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VALIDATION OF SCREENING TOOLS TO ASSESS APPETITE AMONG GERIATRIC PATIENTS

R. HANISAH[1], S. SUZANA[1], F.S. LEE[2]

1. Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia, Jalan Raja Muda A. Aziz, 50300 Kuala Lumpur, Malaysia; 2. Department of General Medicine, Hospital Kuala Lumpur, 50586, Jalan Pahang, Kuala Lumpur, Malaysia. Correspondence: Professor Dr. Suzana Shahar, Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia, Jalan Raja Muda A. Aziz, 50300 Kuala Lumpur, Malaysia. Tel: 603-92897683. Fax: 603-26947621. E-mail: suzanas@medic.ukm.my

Abstract: Poor appetite is one of the main contributing factors of poor nutritional status among elderly individuals. Recognizing the importance of assessment of appetite, a cross sectional study was conducted to determine the validity of appetite screening tools namely, the Council on Nutrition Appetite Questionnaire (CNAQ) and the Simplified Nutritional Appetite Questionnaire (SNAQ) against the Appetite, Hunger and Sensory Perception Questionnaire (AHSPQ), measures of nutritional status and food intake among geriatric patients at the main general hospital in Malaysia. Nutritional status was assessed using the Subjective Global Assessment (SGA) while food intake was measured using the Dietary History Questionnaire (DHQ). Anthropometric parameters included weight, height, body mass index (BMI), calf circumference (CC) and mid upper arm circumference (MUAC). A total of 145 subjects aged 60 to 86 years (68.3 ± 5.8 years) with 31.7% men and 68.3% women were recruited from outpatients (35 subjects) and inpatients (110 subjects) of Kuala Lumpur Hospital of Malaysia. As assessed by SGA, most subjects were classified as mild to moderately malnourished (50.4%), followed by normal (38.6%) and severely malnourished (11.0%). A total of 79.3% and 57.2% subjects were classified as having poor appetite according to CNAQ and SNAQ, respectively. CNAQ (80.9%) had a higher sensitivity than SNAQ (69.7%) when validated against nutritional status as assessed using SGA. However, the specificity of SNAQ (62.5%) was higher than CNAQ (23.2%). Positive predictive value for CNAQ and SNAQ were 62.6% and 74.7%, respectively. Cronbach's alpha for CNAQ and SNAQ were 0.546 and 0.578, respectively. History of weight loss over the past one year (Adjusted odds ratio 2.49) ($p < 0.01$) and thiamine intake less than the Recommended Nutrient Intake (RNI) (Adjusted odds ratio 3.04) ($p < 0.05$) were risk factors for poor appetite among subjects. In conclusion, malnutrition and poor appetite were prevalent among the geriatric outpatients and inpatients. SNAQ was more reliable and valid as an appetite screening tool among this special group of population. There is a need to regularly include nutritional and appetite assessment for early intervention measures in order to prevent consequences of malnutrition.

Key words: Appetite, screening tools, validation, elderly, Malaysia.

Introduction

Nutritional status is greatly affected by appetite which can be defined as the drive to ingest food (1). Poor appetite or anorexia, which causes inability to take food, is common among elderly individuals and may cause significant weight loss (2). Poor appetite had been shown to be prevalent among elderly individuals, ranging from 18.6% among non-institutionalized elderly people (3) to 70% among institutionalized elderly people (4). This may cause malnutrition, which is always taken lightly in the planning of treatment programs for elderly patients (5).

Due to this, there is a need to screen or to assess the appetite of elderly individuals. In addition, since poor appetite is one of the causes of malnutrition among the elderly, screening tools to assess appetite as one the domain of malnutrition are important to be used in clinical and community settings. The screening tools should be easy to used, not time-consuming and have high inter-rater reliability. It should also be robust towards pathology associated with patients' acute diseases (6).

The Appetite, Hunger and Sensory Perception Questionnaire (AHSPQ) was developed by de Jong et. al (7) and consists of 29 questions about appetite, hunger and sensory perception (taste and smell) domains. Although AHSPQ has high internal validity, good reliability and provides correct descriptive data about self-assessment of appetite among elderly people in the Netherlands, it is less suitable to be used in communities with high prevalence of malnutrition (8). Particularly, in hospital setting, the 29-item questionnaire is time consuming and burdensome to be administered.

