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Nutrient intake among elderly in southern Peninsular Malaysia

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ABSTRACT

Studies were conducted in selected areas in three states namely Johor (n=117, male=55, female=62), Negeri Sembilan (n=130, male=52, female=78) and Malacca (n=97, male=33, female=64) involving free living elderly (age range from 60 to 93 years old). Respondents were divided into three age cohort groups that is 60 to 69 years, 70 to 79 years and above 80 years old. Assessment of macro and micronutrients were obtained from 24-hour diet recall for three consecutive days. Household measurements were used to estimate the amount of food consumed. Mean energy intake for both sexes were lower than the Malaysian RDA. Mean energy intake were also found to decline with age increment. The percentage of carbohydrate from total calories is higher compared to fat and protein. No respondents were found to consume less than $^{1}/_{3}$ RDA for protein. Although no significant difference in nutrient intake was noted among age cohort groups, there was a decline in the intake of protein, fat and carbohydrate. Significantly ($p < 0.05$) lower carbohydrate intake was noted in cohort group above 80 years. As for vitamins and minerals consumption, more than 50% of the elderly population studied consumed less than $^{2}/_{3}$ RDA for vitamin A, thiamine, riboflavin, niacin and calcium. Very low intake of nutrient may lead to many health problems. Overall mean energy intake indicate the respondents consume less than the Malaysian RDA for all three age cohort groups. Total mean energy intake were also found to decline with age increment for both sexes. Due to the low energy intake, higher percentage of elderly were found consuming less than $^{2}/_{3}$ RDA for thiamine (65%), riboflavin (63%) and niacin (90%). Other nutrients which were also being consumed less than $^{2}/_{3}$ RDA by the respondents are vitamin A (67%) and calcium (65%). The intake of calcium which was found to be extremely low (ranged from 277 to 303 mg) could lead to problems like osteoporosis.

INTRODUCTION

Studies on elderly have now created interest among researchers and a lot of attention has been given to studies pertaining to nutrient intake among this special group. Progressive decline in energy, lean body mass and protein intake are also associated with aging (Ahmed, 1992). Studies among frail elderly have shown that disabilities diminish their ability to obtain and/or prepare meals (Roe, 1990).

Even though it is generally recognised that caloric needs often decrease after the age of 55 (Winnick, 1980), nutritional needs are still found to be so extent. This is supported by studies from Ahmed (1992). Studies of specific population as shown by Sempos *et al.,* (1984) among middle-aged women also indicate malnutrition or deficiency in nutrients. Therefore, it is

generally accepted that the elderly population are more likely to suffer from nutritional deficiencies than any other population (Nes *et al.*, 1988).

Recent studies have also indicated that in fact, requirements for several nutrients may be different for older and younger group as well as older men and older women (Andreas & Hallfrich, 1989). The effect of age appears to be reduction in caloric needs which parallels the decline of metabolically active lean body mass. The requirements for many nutrients are less for aged women than men because of the former's small body size or lesser proportion of metabolically active tissue (Posner, 1979).

In Malaysia, there was a steady increase in the proportion of the elderly age above 60 years from 5% in 1970 to 6% in 1980 making a total of 745, 100 elderly people (Khoo, 1980). According to Perangkaan Penting Semenanjung Malaysia (1990), the increment in the number of elderly above 60 years has reached 6.1% in 1990. The above data clearly indicate the elderly population is growing and will continue to grow in the near future.

Although not many surveys on nutrient intake have been carried out in Malaysia, the results obtained from limited studies indicated that cases of deficiencies among elderly do exist in the country (Suriah, 1989). The study which was carried out among elderly in Cheras and Seremban old folks homes aged 50 years and above showed that their intake were deficient of vitamin A and niacin when compared to the Malaysian Recommended Dietary Allowance (Suriah & Azhar, 1988; Norimah *et al.*, 1990).

A study on free living elderly in Kampung Sungai Merab instead concluded that more than 50% respondents were found to consume less than $^{2}/_{3}$ RDA for vitamin A, thiamine, riboflavin, niacin, calcium and iron (Azirah & Suriah, 1992). It is therefore essential to look back into the nutritional status and dietary intake of this group and establish dietary guidelines associated to the Asian population generally and Malaysian in particular.

METHOD

Studies were conducted in three southern states of Peninsular Malaysia which are Johor (n=1 17, male=55, female=62) comprising of Kampung Jalan Johor and Parit Haji Ibrahim in Batu Pahat and Mukim Air Hitam in Muar districts, Alor Gajah and Air Molek area in Malacca (n=97, male=33, female=64) and four areas in Negeri Sembilan (n= 130, male=52, female=78) which are Kampung Sungai Sekawang, Kampung Telok, Kampung Jimah Baru and Kuala Pilah district. Respondents in this study are free living elderly Malay between the age of 60 to 93. years old and they are divided into three separate age cohort groups: 60 to 69 years, 70 to 79 years and 80 years and above. The districts and Kampungs were sampled based on convenience, whereas the respondents participated in the survey on voluntary basis.

