

Clinical and socio-demographic factors influencing the oral health-related quality of life of Chinese elders

L. Zhao¹, H.C. Lin¹, E.C.M. Lo² and M.C.M. Wong²

¹Department of Dental Public Health, Guanghua School of Stomatology, Sun Yat-Sen University, Guangzhou, P.R. China; ² Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR

Objectives: The objective of this study was to explore the clinical and socio-demographic factors influencing oral health-related quality of life (OHRQoL) of the Chinese elderly. **Methods:** Two urban districts in Binzhou, Shandong Province, Eastern China were selected and 300 elders aged 60–80 years were recruited. The study subjects completed a structured questionnaire in an interview and underwent a clinical examination. The questionnaire included questions on socio-economic information and a Putonghua version of the General Oral Health Assessment Index (GOHAI) which had been validated for use in Chinese elders to evaluate their OHRQoL. Clinical examination was performed using the criteria recommended by the World Health Organization. Tooth status, periodontal health status, loss of attachment (LOA), and number of occluding tooth pairs were recorded. Duplicate examinations were conducted on 10% of the subjects. **Results:** The mean GOHAI score of the subjects was 46.0 (SD 8.5). Result of an ANCOVA showed that subjects who were older, had no root caries, had no tooth with LOA \geq 6mm, or had more occluding pairs had higher GOHAI scores indicating better OHRQoL. **Conclusion:** The OHRQoL of the study elders was fair and was influenced by age and a number of clinical factors. With limited resources and dental manpower in China, higher priority should be given to the elders who are relatively younger, who have or are at high risk of developing root caries and advanced periodontal diseases, and who have few occluding tooth pairs.

Key words: oral health, quality of life, China, elderly, epidemiology

Introduction

A variety of oral health-related quality of life (OHRQoL) instruments have been developed in the past 20 years as a result of increased concern about the impact of oral conditions on a person's quality of life. Two of the most commonly used instruments are the Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994), and the General Oral Health Assessment Index (GOHAI) (Atchison and Dolan, 1990). Both of these measures have been translated into Chinese and validated for use in epidemiological studies (Wong *et al.*, 2002a; 2002b). The Chinese version of the two measures have also been adapted for use in interview using Putonghua, the official spoken language in China (Ling and Wang, 2003; Xin and Ling, 2006). With the availability of a validated measure it is possible to investigate the OHRQoL of various adult population groups in China and the factors that are related to their OHRQoL.

There is a clear trend of ageing of the population in China and health of the elders has become more important in epidemiological studies. Since OHRQoL is an important part of health-related quality of life but has seldom been studied in China, more attention should be paid to the study of the OHRQoL of Chinese elders. The main purpose of this study was to explore the factors which may influence the OHRQoL of the elders in Shandong Province of Eastern China so as to provide information for the local government for selection of clinical strategies and appropriate use of limited resources on elders with higher needs for dental care.

Material and methods

The study population was elders aged 60 to 80 years living in the urban area of Binzhou, a city in Shandong Province. Located on the coast in Eastern China, Shandong Province has a population of 94 million and is regarded as being at the middle level of economic development in China. Binzhou is a typical medium-size city in China with a population of 3.75 million in 2008. The economic status of Binzhou is at the middle level in Shandong Province. The average annual income per person in the urban area of Binzhou was 15,960 RMB yuans in 2008 (2,234 US\$, 1RMB yuans = 0.14US\$), compared to 16305 RMB yuans in Shandong Province (Bureau of Statistics of Shandong Province, 2009). From a list of the 11 districts in the city, 2 districts were selected by simple random sampling. In each selected district, with assistance from the residents' committee and the local government, 150 dentate elderly residents were selected through the use of a quota sampling method. All the dentate elders approached agreed to participate in the survey. Thus, a total of 300 elders were surveyed, and they completed a questionnaire in a face-to-face interview and underwent a clinical oral examination.

The Chinese Putonghua version of the GOHAI (Ling and Wang, 2003) was used to assess the OHRQoL of the study elders. In addition, the questionnaire included questions to collect data on the socio-demographic background of the elders such as gender, age, education level and monthly income of the subject. The elders completed

the questionnaire with the assistance of an investigator on site. The investigator was trained before the survey on how to conduct interviews and how to answer queries from the subjects.

