ORIGINAL PAPER

Oral health-related quality of life among community dwelling middle-aged and older adults in an urban area in Magway region, Myanmar

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ABSTRACT

This study aims at describing oral health-related quality of life (OHRQoL) and determining its associated factors in a middle-aged and older adult community dwelling population in Myanmar. In a cross-sectional community survey, 633 individuals (men 55% and women 45%), aged 35–65 years, selected by multi-stage random sampling, responded to a structured questionnaire on the Oral Health Impact Profile-short form (OHIP-14), health status, health behavior and socio-demographic information. Participants had an overall mean score of 8.1(item mean=0.65) on the OHIP-14, 57.2% had impaired OHRQoL and 16.6% frequent impaired OHRQoL. The highest prevalence of problems was found to be psychological discomfort (60.2%), followed by physical pain (51.7%) and physical disability (40.9%). In adjusted logistic regression analysis, poor oral health status (tooth loss, having one or more cavities, and poor perceived periodontal health), and poor general health status (depressive symptoms) were positive while oral health behavior (drinking piped or bottled water, using toothpaste with fluoride, and never visited a dentist) were negatively associated with both impaired and frequent impaired OHRQoL. In addition, frequent soft drink consumption was associated with impaired OHRQoL, and having a high household income and being physically inactive were associated with frequent impaired OHRQoL. A high prevalence of impaired OHRQoL was found among this middle-aged and older adult population in central Myanmar. Several risk factors (poor oral health status, poor general health status, poor oral and general health behavior) for impaired OHRQoL were identified, which could help in guiding oral health interventions among the populace.

Keywords: oral health-related quality of life, health status, health behavior, adults, Myanmar

INTRODUCTION

Oral illnesses constitute a major public health problem globally and poor oral health status can have a severe effect on general health and quality of life.[1] Oral health-related quality of life (OHRQoL) which is defined as "people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health,"

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has been identified as a public health priority.[2] The assessment of OHRQoL is important for patient-centered and biopsychosocial oral health care programming and dental research.[3] OHRQoL correlates well with objectively or clinically measuredoral health status.[4] One instrument commonly used to assess OHRQoL is the "Oral Health Impact Profile (OHIP-14).[5] In a study among Greek adults (aged 35–44 years) an overall OHIP-14 item mean score of 1.1 was found,[6] while in a study among 20 to 80 year olds in Norway, the total mean OHIP-14 score was 4.1.[7] Among older adults in Central China, the total and item mean value of the OHIP-14 were 6.8 and 0.47, respectively.[8] The most frequently reported problems in the Norwegian study were physical pain (56%), psychological discomfort (39%) and psychological disability (30%).[7] In a study in the Czech Republic, the most frequently scored domain was physical pain (53%),[9] and among Sudanese adults the two most frequent were psychological discomfort (47%) and physical pain (37%).[10] In Greece high scores of above two were found for functional limitation, physical pain, handicap, and the psychological discomfort scales.[6] Among a large sample of Thai open university students (15–87 years), the most common problems were discomfort while chewing (15.8%), social interaction (12.5%) and pain (10.6%),[11] and among older adults in Central China "physical pain" had the highest scores.[8] There were no studies carried out in the area of assessing OHRQoL among the general adult community dwelling in Myanmar prior to this study.[12]

Factors associated with OHRQoL have been identified as sociodemographic, oral health status, general health status, oral health behavior, and general health behavior. Sociodemographic factors associated with impaired OHRQoL include older age,[7,9,13] female sex,[7,10,11] lower education,[6] and lower economic status.[11] Oral health status factors associated with impaired OHRQoL include dental caries,[10,14,15] tooth loss,[7,9,11,14,15] periodontal diseases,[14] and poor self-rated oral health.[7,9,10] General health status factors associated with impaired OHRQoL include poor mental health, depression[16,17] and systemic diseases (such as diabetes and arthritis).[10,16] Oral health behaviors associated with impaired OHRQoL include inadequate tooth brushing,[9] irregular dental visits,[7] emergency dental attendance[13] and consumption of soft drinks,[9] while general health risk behaviors include smoking,[9,11] alcohol use,[9,11,13] physical inactivity,[13] and infrequent fruit and vegetable consumption.[18]

The aim of this study is to describe the OHRQoL and its associated factors in a middle-aged and older adult community dwelling population in Myanmar.