The Council on Nutrition Appetite Questionnaire (CNAQ) and the Simplified Nutritional Appetite Questionnaire (SNAQ), which consist of eight and four items respectively, have been derived from AHSPQ to screen for poor appetite among elderly individuals (9). Both CNAQ and SNAQ have been shown to be valid and reliable for appetite assessment among clinical and community-dwelling elderly people in the USA (9).

Due to the high prevalence of malnutrition among elderly people, especially in clinical settings (10), there is a need to administer a rapid screening tool for appetite assessment such as CNAQ and SNAQ. To the best of our knowledge, this is among the very few studies attempting to validate appetite screening questionnaire for usage in hospital settings. Other studies have validated the tools among community-dwelling (9)

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individuals and at nursing homes (8). Furthermore, this study is among the first of its kind to validate appetite screening tools among Asian elderly, i.e. Malaysia as previous studies developed and validated these screening tools in the Netherlands (8) and the USA (9). Asian population may have differences in socio-economic, cultural and eating behavior compared to their peers in Western countries. Therefore, this study aimed to determine the validity of CNAQ and SNAQ against AHSPQ, nutritional status and food intake among geriatric patients in Malaysia. In addition, risk factors for poor appetite were also evaluated.

Methods

This cross-sectional study was designed to determine the validation of appetite screening tools CNAQ and SNAQ against AHSPQ, nutritional status and energy and nutrients intakes in identifying elderly patients having poor appetite at Medical Ward and Outpatient Medical Clinic, Kuala Lumpur Hospital of Malaysia. Ethical approval was obtained from Research Ethical Community, Universiti Kebangsaan Malaysia Medical Centre and consent was obtained from all subjects. Subjects were recruited through a convenience sampling among the outpatients and inpatients that meet the inclusion criteria during the study period (July until September 2010). Both groups of outpatients and inpatients were included in this study so that the result of this study can be used in the two distinctive clinical groups.

Subjects' inclusion criteria included aged 60 years and above and able to communicate in English or Malay. Subjects were excluded if they were bedridden, had terminal diseases or mental disturbances, not able to communicate in English or Malay and were receiving enteral or parenteral nutritional support.

Subjects' appetite status were screened using AHSPQ, CNAQ and SNAQ. In addition, Subjective Global Assessment (SGA) was used to evaluate nutritional status. Dietary History Questionnaire (DHQ) was used to obtained habitual food intake for the past seven days before hospital admission in order to calculate habitual energy and nutrients intake. Energy and nutrients intake from DHQ was calculated using NutritionistPro (Axxya Systems LLC 2009) and was compared with Malaysian Recommended Nutrient Intakes (11). Anthropometric measurements included weight and height (12). For subjects who were not able to stand straight, arm span were taken to estimate their height (13). Mid-upper arm circumference (MUAC) and calf circumference (CC) measurements were also conducted to determine subjects' nutritional status based on muscle mass. A MUAC value of less than 23.0 cm for men and 22.0 cm for women indicates loss of peripheral muscle mass (14). As for CC, a value of less than 30.1 cm for men and 27.3 cm for women will indicate muscle loss, especially in the lower limb (15).

Data analysis was carried out using Statistical Product and Service Solution 17.0 (SPSS version 17.0). Independent sample t-test and Mann-Whitney test were used to test differences in gender for linear variables. Pearson's chi square test was used to test differences in gender for categorical data. Binary logistic regression analysis (enter method) was used to determine the factors associated with poor appetite. Descriptive statistics included mean, standard deviation (SD) and minimum and maximum values.

In addition, analysis of sensitivity, specificity, positive and negative predictive values were done to determine the validity of CNAQ and SNAQ. Reliability analysis was carried out using Cronbach's alpha.

Results

Study population

A total of 145 geriatric patients, with mostly (75.9%) from inpatient and 68.3% women, participated in this study. The majority of subjects were Malays (61.4%), followed by Indian (22.7%) and Chinese (15.9%). The mean age for men was 68.0 ± 5.6 years whilst the mean age for women was 68.4 ± 5.9 years. Most subjects in this study aged 60 to 74 years with mean age of all subjects was 68.3 ± 5.8 years.

