Community Dental Health (2011) **28,** 297–300
Received 28 December 2008; Accepted 25 February 2010

doi:10.1922/CDH_2499Zaitsu04

Association of clinical oral health status with self-rated oral health and GOHAI in Japanese adults

T. Zaitsu[1], M. Ueno[1], K. Shinada[1], S. Ohara[2], F.A.C. Wright[1] and Y. Kawaguchi[1]

[1]*Department of Oral Health Promotion, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Japan;* [2]*Oral Diagnosis, General Dentistry, Dental Hospital, Faculty of Dentistry, Tokyo Medical and Dental University, Japan.*

Objective: The objective of this study was to investigate clinical oral health status relationships that affect quality of life (using the 12-item General Oral Health Assessment Index (GOHAI)) and self-rated oral health in a community of Japanese residents. ***Methods:*** 459 residents of Yokote City, Japan aged 40-55 years had oral health examinations and completed self-administered questionnaires collecting data on age, gender, GOHAI items and self-rated oral health. Linear regression analysis was performed with GOHAI or self-rated oral health as a dependent variable and gender, age and indicators of oral health status as independent variables. ***Results:*** The GOHAI indicated 42.7% of subjects were concerned about the appearance of their teeth, 30.1% were worried about teeth problems and 27.5% concerned about sensitive teeth. Analyses showed that gender, decayed teeth, oral dryness and missing teeth were significantly associated with variation in GOHAI scores, and that gender, decayed teeth, oral dryness and oral hygiene were significantly associated with variation in self-rated oral health. ***Conclusion:*** This study revealed that in this sample of Japanese adults aged 40-55 years, decayed teeth and oral dryness affected both GOHAI and self-rated oral health, whereas missing teeth affected GOHAI and oral hygiene affected self-rated oral health. Subjects did not recognise periodontal disease as a quality of life impacting condition or as a health problem.

Key words: *Quality of life, self-rated oral health, dental health status, Japanese adults, GOHAI*

Introduction

Many studies show that the quality of life (QOL) is an important element of health (Locker and Allen, 2007; Locker *et al.,* 2001; Tabira *et al*, 2002). QOL, as the overall goal of health, was suggested by Wilson and Cleary in a model applicable to oral health (Locker, 2005). Many studies have investigated the relationship between oral health status and QOL (Locker *et al.,* 2001). The General Oral Health Assessment Index (GOHAI, Atchison and Dolan, 1990) is a self-administered questionnaire popularly used to assess the Oral Health Related Quality of Life (OHRQoL). GOHAI has been translated, validated and used in many countries (Daradkeh and Khader, 2008; Tubert-Jeannin *et al.*, 2003) including Japan (Naito *et al*., 2006). GOHAI is mainly used with elderly people and there are few OHRQoL studies conducted with groups other than elderly in Japan (Ikebe *et al*, 2007; Locker, 2003; Wong and McMillan, 2005). Particularly there are limited OHRQoL data on the mid-aged groups which could prompt earlier preventive intervention. At this age (40-55 years) it is possible to investigate the relationship between GOHAI and several oral diseases like dental caries and periodontal disease as this age-group tends to have more natural teeth. OHRQoL studies which examine oral health status have mainly focused on tooth loss or xerostomia (Wong and McMillan, 2005) so impacts of dental caries, periodontal disease and oral hygiene have not yet been assessed.

It may be important to investigate the relationship between oral health status and self-rated oral health as Wilson and Cleary have suggested that negative oral health perceptions could be a predictor of oral health related quality of life (Locker, 2005).

Thus, the main aim of this study was to investigate clinical oral health status relationships that affect quality of life using both GOHAI, and self-rated oral health in community of Japanese residents aged 40-55 years.

Methods

All 10,771 residents in Yokote city, Akita Prefecture, Japan aged 40-55 years on the municipal electorate register were sent invitation letters to participate in this study. They were given information about the purpose of this research, the design of the study and response letters to participate. Some 504 agreed to join the study and signed informed consent forms. The investigation was carried out from August 1st to September 30th 2007. Only the 459 subjects with complete data were included in the analysis. The study protocol was approved by the Tokyo Medical and Dental University Ethics Committee (#278).

