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Dentition and Risk of Malnutrition among Elderly Patients in Faculty of Dentistry, Universiti Kebangsaan Malaysia, Malaysia: A Cross-Sectional Study

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ABSTRACT

Objective: *To assess the dentition status and its association with the risk of malnutrition among a group of elderly patients in Kuala Lumpur.* ***Methods:*** *A cross-sectional study was conducted among elderly patients who attended dental clinics in the Faculty of Dentistry, Universiti Kebangsaan Malaysia (UKM). Data on oral health conditions namely the number of teeth, number of posterior occluding pairs, and denture status were gathered from patients' dental records. The nutritional status of respondents was determined using the Malay version of Mini Nutritional Assessment (MNA) followed by Body Mass Index (BMI) measurement. Statistical analysis included descriptive analysis, Chi-square test of association, and correlation coefficient test.* ***Results:*** *Total tooth loss (edentulous) was seen in 31 (28.4%) patients from a total of 109 respondents. From those who still had natural teeth, 65.4% had less than 20 teeth. Based on the MNA score, only 1.8% were malnourished. The majority of them (78.9%) had normal nutritional status while 19.3% were at risk of malnutrition. Patients with lower education levels showed significantly lower mean MNA score and number of teeth. No significant association was noted between MNA scores and the number of teeth present. A slightly higher percentage of patients with less than 20 teeth (22.0%) were at risk of malnutrition and malnourished compared to those with more than 20 teeth (12.0%) but no significant association was observed ($p>0.05$).* ***Conclusion:*** *There was no significant association observed between the number of teeth and the risk of malnutrition among patients undergoing dental treatment in UKM.*

Keywords: Elderly, Malnutrition, Tooth loss

INTRODUCTION

A high proportion of older people worldwide experienced partial or total tooth loss (edentulism). According to data from the World Health Organization (WHO) Study on global aging and adult health (SAGE) from 2007 to 2010 in six countries, the prevalence of edentulism in older people is still high, ranging from 3%-21.7% [1]. This condition can lead to several problems hence affecting the general health and quality of life of the elderly population.

The relationship between the number of teeth and nutritional status has been researched in many studies [2,3]. Reduction in the number of functioning teeth may lead to food avoidance and difficulties in chewing [4], poor diet quality [5], less intake of specific nutrients [6], inadequate calorie intake [7], underweight [8] and overweight or obese [9] among the aged population.

Studies conducted among the Asian elderly communities like Malaysia [10], Sri Lanka [11] and Indonesia [12] have

concluded that tooth loss is significantly associated with being underweight. In contrast, there is also evidence suggesting that elderly patients with a fewer number of functional teeth may have limitations in their diet selection, causing them to frequently consume poor nutritious or processed soft food, which in turn resulting in obesity and overweight [13]. Some older people choose processed or cooked food rather than fresh food to compensate for reduced masticatory function while others may eliminate certain food groups from their diets. Besides, the elderly may try to avoid foods such as raw vegetables, since they are not able to chew them effectively [14]. Thus the relationship between dentition status and nutritional conditions is important in maintaining a good quality of life, but most of the time it is an overlooked public health issue [15].

In general, the studies of an association between dentition and risk of malnutrition were carried out mainly in developed countries whereby health services are easily accessible and tooth loss is frequently replaced with dental prostheses [16]. Such data for developing countries which is still experiencing a high prevalence of edentulism and extensive tooth loss among older populations are still scarce. Therefore, a study on the possible association between the variables in such a setting needs to be further explored. This study aimed to identify the association between the number of teeth with malnutrition risk among elderly dental patients in Universiti Kebangsaan Malaysia, Kuala Lumpur.

MATERIALS AND METHODS

This cross-sectional study was conducted among elderly patients aged 60 years old and above who attended dental polyclinics in Universiti Kebangsaan Malaysia. Ethical approval to conduct the study was obtained from the Research Ethics Committee, Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2018-286). Informed and written consent was taken from all respondents prior to the study.

The sampling population was chosen from patients undergoing prosthodontic treatment in the Faculty of Dentistry Universiti Kebangsaan Malaysia from August to December 2018. The inclusion criteria were dental patients aged 60 years old and above, Malaysian citizen, able to communicate verbally and able to stand straight for measurement of height and weight, while the exclusion criteria were those with mental illness like dementia, medical illness that can alter the weight, oral diseases that affect masticatory function, unable to stand straight or unable to communicate with researchers of this study due to language barrier.