More female subjects were widowed and had low educational as compared to male subjects ($p < 0.01$) (Table 1). Among the most common diagnosis of subjects were hypertension, diabetes mellitus and heart problems. This study showed that women had a higher prevalence of hypertension as compared to male ($p < 0.05$).

Table 1
Socio-economic and health status among subjects

	Male (n = 46)	Female (n = 99)
Age group		
60 – 74 years	40 (87.0%)	85 (85.9%)
≥ 75 years	6 (13.0%)	14 (14.1%)
Marital status[a]		
Single	10 (21.7%)	58 (58.6%)
Married	36 (78.3%)	41 (41.4%)
Education level[a]		
Do not received any formal education	5 (10.9%)	39 (39.4%)
Received formal education	41 (89.1%)	60 (60.6%)
Working status		
Working	39 (84.8%)	94 (94.9%)
Not working & pensioner	7 (15.2%)	5 (5.1%)
Living arrangement:		
Alone	4 (8.7%)	11 (11.1%)
With family or friends	42 (91.3%)	88 (88.9%)
Diagnosis:		
Diabetes mellitus	26 (56.5%)	56 (56.6%)
Hypertension	30 (65.2%)	83a (83.8%)
Heart problems	17 (37.0%)	40 (40.4%)
Respiratory diseases	6 (13.0%)	21 (21.2%)
High cholesterol	7 (15.2%)	17 (17.2%)

a. $p < 0.01$, significant difference between groups (Pearson's chi square test)

Anthropometry and nutritional status

The mean BMI for all subjects was 26.5 ± 5.7 kgm-2 which is in the overweight category according to WHO (16). More women were identified as overweight or obese as compared to men. A total of 10.9% and 3.0% of men and women, respectively were classified as malnourished according to MUAC measurement, indicating upper limb muscle wasting. Whilst, the prevalence of lower limb muscle wasting, as assessed using CC measurement were 34.8% and 20.2% among men and women, respectively.

According to SGA, about 50.0% of both men and women were identified as moderately malnourished. Whilst, about 11.0% of both men and women were classified as severely malnourished.

Table 2
Anthropometric and nutritional status

	Male (n = 46)	Female (n = 99)
BMI classification		
Underweight (BMI < 20.0)	3 (6.5%)	5 (5.0%)
Normal weight (BMI 20.0 – 24.9)	25 (54.3%)	35 (35.4%)
Overweight (BMI 25.0 – 29.9)	13 (28.3%)	29 (29.3%)
Obese (BMI ≥ 30.0)	5 (10.9%)	30 (30.3%)
SGA category		
A (normally nourished)	18 (39.1%)	38 (38.4%)
B (moderately malnourished)	23 (50.0%)	50 (50.5%)
C (severely malnourished)	5 (10.9%)	11 (11.1%)
Nutritional status based on MUAC		
Normal	41 (89.1%)	96 (97.0%)
Malnourished	5 (10.9%)	3 (3.0%)
Nutritional based on CC		
Normal	30 (65.2%)	79 (79.8%)
Malnourished	16 (34.8%)	20 (20.2%)

No significant difference between sex

Dietary intake

The mean energy intake of men (1546.9 ± 612.7 kcal/day) was higher than women (1312.8 ± 564.4 kcal/day) ($p < 0.05$). In addition, men (55.1 ± 24.0 gram/day) also showed higher intake of protein than women (46.9 ± 22.4 gram/day) ($p < 0.05$). More women did not meet the individual requirement for energy and protein (Figure 2).

More than 80% of subjects did not meet the recommendations for calcium, zinc, thiamine, niacin and folate as compared with the Malaysian Recommendation Nutrient Intake (RNI) (11) (Figure 2).

Appetite Assessment

Men (92.7 ± 10.1) showed a higher mean score of AHSPQ than women (87.4 ± 12.2) ($p < 0.05$). There was a trend that more women than men had poor appetite as assessed by CNAQ and SNAQ in Figure 3.