A self-administered questionnaire covered demographic information (gender and age), the Japanese version of GOHAI and a self-rated oral health question. GOHAI is a 12-item instrument comprising questions related to oral function, anxiety and pain/discomfort during the last three months. Response categories for each question were: 1 all the time, 2 often, 3 sometimes, 4 seldom and 5 never.

Correspondence to: Dr Takashi Zaitsu, Department of Oral Health Promotion, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, 1-5-45 Yushima Bunkyo-ku Tokyo, Japan. 113-8549. E-mail: zaitsu.ohp@tmd.ac.jp

Summing the 12 scores gave the mean GOHAI score in the possible range 12-60 with higher scores indicating better perceived OHRQoL. The question to elicit self-rated oral health was: "How do you consider your present oral health condition?" with response options: 1 very bad, 2 bad, 3 fair, 4 good and 5 very good.

Self-administered questionnaires and dental examinations were conducted at local dental clinics by 50 dentists of the Yokote and Hiraka Dental Associations. The required reporting standards, based on WHO (1997) recommendations, were circulated to these dentists in a detailed manual which was then explained and discussed at an information session. The examinations were conducted with subjects in a dental chair under an operator light. The dentists examined and recorded decayed, missing and filled teeth (third molars excluded), periodontal status (gingival bleeding, calculus and pocket depth), oral hygiene and oral dryness. Decay was coded according to the extent of lesion development: D0, sound surface; D1, initial caries; D2, enamel caries; D3, caries of dentin; and, D4, pulpal involvement. Periodontal status was examined using a dental mirror and a periodontal probe. The deepest pocket depth was recorded by probing all sites around each natural tooth. Pocket depths of 4mm or more on any one tooth site were judged to indicate periodontitis. Existence of calculus and gingival bleeding on probing were checked on each tooth while measuring the probing depth.

Oral hygiene was examined and reported as: *good* - plaque hardly existing, *poor* - plaque existing on more than two-thirds of surfaces of the cervical region of one or more teeth; or *fair* - a mid-range score between *good* and *poor*. Oral dryness was visually examined and reported in this analysis as: *yes* - dry or *no* - moist.

Functional Tooth Units (FTUs) were defined as pairs of opposing teeth, and FTU scores were used to evaluate masticatory function (Hatch *et al*., 2001; Kwok *et al.*, 2004; Ueno *et al*., 2008). The total number of FTUs was defined as pairs of opposing natural teeth (i.e. sound, restored and minimal score carious teeth), artificial teeth which may be on implant, fixed or removable prostheses. D4 score carious teeth, with extensive coronal destruction, and missing teeth, were regarded as non-functional units. FTUs from posterior teeth, in which there were two opposing molars, were scored as two, while FTUs with two opposing premolars, scored as one FTU. Therefore, a person with a complete dentition had 12 FTUs (third molars excluded).

Descriptive statistics were calculated for each examined item. The t-test was used to investigate the bivariate association of GOHAI and self-rated oral health with clinical oral health status (number of decayed teeth, missing teeth, filled teeth, teeth with gingival bleeding on probing, teeth with calculus, teeth with 4mm and deeper periodontal pockets and FTUs). GOHAI was categorised from the mean score into *<54* or *54+*. Self-rated oral health was categorised into "*very good/good/fair*" and "*bad/very bad*". The χ^2 test was used to investigate the bivariate association of grouped GOHAI and self-rated oral health data with clinical oral health status (oral hygiene and oral dryness). Oral hygiene was divided into *good/fair* and *poor* response options. Oral dryness were divided into *yes* and *no* response options. Linear regression analysis was performed with GOHAI scores or self-rated oral health as dependent variables. Gender, age and clinical oral health status indicators were used as independent variables. Two-sided p-values less than 0.05 were considered to be statistically significant. Statistical analyses were performed with the SPSS 15.0 J software.

Results

The mean age of the subjects was 48.8 years (s.d. 4.3) with a third, 154, being male, 305 female. The mean numbers of decayed, missing and filled teeth were 1.6, 2.7 and 13.8 respectively, mean DMFT 18.0. The mean number of teeth with gingival bleeding was 5.9, calculus 8.6 and pocket depth 4mm or more 4.7. The proportion of subjects with oral hygiene rated *good/fair* was 87.4% and 12.6% were rated *poor*. Some 3.7% had oral dryness. The mean FTU score was 10.3 units (s.d. 2.5).