This study included dietary assessment of macro nutrients, vitamins and minerals using 24-hour diet recall for three days. Intake of the respondents were recorded for three consecutive days in a food record form. All the meals taken into consideration are meals taken at home. Respondents were asked the types of food consumed 3days prior to the interview. The amount of food

consumed was estimated as accurately as possible using standard household measurements such as bowls, cups, plates, glass and spoons. Assistance from family members were obtained for respondents who are unable to recall exactly the amount of food consumed.

Nutrient composition of food consumed by each respondent was calculated using a computer programme based on the Malaysian Food Composition Table (Tee *et al.,* 1988). Results obtained were then compared to the Malaysian Recommended Dietary Allowance (Teoh, 1975). Intake of less than 66.7% of the RDA for protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid will be considered as inadequate intake.

The collected data was analyzed using the Statistical Analysis System (SAS). The t-test was used to determine differences of intake between sexes, whereas the Duncan multi-variance test was used to determine the significance between mean intake of nutrients for the three age cohort groups.

RESULTS AND DISCUSSION

Mean intake of energy and specific nutrients of the respondents are discussed according to sex and age cohort groups as shown in Table 1. The mean energy intake of the male and female respondents for all age groups was found to be lower than the Malaysian RDA (2020 kcal for male and 1600 kcal for female). Results of the total mean energy intake showed that the energy intake of male and female respondents tend to decline with age increment. The energy intake was significantly lower ($p < 0.05$) among those age more than 80 years (1255 kcal) as compared to those aged 60 to 69 years (1389 kcal) and aged 70 to 79 years (1351 kcal). This age-related decline in caloric intake has also been reported in surveys of food intake overseas (Steinkamp et al., 1985, United States Department of Agriculture, 1985).

Table 1(a). Nutrient intake of elderly in southern Peninsular Malaysia based on age cohort group (60 to 69 years)

Nutrient	Male (n=80) Mean ± SD*	Female (n=127) Mean ± SD	Statistical Analysis	Total Mean Mean ± SD
Energy (kcal)	1484 ± 338	1329 ± 307	P < 0.05	1389 ± 348[a]
Protein (g)	54.19 ± 18.02	45.60 ± 11.88	P < 0.05	48.92 ± 15.11[a]
Fat (g)	37.15 ± 17.39	31.29 ± 12.22	P < 0.05	33.56 ± 14.68[a]
Carbohydrate (g)	228.95 ± 65.21	210.97 ± 54.53	P < 0.05	217.92 ± 58.14[a]
Fibre (g)	2.04 ± 1.52	1.97 ± 1.42	n.s	2.00 ± 1.46[a]
Calcium (mg)	300.22 ± 165.90	265.18 ± 145.44	n.s	278.72 ± 154.23[a]
Phosphorus (g)	812.27 ± 312.60	680.72 ± 244.76	P < 0.05	731.56 ± 279.72[a]
Iron (mg)	8.84 ± 3.89	7.78 ± 3.90	n.s	8.19 ± 3.92[a]
Vitamin A (μg)	517.13 ± 617.61	423.04 ± 313.10	n.s	459.40 ± 456.46[a]
Thiamine (mg)	0.60 ± 0.30	0.52 ± 0.28	n.s	0.56 ± 0.29[a]
Riboflavin (mg)	0.78 ± 0.34	0.71 ± 0.31	n.s	0.74 ± 0.32[a]
Niacin (mg)	5.78 ± 3.08	5.05 ± 3.0	n.s	5.33 ± 3.04[a]
Vitamin C (mg)	35.70 ± 28.06	41.02 ± 37.44	n.s	38.97 ± 34.15[a]

n.s = not significant.
* = mean value ± standard deviation (n-1).
ab = different letters within rows indicate significant differences ($p < 0.05$).

Table 1(b). Nutrient intake of elderly in southern Peninsular Malaysia based on age cohort group (70 to 79 years)

