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ORGINAL ARTICLE

Oral Health and Quality of Life Among Elderly in Thailand

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ABSTRACT

Oral health contributes physically and psychologically to quality of life. **Objective:** To investigate the relationship of oral health status with oral health related and general Quality of Life (QOL) in elderly. **Methods:** Subjects were 612 community dwelling Thai aged 60 years or older. A questionnaire was evaluate socio-demographics, general oral health assessment index (GOHAI) and world health organization quality of life (WHOQOL). Oral examinations assessed teeth present, decayed teeth, gingival bleeding, pocket depth, functional tooth units (FTUs) and salivary flow rate. **Results:** For dentate subjects (n=428), logistic regression showed that teeth present, decayed teeth, gingival bleeding, pocket depth, FTUs and saliva flow rate were associated with GOHAI (p<0.05). Regarding WHOQOL, teeth present, gingival bleeding and FTUs were associated with physical domain (p<0.05). Teeth present, decayed teeth, gingival bleeding and FTUs were related with psychological domain (p<0.05). Teeth present and FTUs were associated with environmental and social domain (p<0.05). For edentulous subjects (n=184), denture wearing was associated with GOHAI and all domains of WHOQOL (p<0.05). **Conclusion:** The number of teeth present, denture wearing and FTUs strongly affected GOHAI and general QOL. Dental caries, periodontal status and salivary flow rate also affected GOHAI and some domains of general QOL of elderly.

Keywords: elderly, oral health, quality of life

INTRODUCTION

The population of elderly Thai will increase continuously and become higher than any other country in the South East Asia region by the mid 21st century. Poor oral health among aged people represents an important public health problem of Thailand. Many studies show that the quality of life (QOL) is an important element of health.[1-2] QOL has been used by numerous researchers to encompass the broader notion of health and is increasingly being used by researchers to evaluate the effect of health care services QOL includes an objective and subjective evaluation of life circumstances.[3]

QOL has been defined by the World Health Organization Quality of Life assessment (WHOQOL) group as individual's perception of his/her position in life in the context of the culture and the value system in which he/she lives and in relation to his/her goals, expectations, standards and concerns.[4] In order to assess QOL, many instruments have been proposed in the literature, including questionnaires aimed to assess general QOL, health-related QOL and disease-specific QOL. Oral health contributes physically and psychologically to quality of life.[5,6] Oral health status influences a person's self-esteem, self-image, and feelings of social well-beings.[7,8] Self-rated oral health had an independent effect on current and future self-rated general health after age and other measures of health status were controlled for by multiple regression analyses.[9]

The General Oral Health Assessment Index (GOHAI) is a self-administered questionnaire consisting of 12 items and is popularly used to assess the Oral Health Related Quality of Life (OHRQoL).[10] GOHAI is mainly used with elderly people.[11-13] It is not known, oral disease are able to exceed the threshold that is enough to effect a person's subjective perception of well-being, resulting in worse general QOL, including physical, psychological, social relations and environmental domains of QOL.[14] Interestingly, it is believed that oral status is able to affect the overall feeling of general QOL.[15]

There has been little research done on the investigation of the relationship between OHRQol, general QOL and oral health status in Thai. Our hypothesis was that older person experiencing oral health problem would report a worse QOL, even after adjustment for sociodemographic variables and systemic disease. Thus, the objective of the present study was to investigate clinical oral health status associated GOHAI and WHOBREF-26 in community dwelling elderly Thai.

METHODS

The study protocol was approved by Naresuan University Ethical Committee on Human Rights. The sample for this study was drawn from elderly people who were aged 60 or more years old and lived in Muang, Phitsanulok Province, Thailand. This was a cross-sectional study (January-June, 2015), with simple random sampling framework by computer program to select subjects. A total of 612 people (158 males, 454 females mean age 68.79±5.9 years) agreed to join the study and signed the informed consent. Subjects, who were diagnosed as having mental diseases by a medical practitioner, were excluded from the study. The questionnaires collected sociodemographic and general health information such as age, educational, income, systemic disease and medications was collected by trained interviewers.

