ORAL HEALTH-RELATED QUALITY OF LIFE OF VILLAGERS IN A SEMI-URBAN DISTRICT IN MALAYSIA

Wan Nor Syariza binti Wan Ali
Wan Mohamad Nasir bin Wan Othman
Wan Nur Alwani binti Wan Abdul Aziz
Haslinda binti Ramli
Mohd Dzulkhairi bin Mohd Rani
Muslimah bt. Ithnin

ABSTRACT

Oral health is essential to general health. It influences the quality of life of an individual. Oral health-related quality of life (OHRQoL) is the impact of oral disease or conditions in the oral cavity on functional, psychosocial and pain, including discomfort. The objective of this study was to investigate OHRQoL of villagers in a semi-urban district in Malaysia in relation to diabetes mellitus, hypertension and overweight or obesity using the validated Malay version of the General Oral Health Assessment Index (GOHAI-Malay). A cross-sectional study was conducted using a stratified two-stage sampling method. Participants were asked to rate their oral health status. They were then interviewed by using the validated GOHAI-Malay questionnaire. The data were tested for normality using Shapiro-Wilks test. Subsequently, Mann-Whitney and Kruskal-Wallis statistical tests were used to determine the level of significance set at $p<0.05$. A total of two hundred participants from four villages were interviewed. The age of the participants was between 18 to 89 years old with mean age of 55.3 (±16.5) years. A total of 56.5% of participants interviewed were females and 13.5% had tertiary education. The mean GOHAI score was 53.66 (±7.4) which ranged from 30 to 60. It was found that 47.5% of the participants showed good quality of life (QOL), 24.0% fair and 28.5% poor. The GOHAI score was statistically significant according to age groups ($p<0.001$), level of education ($p<0.001$) and hypertension ($p=0.003$). The OHRQoL was inversely related to age. Participants with higher educational level indicated better OHRQoL. Participants with hypertension as an underlying health condition appeared to have lower perception of OHRQoL. These findings provide the input in designing intervention activities involving medical and dental practitioners to improve OHRQoL among villagers with hypertension.

Key words: GOHAI, quality of life, OHRQoL, hypertension, elders

INTRODUCTION

Oral health and general health should not be seen as two separate entities of the body (Sheiham, 2005). Ill-health in any part of the body affects the person as an individual and members of the family and community. Pain and discomfort due to oral diseases may lead to loss of work time or school days. Change in the type of food people eat may affect their oral health as well as the general health such as obesity, diabetes mellitus and cardiovascular diseases. Problems in their speech hinders them in communicating with others. The conditions of their oral health influence their self-esteem and rerstrict them from socialising. Diseases of the oral cavity such as dental caries, periodontal disease and oral cancer influence other chronic diseases. Some of the signs and symptoms of chronic diseases are also evident in the oral cavity.

Oral diseases, such as dental caries and periodontal disease affect a large proportion of people throughout the world. The Global Burden of Disease study indicated that dental caries was the most prevalent condition whilst periodontal disease was the sixth most prevalent condition (Richard, 2013). Nevertheless, oral diseases and conditions receive less attention from the society because it is rarely life threatening. The impact of the disease on an individual's daily life and general health are also not communicated to the public in terms of impaired quality of life such as inability to eat, sleep and socialise due to associated pain and discomfort.

Oral diseases and conditions are often measured clinically from the perspective of practitioners based on objective measures using dental indices. However, these indices only measure the end-point of the disease without considering the impact of the disease from the individual's perspective (Nuca, 2007). Therefore, in recognition to the importance in the relationship of the general health and oral health, there is increasing interest to shift from merely focusing on the disease in the oral cavity to the patient or individual in a holistic manner (Higginson and Carr, 2001). This led to the development of Oral Health Related Quality of Life (OHRQoL) measures. These are instruments to ascertain the perceptions by individuals on the functional, social and psychological impacts of oral diseases (Gift, Atchison & Dayton, 1997) or conditions in the oral cavity that affect them.
Most of the studies to assess OHRQoL were conducted in relation to oral disease and conditions such as dental caries, periodontal disease and edentulousness. There were also very few such studies conducted in the country. Similarly, few researchers worldwide attempted to look into the relationship of ORHQoL among people with chronic diseases and conditions such as diabetes mellitus, hypertension and cognitive conditions. Even then, these studies were conducted to assess relationship between OHRQoL and specific diesase. To our knowledge, there were no studies conducted on the relationship between OHRQoL and all the three (3) major systemic diseases and condition namely hypertension, diabetes mellitus and obesity in a