Figure 1
Data collection procedure

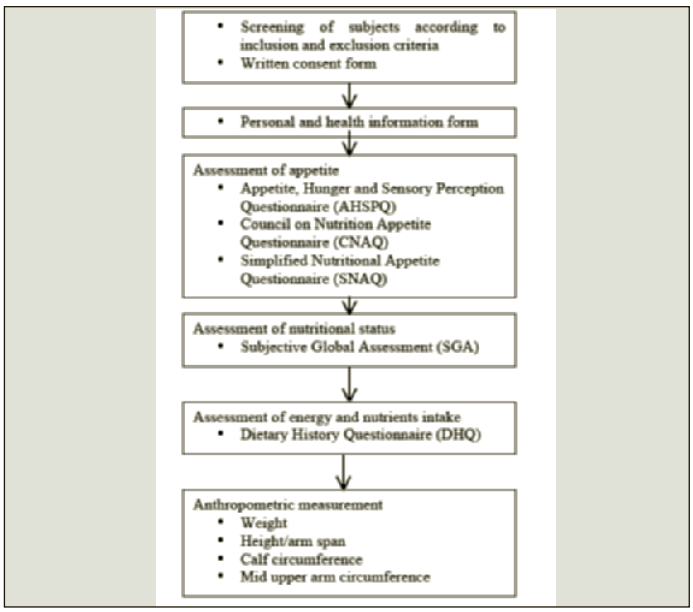


Figure 2
Percentage of subjects not meeting individual requirement for energy and protein and RNI for micronutrients

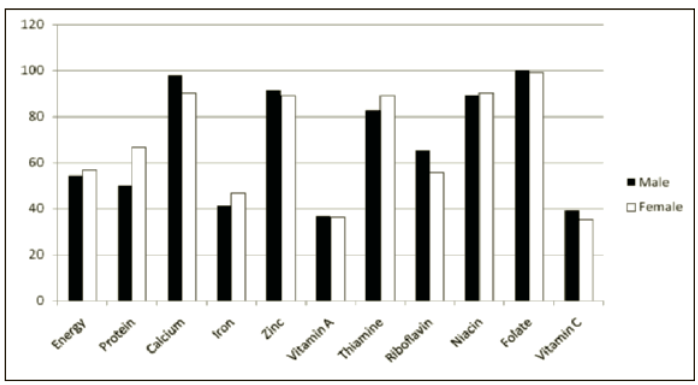
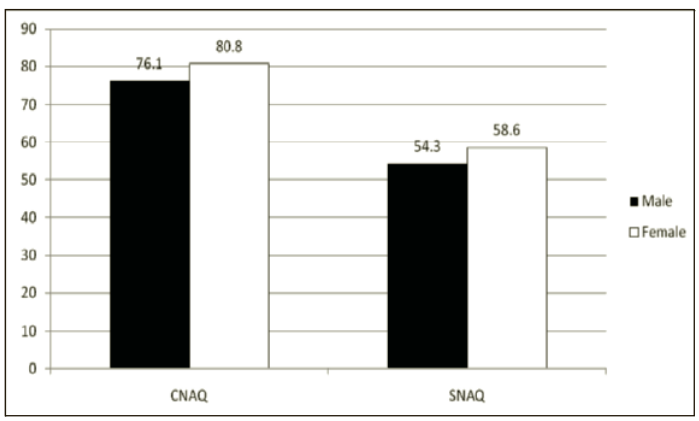


Figure 3
Percentage of subjects classified as having poor appetite according to CNAQ and SNAQ



Sensitivity, specificity, positive predictive value and negative predictive value of appetite screening tools

Table 3 indicates that CNAQ has high sensitivity and low specificity when validated against AHSPQ (25th percentile) (sensitivity 91.67%, specificity 24.77%), AHSPQ (50th percentile) (sensitivity 90.77%, specificity 30.00%), AHSPQ (75th percentile) (sensitivity 84.40%, specificity 36.11%), nutritional status (sensitivity 80.90%, specificity 23.21%) and energy intake (sensitivity 79.34%, specificity 21.74%). No other research regarding validation of CNAQ and SNAQ known to be conducted among Asian elderly communities.