General Oral Health Assessment Index (GOHAI)
GOHAI is a 12-item instrument comprising questions related to oral function, anxiety and pain/discomfort. The response categories for each question were: all the time=1; often=2; sometimes=3; seldom=4; and never=5 during the last three months. The mean score for the GOHAI was obtained by summing the response codes for each of the 12 items. The range of the GOHAI scores are 12-60, in which the higher score indicates better perceived OHRQoL.[10]

Quality of life assessment
Quality of life was assessed with WHOQOL-BREF, a QOL instrument derived from WHOQOL-100 and developed by the WHOQOL-group to be used in epidemiological surveys and clinical trials.[4] WHOQOL-BREF had a validated version in Thai which contains 26 questions comprehending four different domains of QOL: physical (seven question), psychological (six questions), social relations (three questions) and environment (eight questions). The response scales used assessed "how much", "how completely", "how often", "how good" or "how satisfied" the older persons felt in the previous 2 weeks. Responses were in a five-point Likert interval scale. The score range for each WHOQOL-BREF item is 1-5, with lower scores implying a poorer QOL.

Standard clinical dental examinations were performed by one dentist, who examined number of teeth present, filled teeth and decayed teeth, using clinical criteria based on the WHO format.[16] Periodontal status was examines using a periodontal probe. The deepest periodontal pocket depth was recorded by probing all sites around each natural tooth present. Pocket depth of 4mm or deeper on any one tooth site were judged to indicate the presence of periodontitis.

Functional Tooth Units (FTUs) were defined as pairs of opposing teeth, and FTU scores were used to evaluate masticatory function. The total number of FTUs was defined as a pairs of opposing, natural teeth. FTUs from posterior teeth, in which there were two opposing molars, were scored as two, while FTUs with two opposing anterior and premolars, scored as one FTU. Therefore, a person with a complete dentition had 22 FTUs.[17]

All subjects abstained from smoking, eating and drinking for 2 hours prior to the measurement of salivary flow rate. Subjects with complete or removable partial dentures kept their denture in place during the saliva collection. Resting whole saliva was collected for 5 minutes by a spitting method.[18-19]

The SPSS program version 17.00 used for statistical analyses. Frequency analysis was performed to assess response distribution at the item level for GOHAI and WHOQOL-BREF. For dentate and edentulous group, logistic regression analysis was performed with GOHAI scores (0: poorer QOL, 1: good QOL), WHOQOL-BREF 26, physical domain, psychological domain, environmental domain, and social relations (0: poorer QOL, 1 good QOL) as dependent variables. Decayed teeth, number of teeth present, gingival bleeding, pocket depth, FTUs and saliva flow was used as independent variables.

RESULTS

Socio-demographics and health behaviors
The number of subjects aged 60-69 years was 354 person (57.9%) and those aged 70 years and older were 258 person (42.1%). Most of subjects (91.3 %) had no study or finished primary school. Almost a half (45.3%) of subject claimed to have not enough income. Systemic diseases were reported in 74.8% of subjects: hypertension 37.3%, diabetes mellitus 18.3%, heart disease 6.5% and other disease 12.7%, and 76.1% of subjects routinely used prescription medicines. 6.5% of subject had current smoking, only 1.5 % of all subject drank alcohol every day.

GOHAI
The mean and median GOHAI score was 49.94 and 52.0 (SD=9.28) respectively. Frequency answer for each