MATERIALS AND METHODS

Sample and procedure
In a community-based cross-sectional study, 633 participants aged 35 to 65 years, from an urban area of Magway Township were included in the study. They were selected by multi-stage cluster random sampling (one of five districts in Magway region, one of six townships in Magway district, three of 15 wards in Magway Township, 211 households from each of the three wards, one adult member, 35–65 years old, from one household). A household member was interviewed by a trained research assistant using a structured questionnaire, which has been translated from English to Myanmar using standard research procedures and piloted in a sample not forming part of the final sample. Data collection was conducted from April to May 2016. The study protocol was approved by the Committee for Research Ethics (Social Sciences), Mahidol University (MU-SSIRB No.: 2016/1421204) and the Committee of University of Community Health (Magway), Myanmar. Informed consent was obtained from all participants prior to the research interview.

Measures

The questionnaire included socio-demographic information (age, gender, education, and household income), oral health status, general health status, oral health behavior, general health behavior and OHRQoL.

OHRQoL. Symptom and functional status were measured using the OHIP-14.[5] The 14-item questionnaire comprised seven domains: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. Participants were asked whether they have experienced the problem described by each item in the last 12 months. The participants rated their problems on a five-point Likert scale coded as never (score 0), hardly ever (1), occasionally (2), fairly often (3) and very often (4). The OHIP-14 has been validated in Myanmar showing reasonable reliability and excellent construct validity.[12] Cronbach's alpha was 0.94 in this study.

Oral health status

Tooth loss was assessed with the question, "How many natural teeth do you have?" (Response options: 1=no natural teeth, 2=1–9 teeth, 10–19 teeth, and 20 teeth or more).[19] Responses were classified into having 0–19 teeth and 20 or more teeth.

Cavities were assessed with the question, "How many cavities have you had in your permanent teeth?" (Response options ranged from 1=0 cavities to 5= 6 or more cavities).[19] Responses were classified into 1=having one or more cavities and 0=having no cavities.

Perceived periodontal health status was assessed with the question, "How would you describe the state of your gums?" Response options ranged from 1=excellent to 6=very poor.[19] Poor periodontal health status was classified as having poor or very poor status of gums, and good periodontal health as having average to excellent status of gums.

General health status

Chronic conditions were assessed with the question, "Have you been diagnosed (by a doctor or other health worker) with…?" (High cholesterol/high blood lipids, Heart disease, Stroke, Kidney disease, Asthma, Arthritis, Diabetes (high blood sugar), and Cancer). Responses were classified into 1=having one or more chronic conditions and 0=having none.

The Patient Health Questionnare-9 (PHQ-9) was used to screen participants suffering from depression.[20] It has demonstrated high sensitivity (0.84) and specificity (0.77) in a validation study in Thailand (culturally similar to Myanmar), using a cut-off score of nine or more as indicative for major depression symptoms.[21] (Cronbach alpha 0.84).

Oral health behaviors were assessed with five questions[19]:

1) "What is the main source of your home drinking water now? (Whether filtered or not)" (Responses were grouped into 1=piped supply, bottled water and water from commercial dispenser and 0=well or underground water, rain water, river, canal, stream, pond or lake); 2) "How often do you clean your teeth?" (Response options: 1=never to 7=twice or more a day); 3) "Do you use toothpaste containing fluoride?"(Yes or No); 4) "Consumption of soft drinks?"(Responses: 1=more than once a day to 6=never); 5) "How long has it been since you last saw a dentist?" (Response options: 1=less than 6 months to 6=never received dental care).[19]

General health behavior

Smoking status was assessed with the question, "Do you currently smoke any tobacco products (such as cigarettes, bidis, cigars, pipes, betel)?" (Response options: 1=yes, daily, 2=yes, but not daily, 3=no, not at all).[19]

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Problem drinking or hazardous and harmful alcohol use was assessed with the Alcohol Use Disorder Identification Test (AUDIT)-C, using a cut-off score of 3 for women and 4 for men.22) The Cronbach alpha for the AUDIT-C in this study was 0.86.