Based on the formula used to calculate the adequate sample size in cross-sectional studies, where the level of confidence was set at 95%, the estimated sample size was 168. Prior to the clinical examination, patients were briefed on the aim and conduct of the research and were invited to participate in the study. All patients who met the inclusion criteria and agreed to give consent were included.

The measurements used for data collection comprised of four parts: demographic characteristics, Malay version of Mini Nutritional Assessment (MNA), anthropometry measurement, and oral health examination. Data on socio-demographic of respondents were attained from a structured questionnaire interview. Respondents' nutritional status was derived from the Malay version of MNA and anthropometry measurements, and oral health status through an oral examination.

For anthropometry measurements, the height of the subjects was measured using a measuring tape with a sensitivity of 1 mm. Subjects were asked to stand with their backs leaning against the wall, both heels touch the wall with feet side by side. The height was measured twice before taking the average value. The weight was measured using the Tanita BC-581 body composition monitor (Tanita Cooperation, Tokyo, Japan). The scale was placed on a level surface, and subjects wore light garments and barefooted when measuring weight. The Body Mass Index (BMI) score was used to classify respondents into normal, underweight, overweight, or obese. BMI is calculated by dividing an individual's weight in kilograms by the square of his or her height in meters. The unit for BMI is kg/m^2. According to World Health Organization (WHO), individuals with BMI of less than 18.5 kg/m^2 are considered underweight, more than or equal to 25.0 kg/m^2 as overweight while more than or equal to 30.0 kg/m^2 are considered obese [17]. Data for oral health status were gathered from patients' dental records in which oral examination was carried out by dental specialists from Prosthodontics Unit of Dental Faculty Universiti Kebangsaan Malaysia, Kuala Lumpur. The oral health variables included in this study were the number and location of teeth present, and the number of posterior occluding pairs of teeth.

Data obtained were analyzed using SPSS version 23.0. The outcome variable was nutritional status, obtained from MNA scores and classified as a categorical variable (normal nutritional status, at risk of malnutrition and malnourished). Independent variables include sociodemographic characteristics and oral health conditions. Data analysis includes descriptive analysis, to assess frequency and percentage, and mean and standard deviation of data. Bivariate analysis of nutritional status against main independent categorical variables for associations was performed using the Chi-square test. The correlation coefficient test was used to assess the association between the total number of teeth presence and the MNA score.

RESULTS

Among 109 patients who participated in the study, 31 (28.4%) were edentulous. From those who still had natural teeth, 51 patients (65.4%) had less than 20 teeth. The mean MNA score was 25.4 (SD 3.0) indicating well nourished. The majority of them (78.9%) had normal nutritional status while 19.3% were at risk of malnutrition. Only 1.8% (n=2) of the patients were malnourished.

The demographic characteristics of the respondents were summarized in Table 1. The majority of the patients were female (52.3%) and Chinese (47.7%). The mean age was 67.0 (SD 5.4) years with the majority of them were within the 60 to 69-year-old age group (70.6%). Most respondents had secondary or high school education (51.4%), had at least one type of systemic disease (77.1%), and took at least one type of medication (71.6%).

Table 2 summarizes the mean MNA score and the total number of teeth among different socio-demographic variables. Results showed that patients with tertiary education demonstrated a significantly higher mean MNA score (27.1) compared to patients with no formal education (26.0) and primary and secondary education (25.1). As for mean, the number of teeth present, older patients (80 years and above), and without formal education showed a significantly reduced number of teeth ($p<0.05$).

The correlation between the number of teeth and the MNA score using the bivariate correlation coefficient (r) is presented in Table 3. The total mean score of MNA and the number of teeth of the patients were 25.4 and 15.4, respectively. The correlation coefficient between the number of teeth and the total MNA score was 0.091 ($p=0.348$), indicating a weak and not significant association.

