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Relationship between Appetite, Food Intake and Body Composition among Elderly Malays from an Urban Residential Area in Kuala Lumpur, Malaysia

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ABSTRACT

Loss of appetite, decrease in food intake and changes in body composition appear to be inter-related factors that can influence the well-being of older individuals. Therefore, a study was conducted to determine the level of appetite, food intake and its relation to body composition and functional status among non-institutionalised elderly Malays in Cheras, Kuala Lumpur. The Council on Nutrition Appetite Questionnaire (CNAQ), Diet History Questionnaire (DHQ), Bio-impedance Analysis (BIA) and Instrumental Activity of Daily Living (IADL) questionnaire and handgrip dynamometer were used to measure appetite, food intake, body composition and functional status respectively. A total of 112 subjects (41.1% men and 58.9% women) participated with mean age being 66.0 ± 5.0 years for men and 66.3 ± 6.2 years for women. Prevalence of poor appetite was higher in elderly women (72.3%) than in men (52.3%) ($p<0.05$). Pearson's correlation test showed that CNAQ score correlated significantly with age (r=-0.255, $p<0.01$), energy intake (r=0.272, $p<0.01$), IADL score (r=0.408, $p<0.01$) and handgrip strength (r=0.263, $p<0.05$). Energy intake correlated significantly with fat free mass (r=0.424, $p<0.05$), muscle mass (r=0.456, $p<0.05$) and total body water (r=0.403, $p<0.05$). Multiple regression analysis showed that 27.0% of poor appetite could be explained by advanced age, low energy intake and decreased functional status. In conclusion, the study showed that poor appetite was prevalent among the subjects, especially women and this was influenced by aging, inadequate energy intake and decreased functional status.

Keywords: Activities of daily living, appetite, body composition, eating, Malaysia

INTRODUCTION

On average, people become less hungry and eat less as they get older (Chapman, 2007). They generally feel more full before meals, consume smaller meals more slowly, eat fewer snacks between meals and become easily satiated after eating a standard meal as compared to younger persons (Chapman, 2007; Morley, 2001). The decline in appetite

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and food intake commonly seen in the elderly has been described as 'anorexia of aging' (Chapman, 2007; Morley, 2001; Hays & Robert, 2006). Anorexia of aging is a situation in which there is a continuous decline in appetite in the elderly until a drastic and extreme reduction in body weight occurs. It is the consequence of protein-energy malnutrition which is commonly experienced by the elderly (Chapman, 2007; Wilson *et al.*,2005).

Poor appetite is much related to malnutrition and commonly occurs among older people (Solve 1997). Malnutrition occurs due to inadequate or excess intake of some nutrients causing negative consequences on health such as osteoporosis and obesity. It can also be a contributing factor to other chronic or non-communicable diseases like coronary heart disease, diabetes mellitus, hypertension and certain types of cancers (Omran & Morley, 2000a; Tucker & Buranapin, 2001: Ismail, 2002). Rural elderly people in Malaysia are at high risk to malnutrition problems just like other vulnerable groups such as children and pregnant women (Suzana, Earland & Suriah, 2001; Suzana *et al.*, 2007).

Multiple factors contribute to impaired appetite including socio and demographical factors as well as health status (Lee *et al.*, 2007). The elderly who have a good appetite and who are more physically active have less depressive symptoms, subjective stress, much more communication with family and much more social support, as compared to those without appetite (Okatomoa *et al.*, 2007).

Appetite indirectly influences body composition since declining appetite will affect food intake and cause further reduction in body weight of the elderly (Wilson *et al.*, 2005). Advanced age is also associated with changes in body composition, including reduction in fat free mass and increases in body fat mass **(**Cheryl & Lyder, 2001). These changes in body composition especially fat free mass can also impair the functional status of an elderly individual. Functional disability is much related to poor quality of life of the elderly individual because it is the key to being independent in life (Suzana *et al.*, 2007). According to Lubitz *et al.* (2003), loss of functional status among elderly people will increase their healthcare cost as well as reduce their lifespan.