Physical activity was measured by asking respondents, "How frequently do you engage in vigorous physical activity, including sports and physical activity at work in the last 7 days? [Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.]"Physical inactivity was defined as engaging less than once per week in vigorous physical activity.[23]

Fruit and vegetable consumption was measured with the questions, "How many servings of fruit do you eat on a typical day? [One standard serving = 80 grams, or 6–8 pieces of ripe papaya, water melon or pineapple, 1 banana, 1 tangerine, 4 rambutans, 1/2 cup of no-added-sugar processed fruit, 1/2 cup of canned fruit or 1/2 cup of 100% fruit juice]" and "How many servings of vegetables do you eat on a typical day [One standard serving = 80 grams or 1/2 cup of cooked leafy vegetables, 1 cup of raw green leafy vegetables, 1/ 2 cup of tomato, carrot, pumpkin, cabbage, beans or white onion, or 1/2 cup of 100% vegetable juice]". The consumption of less than five servings of fruit and vegetables a day was defined as inadequate.[19,24]

Statistical analysis

Data analyses were conducted with IBM SPSS (version 24.0) (Chicago, IL, USA).The sample was described with descriptive statistics. Logistic regression analysis was used to assess the association between socio-demographic factors, oral health status, general health status, oral health behavior, general health behavior and impaired OHRQoL. Impaired OHRQoL was defined as scoring two or more on any item of the OHIP-14, and "frequent" impaired OHRQoL was defined as scoring three or more on any item of the OHIP-14.

RESULTS

Sample characteristics

The sample included 633 adults (348 males and 285 females) aged 35 to 65 years, mean age 45.0 years (SD=8.6); the response rate was 98%. More than one-third of the participants (38.9%) had post-secondary education, and 41.2% had a household income of 300000 or more Kyat. Regarding oral health status, 11.1% of participants reported to have 0–19 natural teeth, 48.2% having one or more cavities, and 7.1% perceived their periodontal status as poor. In terms of general health status, 17.9% of the participants reported to have been diagnosed with one or more chronic conditions, and 3.9% scored positive on depressive symptoms. In relation to oral health behavior, 55.6% of respondents indicated that their drinking water comes from sources having fluoride, 58.0% cleaned their teeth twice or more times a day, 84.2% used toothpaste with fluoride, 42.2% consumed soft drinks once or more times a day and 51.2% had never been to a dentist. Regarding general health behavior, 24.2% of participants were current smokers, 10.4% were problem drinkers, 48.8% were physically inactive, and 80.4% ate insufficient fruit and vegetables. On a score range from 0 to 56 on impaired OHRQoL, the overall mean score was 8.1 (item mean score 0.58, SD=0.65), 57.2% had impaired OHRQoL, and 16.6% frequent impaired OHRQoL

Oral health-related quality of life

Almost one-third (32.7%) of participants reported having no problems on any of the 14 items

Table 1 Sample characteristics

Variable	Sample	OHIP-14 scores	Impaired OHRQoL	Frequent impaired OHRQoL
	N (%)	M (SD)	n (%)	n (%)
Sociodemographic variables				
All	633	8.1 (9.1)	362 (57.2)	105 (16.6)
Age (50-65 years)	198 (31.3)	8.4 (9.3)	111 (56.1)	45 (22.7)
Male	348 (55.0)	8.9 (9.3)	190 (54.6)	63 (18.1)
Education (high)	246 (38.9)	9.1 (9.8)	145 (58.9)	49 (19.9)
Household income per month in Myanmar Kyats[1]				
Low (50000–170000)	211 (33.3)	8.3 (8.4)	132 (62.6)	26 (12.3)
Medium (171000–299000)	161 (25.4)	7.6 (9.4)	87 (54.0)	24 (14.9)
High (300000 and more)	261 (41.2)	8.2 (9.4)	143 (54.8)	55 (21.1)
Oral health status				
Number of teeth (0-19)	70 (11.1)	13.1 (10.4)	54 (77.1)	20 (28.6)
Cavity (1 or more)	305 (48.2)	10.7 (10.1)	202 (66.2)	73 (23.9)
Perceived periodontal health (poor)	45 (7.1)	21.6 (7.2)	43 (95.6)	21 (46.7)
General health status				
Chronic conditions (1 or more)	113 (17.9)	9.3 (9.2)	66 (58.4)	15 (13.3)
Depressive symptoms	25 (3.9)	16.0 (12.9)	20 (80.0)	11 (44.0)
Oral health behaviour				
Drinking water source (piped, bottled)	352 (55.6)	7.9 (8.7)	183 (52.0)	44 (12.5)
Tooth cleaning (twice or more/day)	367 (58.0)	6.9 (8.4)	197 (53.7)	65 (17.7)
Uses toothpaste with fluoride	533 (84.2)	8.0 (9.0)	289 (54.2)	79 (14.8)
Soft drinks (≥once/day)	267 (42.2)	8.2 (8.6)	170 (63.7)	38 (14.2)
Never dental care visit	324 (51.2)	5.3 (7.3)	149 (46.0)	30 (9.3)
General health behaviour				
Smoking	153 (24.2)	6.6 (7.7)	84 (54.9)	27 (17.6)
Problem drinking	66 (10.4)	6.1 (7.5)	35 (53.0)	12 (18.2)
Physically inactive	309 (48.8)	8.2 (9.2)	184 (59.5)	67 (21.7)
Inadequate fruit and vegetable consumption	509 (80.4)	8.3 (9.2)	283 (55.6)	85 (16.7)