Table 4 presents the association between oral health conditions and nutritional status of the study population. A slightly higher percentage of patients with less than 20 teeth (50.6%) were overweight and obese compared to those with more than 20 teeth (48.0%). However, no significant association was observed ($p>0.05$). Similarly, a higher percentage of patients with less than 20 teeth (22.2%) were at risk of malnutrition and malnourished compared to those with more than 20 teeth (12.0%), but the findings were not statistically significant ($p>0.05$). In relation to the number of pairs of posterior teeth that occlude, a higher percentage of patients with less number of occluding teeth (0 to 3 pairs) were overweight and obese (50.6%) and at risk of malnutrition (22.2%) but no significant association was noted ($p>0.05$).

As for denture conditions, a higher proportion of patients who had poor denture retention and stability (24.4%) were at risk of malnutrition and malnourished compared to those with good denture conditions (8.3%) ($p>0.05$).

Table 1 Demographic characteristics, oral health conditions and nutritional status of respondents

Items	n (%)	Mean (SD)
Sex		
Male	52 (47.7%)	
Female	57 (52.3%)	
Age group		
60-69	77 (70.6%)	
70-79	27 (24.8%)	67.0 (5.4)
80 and above	5 (4.6%)	
Education level		

No formal education	2 (1.8%)	
Primary and secondary	88 (80.8%)	
Tertiary	25 (5.6%)	
Medical condition		
Yes	84 (77.1%)	
No	25 (22.9%)	
Dental status		
Dentate	78 (71.6%)	
Edentate	31 (28.4%)	
Total number of teeth		
0 teeth	31 (28.4%)	15.4 (8.4)
1-19 teeth	51 (46.8%)	
20 and more	27 (24.8%)	
Total pairs of posterior occluding teeth		
0-3 pairs	86 (78.9%)	
4-8 pairs	23 (21.1%)	
Body Mass Index (BMI)		
Normal	53 (48.6%)	
Underweight	3 (2.8%)	
Overweight	36 (33.0%)	
Obese	17 (15.6%)	
MNA score		
Well nourished	86 (78.9%)	25.4 (3.0)
At the risk of malnutrition	21 (19.3%)	
Malnourished	2 (1.8%)	

Table 2 Mean MNA score and number of teeth among different socio-demographic variables

Variables	MNA score mean (SD)	p-value	Number of teeth mean (SD)	p-value
Gender				
Male	25.7 (2.9)	0.687	10.2 (10.1)	0.412
Female	25.2 (3.1)		11.8 (9.8)	
Age group				
60-69	25.4 (3.1)	0.97	12.7 (10.1)	0.026*
70-79	25.5 (2.7)		7.2 (8.7)	
80 and above	25.7 (2.6)		6.4 (8.8)	
Education level				
No formal education	26.0 (0.7)	0.019*	2.0 (2.8)	0.024*
Primary and secondary	25.1 (3.0)		10.2 (9.9)	
Tertiary	27.1 (2.2)		16.2 (8.9)	
Medical condition				
Yes	25.3 (3.0)	0.784	12.0 (10.3)	0.046*
No	25.9 (2.9)		8.0 (8.3)	

*Significant at p-level <0.05

Table 3 Correlation between number of teeth and MNA score

Total MNA score, mean (SD)	25.4 (3.0)
Number of teeth, mean (SD)	15.4 (8.4)
Number of teeth* total MNA score	r=0.091; p=0.348
*Pearson's correlation coefficient; significant at p-level <0.05	

Table 4 Association between number of teeth, number of posterior pairs of occluding teeth and denture condition with Body Mass Index (BMI) and Mini Nutritional Assessment (MNA)

Items	BMI n (%)			MNA n (%)		
	Normal	Overweight and obese	p-value	Normal	At-risk and malnourished	p-value
Dental status						
Dentate	34 (45.3%)	41 (54.7%)	0.135	62 (82.7%)	13 (17.3%)	0.319
Edentate	19 (61.3%)	12 (38.7%)		23 (74.2%)	8 (25.8%)	
Number of teeth						
0 to 19 teeth	40 (49.4%)	41 (50.6%)	0.819	63 (77.8%)	18 (22.2%)	0.262
20 teeth and more	13 (52.0%)	12 (48.0%)		22 (88.0%)	3 (12.0%)	
Number of posterior teeth that occlude						
0-3 pairs	42 (48.8%)	44 (51.2%)	0.62	67 (77.9%)	19 (22.1%)	0.222
4-8 pairs	11 (55.0%)	9 (45.0%)		18 (90.0%)	2 (10.0%)	
Denture condition						
Good	6 (50.0%)	6 (50.0%)	0.823	11 (91.7%)	1 (8.3%)	0.218
Poor	22 (53.7%)	19 (46.3%)		31 (75.6%)	10 (24.4%)	