As the population of older people is on the rise, there is a challenge to maintain their good health status and well-being (Wikbly & Fagerskiold, 2004). Poor appetite among the elderly seems to be one of the basic factors which has a huge and negative impact on the health condition of the elderly. Therefore, this study aims to assess the prevalence of poor appetite and determine the relationship between appetite, energy intake, physical activity and body composition as well as other factors which may influence poor appetite among the elderly people.

METHODOLOGY

This is a cross-sectional study that was carried out from September 2008 until early January 2009. A total of 112 subjects (46 is men and 66 women) residing in low cost flats in Cheras, Kuala Lumpur participated in this study through a community survey. Inclusion criteria were individuals aged 60 years old and above, Malays, permanent resident for at least one year and had no terminal and mental illness. Cheras has been chosen as the study area since this study is part of a larger study on sarcopenia for which DEXA measurements will be conducted at the university hospital in Cheras. Initially, this study invited all elderly people regardless of ethnicity to participate. However, only a small number of elderly Chinese (n=7) and Indians (n=2) volunteered as subjects. Therefore, they were dropped from the analysis to prevent dilution effect. This is a convenience sampling survey with the hypothesis 'is there is any reduction in appetite with ageing and whether it will influence food intake and body composition of the elderly'. This

study was ethically approved by the Medical Research Centre of Universiti Kebangsaan Malaysia. Informed and written consent was obtained from the subjects.

Subjects were gathered at a community hall for anthropometry and body composition measurements. They were also interviewed for socio-demographic data, health profile, food intake using Diet History Questionnaire (DHQ) (Suzana, Aerland & Suriah, 2000), and physical activity using International Physical Activity Questionnaire (IPAQ) (Hagstromer, Oja & Sjostrom, 2006). Appetite was measured using Council of Nutrition Appetite Questionnaire (CNAQ) (Wilson *et al.,* 2005) and functional status was determined by the Instrumental Activity of Daily Living (IADL) questionnaire (Suzana *et al.,* 2007) together with hand grip strength measurements (Sammons JAMAR 7498-05 Hydraulic Hand Dynamometer, Sammons Preston Roylan, Nottinghamshire, United Kingdom)(Manandhar, 1995). Anthropometry parameters measured were body weight (TANITA digital lithium scale HD319, TANITA Corporation, Tokyo, Japan), height (SECA Leicester Portable Height Measure SECA Corporation, Humberg, German), and waist circumference using SECA measuring tape (SECA Corporation, Humberg, German). The anthropometric measurements were taken according to standard protocol (Lee & Nieman 1993). For body weight measurement, subjects were asked to put aside personal things from their pocket like wallet, handphone, and watch to ensure sufficient accuracy. For height measurement, subjects were asked to stand with the heels together and the heels, buttocks and upper part of the back touching the scale and the head in the Frankfort plane with the orbitale (lower edge of the eye socket) in the same horizontal plane as the tragion (the notch superior to the tragus of the ear). The waist circumference was taken at the narrowest point between the lower costal which is the 10^{th} rib border and the top of the iliac crest perpendicular to the long axis of the trunk. Maltron Bio-Scan 916 (Maltron International Ltd, Rayleigh, Essex, United Kingdom) was used for determining body composition using bio-impedance analysis method (*www.maltronint.com/portable_products.htm/ 31-07-2008*).

Poor appetite prevalence was measured using the Council of Nutrition Appetite Questionnaire (CNAQ) (Wilson *et al.,* 2005). The CNAQ has been developed and validated against Appetite, Hunger and Sensory Perception Questionnaire (ASHPQ) among community dwelling elders (Wilson *et al.,* 2005). Specifically, the CNAQ consists of 8-items on the appetite assessment on a likert scale of 1 to 5. The sum of scores for the individual items constitutes the CNAQ score with scores $\leq$28 indicating poor appetite and scores >28 indicating good appetite.