community. These diseases are prevalent in Malaysia and shared a common risk factor that is sugar. A review by Tee and Yap (2017) indicated that the prevalence of diabetes mellitus in Malaysia in 2015 was 17.5%, almost doubled the prevalence in 1966. It was also found that in 2015, there were 47.7% adults with the problem of either overweight or obesity. There was also also an increase of hypertension among adults aged ≥30 years from 32.9% in 1996 to 43.5% in 2011.

The two most frequently used OHRQoL measures of impact of oral conditions on daily functioning are the short version of Oral Health Impact Profile (OHIP) and the General Oral Health Assessment Index (GOHAI). Nevertheless, GOHAI is considered for this study as it is more effective than OHIP (short version) at detecting the oral function problems due to oral diseases. It was also shown to be sensitive to the provision of oral health care with regard to functional and psychosocial impacts (Locker et al., 2001).

It was found that the responses to GOHAI items on certain oral condition are dependent on cultural background. Presence or absence of teeth, for instance, have different connotation of importance in different cultures. Therefore, it is important that the GOHAI be assessed in various communities and countries due to cross cultural differences.
The objective of this study was to investigate OHRQoL of villagers in a semi-urban district in Malaysia in relation to diabetes mellitus, hypertension and Body Mass Index using the validated Malay version of General Oral Health Assessment Index (GOHAI-Malay).

This paper emphasised on oral health and general health interface and the rationale for using OHRQoL measures in relation to chronic diseases and conditions. This is proceeded with description of the data collection method using the validated multiple-item GOHAI-Malay questionnaire and the single-item self-rated assessment. The sample size, the selection of the participants from the semi-urban villages and statistical analysis are also described. The result of the study is presented according to the demographic profile of the participants, their general diseases and conditions and the corresponding GOHAI scores. A summary of the responses to each item of the questionnaire are presented in the form of numbers and percentages. Finally, the salient points are discussed and the conclusion is presented.

METHODOLOGY

This study was part of the overall *Kampung Mizan* project, that is the development of a harmonious dwelling of local villages currently conducted by the Universiti Sains Islam Malaysia.

It was a cross-sectional study on villagers from a semi-urban district in Malaysia using a stratified two-stage sampling method to identify the villages whilst selection of the participants in these villages was based on convenience sampling.

The calculation of sample size adopted the test-retest reliability approach. The assumed expected GOHAI r was 0.8 (H_o:p_o = 0.7 and H_1:p_1 = 0.8). A two-sided test as suggested by Walter et al. (1998) was used with $\beta = 0.1$ (90% power) and $\alpha = 0.05$. This resulted in a required sample size of 162 participants. The sample size was increased to 194 to cater for 20% dropout.
The participants were asked to rate their oral health by indicating either as excellent, very good, good, average or poor. This was followed with assessment of OHRQoL using the validated GOHAI-Malay questionnaire (Othman, et al., 2006).

Participants were interviewed by a trained personnel using this instrument, taking into consideration their socio-demographic characteristics (sex, age and educational status), presence of non-communicable diseases (hypertension and diabetes mellitus) and overweight or obesity based on their Body Mass Index (BMI).

This study adopted the definitions of diabetes mellitus and hypertension used in the National Health and Morbidity Survey 2015. Diabetes mellitus and hypertension were defined as self-reported of being told to have diabetes mellitus or hypertension by a doctor or assistant medical officer (AMO) (Institute of Public Health, 2015). The BMI was determined by weight in kg divided by square of height in metres. It was dichotomised into <25 and with≥25 as the cut-off point for overweight.