DISCUSSION

Findings from this study highlighted that a higher proportion of patients with compromised dentition (22.2%) and poor denture conditions (24.4%) were at risk of malnutrition and malnourished as compared to patients having good dentition (12.0%) and denture status (8.3%). It was also noted that overweight and obese were prevalent among patients with a reduced number of teeth and unsatisfactory denture quality. However, conclusive results could not be drawn as no statistically significant associations were observed between dental conditions and nutritional status of respondents.

It was reported in this study that about three-quarters of the patients had less than 20 teeth (28.4% edentulous and 46.8% partially edentulous). Although results showed no significance, it was noted that there was a lower mean number of teeth (8.0) in the at-risk and malnourished group as compared to patients classified in the normal nutritional state (11.3), thus suggesting a possible link between a reduced number of teeth and risk of malnutrition. Findings from this study are in line with earlier studies that observed non-statistical significant associations between dentition status and nutritional condition [3,18]. As nutritional status is influenced by several factors like demographic features and health status, plus variation in clinical characteristics, conflicting results may occur in establishing the association.

Contrarily, several studies have highlighted the associations between compromised oral health due to tooth loss with malnutrition [8,9]. This may be due to changes in a dietary pattern like avoiding fiber-rich food and preferences for a poor nutritious soft diet. Thus, maintaining an optimum number of functional teeth, defined as having 20 teeth and more, plays an important role in sustaining satisfactory nutritional status among the elderly. In line with that, it is very important to advocate on healthy functioning dentition into old age as it may help to maintain a satisfactory body mass index as well as improving the quality of life of the vulnerable group.

The role of medical conditions as predictors to nutritional conditions had been supported by previous research, in which these studies showed a positive association between medical comorbidities and nutritional status. In this study, a high prevalence (77.1%) of chronic diseases was reported among respondents. According to the National Health and Morbidity Survey, NHMS, report in 2015, non-communicable diseases like hypertension, Type 2 diabetes, coronary heart disease, and stroke were more widespread in the 60 years and above age group. In addition to that, previous studies also have highlighted the role of overweight and obesity as risk factors to several chronic diseases in the el-

derly. Locally, the prevalence of overweight among the elderly has doubled from 15.6% in 1996 to 34.5% in 2015, while there were a three times increased in the prevalence of obesity from 3.1% in 1996 to 15.8% in 2015 [19,20]. The increase in the prevalence of these risk factors had given rise to non-communicable disease prevalence in which the elderly group was the most affected. However, as this study was cross-sectional in design, the role of medical conditions as the cause or effect of nutritional impairments amongst older people could not be established.

This study has some limitations especially since its cross-sectional design could not establish a causal relationship. A longitudinal study with a larger sample size and multi-centered locations can be carried out in future research. Respondents were also limited to patients undergoing prosthodontic treatment in the clinics within Universiti Kebangsaan Malaysia, Kuala Lumpur. Data collected from single-centered institutions or clinics in Universiti Kebangsaan Malaysia, Kuala Lumpur may not represent the actual burden of diseases among the elderly population in the country. For the Mini Nutritional Assessment, recall bias may also occur especially on the number of full meals and frequency and portion of protein, fruits, vegetables, and fluid consumed. Some of the subjects were inconsistent in their daily food intake in the context of variation and portion. However, studies of the association between the variables in the local setting are still limited, thus findings from this study can serve as baseline data for researchers who are interested in this field. Suggestions to include longitudinal studies with larger sample sizes and area coverage can be carried out to establish a temporal relationship between the variables.

CONCLUSION

This study found no significant associations between dentition and risk of malnutrition among elderly patients in Universiti Kebangsaan Malaysia, Kuala Lumpur. Although no significant association was shown, reduction in the mean number of teeth as MNA score reduced could be of clinical relevance, such as promoting greater awareness and observance among dental practitioners towards the importance of oral health signs of nutritional problems. Dental practitioners could also encourage the optimum number of teeth, especially at an earlier age as it may help to maintain good nutritional status as well as improving quality of life.

DECLARATIONS

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Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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