Table 1. Distribution of GOHAI items

GOHAI	Never	Seldom	Sometime	Often	Very often	Always
Functional limitation						
Trouble biting/chewing food	241 (39.4)	123 (20.1)	124 (20.3)	50 (8.2)	41 (6.6)	33 (5.4)
Uncomfortable to swallow	444 (72.5)	74 (12.1)	66 (10.8)	14 (2.3)	8 (1.3)	6 (1.0)
Prevented from speaking	436 (71.2)	84 (13.7)	58 (9.5)	15 (2.5)	8 (1.3)	11(1.8)
Pain and discomfort						
Discomfort when eating	224 (36.6)	142 (23.2)	134 (21.9)	40 (6.5)	36 (5.9)	36 (5.9)
Use medication to relieve pain	367 (60.0)	110 (18.0)	102 816.7)	18 (2.9)	7 (1.1)	8 (1.3)
Teeth, gums sensitive to hot/cold	359 (58.7)	93 (15.2)	117 (19.1)	12 (2.0)	14 (2.3)	17 (2.8)
Psychological impacts						
Unhappy with appearance	327 (53.7)	117 (19.1)	114 (18.6)	25 (4.1)	17 (2.8)	12 (2.0)
Worried or concerned	292 (47.7)	128 (20.9)	113 (18.5)	44 (7.2)	23 (3.8)	12 (2.0)
Nervous or self-consious	293 (47.9)	135 (22.1)	109 (17.8)	37 (6.0)	23 (3.8)	15 (2.5)
Uncomfortable eating in front of people	475 (77.6)	62 (10.0)	43 (7.0)	16 (2.6)	7 (1.1)	10 (1.6)
Behavioural impacts						
Limit kinds or amounts of food	260 (42.5)	133 (21.7)	130 (21.2)	44 (7.2)	19 (3.1)	26 (4.2)
Limit contacts with others	483 (78.9)	51 (8.3)	62 (10.0)	8 (1.3)	5 (0.8)	3 (0.5)

Table 2. Frequency responses (%) for items of WHOQOL-BREF

Scale point/domain and facets	1	2	3	4	5
General QOL	0.7	2.8	55.5	33.5	7.5
General health	1.2	11.9	16.3	61.4	9.2
Physical health					
Pain and discomfort	22.1	35.3	31.5	7.7	3.4
Energy and fatigue	1.3	6.1	51.8	22.7	18.1
Sleep and rest	1.0	13.5	11.8	59.6	14.1
Dependence on medication	19.8	23.5	35.6	17.0	4.1
Mobility	2.5	5.4	28.3	46.4	17.5
Activities of daily living	1.0	5.7	16.5	65.5	11.3
Working capacity	1.6	6.7	28.8	52.9	10.0
Psychological					
Positive feeling	2.5	57.8	34.7	2.5	2.5
Negative feeling	27.6	47.7	16.8	6.8	1.1
Self-esteem	1.1	2.9	34.0	44.9	17.1
Thinking, learning, memory, concentration	0.7	6.9	49.3	34.6	8.5
Body image	1.6	3.1	34.6	27.5	33.2
Spirituality, religion and personal beliefs	1.1	4.6	25.4	55.7	13.2
Social relationship					
Personal relations	1.0	3.3	36.4	48.0	11.3
Sex	2.6	2.9	42.8	40.1	11.6
Practical social support	0.2	2.8	28.4	57.5	11.1
Environment					
Financial resources	11.9	17.4	50.0	10.9	9.8
Information and skills	1.1	8.7	55.9	25.8	8.5
Recreation and leisure	1.5	14.9	50.3	22.5	10.8
Home environment	0.7	3.3	18.0	51.3	26.8
Physical safety and security	1.0	2.9	46.1	36.8	13.2
Physical environment	0.7	3.2	48.2	33.2	14.7
Access health service	0.0	2.6	10.5	70.4	16.5
Transport	1.3	7.1	16.2	62.3	13.1