The GOHAI questionnaire consisted of 12 items. It was used to assess oral health-related problems from three dimensions: physical function (concern about eating, speech and swallowing), psychosocial function (concern about oral health, self-image, self-consciousness regarding health and avoidance of social contact due to oral health problems) and pain or discomfort (Atchison & Dolan, 1990).

The response options for the questionnaire was based on the experiences of the participants for the past three months. A 5-point Likert scale of 1 (always); 2 (often); 3 (sometimes); 4 (seldom); and 5 (never) was used. For the purpose of analyses, the scoring for items 3, 5 and 7 were reversed to harmonise with other statements that were formulasted in the negative form. The final score for each participant ranged from the minimum score of 12 to the maximum score of 60. The higher score reflects better self-perceived oral health related quality of life, or negative impact on the quality of life. The final score for each individual were categorised as good (score 57-60), fair (score 51-55) or poor (score 50 or less).

The data were tested for normality using Shapiro-Wilks test. It was found that the GOHAI score was not normally distributed. Therefore, Mann-Whitney and Kruskal-Wallis statistical tests were used to determine level of significance of the variables which was set at $p < 0.05$.

Ethical approval was obtained from the Medical Ethics Committee of the Faculty of Dentistry, Universiti Sains Islam Malaysia (USIM/FPg-MEC/2016/No(17). Written informed consent were obtained from participants before the interview.

RESULT

A total of two-hundred (200) residents from four villages were interviewed. The mean age of the participants was 55.3 (±16.5) and ranged from between 18 to 89 years old.

The proportion of female to male was 56.5% and 43.5% respectively, whilst 13.5% of participants had tertiary education and 5% had no formal education. The socio-demographic profile of the participants and their GOHAI scores are shown in **Table 1**.

The mean GOHAI score was 53.66 (±7.4) and ranged from 30 to 60. When the GOHAI scores were categorised according to level of oral health-related quality of life (OHRQoL), it was found that 95 (47.5%) participants had good OHRQoL, 48 (24.0%) as moderate OHRQoL and 57 (28.5%) as poor OHRQoL.

The GOHAI score was statistically significant between the age groups (p<0.001). It was inversely related to age, that is the higher age groups were found to have lower GOHAI scores. The GOHAI score was also statistically significant between the level of education (p<0.001), that is those with higher level of education were found to have higher GOHAI score.

Table 1: Socio-demographic Profile of Participants and GOHAI Score

Variables	n (%)	Mean GOHAI Score	Median (IQR)	*p*-value
Gender				
Male	87 (43.5)	52.6 (±7.7)	54 (12)	Mann_Whitney U **p=0.083**
Female	113 (56.5)	55.7 (±7.1)	57 (9)	
Age				
15-19	3 (1.5)	56 (±6.9)	60 (0)	Kruskal Wallis **p<0.001** (Statistically significant)
20-24	7 (3.5)	60 (±0.0)	60 (0)	
25-29	5 (2.5)	58.6 (±2.2)	60 (4)	
30-34	11 (5.5)	57.7 (±2.9)	58 (4)	
35-44	31 (15.5)	54.4 (±8.2)	60 (11)	
45-54	34 (17.0)	53.9 (±7.6)	57 (9)	
55-64	40 (20.0)	54.8 (±5.5)	56 (9)	
65-75	38 (18.0)	50.4 (±8.2)	51 (12)	
75+	31 (15.5)	51.3 (±7.8)	52 (12)	
Educational Level				
No formal education	11 (5.5)	50.7 (±7.4)	51 (15)	Kruskal Wallis **p<0.001** (Statistically significant)
Primary school	61 (30.5)	50.9 (±12.0)	51 (12)	
Secondary School	101(50.5)	54.4 (±7.1)	57 (8)	
Tertiary education	27 (13.5)	57.9 (±4.0)	60 (3)	

The level of OHRQoL was also measured against underlying medical conditions in particular diabetes mellitus, hypertension and overweight or obesity, measured using Body Mass Index as shown in **Table 2**.