Table 3
Sensitivity, specificity, positive predictive value and negative predictive value for CNAQ and SNAQ

Parameter	CNAQ	SNAQ
AHSPQ (25th percentile)		
Sensitivity (%)	91.67	77.78
Specificity (%)	24.77	49.54
Positive predictive value (%)	28.70	33.73
Negative predictive value (%)	90.00	87.10
AHSPQ (50th percentile)		
Sensitivity (%)	90.77	75.38
Specificity (%)	30.00	57.50
Positive predictive value (%)	51.30	59.04
Negative predictive value (%)	80.00	74.19
AHSPQ (75th percentile)		
Sensitivity (%)	84.40	64.22
Specificity (%)	36.11	63.89
Positive predictive value (%)	80.00	84.34
Negative predictive value (%)	43.33	37.10
Malnutrition using SGA		
Sensitivity (%)	80.90	69.66
Specificity (%)	23.21	62.50
Positive predictive value (%)	62.61	74.70
Negative predictive value (%)	43.33	56.45
Energy intake not meeting individuals requirement		
Sensitivity (%)	84.00	62.96
Specificity (%)	26.56	50.00
Positive predictive value (%)	59.13	61.45
Negative predictive value (%)	56.67	51.61

SNAQ has lower sensitivity but higher specificity than CNAQ when validated against AHSPQ (25th percentile) (sensitivity 77.78%, specificity 49.54%), AHSPQ (50th percentile) (sensitivity 75.38%, specificity 57.50%), AHSPQ (75th percentile) (sensitivity 64.22%, specificity 63.89%), nutritional status (sensitivity 69.66%, specificity 62.50%) and energy intake (sensitivity 57.85%, specificity 47.83%) (Table 3).

Reliability of appetite screening tools

The reliability of CNAQ and SNAQ were 0.546 and 0.578, respectively, as assessed using Cronbach's alpha.

Factors associated with poor appetite among elderly individuals

As shown in Table 4, univariate analysis indicated that the intake of thiamine ($p < 0.05$) and history of weight loss over the past one year ($p < 0.01$) were found to be associated with poor appetite as assessed with SNAQ. Low thiamine intake [Adjusted Odds Ratio 3.04, $p < 0.05$] and history of weight loss over the past one year [Adjusted Odds Ratio 2.49, $p < 0.01$) remained as important determinants of poor appetite when analysed using multivariate analysis (Table 5).

Table 4
Association between poor appetite with socio-economi, health status and dietary intakes using SNAQ

	Score SNAQ ≤ 14 (n = 83)		Score SNAQ > 14 (n = 62)		p-value
	n	%	n	%	
Age					
60 – 74 years	69	55.2	56	44.8	0.214
≥ 75 years	14	70.0	6	30.0	
Sex					
Female	58	56.6	41	41.4	0.631
Male	25	54.3	21	45.7	
Location					
Outpatient	16	45.7	19	54.3	0.114
Inpatient	67	60.9	43	39.1	
Race					
Malay	40	51.9	37	48.1	0.170
Non - Malay	43	63.2	25	36.8	
Marital status					
Married	40	51.9	37	48.1	0.170
Single	43	63.2	25	36.8	
Education status					
Did not received any formal education	30	68.2	14	31.8	0.079
Received formal education	53	52.5	48	47.5	
Working status					
Working	77	57.9	56	42.1	0.597
Not working/pensioner	6	50.0	6	50.0	
Living arrangement					
Alone	10	66.7	5	33.3	0.436
With family/friends	73	56.2	57	43.8	
Social activities					
At least once a month	29	50.9	28	49.1	0.213
No	54	61.4	34	38.6	
Physical activities					
At least once a week	24	54.5	20	45.5	0.665
No	59	58.4	42	41.6	
Diabetes mellitus					
Yes	47	57.3	35	42.7	0.983
No	36	57.1	27	42.9	
Hypertension					
Yes	63	62.3	50	37.7	0.496
No	20	62.5	12	37.5	
Heart problems					
Yes	30	52.6	27	47.4	0.367
No	53	60.2	35	39.8	
Respiratory diseases					
Yes	20	74.1	7	25.9	0.050
No	63	53.4	55	46.6	
High cholesterol					
Yes	15	57.7	9	42.3	0.569
No	68	56.2	53	43.8	
Polypharmacy					
Yes	50	55.6	40	44.4	0.600
No	33	60.0	22	40.0	
History of falls					
Yes	30	57.7	22	42.3	0.935
No	53	57.0	40	43.0	
Difficulty in urinating					
Yes	22	71.0	9	29.0	0.081
No	61	53.5	53	46.5	
History of weight loss[b]					
Yes	48	68.6	22	31.4	0.008