'Nutritionist-Pro' software version 3.1n (Axxya system) was used to analyse nutrient intake from the Diet History Questionnaire (DHQ). Statistical Package for Social Sciences version 15 (SPSS, Inc) was used to analyse the data collected. Independent sample *T*-test was used to examine differences between sexes for the anthropometry measurement, body composition, hand grip strength and IADL score. For data that was not normally distributed, the Man-Whitney test was carried out as the non-parametric test to compare the mean between sexes. Chi-squared test was used to determine the relationship between sex and categorical data such as marital status, living arrangement, education level, working status financial source and physical activity. Pearson's correlation was used to assess correlations between continuous data such as CNAQ score, energy intake, body composition and hand grip strength. Multiple regression analysis was carried out to explore best predictors for appetite with significant factors being examined using univariate analysis which were entered as independent variables using the enter method.

Table 1. Socio-demographic and socio-economic data and appetite status of subjects (expressed as number and percentage)

	Sex		*Appetite classification*		
	Men (n=46)	*Women (n=66)*	*Poor (n=70)*	*Good (n=39)*	Total (n=112)
Marital status					
Married	41 (89.1)	30 (45.5)	43(61.4)	26(66.7)	71 (63.4)
Unmarried / divorce	5 (10.9)	36 (54.5) [a]	27(38.6)	13(33.3)	41 (36.6)
Living arrangement					
Alone	0 (0)	8 (12.1)	8(11.4)	0(0.0) [b]	8 (7.1)
Not alone	46 (100)	58 (87.9) [b]	62(88.6)	39(100.0)	104 (82.9)
Education level					
Had formal education	45 (97.8)	56 (84.8)	63(90.0)	36(92.3)	101 (90.2)
No formal education	1 (2.2)	10 (15.2) [b]	7(10.0)	36(92.3)	101 (90.2)
Working status					
Working	8 (17.4)	8 (12.1)	9(12.9)	7(17.9)	16 (14.2)
Not working / retired	38 (82.6)	58 (87.9)	61(87.1)	32(82.1)	96 (85.7)
Financial source					
Self finance	33 (71.7)	20 (30.3)	30(42.9)	22(56.4)	53 (47.3)
Depend on others	13 (28.3)	46 (69.7) [a]	40(57.1)	17(43.6)	59 (52.7)
Physical activity					
Low	9 (19.6)	20 (30.3)	17(24.3)	11(28.2)	29 (25.9)
Moderate	25 (54.3)	32 (48.5)	37(52.9)	19(48.7)	57 (50.9)
High	12 (26.1)	14 (21.2)	16(22.8)	9(23.1)	26 (23.2)

[a] $p<0.001$, Chi-squared test showed significant difference between sexes
[b] $p<0.05$, Chi-squared test with Yate's correction

RESULTS

General

A total of 112 subjects (46 men and 66 women) with a mean age of 66±5.7 years old participated in this study. The majority of subjects were married (63.4%), living with their family (82.9%) and had formal education (90.2%) particularly among men ($p<0.05$) as shown in Table I. More women (69.7%) were dependent on others for financial resources as compared to men (28.3%)($p<0.05$).

The reliability test for Council of Nutrition and Appetite Questionnaire (CNAQ) on a sub-sample of 30 elderly Malays, showed the Alpha value to be 0.61 indicating moderate reliability. The test and re-test results also showed good correlations ($r=0.79$, $p<0.01$). Therefore, this questionnaire was considered reliable and valid for use in assessing appetite status among the elderly in Malaysia. Based on CNAQ classification, 52.3% of men and 72.3% of women were classified as having poor appetite while the overall prevalence was 64.2%. Generally, the socio-demographic and socio-economic factors studied had no significant difference ($p>0.05$) with the classification of appetite among subjects, with the exception of living arrangement as shown in Table 1.