The GOHAI score was found to be statistically significant with those who reported to be diagnosed of hypertension (p=0.003). However, the GOHAI scores were not statistically significant when comparison was made between those who reported to have diabetes mellitus and those without. Similarly, when the participants with BMI <25 were compare with BMI ≥25, the differences in GOHAI scores was not statistically significantly.

Table 2: GOHAI Score and Underlying Medical Conditions

Independent Variables	n (%)	Mean GOHAI Score	Median (IQR)	*p*-value
Diabetes mellitus				
No	171 (85.5)	54.0 (±7.1)	56 (11)	
Yes	29 (14.5)	51.8 (±8.7)	54 (15)	***p*=0.210**
Hypertension				
No	126 (63.0)	54.7 (±7.1)	58 (9)	Mann_Whitney U
Yes	74 (37.0)	51.9 (±13.0)	53 (13)	***p*=0.003** (Statistically significant)
Body Mass Index (BMI)				
<25	85 (42.5)	53.4 (±6.9)	54 (12)	
≥25	115 (57.5)	53.9 (±7.8)±	57 (10)	***p*=0.369**

When the participants were asked to rate their oral health status, 20 (10.0%) rated their oral health as excellent, 33 (16.5%) as very good, 69 (34.5%) as good, 36 (18%) as fair and 42 (21.0%) rated as poor. This is presented in **Table 3**. The participants' perception of their overall oral health condition was found to be related with their OHRQoL whereby participants with poor oral health status had presented with low OHRQoL score (*p<0.001*).

Table 3: Self-rated Oral Health Status

Oral Health status	n (%)	Mean GOHAI Score	Median (IQR)	*p*-value
Poor	42 (21.0)	46.36 (9.336)	48(16)	
Fair	36 (18.0)	51.64 (6.005)	52 (10)	
Good	69 (34.5)	56.13 (4.595)	58 (7)	Kruskal Wallis ***p*<0.001** (Statistically significant)
Very good	33 (16.5)	57.36 (4.595)	60 (4)	
Excellent	20 (10.0)	58.00 (4.168)	60 (2)	

The responses of the participants on all the twelve items in the questionnaire were also taken into consideration in order to determine the factors that influence the OHRQoL. These responses are presented in Table 4. Most of the participants responded to the twelve (12) GOHAI questionnaire as "never" or "seldom". This indicated that their quality of life in terms of physical function, pain and discomfort, and psychological impacts was good. This was consistent with the self-rated responses on their oral health status. The common problems faced among 17.5% to 20.5% of the participants was the trouble in biting/or chewing the food and so they had to limit the kind of food they take.

Table 4: Responses of Participants on GOHAI Items

In the past three months:	Never (5) n (%)	Seldom (4) n (%)	Sometimes (3) n (%)	Often (2) n (%)	Always (1) n (%)
Physical function					
Limit the kind of food (1)	110 (55.0)	37 (18.5)	18 (9.0)	28 (14.0)	7 (3.5)
Trouble biting/chewing (2)	108 (54.0)	36 (18.0)	15 (7.5)	24 (12.0)	17 (8.5)
Trouble swallowing (3)	134 (67.0)	45 (22.5)	7 (3.5)	8 (4.0)	6 (3.0)
Unable to speak clearly (4)	143 (72.5)	47 (23.5)	0 (0)	7 (3.5)	3 (1.5)
Pain and Discomfort					
Discomfort when eating (5)	119 (59.5)	43 (21.5)	8 (4.0)	15 (7.5)	15 (7.5)
Medications for pain (8)	164 (82.0)	24 (12.0)	4 (2.0)	3 (1.5)	5 (2.5)
Sensitive teeth (12)	167 (83.5)	21 (10.5)	10 (5.0)	2 (1.0)	0 (0)
Psychosocial impacts					
Limit contacts with others (6)	147 (73.5)	44 (22.0)	5 (2.5)	4 (2.0)	0 (0)
Unhappy with appearance (7)	121 (60.5)	43 (21.5)	16 (8.0)	11 (5.5)	9 (4.5)
Worried or concerned (9)	150 (75.0)	30 (15.0)	10 (5.0)	7 (3.5)	3 (1.5)
Nervous, self-conscious (10)	159 (79.5)	28 (14.0)	7 (3.5)	5 (2.5)	1 (0.5)
Uncomfortable eating in front of others (11)	157 (78.5)	29 (14.5)	8 (4.0)	5 (2.5)	1 (0.5)