Nutrient	Male (n=44) Mean ± SD*	Female (n=59) Mean ± SD	Statistical Analysis	Total Mean Mean ± SD
Energy (kcal)	1535 ± 366	1214 ± 309	P < 0.05	1351 ± 367[ab]
Protein (g)	54.51 ± 13.35	43.69 ± 11.28	P < 0.05	48.32 ± 13.28[a]
Fat (g)	37.11 ± 15.99	28.22 ± 13.37	P < 0.05	32.02 ± 15.13[a]
Carbohydrate (g)	245.95 ± 63.21	196.67 ± 49.18	P < 0.05	217.72 ± 60.50[a]
Fibre (g)	2.35 ± 1.82	1.99 ± 1.73	n.s	2.15 ± 1.77[a]
Calcium (mg)	298.61 ± 158.11	260.84 ± 143.22	n.s	276.97 ± 150.18[a]
Phosphorus (g)	812.67 ± 375.76	674.91 ± 218.40	P < 0.05	733.76 ± 302.22[a]
Iron (mg)	8.77 ± 3.63	7.37 ± 3.61	n.s	7.97 ± 3.67[a]
Vitamin A (μg)	425.64 ± 294.67	493.69 ± 761.22	n.s	464.62 ± 606.01[a]
Thiamine (mg)	0.58 ± 0.26	0.52 ± 0.34	n.s	0.55 ± 0.31[a]
Riboflavin (mg)	0.84 ± 0.33	0.71 ± 0.31	P < 0.05	0.76 ± 0.32[a]
Niacin (mg)	5.37 ± 2.01	4.08 ± 2.27	P < 0.05	4.63 ± 2.24[a]
Vitamin C (mg)	57.94 ± 39.15	41.61 ± 38.10	P < 0.05	48.57 ± 39.21[a]

n.s = not significant.
* = mean value ± standard deviation (n-1).
ab = different letters within rows indicate significant differences (p < 0.05).

Table 1(c). Nutrient intake of elderly in southern Peninsular Malaysia based on age cohort group (more than 80 years)

Nutrient	Male (n=16) Mean ± SD*	Female (n=18) Mean ± SD	Statistical Analysis	Total Mean Mean ± SD
Energy (kcal)	1346 ± 329	1174 ± 281	n.s	1255 ± 312[b]
Protein (g)	48.72 ± 11.24	43.52 ± 12.82	n.s	45.97 ± 12.20[a]
Fat (g)	9.88 ± 12.72	32.70 ± 15.87	n.s	31.37 ± 14.33[a]
Carbohydrate (g)	212.96 ± 62.07	182.40 ± 45.94	n.s	196.78 ± 55.48[b]
Fibre (g)	1.99 ± 1.68	1.34 ± 0.99	n.s	1.64 ± 1.38[a]
Calcium (mg)	275.06 ± 190.80	326.91 ± 166.06	n.s	302.51 ± 177.32[a]
Phosphorus (g)	790.74 ± 216.15	778.63 ± 279.70	n.s	784.33 ± 248.14[a]
Iron (mg)	7.60 ± 3.23	6.72 ± 2.77	n.s	7.14 ± 2.98[a]
Vitamin A (μg)	470.67 ± 337.69	528.63 ± 460.46	n.s	529.94 ± 405.31[a]
Thiamine (mg)	0.58 ± 0.38	0.64 ± 0.34	n.s	0.62 ± 0.35[a]
Riboflavin (mg)	0.72 ± 0.33	0.86 ± 0.38	n.s	0.79 ± 0.36[a]
Niacin (mg)	5.16 ± 2.39	4.99 ± 2.94	n.s	5.07 ± 2.66[a]
Vitamin C (mg)	40.25 ± 30.37	45.20 ± 32.00	n.s	2.87 ± 30.88[a]

n.s = not significant.
* = mean value ± standard deviation (n-1).
ab = different letters within rows indicate significant differences (p < 0.05).

According to Elahi *et al.* (1983), the decline in energy intake appeared to be a pure effect of age, with no confounding cohort or time effects. Reduced fat consumption by the elderly was said to account for the decrease in energy intake. Age-related decreases in physical activities and basal metabolic rate (BMR) observed among the elderly have also been considered responsible in part for their smaller caloric consumption (Wurtman et al., 1988). Although it is not known whether these reduced nutrients intake will result in malnutrition, it is desirable to increase consumption

of the critical nutrients (Munro *et al.*, 1987).

Even though there seemed to be a decline in the intake of protein, fat, carbohydrate and iron with age; there was no significant difference observed among the age groups except for carbohydrate. The older cohort group had a significantly ($p < 0.05$) lower intake compared to the other two groups.

The two major sources of energy are fat and carbohydrate. A small amount of fat is required to provide 30% of total calories per day whereas a larger quantity of carbohydrate is required to provide approximately 55% of caloric requirement. The remaining 15% can be provided by protein, in order to have a balanced diet (Malaysian Diabetes Association, 1993). Looking at the percentage breakdown from the total calorie intake of the elderly, the percentage of protein and fat for both male and female were below the required levels for a healthy diet guidelines with protein ranging from 13.72% to 14.83% and fat from 19.98% to 25.07%. As expected, the carbohydrate was found to contribute more than 55% of the total calories in all age groups (between 61.17% to 64.80%) as shown in Table 2.