Table 3. Association of GOHAI items with oral health status

	DT	Teeth present	FT	Gingival bleeding	≥4 mm pockets depth	Salivary flow rate	FTUs
Functional limitation							
Trouble biting/chewing food	ns	R=0.546**	ns	ns	ns	R=0.305**	R=0.407**
Uncomfortable to swallow	ns	ns	ns	ns	ns	R=0.321*	ns
Prevented from speaking	ns	R=0.238*	ns	ns	ns	R=0.226*	ns
Pain and discomfort							
Discomfort when eating	ns	R=0.627**	ns	ns	ns	ns	R=0.291**
Use medication to relieve pain	R=0.343*	ns	ns	R=0.190*	ns	ns	ns
Teeth, gums sensitive to hot/cold	R=0.207*	R=0.314**	ns	R=0.323**	R=0.313**	R=0.287*	ns
Psychological impacts							
Unhappy with appearance	ns	R=0.193*	ns	R=0.202*	R=0.426*	ns	ns
Worried or concerned	R=0.259*	R=0.145*	ns	R=0.284**	ns	ns	R=0.193*
Nervous or self-consious	R=0.432*	ns	ns	R=0.384**	ns	ns	R=0.125**
Uncomfortable eating in front of people	ns	R=0.261**	ns	ns	ns	ns	R=0.146**
Behavioural impacts							
Limit kinds or amounts of food	ns	R=0.431**	ns	ns	ns	ns	R=0.411**
Limit contacts with others	R=0.233*	R=0.210*	ns	ns	ns	ns	R=0.151**
Total GOHAI	R=0.287*	R=0.542**	ns	R=0.322**	R=0.353*	R=0.295**	R=0.402**

*>0.05, **>0.01, ns = no significant

Table 4. Logistic regression analysis of the variables independently associated with the GOHAI and WHOQOL-BREF domains (≤median) in dentate subjects (n=428)

Variable	Category	GOHAI			Physical			Psychological			Environment			Social relations		
		OR	95 % CI	P	OR	95 % CI	P	OR	95 % CI	P	OR	95 % CI	P	OR	95 % CI	P
Decayed teeth	None (Ref)															
	> 1	1.98	1.21-2.34	0.025	1.05	0.62-1.75	0.064	1.23	1.19-1.96	0.048	1.06	0.71-1.58	0.243	0.69	0.46-1.03	0.075
Number of teeth	20 or more (Ref)															
	1-19	2.02	1.34-3.11	0.022	1.91	1.39-4.62	0.032	1.66	1.08-2.53	0.012	1.83	1.28-3.67	0.018	1.55	1.10-2.18	0.036
Bleeding gingival	None (Ref)															
	> 1	1.59	1.17-2.13	0.044	1.27	1.17-4.14	0.038	1.28	1.15-1.99	0.021	1.41	1.17-1.96	0.046	0.65	0.20-2.05	0.267
Pocket depth	None (Ref)															
	> 1	1.46	1.12-2.31	0.005	1.21	1.07-1.88	0.041	0.89	0.26-2.63	0.621	1.76	1.08-2.76	0.021	1.09	0.64-1.59	0.968
FTUs	10 or more (Ref)															
	1-9	1.79	1.12-2.18	0.033	1.81	1.11-2.51	0.028	1.45	1.02-2.35	0.047	1.51	1.12-2.34	0.041	1.78	1.02-3.02	0.031
	0	2.01	1.22-2.45	0.016	1.92	1.23-2.92	0.046	1.83	1.12-2.62	0.008	1.67	1.21-2.75	0.005	1.97	1.22-2.98	0.024
Resting salivary flow	≥0.1 ml/min (Ref)															
	<0.1 ml/min	1.19	1.02-1.74	0.043	1.23	0.77-1.96	0.475	1.28	0.57-1.45	0.626	0.73	0.46-1.17	0.562	1.08	0.67-1.72	0.223

Adjusted by age, gender, education, household income, smoking, systemic disease and intake of medicine.

Table 5. Logistic regression analysis of the variables independently associated with the GOHAI and WHOQOL-BREF domains (≤median) edentulous subjects (n=184)

Variable	Category	GOHAI			Physical			Psychological			Environment			Social relations		
		OR	95 % CI	P value	OR	95 % CI	P value	OR	95 % CI	P value	OR	95 % CI	P value	OR	95 % CI	P value
Denture	Yes (Ref)															
	No	2.53	1.61-3.54	0.001	2.05	1.32-3.75	0.003	1.96	1.05-2.11	0.048	1.34	1.02-1.98	0.043	1.69	1.16-2.01	0.005
Resting salivary flow	≥0.1 ml/min (Ref)															
	<0.1 ml/ min	1.22	1.02-1.74	0.043	1.23	0.77-1.96	0.475	1.28	0.57-1.45	0.626	0.73	0.46-1.17	0.562	1.08	0.67-1.72	0.223

Adjusted by age, gender, education, household income, smoking, systemic disease and intake of medicine.

items of GOHAI was shown in Table 1. Third important complaints of oral health problems of all subjects were discomfort when eating, trouble biting/ chewing food and limit kinds or amounts of food.