DISCUSSION

This study was an attempt to examine the oral health related quality of life of participants from four (4) villages in a semi-urban district in Malaysia based on the demographic characteristics such as, gender, age and educational level as well as systemic diseases and condition, that include diabetes mellitus, hypertension and overweight or obese.

The total number of participants was 200 and this was more than the number of the sample required which was 162. This indicated the overwhelming response from the villagers who volunteered to participate in this study. The high response rate was because the interviewer was accompanied by a member of the community known to the villagers during the home visit. Therefore, rejection from participating in the study would affect their dignity and may subsequently affect their participation in the follow-up studies.

It was found that there was an inverse relationship between age and GOHAI score. This was consistent with other studies that showed statistically significant higher GOHAI scores and better OHRQoL among the younger age group (Tubert-Jeannin et al., 2003 and Kressin et al., 1997). It was explained that this was due to the narrow age group and inability of older age groups to adapt with oral hygiene practice (Denis et al., 2017).

The level of education status influences the GOHAI score (Motallebnejad, 2013). This is also consistent with our study whereby well-educated participants had higher GOHAI score. Similarly, after adjusting for age, sex, and pension status, Tsakos et al. (2009) also found a statistically significant gradient effect of educational level on GOHAI scores.

There was no significant difference ($p>0.05$) of GOHAI scores between male and female participants in this study. John el al. (2004) indicated that oral health-related quality of life was not associated with socioeconomic or demographic factors. It was also concluded that demographic indicators were poor predictors of quality of life (Singh, et al., 2014).

Hypertension is considered a serious public health problem due to its chronic nature of the disease, high costs of hospitalisation, and a factor for early retirement and disability (de Carvalho, 2013). This study found significant relationship between the GOHAI score and hypertension. Trevisol et al., (2012) indicated that individuals with hypertension have lower quality of life, particularly when blood pressure is controlled by drug treatment. Hypertension itself does not result in manifestations in the oral cavity. However, the use of high blood pressure medications may result in side effects such as dry mouth (xerostomia), gingival hyperplasia, pain or swelling of the salivary glands, altered taste sensation and several other signs and symptoms (Guggenheimer, 2003). This has clinical significance to both dental and medical practitioners. Dentists are in an enviable position to detect cases of hypertension patients on medication in the dental clinic. They should be familiar with medications that could have the potential to adversely affect blood pressure control as well as commonly prescribed antihypertensive medications, their side effects, and drug interactions (Southerland et al., 2016). They can institute necessary actions to control the side effects in the oral cavity. Medical practitioners should alert those on hypertensive drugs on its oral manifestations to avoid their patients from discontinuing the medication that may cause severe consequences to the person.

Diabetis mellitus is a chronic disease with several signs and symptoms that are manifested in the oral cavity. This include xerostomia, increased accumulation of plaque and culculus, periodontitis, periapical abscess and burning mouth syndrome (Newman et al., 2006). Our study found that participants who reported to have diabetes mellitus had high GOHAI scores indicating that the disease did not affect their quality of life. This finding was consistent with the study by Nikbin et al. (2014) who found that diabetic patients had poor oral health but their OHRQoL scores were high, indicating good quality of life. This implied that although diabetic patients had poor oral health, it did not significantly affect their oral health-related quality of life. In this respect, oral health status affected psychological aspects of OHRQoL rather than functional aspect (Sandberg et al., 2000) as reflected in the high GOHAI score.