Table 1 summarises the responses to of the GOHAI items and the self-rated assessments of oral health. The mean GOHAI score was 53.6 (s.d. 6.1). Table 1 shows only the proportion of subjects who answered negatively on the GOHAI, that is, *all the time*, *often* or *sometimes*.

Bivariate analyses using both mean and grouped GOHAI scores had significant relationships with missing teeth and FTUs (Table 2). Decayed teeth, FTUs, periodontal status (gingival bleeding, calculus and pocket depth), oral hygiene and oral dryness also showed significant relationships with poor (*bad/very bad*) self-rated oral health (Table 3). Linear regression analysis showed that GOHAI score was significantly associated with gender, number of decayed teeth, number of missing teeth and oral dryness while poor self-rated oral health was significantly, associated with gender, number of decayed teeth, poor oral hygiene and oral dryness (Table 4).

Table 1. General Oral Health Assessment Index (GOHAI) and self-rated oral health

Characteristics	*% (n=459)*	
*GOHAI 12 items**		
Have to limit food intake/choice of food	14.6	
Trouble biting/chewing	19.4	
Unable to swallow comfortably	2.8	
Unable to speak clearly	6.5	
Discomfort during eating	12.0	
Limited contact with people	5.9	
Not pleased with the look of teeth	42.7	
Use medication to relieve pain	8.9	
Worried about teeth problems	30.1	
Self-conscious of teeth problems	12.6	
Uncomfortable eating in front of people	4.6	
Sensitive to hot/cold/sweet/sour food	27.5	
Self-rated oral health		
Very good	7.2	
Good	16.6	76.7%
Fair	52.9	
Bad	20.5	
Very bad	2.8	23.3%

* Percentage reporting 'All the time', 'Often' or 'Sometimes'

Table 2. Bivariate association of GOHAI with oral health status

Oral health status	*Below GOHAI mean, <54 n=175*	*Above GOHAI mean, 54+ n=284*	*p-value*
Decayed Teeth [a]	1.8	1.4	0.112
Missing Teeth [a]	3.4	2.2	<0.001
Filling Teeth [a]	13.6	14.0	0.476
FTU [a]	9.6	10.7	<0.001
Gingival bleeding [a]	5.8	5.9	0.863
Existence of calculus [a]	9.0	8.3	0.337
Deep pockets [a]	5.4	4.2	0.053
Oral hygiene (poor) [b] %	14.9	11.3	0.261
Oral dryness [b] %	5.7	2.5	0.073

[a] T-test [b] χ^2 test

Table 3. Bivariate association of self-rated oral health with oral health status

	Self-Rated Oral Health Group		
Oral health status	*Bad n=352*	*Good/Fair n=107*	*p-value*
Decayed Teeth [a]	1.4	2.2	0.010
Missing Teeth [a]	2.5	3.3	0.053
Filling Teeth [a]	14.0	13.4	0.340
FTU [a]	10.5	9.7	0.007
Gingival bleeding [a]	5.5	7.2	0.022
Existence of calculus [a]	7.9	10.8	0.002
Deep pockets [a]	4.1	6.4	0.004
Oral hygiene (poor) [b] %	9.4	23.4	<0.001
Oral dryness [b] %	2.3	8.4	0.003

[a] t-test [b] χ^2 test

Table 4. Linear regression analysis with GOHAI (G) and self-rated oral health (SR) as the dependent variables

	B		*S.E.*		*Beta*		*t*		*p*	
	G	*SR*	*G*	*SR*	*G*	*SR*	*G*	*SR*	*G*	*SR*
Gender	-1.37	0.26	0.60	0.09	-0.11	0.14	-2.27	3.00	0.023	0.003
Age	0.02	-0.02	0.07	0.01	0.02	-0.07	0.35	-1.51	0.729	0.133
Decayed teeth	-0.25	0.05	0.11	0.02	-0.11	0.15	-2.29	3.14	0.023	0.002
Missing teeth	-0.36	0.02	0.11	0.02	-0.19	0.08	-3.35	1.43	0.001	0.154
Filled teeth	-0.09	0.01	0.05	0.01	-0.08	0.06	-1.53	1.27	0.126	0.206
FTUs	0.22	-0.03	0.14	0.02	0.09	-0.07	1.65	-1.28	0.099	0.200
Gingival bleeding	0.07	0.00	0.05	0.01	0.07	0.02	1.23	0.34	0.218	0.735
Dental calculus	-0.05	0.01	0.04	0.01	-0.06	0.10	-1.05	1.79	0.295	0.074
Pocket depth ≥4mm	-0.07	0.01	0.06	0.01	-0.07	0.06	-1.20	1.00	0.232	0.317
Oral hygiene	-0.58	0.21	0.58	0.08	-0.05	0.12	-0.99	2.45	0.322	0.015
Oral dryness	3.71	-0.50	1.45	0.21	0.12	-0.11	2.55	-2.36	0.011	0.019