The clinical examinations were conducted by a single trained examiner (LZ). Disposable plane mouth mirrors attached to an intra-oral LED light and CPI probes were used in the examination. Tooth status and root caries were recorded using the decayed, missing and filled teeth (DMFT) index and the diagnostic criteria recommended by the World Health Organization (1997). The global dental status of elders was assessed using the Tissue Health (T-Health) index (Sheiham *et al.*, 1987) in which weights of 4, 2 and 1 were given for sound, filled and decayed teeth respectively. In assessing the periodontal health status, the number of teeth with probing pocket depth (PPD) ≥ 6 mm, the number of teeth with loss of attachment (LOA) ≥ 6 mm, and the number of teeth with mobility \geq grade 2 (tooth could move in mesial-distal and buccal-lingual directions when a light force was applied) in each subject was recorded.

In assessing the mastication function of the subject, the number of occluding tooth pairs was counted. Two variables, occluding pairs I and occluding pairs II were recorded in this study. Occluding pairs I was defined as the number of pairs of maxillary and mandibular teeth that came into contact when the subject closed in centric occlusion. This included bridge abutments and pontics but excluded the false teeth in removable dentures, teeth indicated for extraction, and pontics indicated for removal because of loose bridges or caries in abutments (Lin *et al.*, 2001). Occluding pairs II was defined as the number of occluding pairs of natural and/or false teeth with dentures in position (Burke and Wilson, 1995).

To monitor intra-examiner reproducibility, duplicate examinations were carried out on a 10% random sample of the study subjects throughout the survey. All teeth were re-examined for tooth status while two quadrants were randomly selected for PPD and LOA assessments.

Each questionnaire was checked on site for completeness and if there were missing data or errors in the answers, the necessary information was obtained from the subject concerned. Classification of the subject's current occupation or that immediately before retirement followed that set by the government of China and four categories were used. Category I included government and enterprise administrators, professionals and technicians; Category II included clerks, general workers, farmers and military personnel; Category III were those who run small private business; and Category IV were those who were without a fixed job.

The GOHAI score of the subject was computed from the subject's answers to the 12 questions in the questionnaire. The score could range from 12 to 60, with a higher score indicating a better reported oral health-related quality of life. Two-sample t-tests and one-way ANOVA were used to assess the relationships between the GOHAI scores and the individual socio-demographic and clinical variables. Analysis of covariance (ANCOVA) was performed to assess the effect of the socio-demographic and clinical variables on the GOHAI score of the subjects. The independent variables were the subject's age, gender, education level, monthly income, occupation, number of

missing teeth (MT), DMFT score, number of teeth with root caries, number of teeth with PPD ≥ 6 mm, number of teeth with LOA ≥ 6 mm, number of teeth with mobility \geq grade 2, T-Health score, and number of occluding tooth pairs. Backward elimination method was used to remove insignificant variables ($p > 0.05$) and only the significant variables with a p-value of 0.05 or smaller remained in the final model. Multiple comparisons by Bonferroni's method were used to examine the significance of the difference in GOHAI scores for variables with three or more groups. Data analyses were performed using the statistics software SPSS 16.0 and the level of statistical significance was set at 0.05.

As this study was a descriptive cross-sectional survey, the desirable precision of the main statistic (GOHAI) was used in determining the required sample size. Using an estimated standard deviation of 8 (Wong *et al.*, 2002b) and a standard error of 0.5, a sample size of more than 260 was planned.

Results

Altogether 300 elderly subjects were surveyed. Their mean age was 67.7 years and 49% were men (Table 1). One-third of the subjects had attained no higher than primary school education level while a fifth had tertiary education. Since many of the subjects had retired from work, about half of them had a monthly income of 1000 RMB yuans or less which was lower than the average income of the urban residents in Binzhou.

The GOHAI score of the surveyed elders ranged from 21 to 60, with a mean score of 46.0 (SD 8.5). Regarding the three components of the GOHAI score, the mean score for physical functioning was 11.0 (SD 3.0), the mean score for pain and discomfort was 15.4 (SD 2.9) while that for psychosocial functioning was 19.5 (SD 4.2). Results of the bivariate analysis (Table 1) show that none of the socio-demographic variables studied had a statistically significant relationship with the elders' GOHAI score.