Inglehart and Bragmain (2002), identified three (3) methods in measuring OHRQoL namely social indicators, global self-rating (single-item questionnaire) and socio-dental indicators (multiple items questionnaires). The first two methods were used in this study. The social indicator method assesses the effect of oral conditions at the community level such as days loss from work or school. It is not used in this study as it employs different methodology and sets of instruments.

The global self-rating is the simplest method of assessing self-perception of OHRQoL (Nuca, 2007 and Thomson, 2012). It is based on individual's response on their oral health to a single question. It also allows individuals to decide the oral health experiences that is more important on their quality of life (Inglehart & Bagramian, 2002). This study found that the majority of the participants indicated that their oral health was good. Other studies also revealed similar finding (Locker, 2005 and Ravaghi et al., 2012). On the other hand, there are also findings that are contrary to the present study (Kim & Patton, 2010). Therefore, findings on this aspect is equivocal.

The most widely used method to assess OHRQoL is the socio-dental indicators. This method uses multiple items questionnaires (Slade, 2002). The present study adopts the General Oral Health Assessment Index (GOHAI) as it was commonly used in clinical or epidemiological studies, sensitive to provision of oral health care and validated in many languages including Malay. The validated GOHAI-Malay questionnaire was used in this study. GOHAI was originally designed to determine the OHRQoL among the elderly. Other studies indicated that it could be used for other age groups and socio-demographic characteristics (Atchison & Gift, 1997). A distinguishing feature of this index is that most of the statements were in the negative form but there were three statements out of twelve that were worded in positive form. It was designed in such a manner to ensure the participants are more careful in filling up the questionnaire (Hebling and Pereira, 2007). Nevertheless, researchers have to be cognisance of this characteristic of the index and harmonise all the statements into the negative form for analysis. GOHAI provides an individual's perspectives of a health outcome that can complement clinical measures of oral health.
The use of both global self-rating and socio-indicator methods in this study was to check consistency of the results. It was found that finding of global self-rating as indicated by the participants was consistent with that of the overall GOHAI score for this community. Locker et al. (2005) also found that the global self-rating correlated with the social-indicator index that assessed the perception of individuals on how oral health affects daily activities.

CONCLUSION

This study exemplified the importance of oral health and general health relationship. The OHRQoL provides the linkage to this relationship and paved the way for the establishment of a holistic approach in assessment of health. It also supported the findings of other related studies that there are cross-cultural differences in OHRQoL even for similar diseases or conditions. Therefore, it is essential that the perception of an individual on his/her oral health status is taken into consideration in the assessment of health status.

This study indicated that most of the participants in this semi-urban district considered their oral health as good. However, the level of quality of life appeared to be inversely proportional to age but proportional to level of education. Those with hypertension indicated that they have lower OHRQoL than those without. This may be due to the hypertensive medications used to control the disease. There was no statistical difference in OHRQoL among participants who reported to suffer from diabetes mellitus. This is in spite of well documented reports that there are signs and symptoms of diabetes mellitus manifested in the oral cavity.

The findings of this study can used to advocate development of a collaborative programme between dental and medical practitioners on enhancing the quality of life of hypentensive patients and increase compliance to the medication regime. Discontinuation of medication due to side effects manifested in the oral cavity and resulting in low OHRQoL may cause serious consequences to the patient.

A limitation of this study is that it adopted the cross-sectional study design. It would be useful to conduct a longitudinal study to assess the QHRQoL over time for individuals with or without underlying medical conditions in order to identify factors that influence OHRQoL. Another limitation of this study is that it adopted the approach of the National Health and Mobidity Survey 2015 based on self-report of the participants.in determining presence of diabetes mellitus and hypertension. Therefore, objective assessment of the disease levels could not be established and as a result, an intensive analysis of the relationship between these diseases and OHRQoL could not be carried out. Future studies need to address these methodological issues.