Table 2. Anthropometry, body composition and functional status of subjects (expressed as mean ± SD)

Parameter (unit)	*Sex*		*Appetite*	
	Men (n=46)	*Women (n=66)*	*Poor (n=70)*	*Good (n=39)*
Anthropometry				
Weight (kg)	64.7 ± 12.4	58.8 ± 11.2 [a]	60.3 ± 12.0	63.3 ± 12.1
Height (cm)	160.5 ± 7.9	147.6 ± 5.7 [a]	152.0 ± 9.1	154.7 ±9.2
BMI (kg / m^2)	25.2 ± 4.7	26.9 ± 4.5 [a]	26.1 ± 4.9	26.4 ± 4.5
Waist circumference (cm)	88.2 ± 11.2	85.2 ± 11.3	86.3 ± 1.7	87.2 ± 10.8
Body composition				
Fat free mass (kg)	48.07 ± 6.86	35.23 ± 5.28	39.3 ± 8.4	42.5 ± 9.0
Fat mass (%)	24.9 ± 7.7 [a]	38.9 ± 9.0	34.2 ± 10.8	32.0 ± 11.2
Muscle mass (kg)	23.32 ± 3.67 [a]	15.60 ± 2.45	17.9 ± 4.6	20.2 ± 5.2 [a]
Total body water (L)	37.75 ± 6.26	30.40 ± 5.29	32.9 ± 6.8	34.6 ± 6.7
Functional status				
Hand grip strength (kg)	18.63±6.22	8.52±4.53	11.0 ± 7.1	15.4 ± 6.3 [a]
IADL score	13.4±1.4	13.0±1.8	12.9 ± 2.0	13.7 ± 0.8 [a]

[a] $p<0.05$, significant difference using independent sample *t*-test
* $p<0.05$, significant difference using Pearson's Chi-square
BMI – Body mass index

Relationship between appetite and anthropometric status

Body Mass Index (BMI) was significantly higher in women compared to men ($p<0.05$) as shown in Table 2. Based on WHO (1998) BMI classification, more than half (62.5%) of the subjects were in the overweight and obesity classes and the majority were women. Percentage of abdominal obesity was also high among subjects (26.8%) and it was significantly higher in women (41.8%) compared to men (7.1%)($p<0.05$). The mean of waist circumference for men was higher than for women which contradicts with percentage abdominal obesity, probably due to the difference in cut-off line between gender. Abdominal obesity was also significantly higher in subjects with poor appetite (35.0%) compared to those with good appetite (13.9%) ($p<0.05$).

Functional status of subjects, as assessed using IADL score, was better in men (76.1%) compared to women (65.2%). IADL scores were also higher among elderly with good appetite than those with poor appetite as shown in Table 2.

Relationship between food intake and appetite

Apparently, energy and nutrient intake of most nutrients was higher among subjects with good appetite and it was significant for energy and protein intake. However, the intake of some nutrients such as calcium, iron, thiamin, riboflavin and niacin was higher among women with poor appetite. Among men, only calcium and niacin intake was higher in those with poor appetite as shown in Table 3.

There were significant correlations between appetite as assessed using CNAQ score and age ($r= -0.255$, $p<0.05$), energy intake ($r= -0.272$, $p<0.05$), and functional status for both handgrip strength (r= -

Table 3. Energy and nutrient intake of subjects (Expressed as mean ± SD)