General quality of life WHOQOL-BREF 26

Frequency answers for each item of the WHO-BREF were distributed across the full range of the scale showed in the Table 2. The mean and median scores of physical domain (58.7 and 56.0, SD=10.4), psychological domain (59.7 and 56.0, SD=10.9), social relationship (66.4 and 66.0, SD=15.9) and environmental domain (65.5 and 63.0, SD=13.1). The third poorer QOL items in this population were negative feeling (27.6%), pain and discomfort (22.1%) and dependence on medication (19.8%), respectively.

Oral health status

Thirty percent of subjects (n=184) were edentulous. The mean of teeth present was 10.8±9.9. The mean FTUs were 5.2±5.1. Overall active decay was 57.8% of all subjects. There were no significant differences were found by age and gender. Half of subjects (50%) had at least one deep (4 mm or deeper) pocket. The percentage of subjects with teeth with gingival bleeding was 67.6. The percentage of subjects had low salivary flow rate was 24.7.

Relationship between GOHAI and oral health

The relationship between the GOHAI 12 items and oral health status is shown in Table 3. Decayed teeth had significant related to six GOHAI items. Number of teeth present was significantly related to nine GOHAI items. Gingival bleeding had significantly related five GOHAI items. Pockets depth had significant related with two GOHAI items. FTUs had significant with seven GOHAI items. Filled teeth had no significant relationships to any of GOHAI items.

Relationship between oral health status and quality of life

For dentate subjects, logistic regression analysis showed in the Table 4. Number of teeth present, decayed teeth, gingival bleeding, pocket depth, FTUs and saliva flow rate were significantly associated with GOHAI. Regarding WHOQOL, Number of teeth present, gingival bleeding and FTUs significantly associated with the physical domain (p<0.05). Number of teeth present, decayed teeth, gingival bleeding and FTUs was significantly related with the psychological domain (p<0.05). Number of teeth present and FTUs were significantly associated with the environment domain and the social domain (p<0.05). For edentulous subjects, denture wearing was significantly associated with GOHAI and all domains of WHO-BREF (p<0.05). Subject with no denture might impact GOHAI score than those with denture (OR 2.53) (Table 5).

DISCUSSION

The mean GOHAI score in this study suggested a relatively high impact of oral health on the population studied. The mean score was considerably higher than the oral health impact reported in other studies, for example in Chinese (mean score = 48.9), Malay population (mean score = 46.2).[13,20] In contrast however, the Thai mean score was lower than that reported in Germany where the mean score=53.[21] On examining variation in GOHAI by socio-demographic characteristics gender, education and socio-economic status, reported statistical differences between income and GOHAI score in this study. Well educated, a higher annual household income were more likely to have a high GOHAI score.[10]

This study use the WHOQOL-BREF 26 for elderly Thais, which instrument reports on four domains of life: physical, psychological, social, and environmental.

The scores of quality of life in this study for, physical health and psychological health were lower than those reported in similar populations in Norway, Switzerland, Sweden, Denmark, Germany, and the Czech Republic. Social relationships in our study, however were higher than those reported.[22] This study therefore shows, that elderly Thais had a slightly overall lower perception of their quality of life when compared with similar aged population in other countries. The Thai population however had a higher quality of life perception in the domain of social health-social relationships-which possibly show, the very close social and family relationship values hold by the Thai culture.

This study also found that the younger age group had higher scores for physical health than the older group. Other studies have also found, that demographic factors have been associated with higher QOL; included age, gender and income. [23-25] In the present study we reported a significant relationship of physical and psychological domain and educational level. These results are in good agreement with findings in the history of public health research, in that the lower socioeconomic strata are associated with lower health status.[26-29] Higher levels in each domain of quality of life were associated with increase in economic level, similarly found with Hugo et al.[30] The present study, however failed to find a relationship between gender and QOL this may be due to a small number of males in this study.