ACKNOWLEDGEMENTS

This study was funded by USIM/Bank Rakyat Research Grant_K6/FPG/052002/42917 under the Universiti Sains Islam Malaysia Kampung Mizan Project. We sincerely thank the State Government of Negeri Sembilan for their support and the villagers for their meaningful participation in this study.

REFERENCES

Atchison, K.A. & Dolan, T.A. (1990). Development of the Geriatric Oral Health Assessment Index. Journal of Dental Education, 54(11), 680-687.
Atchison, K.A. & Gift, H.C. (1997). Perceived oral health in a diverse sample. Advances in Dental Research, 11(2), 272–280.
de Carvalho, M.V., Siqueira, L.B., Sousa, A.L.L. & Jardim, P.C.B.V. (2013). The influence of hypertension on quality of life. Arquivos Brasileiros de Cardiologia, 100(2).
Denis, F., Hamad, M., Trojak, B., Tubert-Jeannin, S., Rat, C., Pelletier, J-F., & Rude, N. (2017). Psychometric characteristics of the General Oral Health Assessment Index (GOHAI) in a French representative sample of patients with schizophrenia. BMC Oral Health, 17,75.
Gift, H.C., Atchison K.A. & Dayton, C.M. (1997). Conceptualizing oral health and oral health related quality of life. Social Science & Medicine, 44(5), 601–8.
Guggenheimer, J. & Moore, P.A. (2003). Xerostomia: etiology, recognition and treatment. J American Dental Association, 134,61–9.
Hebling, E., & Pereira, A.C. (2007). Oral health-related quality of life: A critical appraisal of assessment tools used in elderly people. Gerodontology, 24, 151–161.
Higginson, I.J., & Carr, A.J. (2001). Using quality of life measures in the clinical setting. British Medical Journal, 322, 1297.
Inglehart, R.M. & Bagramian. R.A. 2002. Oral Health-Related Quality of Life. Quintessence Publishing Co., Inc. Chicago, USA.
Institute of Public Health. (2015). National Health and Morbidity Survey 2015 (NHMS) Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems. Kuala Lumpur, Ministry of Health Malaysia.
Sandberg, G.E., Sundberg, H.E., Fjellstrom, C.A. & Wikblad, K.F. (2000). Type 2 diabetes and oral health : A comparison between diabetic and non-diabetic subjects. Diabetes Research in Clinical Practice, 50, 27–34.
John, M.T., Koepsell, T.D., Hujoel, P. (2004). Demographic factors, denture status and oral health-related quality of life. Community Dentistry and Oral Epidemiology, 32, 125–132.
Kim, H.Y. & Patton, L.L. (2010). Intra-category determinants of global self-rating of oral health among the elderly. Community Dentistry and Oral Epidemiology, 38, 68–76
Kressin, N.R., Atchison, K.A. & Miller D.R. (1997). Comparing the impact of oral disease in two populations of older adults: Application of the geriatric oral health assessment index. Journal of Public Health Dentistry, 57, 224–232.
Locker, D., Matear, D., Stephens, M., Lawrence H., & Payne, B. (2001). Comparison of the GOHAI and OHIP-14 as measures of the oral health-related quality of life of the elderly. Community Dentistry and Oral Epidemiology, 29, 373–381.
Locker, D., Wexler, E. & Jokovic, A. (2005). What do older adults' global self-ratings of oral health measure? Journal of Public Health Dentistry, 65:146–52
Motallebnejad, M., Mottaghi, K., Mehdizade, S., Alaeddini, F. & Bijani, F. (2013). Reliability and validity of the Persian version of the General Oral Health Assessment Index (GOHAI). Caspian Journal of Dental Research, 2(1), 8-17.
Newman, M.G., Takei, H.H., Klollevold, P.R., Carranza, F.A. (2006). Carranza's Clinical Periodontology. Saunders, China.
Nikbin, A., Bayani, M., Jenabian, N., Khafri, S. & Motallebneja, M. (2014). Oral health related quality of life in diabetic patients: Comparison of the Persian version of Geriatric Oral Health Assessment Index and Oral Health Impact Profile: A descriptive-analytical study. Journal of Diabeties & Metabolic Disorders, 13:32.
Nuca, C., Amariei, C., Rusu, D-L., & Arendt, C. (2007). Oral health-related quality of life evaluation. Oral Health and Dental. Management in the Black Sea Countries, 6(1), 3-8.
Othman W-NMW, Muttalib KA, Bakri R, Doss JG, Jaafar N, Salleh NC.(2006). Validation of the Geriatric Oral Health Assessment Index (GOHAI) in the Malay language. Journal of Public Health Dentistry, 66(3), 199–204.
Ravaghi V, Underwood M, Marinho V, Eldridge S. (2012). Socioeconomic status and self-reported oral health in Iranian adolescents: The role of selected oral health behaviors and psychological factors. Journal Public Health Dentistry, 72, 198–207.
Richards D. (2013). Oral diseases affect some 3.9 billion people. Journal of Evidence Based Dental Practice, 14(2), 35.
Slade, G.D. (2002). Oral health-related quality of life: Assessment of oral health-related quality of life. In: Inglehart, M.R. & Bagramian, R.A., eds. Oral health-related quality of life. Illinois, Quintessence Publishing Co. Inc., Chicago, USA.
Southerland, J.H., Gill, D.G., Gangula, P.R., Halpern, L.R., Cardona, C.Y. & Mouton, C.P. (2016). Dental management in patients with hypertension: Challenges and solutions. Clinical, Cosmetic and Investigational Dentistry, 8, 111–120