[1] 1 US\$ =1300 Myanmar Kyats

of the OHIP-14. On individual items, the highest prevalence of any problems was reported to be self-conscious (55.9%), followed by discomfort when eating food (46.3%), and painful aching in the mouth (41.7%). Among the seven different OHIP-14 domains, the highest prevalence of problems was found to be psychological discomfort (60.2%), followed by physical pain (51.7%) and physical disability (40.9%) (Table 2).

Associations with oral health-related quality of life

In adjusted logistic regression analysis, poor oral health status (tooth loss, having one or more cavities, and poor perceived periodontal health), and poor general health status (depressive symptoms) were positive and oral health behavior (drinking piped or bottled water, using toothpaste

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Table 2 Frequency responses on individual items and domains of the OHIP-14

OHIP-14 items	0=Never	1=Hardly ever	2=Occa-sionally	3=Fairly often	4=Very often	Any problem	OHIP-14 domains (scores >0)	
	%	%	%	%	%	%		N (%)
Trouble pronouncing words	77.1	11.2	11.5	0.0	0.2	22.9	Functional limitations	250 (39.5)
Worsened sense of taste	65.2	11.4	22.3	1.1	0.0	34.8		
Painful aching in mouth	58.3	12.6	26.7	2.4	0.0	41.7	Physical pain	327 (51.7)
Uncomfortable to eat food	53.7	12.6	28.1	5.4	0.2	46.3		
Been self-conscious	44.1	14.5	28.9	8.2	4.3	55.9	Psychological discomfort	381 (60.2)
Felt tense	64.1	8.1	24.0	3.6	0.2	35.9		
Unsatisfactory diet	65.2	9.8	21.6	3.3	0.0	34.8	Physical disability	259 (40.9)
Interrupting meals	64.6	13.9	18.8	2.7	0.0	35.4		
Difficulty relaxing	70.5	14.4	13.6	1.6	0.0	29.5	Psychological disability	251 (39.7)
Embarrassed	62.9	12.0	22.1	3.0	0.0	37.1		
Irritable with other people	77.9	12.8	8.8	0.5	0.0	22.1	Social disability	183 (28.9)
Difficulty doing usual jobs	74.9	11.5	12.2	1.4	0.0	25.1		
Life is less satisfying	77.4	10.3	11.4	0.9	0.0	22.6	Handicap	163 (25.8)
Unable to function	79.8	11.2	8.8	0.2	0.0	20.2		
One or more items	32.7						OHIP-14 score	426 (67.3)

with fluoride, and never having visited a dentist) were negatively associated with both impaired OHRQoL and frequent impaired OHRQoL. In addition, frequent soft drink consumption was associated with impaired OHRQoL, and having a high household income and being physically inactive were associated with frequent impaired OHRQoL. Regular tooth cleaning (twice or more a day) was in bivariate analysis protective from impaired OHRQoL (Table 3).