		Men (n=46)				*Women (n=66)*			
Nutrient	*Unit*	*Poor appetite (day)*	*%RNI*	*Good appetite (day)*	*%RNI*	*Poor appetite (day)*	*%RNI*	*Good appetite (day)*	*%RNI*
Energy	kcal/day	1408±278	70.0	1575±451	78.4	1199±291	67.4	1237±239	69.5
	kcal/day/kg bw	23.2±5.7	-	24.2±7.7	-	21.2±6.5	-	21.9±7.1	-
Carbohydrate	g/day	223.4±58.6	-	252.4±88.5	-	193.2±52.0	-	195.1±33.5	-
	% kcal	62.9±8.4	-	63.7±7.5	-	64.5±7.0	-	63.5±7.3	-
Protein	g/day	49.9±13.3	84.6	57.9±16.3	98.1	47.2±15.5	92.5	50.0±17.2	98.0
	g/kg bb	0.8±0.3	-	0.9±0.3	-	0.8±0.3	-	0.9±0.4	-
Fat	g/day	32.3±12.5	-	37.2±16.0	-	26.9±11.0	-	28.6±11.5	-
	% kcal	22.2±8.0	-	31.4±6.6	-	19.8±5.5	-	20.5±6.0	-
Calcium	mg/day	383.7±134.2	38.4	378.0±166.5	37.8	381.9±223.0	38.2	343.9±135.2	34.4
	mg/1000kcal	275.6±78.5	-	249.5±106.8	-	320.5±146.7	-	278.0±97.8	-
Iron	mg/day	11.3±4.6	80.7	13.7±6.4	97.9	10.8±5.4	99.1	9.7±3.0	88.2
	mg/1000kcal	8.0±2.6	-	8.9±3.3	-	9.0±3.8	-	7.8±1.7	-
Vitamin A	ì g/day	1350.5±6947	225.1	1488.3±1147.6	248.1	1236.4±916.4	206.1	1115.3±791.9	185.9
	ì g/1000kcal	981.9±537.1	-	932.0±596.0	-	1063.0±834.9	-	924.6±705.2	-
Thiamin	mg/day	0.8±0.3	66.7	1.0±0.4	83.3	1.0±0.6	90.9	0.8±0.3	72.7
	mg/1000kcal	0.6±0.3	-	0.6±0.2	-	0.9±0.5	-	0.7±0.3[a]	-
Riboflavin	mg/day	1.0±0.3	76.9	1.2±0.6	92.3	1.1±0.5	100.0	0.9±0.3	81.8
	mg/1000kcal	0.8±0.3	-	0.8±0.3	-	0.9±0.4	-	0.8±0.2[a]	-
Niacin	mg/day	9.8±5.8	61.3	8.6±2.9	53.8	9.1±5.1	65.0	7.9±2.8	56.4
	mg/1000kcal	6.9±3.3	-	5.5±1.3	-	7.7±4.3	-	6.6±2.8	-
Vitamin C	mg/day	95.0±91.8	135.7	105.3±96.5	150.4	94.2±73.8	134.6	104.7±112.4	149.6
	mg/1000kcal	66.3±62.6	-	70.5±68.4	-	82.7±68.1	-	89.2±105.3	-

[a] $p<0.05$, significant difference in Mann-Whitney test

Table 4. Correlation between CNAQ score to age, anthropometry, body composition, energy intake, functional status and physical activity of the subjects

	Correlation value (r) score CNAQ		
Parameter	*Men (n=46)*	*Women (n=66)*	*Total (n=112)*
Age	-0.295	-0.242	-0.255[a]
Anthropometry			
BMI (kg / m^2)	0.118	0.097	0.068
Waist circumference (cm)	0.105	-0.093	0.002
Body composition			
Fat free mass	0.029	0.022	0.140
Fat mass	0.063	0.063	-0.002
Muscle mass	0.123	0.061	0.186
Total body water	0.045	0.055	0.124
Food intake			
Energy intake	0.156	0.361[b]	0.272[a]
Functional status			
IADL score	0.220	0.481[a]	0.408[a]
Hand grip strength	0.146	0.258[b]	0.263[a]
Physical Activity			
MET-minute / week	0.190	-0.013	0.105

[a] $P<0.05$, significant correlation

0.263,$p<0.05$) and IADL score (r= -0.408, $p<0.05$), as shown in Table 4. However, using multiple linear regression analysis with enter method, advancing age (β=-0.148 SEM=0.048, $p<0.10$), energy intake (β=0.02 SEM=0.01, $p<0.05$), and IADL score (β=0.746, SEM=0.162, p<0.01) were the important associated factors with R^2 of 27.0%.

DISCUSSION

The prevalence of poor appetite was very high among the elderly Malays residing in Cheras, Kuala Lumpur (64.2%). By using the same method, the prevalence of appetite was almost the same for one study conducted among institutionalised Chinese elderly in Penang where 70% experienced poor appetite (Suzana & Yow, 2009). However, this figure is higher by 10.5% over that reported among the older population in the United States (Wilson *et al.*, 2005). This may be attributedto the expected better healthcare system in the United States as compared to Malaysia (Wilson *et al*., 2005; Ismail, 2002).