Table 2. Percentage of protein, fat an intake among elderly

Age Cohort	Sex	Nutrients (% from total calories)		
		Protein	Fat	Carbohydrate
60 – 69 years (n = 207)	Male	14.60	22.53	61.71
	Female	13.72	21.19	63.50
70 – 79 years (n = 103)	Male	14.20	21.76	64.09
	Female	14.40	20.92	64.80
Above 80 years (n = 34)	Male	14.48	19.98	63.29
	Female	14.83	25.07	62.19
Total (n = 344)	Male	14.43	21.42	63.03
	Female	14.32	22.39	63.48

According to Chong *et al.* (1984), rice is the main source of energy for village population where carbohydrate provides 51% of total energy in a diet. The higher consumption of carbohydrate among elderly in all three states were probably due to the fact that food that are rich in carbohydrate such as rice, starchy vegetables and fruits are cheaper and easier to obtain. Majority of respondents in this study are from the low income group and most of them are working as farmers, paddy planters, rubber tappers and small holders.

Another possible reason for the high carbohydrate consumption is the absence of teeth among many of the respondents in this study. No doubt most of them wear dentures, but according to Burtis *et al.* (1988), incorrectly fitted dentures which results in altered mouth posture could also play a role in food pattern.

Fat provides concentrated source of calories as well as satiety of a diet. It also carries the fat soluble vitamins (A, D, E and K) and is the source of the essential fatty acid, arachidonic acid or

its precursor, linoleic acid (Posner, 1979). The sources of fat for these elderly was from coconut milk commonly used in gravy and cooking oil used in stir fried dishes. Most respondents were fond of stir fried and boiled food.

Although the percentage of food protein from the total calories is a little low, it still provide the amino acids needed for the synthesis and maintenance of hard and soft tissues (muscle, bone and teeth) as well as for the synthesis of hormones and non-essential amino acids, protein, hemoglobin and other nitrogen containing substances (Posner, 1979). Based on the Malaysian RDA for protein (53 g/day for men and 41 g/day for women), no respondents were found consuming less than $^{1}/_{3}$ RDA. Most of them were found consuming more than $^{2}/_{3}$ RDA which is the level of adequacy in the diet (Kerry, *et al.,* 1968) for both sexes (Table 3). The main sources of protein were various kinds of fish, eggs and soybean products for example tempeh. Red meat such as beef or mutton were taken occasionally as they are more expensive and the texture is tougher.

The percentage of elderly subjects with dietary intake below two-thirds of the RDA was found to be higher for vitamin A (67.44%), thiamine (64.83%), riboflavin (62.79%), niacin (90.12%) and calcium (64.83%). The deficiency of vitamin B groups, thiamine and riboflavin have been related to low intake of energy (Munro *et al.,* 1987). The intake of calcium is strikingly low ranging from a mean of 276.97 mg to 302.51 mg as compared to the recommended amount of 450 mg/day. The high percentage of elderly with low calcium intake is probably related to the low consumption of milk and milk products among respondents. Only a small number of elderly consumed milk as it is while most of them will frequently consume plain coffee, tea or milo. Krondl *et al.,* (1982) reported that fluid milk, fruits and vegetables were consumed infrequently by elderly. Lack of milk and milk products in the diet can result in calcium deficiency while avoidance of vegetables and fruits may result in an insufficient intake of vitamin A and also fibre. The elderly in this study do not consume vegetables daily and the amount when consumed was approximately 2 tablespoon to about ½ cup.

Table 3. Distribution of elderly with nutrient intake below two thirds (67%) of the Malaysian recommended dietary allowance

Nutrients	Male (n = 140) n (%)	Female (n = 204) n (%)	Total (n = 344) n (%)
Protein (g)	13 (9.28)	11 (5.39)	24 (6.98)
Vitamin A (μg)	93 (66.43)	139 (68.14)	232 (67.44)
Vitamin C (mg)	72 (51.43)	69 (33.82)	141 (40.99)
Thiamine (mg)	87 (62.14)	136 (66.67)	223 (64.83)
Riboflavin (mg)	81 (57.86)	135 (66.18)	216 (62.79)
Niacin (mg)	121 (86.43)	189 (92.65)	310 (90.12)
Calcium (mg)	88 (62.86)	135 (66.18)	223 (64.83)
Ferum (mg)	41 (29.29)	89 (43.63)	130 (37.79)

Although this might not contribute to the development of osteomalacia due to the plentiful of sunshine, it may play a role in the development of osteoporosis. Therefore, advice on increasing the consumption of calcium-rich food and vitamin B complex supplementation may be desirable (Smith, 1987).

In conclusion, this study reports that a higher percentage of elderly were deficient in energy, vitamin A, thiamine, riboflavin, niacin and calcium. Mean energy intake was found to decline with the increment of age for both sexes. Further studies are therefore desirable to obtain a thorough vision of nutrients intake among elderly Malaysians. This is essential to enable planning of programme for this group and curb nutritional deficiencies possibly at national or state level.

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