)	233 (35.0)	Second
	Grade 2	3 (0.7)	6 (1.4)	8 (3.6)	3 (1.3)	11 (1.6)	9 (1.3)	ns
	Grade 3	7 (1.6)	8 (1.8)	7 (3.1)	8 (3.6)	14 (2.1)	16 (2.4)	
Saliva	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 1	416 (93.7)	412 (92.8)	214 (96.0)	219 (98.2)	630 (94.5)	631 (94.6)	ns
	Grade 2	26 (5.9)	29 (6.5)	8 (3.6)	3 (1.3)	34 (5.1)	32 (4.8)	Second
	Grade 3	0 (0)	1 (0.2)	0 (0)	1 (0.4)	0 (0)	2 (0.3)	**.006*[e]**
Swallowing	Missing	2 (0.5)	2 (0.5)	1 (0.4)	0 (0)	3 (0.4)	2 (0.3)	First
	Grade 0	0 (0)	4 (0.9)	0 (0)	0 (0)	0 (0)	4 (0,6)	ns
	Grade 1	403 (90.8)	387 (87.2)	207 (92.8)	204 (91.5)	610 (91.5)	591 (88.6)	Second
	Grade 2	26 (5.9)	41 (9.2)	13 (5.8)	13 (5.8)	39 (5.8)	54 (8.1)	ns
	Grade 3	13 (2.9)	10 (2.3)	2 (0.9)	6 (2.7)	15 (2.2)	16 (2.4)	

* Significant difference between genders at the 0.05 level.

[a] Statistical significans between grade 2 and 3 (p=0.047).

[b] Statistical significans between grade 1 and 2 (p=0.031).

[c] Statistical significans between grade 1 and 2 (p=0.007).

[d] Statistical significans between grade 1 and 2 (p=0.002).

[e] Statistical significans between grade 1 and 2 (p=0.003).

Hälsohögskolan
Avdelningen för Naturvetenskap och Biomedicin
Box 1026, SE-551 11 JÖNKÖPING

Table III. Correlations between oral parameters at first (n= 664) and second (n=665) assessment.

	Assessments	Voice First	Voice Second	Lips First	Lips Second	Oral Mucosa First	Oral Mucosa Second	Tounge First	Tounge Second	Gums First	Gums Second	Teeth First	Teeth Second	Prosthetics First	Prosthetics Second	Saliva First	Saliva Second	Swallowing First	Swallowing Second
Voice	First	1		.247**		.212**		.173**		.03		.055		-.036		.333**		.247**	
	Second		1		.215**		.240**		.205**		.072		-.068		.045		.297**		.252**
Lips	First	.247		1		.123**		.202**		.032		.032		.037		.246**		.231**	
	Second		.215**		1		.260**		.269**		.016		.005		.012		.255**		.255**
Oral Mucosa	First	.212**		.123**		1		**.480**		.128**		.161**		.013		**.434**		.172**	
	Second		.240**		.260**		1		**.567**		.153**		.173**		-.018		**.536**		.216**
Tounge	First	.173**		.202**		**.480**		1		.036		.073		.018		**.378**		.072	
	Second		.205**		.269**		**.567**		1		.127**		.071		.003		**.470**		.140**
Gums	First	-.03		.032		.128**		.036		1		**.259**		-.82*		.007		-.067	
	Second		.072		.016		.153**		.127**		1		**.319**		-.190**		.04		.031
Teeth	First	.055		.032		.161**		.073		.259**		1		**-.307**		.048		.007	
	Second		-.068		.005		.173**		.071		**.319**		1		**-.410**		.034		.033
Prosthetics	First	-.036		.037		.013		.018		-.082*		**-.307**		1		.043		-.046	
	Second		.045		.012		-.018		.003		-.190**		**-.410**		1		.01		-.038
Saliva	First	**.333**		.246**		**.434**		**.378**		.007		.048		.043		1		.206**	
	Second		.297**		.255**		**.536**		**.470**		.04		.034		.01		1		.204**
Swallowing	First	.247**		.231**		.172**		.072		-.067		.007		-.046		.206**		1	
	Second		.252**		.225**		.216**		.140**		.031		.033		-.038		.204**		1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Hälsohögskolan
Avdelningen för Naturvetenskap och Biomedicin
Box 1026, SE-551 11 JÖNKÖPING