From the duplicate examinations, it was found that the kappa coefficient values for the assessments of coronal caries, root caries, PPD, LOA and occluding tooth pairs were 0.99, 0.97, 0.88, 0.87 and 1.00 respectively, indicating excellent intra-examiner reliability. Regarding the dental status of the surveyed subjects, their mean DMFT score of was 13.0 (SD 9.2), their mean MT score was 10.1 (SD 9.2), and their mean T-Health score was 80.0 (SD 36.5). One-third of the subjects had root caries (Table 2). Only 6% of the elders had teeth with a PPD ≥ 6 mm while one-third had one or more teeth with LOA ≥ 6 mm. Around a quarter had one or more teeth with a mobility grade 2 or above. Most elders had 10 or more occluding tooth pairs.

In the bivariate analysis, it was found that all of the clinical variables, except the number of teeth with PPD ≥ 6 mm, had a statistically significant relationship with the elder's GOHAI score. Higher GOHAI scores were found in elders who had a lower DMFT score, a higher T-Health score, no tooth with root caries, no tooth with a LOA ≥ 6 mm, no tooth with a mobility grade ≥ 2 , or more occluding tooth pairs.

Table 1. Mean GOHAI scores of the elderly subjects in relation to socio-demographic variables.

	% (n=300)	Mean GOHAI score	p-value
Gender			0.787*
male	48.7	46.1	
female	51.3	45.8	
Educational level			0.891#
up to / or primary	34.2	46.4	
lower secondary	25.2	46.1	
upper secondary	20.8	45.5	
tertiary	19.8	45.6	
Monthly income (RMB yuans)			0.128#
<500	32.4	47.0	
500-1000	19.7	44.7	
1000-2000	30.8	45.0	
>2000	17.1	47.4	
Occupation			0.783#
category I	30.3	46.1	
category II	21.0	46.3	
category III	24.0	45.1	
category IV	24.7	46.3	

* 2-sample t-test

One-way ANOVA

Four of the independent variables remained in the final model of the ANCOVA (Table 3). Elderly subjects who were older ($p=0.001$), had no teeth with root caries ($p=0.001$), had no teeth with $LOA \geq 6\text{mm}$ ($p<0.001$), and had 13 or more occluding tooth pairs II ($p=0.013$) would have a higher mean GOHAI score, which indicated a better OHRQoL.

Discussion

The study was conducted in Binzhou, a middle level economic development area in Shandong Province, Eastern China. The results from this study would be relevant to other areas of China with a similar economic development level but perhaps not for all areas in China. Selection of an appropriate measure of OHRQoL in an epidemiological survey should be made on the basis of which health domains form the focus of the assessment and the extent to which each measure reflects the oral health concerns of the target population. It has been shown that the GOHAI is better than the OHIP-14 in detecting the common outcomes of oral disorders such as functional limitation and discomfort, while the OHIP-14 places greater emphasis on psychological and behavioral outcomes (Locker *et al.*, 2001). It was anticipated that Chinese elders would be more concerned about the functional impacts of oral disorders and, thus, the GOHAI was chosen for this study.

The main finding of this study is that most of the clinical variables used for measuring the elders' oral health status were associated with their GOHAI score. When considering the impact of all of the study variables simultaneously in a multivariable analysis, not having root caries, not having teeth with $LOA \geq 6\text{mm}$, and having more occluding tooth pairs were significantly associated with the GOHAI score.

Elders having root caries are likely to suffer from tooth sensitivity to cold, hot, acid and touch, and even symptoms of pulpitis such as pain. So it is not surprising to find that the elderly study subjects with root caries had a poorer OHRQoL than those without. However, in two other surveys, one conducted in Greece and another in Thailand, no significant difference in mean Oral Impacts on Daily Performances (OIDP) scores was found between the elders with root caries and those without (Srisilapanan and Sheiham, 2001; Tsakos *et al.*, 2004).

In this study, elders who had teeth with advanced loss of periodontal attachment ($LOA \geq 6\text{mm}$) had a poorer OHRQoL than those without this condition. This finding agrees with the results from other studies (Ng and Leung, 2006; Srisilapanan and Sheiham, 2001). These findings highlight the importance of prevention and treatment of periodontal diseases in the Chinese elders for achieving a better OHRQoL.

One important aspect of OHRQoL is chewing ability and enjoyment of food. Having a sufficient number of tooth pairs, including both natural and artificial teeth, in occlusion are necessary for adequate function. In this study, elders having 13 or more occluding tooth pairs had a better OHRQoL and this result concurs with that of a previous study in Hong Kong (Yu *et al.*, 2008). A recent prospective cohort study in the USA also found that elders with removable dentures were less likely to report chewing difficulty (Gilbert *et al.*, 2004). Indeed, eating or having a meal is an especially important activity in Chinese culture, both for the pleasure of enjoying food and also for taking part in the social gathering. The results of this study suggest that preservation of the natural teeth and provision of dental prosthesis to replace missing teeth would be important for improving the OHRQoL of Chinese elders.