Sheiham, A. (2005). Editorials: Oral health, general health and quality of life. Bulletin of the World Health Organisation, 83(9).
Singh, V., Singh, R., Jyoti, A., Sahu, S.K., Khan, M. & Kumar, A. (2014). The Relationship Between Conventional Prosthesis Wearing and Geriatric Oral Health Assessment Index in Garhwa Town, Jharkhand. International Journal of Dental Medical Research, 1(3), 24-29.
Thomson, W.M., Mejia, G.C., Broadbent, J.M., Poulton, R. (2012). Construct validity of Locker's global oral health item. Journal of Dental Research, 91, 1038–42.
Tsakos, G., Sheiham, A., Iliffe, S. (2009). The impact of educational level on oral health-related quality of life in older people in London. European Journal of Oral Sciences, 117, 286–292.
Tubert-Jeannin, S., Riordan, P.J., Morel-Papernot, A., Porcheray, S., Saby-Collet, S. (2003). Validation of an oral health quality of life index (GOHAI) in France. Community Dentistry and Oral Epidemiology, 31, 275–284.
Trevisol, D.J., Moreira1, L.B., Fuchs, F.D. & Fuchs, S.C. (2012). Health-related quality of life is worse in individuals with hypertension under drug treatment: Results of population-based study. Journal of Human Hypertension, 26, 374–380.
Walter SD, Eliaszw M, Donner A. (1998). Sample size and Optimal Design Reliability Studies. Statistics in Medicine, 17, 101-10.

Wan Nor Syariza binti Wan Ali
Faculty of Dentistry
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: wan_syariza@usim.edu.my

Wan Mohamad Nasir bin Wan Othman
Faculty of Dentistry
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: ddwan818@usim.edu.my

Wan Nur Alwani binti Wan Abdul Aziz
Faculty of Dentistry
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: dr.alwani@usim.edu.my

Haslinda binti Ramli
Faculty of Dentistry
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: drhaslinda@usim.edu.my.

Mohd Dzulkhairi bin Mohd Rani
Faculty of Medicine and Health Sciences
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: drdzulkhairi@usim.edu.my.

Muslimah bt. Ithnin
Faculty of Medicine and Health Sciences
Universiti Sains Islam Malaysia, 65000 Nilai, Malaysia
Email: mus_miema@yahoo.com.