DISCUSSION

To our knowledge, this is the first time the OHIP-14 was used to investigate OHRQoL and its associated factors in a middle-aged and older adult community dwelling population in Myanmar. The study reveals that a substantial number of the Myanmar population had impaired OHRQoL, which is higher than in Norway[7] and Central China,[8] but lower than in a study among a middle-aged sample in Greece.[6] It also reveals the highest prevalence of problems as psychological discomfort (feeling tense and/or self-conscious), followed by physical pain and physical disability. Psychological discomfort was the highest in this study, which was also found in Sudan,[10] and it was the second highest in Norway[7] and the fourth highest in Greece.[6] While this study reveals physical pain as the second highest, several previous studies reveal the highest problems as physical pain, e.g., in Norway,[7] Czech Republic,[9] and in China.[8]

These differences may be due to differences in the study population and perception of impaired oral health in different cultures.[10,25] The high prevalence of psychological problems related to oral health found in this study may need special attention in clinical dental practice, as suggested previously.[7]

Table 3　Associations with Oral Health Related Quality of Life (OHRQoL)

Variable	Impaired OHRQoL		Frequent impaired OHRQoL	
	COR (95% CI)	AOR (95% CI)	COR (95% CI)	AOR (95% CI)
Sociodemographic variables				
Age (50–65 years) (base=35–49 years)	0.94 (0.67, 1.31)	–	1.84 (1.20, 2.83)**	1.25 (0.78, 2.03)
Male (base=female)	0.79 (0.58, 1.09)	–	1.28 (0.84, 1.96)	–
Education (high) (base=low)	1.12 (0.81, 1.56)	–	1.47 (0.96, 2.24)	–
Household income per month				
Low (50000–170000)	1 (Reference)	–	1 (Reference)	1 (Reference)
Medium (171000–299000)	0.70 (0.46, 1.07)	–	1.25 (0.69, 2.27)	1.39 (0.72, 2.68)
High (300000 and more)	0.73 (0.50, 1.05)	–	1.90 (1.14, 3.15)*	2.07 (1.17, 3.66)*
Oral health status				
Number of teeth (0–19) (base=20–32)	2.25 (1.28, 3.97)**	1.97 (1.01, 3.84)*	2.79 (1.56, 5.00)***	2.01 (1.02, 3.97)*
Cavity (1 or more) (base=0)	2.06 (1.49, 2.84)***	1.79 (1.26, 2.55)***	2.91 (1.86, 4.56)***	2.32 (1.41, 3.82)***
Perceived periodontal health (poor) (base=Average to excellent)	15.34 (6.12, 38.43)***	10.34 (4.00, 26.76)***	5.67 (3.45, 9.32)***	4.73 (2.19, 10.21)***
General health status				
Chronic conditions (1 or more) (base=none)	1.06 (0.70, 1.61)	–	0.73 (0.41, 1.32)	–
Depressive symptoms (yes) (base=no)	3.11 (1.15, 8.40)*	3.23 (1.14, 9.15)*	4.30 (1.89, 9.75)***	4.88 (1.66, 14.33)**
Oral health behaviour				
Drinker water (piped, bottled) (base=other sources)	0.62 (0.45, 0.85)**	0.65 (0.45, 0.93)*	0.52 (0.34, 0.79)**	0.55 (0.34, 0.88)*
Tooth cleaning (twice or more/day) (base:<twice/day)	0.71 (0.51, 0.98)*	0.88 (0.61, 1.27)	1.22 (0.79, 1.87)	–
Uses toothpaste with fluoride (yes) (base=no)	0.44 (0.27, 0.70)***	0.44 (0.26, 0.73)**	0.50 (0.30, 0.82)**	0.53 (0.35, 0.89)*
Soft drinks (≥once/day) (base:<once/day)	1.59 (1.15, 2.19)**	1.63 (1.11, 2.39)*	0.74 (0.48, 1.14)	–
Never dental care visit (base=any visit)	0.38 (0.28, 0.53)***	0.45 (0.31, 0.65)***	0.32 (0.20, 0.50)****	0.46 (0.28, 0.76)**
General health behaviour				
Smoking (yes) (base=no)	0.89 (0.61, 1.28)	–	1.10 (0.68, 1.79)	–
Problem drinking (yes) (base=no)	0.83 (0.50, 1.38)	–	1.13 (0.58, 2.20)	–
Physically inactive (yes) (base=active)	1.21 (0.88, 1.66)	–	2.08 (1.35, 3.21)***	1.66 (1.04, 2.65)*
Inadequate fruit and vegetable consumption (yes) (base=no)	0.71 (0.48, 1.07)	–	1.04 (0.61, 1.78)	–