Based on gender, prevalence of poor appetite was greater among elderly women (72.3%) compared to elderly men (52.3%). The findings of the study among institutionalised Chinese elderly in Penang also showed a similar trend with 70.6% of women having poor appetite compared to only 69.4% of men having poor appetite (Suzana & Yow 2009). Elderly women tend to have a poorer appetite due to other confounding factors of appetite such as loneliness and depression as well as a longer lifespan than men (Gustafsson & Sindenvall 2002). Insomnia is one other factor that is associated with poor appetite and it has been found to have a higher prevalence in elderly women than in elderly men (Suzana & Charn 2009).

This study also found that elderly subjects who were living alone were more likely to have poor appetite. Wikbly & Fagerskiold (2004) reported that elderly people will eat more when taking meals with their family members, relatives, or friends rather than eating alone. The same study also states that environmental condition and health status, as well as being free from any disease positively affected appetite. A study in Japan showed that only communication with family was significantly associated with good appetite. The indirect effect of communication with family on appetite was much greater than the direct effect. These findings suggest that communication with family may be a beneficial promoter of appetite in the elderly (Okatomoa *et al.*, 2007).

Overall, mean energy intake of the subjects was 1347 kcal / day and this was lower than the requirements of the Malaysian Recommended Nutritional Intake (RNI). A previous study among the rural elderly in Malaysia also reported a similar concern (Suzana *et al*., 2000). In a recent study, mean energy intake for men was found to be 1412 ± 461 kcal / d and 1201 ± 392 kcal / d for women, which were below the Recommended Nutrient Intake (RNI) for Malaysia. However, it must be admitted that this is a difficult assertion to make in an age-group which generally experiences declining energy expenditure (Suzana *et al.*, 2007).

In the present study, subjects with good appetite apparently consumed slightly more energy and nutrients but the differences were not significant. Among the elderly, even good food intake as a result of good appetite does not confirm sufficient nutrient intake as they seem to attain satiety quite easily, even after a small meal (Chapman, 2007). In addition, Chapman (2007) reported that as an individual gets older, they will be more likely to feel less hungry and eat in smaller quantities during meal times. This can be explained by physiological changes of aging such as alteration in taste and smell. Changes in hormonal balance regulation and also a decline in adaptive relaxation of the fundus of the stomach and an increased rate of antral filling appear to play a role in the early satiation seen in many older persons (Morley, 2001).

In this study, functional status had a significant association with poor appetite among subjects, with energy intake as the covariate. Normal aging is related to change in body composition and decreases in physical activity (Chapman, 2007; Dipietro, 2001). Changes in body composition such as a reduction in fat free mass especially muscle mass can result in a condition termed as sarcopenia. Sarcopenia can lead to restrictions in physical activity as well as limitations in functional status of the elderly (Doherty, 2003). According to Roubenoff (2003), muscle quantity decreases with increasing age and this will also cause a decrease in the functional status of the elderly. This limited functional ability will in turn affect the mobility and quality of life of the elderly. However, there is no significant correlation found between appetite status and body composition in this study.

In the present study, a slightly higher percentage of subjects with good appetite were regularly engaged in moderate (48.7%) and heavy (23.1%) physical activity, as compared to those with poor appetite. However, this difference was not significant probably due to the small sample size. The occurrence of poor appetite in the elderly is a social and health concern as it can lead to many health problems, disease, poor functional status and disability. All of these negative consequences should be avoided in order to ensure improvement and maintenance of well-being of the elderly population.

The classification of appetite status using CNAQ may have some bias when applied to a Malaysian population. Although the reliability and validity test had been carried out, the results showed that the

CNAQ has moderate reliability. Therefore, some effort must be extended to increase the reliability and validity of CNAQ in assessing appetite status among the Malaysian population. It is suggested that future studies increase the sample size to allow for comparison among the various ethnic groups in Malaysia.

CONCLUSIONS AND IMPLICATIONS

Poor appetite affected almost a quarter of the elderly subjects in this study, particularly women. This is associated with advanced age, lower energy intake and lower functional status as assessed using IADL scores and handgrip strength. There is a dire need to identify and recognise these problems early and plan for a comprehensive intervention programme providing better nutrition and physical activity opportunities for the elderly.

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