In this study we found the significant correlation between GOHAI and WHOQOL-BREF, also found the significant positive correlation between OHRQoL and GHRQoL. General health-related quality of life can be explained by dental conditions. This shows that oral well-being has an impact on general well-being.[31] This study found that the significant between dental decayed and GOHAI. Severe caries detracts from quality of life: there experience pain, discomfort, disfigurement, acute and chronic infections, and eating and sleep disruption as well as higher risk to higher risk of hospitalization and high treatment costs.[32] Dental caries is a serious oral health problem for the elderly. The final consequence of dental caries is loss of teeth, which, in turn, has serious consequences for general health and the quality of life of the elderly.[28] Our results show that filled teeth demonstrate not significant correlation with the GOHAI score. The same occurs when teeth are healthy and functional. The lack of significant correlation with clinical measures confirms findings by other researchers and suggests that patients may not identify early dental disease as a problem, but base their oral health perceptions on other, more functional concerns.[33]

Tooth loss had impacts on oral-health-related quality of life. Having fewer teeth was significantly related to a worse GOHAI score.[10] A possible explanation to the association between edentulism and worse QOL in the physical domain lies on the face that tooth loss is known to cause pain and suffering, which are facets included in physical domain of WHOQOL-BREF.[34] Edentulism may also place restriction on mastication and speech, and consequently reflect on self-rated QOL related to physical domains, as observed in the present study.[30] Missing teeth causes embarrassment, adversely affecting one's esteem, and body image, which are two of the facets that compose the Psychological domain of WHOQOL-BREF.[35] This may be one of the reasons why aged persons with fewer teeth were more likely to have lower scores in this particular domain.

FTUs associated with a poorer QOL in all four domains of WHOQOL-BREF. This finding seems to support the notion that oral status can directly affects one's perception of well-being and general QOL. FTUs related to ability to chew is related to masticatory dysfunction, which is known to place restrictions on eating (i.e. physical domain), discourages people to enjoy meals with family or friends (i.e. psychological, social relations, and environment domains), and may also interfere with one's social relations.[36] Mastication is considered an important basic function to maintain life; and it is gravely affected by the collapse of one's masticatory environment caused by oral disease.[37] It is likely that chewing ability would affect general health through a pathway involving the impact of food selection or selective food avoidance on diet and nutrition. Having more teeth has been reported to be associated with having a healthy diet rich in fruit and vegetable, a satisfactory nutritional status and acceptable body mass index.[11] This assumption is supported by evidence showing that older persons who did not have their missing teeth replaced with removable or fixed dental prostheses related their QOL as worse than those who had missing teeth replaced.[28]

This study found that the significantly between bleeding gingival and quality of life. Bleeding on probing able to cause negative impacts in the daily life.[38] Older people with some teeth with periodontal attachment loss of more than 6 mm had highly significant differences in the oral impact on daily performances scores compared to those without attachment loss.[39] An absence of saliva results in a number of oral changes and related behaviors that can influence a patient's quality of life.[40]

Oral health status can influence people physically and psychologically, as well as how they enjoy life-how they look, speak, chew and taste food and socialize. Their self-esteem, self-image and feelings of social well-being are also affected.[5,41] Oral health defined in general physical, psychological and social well-being terms in relation to oral status. Cohen and Jago consider the greatest contribution of dentistry is to improve quality of life.[42] Disruptions in physical, psychological and social functioning are therefore important in assessing oral health.

The findings from the present study support the evidence that oral status may cause suffering and impacts on general QOL. This is one of the first studies to our knowledge reporting that older persons without teeth and FTUs have an increased chance of reporting a poorer QOL in general as assessed with WHOQOL-BREF. Keeping natural teeth by oral health care for prevention tooth decayed and periodontal disease, replacement missing teeth with denture for more number of FTUs, should be include for oral health promotion program for elderly population would improvement QOL. Intervention studies are needed to assess whether dental care reduces the impacts and affects quality of life.