AOR=Adjusted Odds Ratio, CI=Confidence Interval; ***P<0.001; **P<0.01; *P<0.05

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In agreement with previous studies,[7,9,13] this study found in bivariate analysis that older age was associated with (frequent) impaired OHRQoL. While previous studies found a preponderance of impaired OHRQoL in women,[7,10,11] this study did not find any significant gender differences. Previous studies[6,11] found that lower education and lower economic status were associated with (frequent) impaired OHRQoL, while this study found that higher economic status or having a higher household income was associated with (frequent) impaired OHRQoL. It is possible that in the epidemiological transition from infectious to non-communicable diseases, higher income segments of the society are the first to affect lifestyle changes, including poor oral health practices, that can affect oral health and impair OHRQoL.

This study is consistent with previous research[9-11,14,15] because it reveals that poor oral health status (tooth loss, having one or more cavities, and poor perceived periodontal health) increased the risk for impaired OHRQoL. Poor perceived periodontal health had the strongest association with having (frequent) impaired OHRQoL(Odds Ratio, OR= 4.7; 95% Confidence Interval 2.2–10.2). A similar result was found in the Norwegian study.[7]

Poor mental health (depressive symptoms) was associated with impaired OHRQoL in this study, which was also found in several previous studies.[16,17] While some previous studies found an association between the number of systemic diseases[10,16] and impaired OHRQoL, this study did not find such an association.

This study found that several oral health behaviors (drinking piped or bottled water, using toothpaste with fluoride, infrequent soft drink consumption and never visited a dentist) were protective from impaired OHRQoL. Some of these results are consistent with previous findings, including tooth brushing,[9] and consumption of soft drinks.[9] The probable sub-optimal fluoridation of water supply (using drinking water from the well or underground water, rainwater, river, canal, stream, pond or lake the rain) may have led to poorer oral health, which has been found in previous studies.[26] Contrary to previous studies,[7,13] this study found an inverse association between dental visits and impaired OHRQoL. Among our study participants who had consulted a dentist, the majority (91.9%) consulted a dentist the last time because of pain or trouble with teeth, gums and mouth and only 8.1% had gone for a preventative check-up (analysis not shown). This may explain why "never visited a dentist" was protective from impaired OHRQoL in this study. Regarding this study, and overall, the importance of oral hygiene practices need to be emphasized for better oral health and related quality of life.

While previous studies found an association between several general health risk behaviours,[9,11,13,18] and impaired OHRQoL, this study found only for physical inactivity such an association. Chronic diseases, including oral diseases, share common risk factors, and therefore, the integration of oral and general public health policies based on a common risk factor approach is propagated in Myanmar.

Study limitations include the cross-sectional design of the study; therefore, no causative conclusions can be drawn. Since the study sample only included three wards in one district, results cannot be generalized to a larger population. All assessment measures used in this study were by self-report, which may have biased responses. In future studies oral examinations should be performed.

CONCLUSION

A high prevalence of impaired OHRQoL was found among this middle-aged and older adult population in central Myanmar. Several risk factors (poor oral health status, poor general health status, poor oral and general health behavior) for impaired OHRQoL were identified, which could

help in guiding oral health interventions among this populace.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1   Acharya S. Oral health-related quality of life and its associated factors in an Indian adult population. *Oral Health Prev Dent*. 2008;16(3):175–84.

2   Allison P, Locker D, Jokovic A, Slade G. A cross-cultural study of oral health values. *J Dent Res*. 1999;78(2):643–9.

3   Almoznino G, Aframian DJ, Sharav Y, Sheftel Y, Mirzabaev A, Zini A. Lifestyle and dental attendance as predictors of oral health-related quality of life. *Oral Dis*. 2015;21(5):659–666. doi:10.1111/odi.12331.

4   Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol use disorders identification test. *Arch Intern Med*. 1998;158(16):1789–1795.