No	35	46.7	40	53.3	
Folate					
< RNI	70	57.9	51	42.1	0.614
≥ RNI	12	52.2	11	47.8	
Protein					
< RNI	60	60.0	40	40.0	0.264
≥ RNI	22	50.0	22	50.0	
Calcium					
< RNI	77	57.5	57	42.5	0.745
≥ RNI	5	50.0	5	50.0	
Iron					
< RNI	42	64.6	23	35.4	0.092
≥ RNI	40	50.6	39	49.4	
Zinc					
< RNI	75	57.9	55	42.1	0.581
≥ RNI	7	50.0	7	50.0	
Vitamin A					
< RNI	29	54.7	24	45.3	0.680
≥ RNI	53	58.2	38	41.8	
Thiamin[a]					
< RNI	76	60.3	50	39.7	0.031
≥ RNI	6	33.3	12	66.7	
Riboflavin					
< RNI	50	58.8	35	41.2	0.585
≥ RNI	32	54.2	27	45.8	
Niacin					
< RNI	75	57.7	55	42.3	0.581
≥ RNI	7	50.0	7	50.0	
Folate					
< RNI	83	57.2	62	42.8	
≥ RNI	0	0.0	0	0.0	
Vitamin C					
< RNI	32	60.4	21	39.6	0.525
≥ RNI	50	54.9	41	45.1	

a. $p < 0.05$; b. $p < 0.01$; significant difference between groups (Pearson's chi square test)

Table 5
Major determinants of poor appetite as assessed using SNAQ among elderly subjects

Risk factors	Adjusted odds ratio	95% confidence interval (lower bound – upper bound)	p – value
Female	1.19	0.59 – 2.40	0.63
Aged ≥ 75 years	0.53	0.19 – 1.46	0.22
No formal education	1.94	0.92 – 4.09	0.08
Iron intake < RNI	1.78	0.91 – 3.49	0.09
Respiratory diseases	2.49	0.98 – 6.35	0.06
History of weight loss over the past one year[b]	2.49	1.27 – 4.90	0.008
Thiamine intake < RNI[a]	3.04	1.07 – 8.63	0.037

a. $p < 0.05$; b. $p < 0.01$, binary logistic regression analysis (enter method) at 2 – tailed significance

Discussion

To the best of our knowledge, this is the first study regarding appetite among elderly patients conducted in Malaysia. This study involved three appetite screening tools: AHSPQ, CNAQ and SNAQ, which were developed and validated in Netherlands and the USA. However, in order for these appetite screening tools to be used in Malaysia, it need to be validated among Malaysian population. This is important as various factors may influence the validity of these screening tools among Malaysian population as compared to the Western population. With this study, elderly patients with poor appetite will be identified and further deterioration in nutritional status can be prevented.

This study showed that more subjects were identified as malnourished from SGA as compared to MUAC and CC. This is because SGA identified a person as malnourished based on several parameters, such as weight changes over the last six months, changes in food intake as compared to habitual intake, gastrointestinal symptoms experienced more than two weeks, functional ability, diseases and its relation with nutritional requirements and physical changes. Whilst, MUAC and CC only identified a person as malnourished based on muscle mass.

This study showed that more men were malnourished according to MUAC and CC although most of them meet their personal energy and protein requirement as compared to women. This may due to the difference in age-related of muscle loss and strength between sex groups. Baumgartner et al (1999) (17) showed that, after adjustments were made on various parameters, declining free-testosterone level, due to advanced age, would cause elderly men to experienced more muscle loss as compared to elderly women ($p<0.01$).

This study revealed that women were more likely to have poor appetite, as assessed using the three investigated tools (i.e AHSPQ, CNAQ and SNAQ). This is consistent with previous study among institutionalized Chinese elderly people (4).

Table 3 indicates that CNAQ had a higher sensitivity but lower specificity than SNAQ. CNAQ also had a lower positive predictive value than SNAQ. Negative predictive value for CNAQ was also higher than SNAQ, except for validation against nutritional status and energy intake. Study by Wilson et al. (9) showed that CNAQ has sensitivity of 80.20% and specificity 80.30% when validated against elderly individuals in the USA. Whilst, the same study showed that SNAQ has sensitivity and specificity values of 81.30% and 88.20%, respectively.