CONCLUSION

The number of teeth present, denture wearing and FTUs strongly affected the oral health related and general QOL. Dental caries, periodontal status and salivary flow rate also affected oral health related QOL and some domains of general QOL. Therefore, it is considered that an improvement in oral health status would promote QOL of older Thai.

CONFLICT OF INTEREST

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias the conduct and findings of this study.

REFERENCES

1. Tabira Y, Yasunaga M, Nagamoto N, Matsushita H, Fukunaga Y, Ihara T, et al. Quality of life after esophagectomy for cancer: an assessment using the questionnaire with the face scale. Surg Today. 2002;32:213-9.
2. Locker D, Allen F. What do measures of 'oral health-related quality of life' measure?. Community Dent Oral Epidemiol. 2007;35:401-11.
3. Naidoo J, Wills J. Health promotion foundation for practice. 2nd ed. Oxford, UK: Baillière Tindall; 2000.
4. WHOQOL Group. The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization. Social Science & Medicine. 1995;41:101403-9.
5. Locker D. Measuring oral health: a conceptual framework. Community Dent Health. 1998;5:3-18.
6. Allen PF. Assessment of oral health related quality of life. Health Qual Life Outcomes. 2003;1: 40.
7. Ranta K, Tuominen R, Paunio I. Perceived oral health status and ability to chew among an adult Finnish population. Gerodontics. 1987;3:136-9.
8. Ekelund R. Dental state and subjective chewing ability of institutionalized elderly people. Community Oral Epidemiol. 1989;17:24-7.
9. Benyamini Y, Leventhal H, Leventhal EA. Self-rated oral health as an independent predictor of self-rated general health, self-esteem and life satisfaction. Soc Sci Med. 2004; 59:1109-16.
10. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ. 1990;11:680-7.
11. Marcenes W, Steele JG, Sheiham A, Walls AW. The relationship between dental status, food selection, nutrient intake, nutritional status, and body mass index in older people. Cad Saude Publica. 2003;19:809-16.
12. Locker D. Dental status, xerostomia and the oral health-related quality of life of an elderly institutionalized population. Spec Care Dentist. 2003;23: 86-93.
13. Wong MC, McMillan AS. Tooth loss, denture wearing and oral health-related quality of life in elderly Chinese people. Community Dent Health. 2005;22: 156-61.
14. Arnold R, Ranchor AV, Sanderman R, Kempen GI, Ormel J, Suurmeijer TP. The relative contribution of domains of quality of life to overall quality of life for different chronic diseases. Qual Life Res. 2004;13:883-96.
15. Hugo FN, Hilgert JB, de Sousa L, Cury JA. Oral status and its association with general quality of life in older independent-living south-Brazilians. Community Dent Oral Epidemiol. 2009;37:231-40.
16. World Health Organization. Oral health surveys: basic methods - 5th edition. 2013
17. Samnieng P, Ueno M, Shinada K, Zaitsu T, Allan F, Wright C, Kawaguchi Y. Oral health status and chewing ability is related to mini-nutritional assessment results in an older adult population in Thailand. J Nutr Gerontol Geriatr. 2011;30: 291-304.
18. Osterberg T, Landahl S, Hedegard B. Salivary flow, saliva, pH and buffering capacity in 70-year-old men and women. Correlation to dental health, dryness in the mouth, disease and drug treatment. J Oral Rehabil. 1984;11:157-70.
19. Narhi TO, Kurki N, Ainamo A. Saliva, salivary micro-organisms, and oral health in the home-dwelling old elderly--a five-year longitudinal study. J Dent Res. 1999; 78:1640-6.
20. Othman WN, Muttalib KA, Bakri R, Doss JG, Jaafar N, Salleh NC, et al. Validation of the Geriatric Oral Health Assessment Index (GOHAI) in the Malay language. J Public Health Dent. 2006;66:199-204.
21. Hassel AJ, Rolko C, Koke U, Leisen J, Rammelsberg P. A German version of the GOHAI. Community Dent Oral Epidemiol. 2008;36:34-42.
22. Dragomirecka E, Bartonova J, Eisemann M, Kalfoss M, Kilian R, Martiny K, von Steinbuchel N, Schmidt S. Demographic and psychosocial