F=5.09, p<0.001 for GOHAI . F=5.95, p<0.001 for self-rated oral health

Discussion

The response rate of participation was 4.3% in this study. Participants had to visit a local dental clinic for examination and complete a consent form and questionnaires: a considerable demand on their time and effort. In Japan, it is uncommon for people to go to a clinic for regular examinations, instead they tend to go only when some symptoms like toothache or biting difficulty occurs. This may partly explain the low response rate. However, our sample's mean GOHAI score was almost the same as that of Japanese aged 40-59 years (Naito, 2007) and their mean DMFT was almost the same that was found in the 2005 national oral health survey of 40-54 year-olds (SACSDD, 2007) suggesting our sample is close to the Japanese population for this age group. Male response rates may be lower than females because many middle-aged males were at work in the daytime. However analysis by linear regression adjusted for any impacts of gender. This research was a community-based study involving and engaging local dentists. One of the epidemiological limitations of the study therefore is that clinical measurements lack rigorous calibration and standardization.

It should be noted that oral health service delivery and the National Health Service in Japan is different from many other nations. In Japan, all residents benefit from a public health insurance system covering the main dental treatment needs, such as dental caries, periodontal diseases and prosthetic treatment. This benefit may impact substantially on QOL measures such as GOHAI. Compared with other countries, the Japanese have fewer decayed and missing teeth but many filled teeth (WHO, 2008) and high levels of conservative and prosthetic treatments.

The main oral health complaints of Japanese adults aged 40-55 years, in this study, were the appearance and pain associated with their teeth. On the other hand, the main complaints reported by older people (mean 83 years) were discomfort when eating, and not biting well (Locker *et al*, 2001). In general, it appears from these findings that this mid-aged group of Japanese people is more concerned with the impact of psychological well-being and pain, than the older groups who tend to report higher levels of oral function problems and discomfort as their main concerns.

The linear regression analysis suggests that oral health status elements which appeared to impact strongly on GOHAI and self-rated oral health were somewhat different. Gender, decayed teeth and oral dryness affected both GOHAI and self-rated oral health, whereas missing teeth affected GOHAI and oral hygiene affected self-rated oral health.

Gender affected GOHAI and self-rated oral health. These findings are similar to research showing female GOHAI scores to be lower than male scores (Tsakos *et al.*, 2009). Missing teeth affected only the GOHAI score and not self-rated oral health. Oral hygiene affected only self-rated oral health. But the signs of periodontal disease such as gingival bleeding, calculus and pocket depth which may cause tooth loss were not related to either GOHAI or self-rated oral health.

These findings strongly suggest that there is little linkage between periodontal health, and either quality of life (GOHAI) or self-perception of periodontal diseases in this population. It would seem appropriate therefore to provide health education programs to help this age group to recognise their periodontal status so that they can prevent periodontal diseases and associated loss of teeth.

In conclusion, this study revealed that the main complaints of Japanese adults aged 40-55 years are appearance of their teeth or pain from teeth. Gender, decayed teeth and oral dryness were related to both GOHAI and self-rated oral health, whereas missing teeth were only related to GOHAI, and oral hygiene was only related to self-rated oral health. Further research is required on more representative samples of the Japanese mid-aged population, with more refined methods to observe whether the trends found in this study can be generalized.

Acknowledgements

This study was supported by a grant from the 8020 Promotion Foundation and the Grant-in-Aid for Scientific Research by Ministry of Health, Labour and Welfare, Japan (H18-Iryou-Ippan-037). We also thank the Yokote and Hiraka Dental Associations for their cooperation with this study and both their members and the participants for their great help.

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