5   Dahl KE, Wang NJ, Skau I, Ohrn K. Oral health-related quality of life and associated factors in Norwegian adults. *Acta Odontol Scand*. 2011;69(4):208–214. doi:10.3109/00016357.2010.549502.

6   DHHS. *Oral health in America: a report of the surgeon general*. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institute of Health; 2000.

7   Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral conditions and health-related quality of life: A systematic review. *J Dent Res*. 2017;96(8):864–874. doi:10.1177/0022034517709737.

8   Hodacová L, Smejkalová J, Cermáková E, Slezák R, Jacob V, Hlavácková E. Oral health-related quality of life in Czech population. *Cent Eur J Public Health*. 2010;18(2):76–80.

9   Jensen PM, Saunders RL, Thierer T, Friedman B. Factors associated with oral health-related quality of life in community-dwelling elderly persons with disabilities. *J Am Geriatr Soc*. 2008;56(4):711–717. doi:10.1111/j.1532-5415.2008.01631.x.

10 Khalifa N, Allen PF, Abu-bakr NH, Abdel-Rahman ME. Psychometric properties and performance of the Oral Health Impact Profile (OHIP-14s-ar) among Sudanese adults. *J Oral Sci*. 2013;55(2):123–132.

11 Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606–613.

12 Lee HS, Kim C. Effects of Oral Health Impact Profile (OHIP) on depression and quality of life among community-dwelling Korean elderly persons. *J Korean Acad Community Health Nurs*. 2012;23(3):338–346.

13 Lotrakul M, Sumrithe S, Saipanish R. Reliability and validity of the Thai version of the PHQ-9. *BMC Psychiatry*. 2008;8:46. doi:10.1186/1471-244X-8-46.

14 Nandi A, Glymour MM, Subramanian SV. Association among socioeconomic status, health behaviors, and all-cause mortality in the United States. *Epidemiology*. 2014;25:170–177.

15 Nanri H, Yamada Y, Itoi A, Yamagata E, Watanabe Y, Yoshida T. Frequency of fruit and vegetable consumption and the oral health-related quality of life among Japanese elderly: a cross-sectional study from the Kyoto-Kameoka study. *Nutrients*. 2017;9(12). pii:E1362. doi:10.3390/nu9121362.

16 Papaioannou W, Oulis CJ, Latsou D, Yfantopoulos J. Oral health-related quality of life of Greek adults: a cross-sectional study. *Int J Dent*. 2011;2011:360292. doi:10.1155/2011/360292.

17 Peltzer K, Mongkolchati A. Severe early childhood caries and social determinants in three-year-old children from Northern Thailand: a birth cohort study. *BMC Oral Health*. 2015;15:108. doi:10.1186/s12903-015-0093-8.

18 Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and

risks to oral health. *Bull World Health Organ*. 2005;83(9):661–669.

19   Satheannoppakao W, Aekplakorn W, Pradipasen M. Fruit and vegetable consumption and its recommended intake associated with sociodemographic factors: Thailand National Health Examination Survey III. *Public Health Nutr*. 2009;12(11):2192–2198.

20   Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. *J Dent Res*. 2011;90(11):1264–1270. doi:10.1177/0022034511399918.

21   Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community Dent Health*. 1994;11(1):3–11.

22   Soe KK, Gelbier S, Robinson PG. Reliability and validity of two oral health related quality of life measures in Myanmar adolescents. *Community Dent Health*. 2004;21(4):306–311.

23   Tsakos G, Steele JG, Marcenes W, Walls AW, Sheiham A. Clinical correlates of oral health-related quality of life: evidence from a national sample of British older people. Eur J Oral Sci. 2006;114(5):391–395.

24   World Health Organization (WHO). The STEPS instrument and support materials. WHO. http://www.who.int/ncds/surveillance/steps/instrument/en/. Accessed May 10, 2016.

25   Yiengprugsawan V, Somkotra T, Seubsman SA, Sleigh AC. Thai Cohort Study Team. Oral health-related quality of life among a large national cohort of 87, 134 Thai adults. *Health Qual Life Outcomes*. 2011;9:42. doi:10.1186/1477-7525-9-42.

26   Zhou Y, Zhang M, Jiang H, Wu B, Du M. Oral health related quality of life among older adults in central China. *Community Dent Health*. 2012;29(3):219–223.