correlates of quality of life in the elderly from a cross-cultural perspective. Clin Psychol Psychother. 2008;15:193-204.
23. Atchison KA, Der-Martirosian C, Gift HC. Components of self-reported oral health and general health in racial and ethnic groups. J Public Health Dent. 1998;58:301-8.
24. Wong MC, Liu JK, Lo EC. Translation and validation of the Chinese version of GOHAI. J Public Health Dent. 2002;62:78-83.
25. Ergul S, Akar GC. Reliability and validity of the Geriatric Oral Health Assessment Index in Turkey. J Gerontol Nurs. 2008;34:33-9.
26. Feldman JJ, Makuc DM, Kleinman JC, Cornoni-Huntley J. National trends in educational differentials in mortality. Am J Epidemiol. 1989;129:919-33.
27. Feinstein JS. The relationship between socioeconomic status and health: a review of the literature. Milbank. 1993; Q 71: 279-322.
28. Mack F, Schwahn C, Feine JS, Mundt T, Bernhardt O, John U, et al. The impact of tooth loss on general health related to quality of life among elderly Pomeranians: results from the study of health in Pomerania (SHIP-O). Int J Prosthodont. 2005;18:414-9.
29. Mackenbach JP, Kunst AE, Cavelaars AE, Groenhof F, Geurts JJ. Socioeconomic inequalities in morbidity and mortality in western Europe. The EU Working Group on Socioeconomic Inequalities in Health. Lancet. 1987;349:1655-9.
30. Hugo FN, Hilgert JB, de Sousa Mda L, da Silva DD, Pucca Jr GA, Jr. Correlates of partial tooth loss and edentulism in the Brazilian elderly. Community Dent Oral Epidemiol. 2007;35:224-32.
31. Zimmer S, Bergmann N, Gabrun E, Barthel C, Raab W, Ruffer JU. Association between oral health-related and general health-related quality of life in subjects attending dental offices in Germany. J Public Health Dent. 2010;70:167-70.
32. Acs G, Lodolini G, Kaminsky S, Cisneros GJ. Effect of nursing caries on body weight in a pediatric population. Pediatr Dent. 1992;14:302-5.
33. Gooch BF, Dolan TA, Bourque LB. Correlates of self-reported dental health status upon enrollment in the Rand Health Insurance Experiment. J Dent Educ. 1989;53: 629-37.
34. Sheiham A. Oral health, general health and quality of life. Bull World Health Organ. 2005;83:644.
35. 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.
36. Yoshida M, Sato Y, Akagawa Y, Hiasa K. Correlation between quality of life and denture satisfaction in elderly complete denture wearers. Int J Prosthodont. 2001;14:77-80.
37. Yoshida Y, Hatanaka Y, Imaki M, Ogawa Y, Miyatani S, Tanada S. Epidemiological study on improving the QOL and oral conditions of the aged--Part 1: The relationship between the status of tooth preservation and QOL. J Physiol Anthropol Appl Human Sci. 2001;20:363-8.
38. Amaral Loureiro AC, Costa FO, da Costa JE. The impact of periodontal disease on the quality of life of individuals with Down syndrome. Downs Syndr Res Pract. 2007;12:50-4.
39. Srisilapanan P, Sheiham A. The prevalence of dental impacts on daily performances in older people in Northern Thailand. Gerodontology. 2001; 18:102-8.
40. Locker D. Subjective reports of oral dryness in an older adult population. Community Dent Oral Epidemiol. 1993;21:165-8.
41. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AW. Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. Community Dent Oral Epidemiol. 2001; 29:195-203.
42. Cohen LK, Jago JD. Toward the formulation of sociodental indicators. Int J Health Serv. 1976;6: 681-98.

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