Table 2. Mean GOHAI scores of the elderly subjects in relation to selected clinical variables

	% (n=300)	Mean GOHAI score	p-value*
DMFT			<0.001
0-9	43.7	47.8	
10-19	34.3	43.3	
≥20	22.0	46.5	
MT			<0.001
0-9	62.0	46.8	
10-19	21.7	42.1	
≥20	16.3	48.0	
No. of teeth with root caries			<0.001
0	66.0	47.6	
1	21.0	43.8	
≥2	13.0	41.2	
T-Health score			0.003
0-79	37.7	44.0	
80-99	23.0	46.0	
≥100	39.3	47.8	
No. of teeth with PPD≥6mm			0.088
0	94.0	46.2	
1	4.3	42.1	
≥2	1.7	40.8	
No. of teeth with LQA≥6mm			<0.001
0	66.3	47.8	
1	17.4	43.2	
≥2	16.3	41.5	
No. of teeth with mobility≥2			0.042
0	76.7	46.6	
1	11.7	44.3	
≥2	11.6	43.3	
No. of occluding pairs I			<0.001
0-9 pairs	41.3	45.0	
10-12 pairs	22.7	43.8	
≥13 pairs	36.0	48.4	
No. of occluding pairs II			<0.001
0-9 pairs	17.7	42.4	
10-12 pairs	25.6	43.5	
≥13 pairs	56.7	48.2	

* One-way ANOVA

In this study, it was found that the influence of the subjects' socio-demographic background on their OHRQoL was small and, except that of age, was insignificant. This finding agrees with other studies conducted in China, Western Europe and Australia (John *et al.*, 2004; Steele *et al.*, 2004; Wong *et al.*, 2002b). In traditional Chinese communities conformity to the social norm is emphasized and overt expression of individual differences is discouraged. Thus, variation in the reported OHRQoL due to socio-demographic variables may be expected to be small. Another explanation is that the elderly in this study had lived in a socialist state for over 50 years in which social class differences were relatively small.

Although one may expect the oral health conditions of the elders to deteriorate as they age, in this study an increase in age was found to be associated with a

higher GOHAI score or a better OHRQoL. Results of other studies are not consistent in this respect, while some studies found that older people reported a better OHRQoL (Steele *et al.*, 2004), others did not (John *et al.*, 2004). When assessing quality of life, elders may compare their expectations with their experiences, considering what they see as being normal and acceptable for a given age. When expectations are matched by the current situation, for example for a person with a low expectation, the impact of poor oral health on his quality of life may be small (Carr *et al.*, 2001).

In conclusion, the present study of elders living in an urban area in Eastern China found that their OHRQoL was fair and was influenced by their age and a number of clinical factors. Prevention and treatment of root caries and advanced loss of periodontal attachment would be important

Table 3. Result of ANCOVA on the relationship between GOHAI score and independent variables.

Independent variable	Estimate	S.E. (estimate)	p-value	Bonferroni's multiple comparison
Age in years	0.3	0.1	0.001	
No. of teeth with root caries			0.001	
(a) 0 tooth	5.1	1.4		(a) > (c)
(b) 1 tooth	2.5	1.6		
(c) ≥ 2 teeth [#]				
No. of teeth with LOA ≥ 6 mm			<0.001	
(a) 0 tooth	5.6	1.3		(a) > (b)
(b) 1 tooth	1.5	1.5		(a) > (c)
(c) ≥ 2 teeth [#]				
No. of occluding tooth pairs II			0.013	
(a) 0-9 pairs	-2.8	1.3		(c) > (b)
(b) 10-12 pairs	-2.9	1.1		
(c) ≥ 13 pairs [#]				
(Intercept)	21.2	6.0	<0.001	

$R^2 = 0.211$; F-value = 11.19; df=7;

p<0.001

[#] reference category

in improving their OHRQoL, and so are the preservation of natural teeth and replacement of missing ones. With limited resources and dental manpower in China, higher priority should be given to the elders who are relatively young, who have or are at high risk of developing root caries or advanced periodontal diseases or who have few occluding tooth pairs.

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