Sensitivity and specificity values of CNAQ and SNAQ in this study were lower than the result from Wilson et al. (9). This may be due to the different population recruited in both studies. This study involved Asian elderly individuals while study by Wilson et al. (9) involved elderly individuals in the USA. In addition, the domains used to validate the screening tools were also different. This study validated the screening tools against AHSPQ, nutritional status and energy intake while study by Wilson et al. (9) validated the screening tools against weight loss of at least 5% over 6 months period. Additionally, the difference in the results may be due to the difference in the population. This study was conducted on both outpatient and inpatient settings, whilst, the population in Wilson et al (9) involved subjects from residents of long-term care facilities and community dwelling individuals. In addition, the difference in the result may also be due to age of the subjects. Subjects who participated in this study aged 60 years and above. However, subjects aged 20 years and above were included from the community dwelling group in Wilson et al (9).

In the study by Wilson et al. (9), Cronbach's alpha for both

CNAQ and SNAQ were 0.470 and 0.510, respectively. The present study also found that SNAQ has a higher Cronbach's alpha than CNAQ. This indicates that SNAQ gives more consistent measurement than CNAQ in the assessment of appetite among elderly individuals.

As previously discussed, CNAQ has high sensitivity but low specificity values. Whilst, SNAQ showed moderate sensitivity and specificity values. In order for a screening tools to be used effectively, sensitivity and specificity values have to be balanced with one another so that the possibilities of true answers whether subjects are having poor appetite are balanced.

In addition, SNAQ has higher positive predictive value and reliability than CNAQ. Higher positive predictive values for SNAQ indicate that the possibility of subjects with poor appetite when tested positive by SNAQ would experienced poor appetite in the future (18).

Besides, SNAQ is simpler to use than CNAQ. Due to all these factors, SNAQ is more suitable to be used in either clinical or community settings in determining elderly individuals with poor appetite. However, due to the moderate sensitivity and specificity values of SNAQ, subjects must be screened again after six months in order to evaluate the occurrence of poor appetite among subjects. Further studies need to be conducted to prospectively determine the consequences of poor appetite on health and clinical outcomes.

Subjects with intake of thiamine less than RNI has an increased risk by three times to have poor appetite than those meeting the recommendation. Thiamine plays an important role as a co-enzyme of various kinds of dehydrogenases in energy metabolism and metabolic processes involving carbohydrates, amino acid and fat (19). Thiamine deficiency causes disruption to α – ketoglutarate dehydrogenase activities through reduction in co-enzyme activities. This increases flux through gammaaminobutarate (GABA) pathway. GABA functions in the control of food intake. Differences in the GABA levels are the main cause of association between thiamine deficiency and poor appetite (19). There is a need to evaluate the efficacy of provision of thiamine rich food or supplement in improving the appetite status of elderly individuals. Other minerals associated with poor appetite, such as zinc, should also be given attention (20).

This study has also determined that history of weight loss over the past one year increased risk of poor appetite by two folds. As one ages, the best measurement of nutritional status is by assessing the weight loss (9). Among the factors which causes weight loss among elderly individuals are reduction in intake and absorption of nutrients, age-related muscle mass loss (sarcopenia), severe osteoporosis, reduction in muscle and fat mass (cachexia) and dehydration (9). On the other hand, poor appetite might also lead to weight loss (21). Thus, both warning signals of poor appetite and weight loss should be recognized and intervene early in order to reduce health risk associated with weight loss. However, it should be recognized that this study was a cross-sectional study that limits the interpretation of 'cause' and effect'. Further prospective longitudinal study is needed to determine the synergy effect of inadequate thiamine intake and weight loss with appetite.

Conclusion

This study concluded that SNAQ was more valid and reliable than CNAQ in screening elderly individuals with poor appetite. Low thiamine intake and weight loss increased risk of poor appetite by three and two folds, respectively. There is a need to identify the risk earlier in order to prevent undesirable consequences of poor appetite that would increased malnutrition and co-morbidity associated with it.

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