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Energy expenditure of Myanmar elderly people from home for the aged (Hninsigone), Yangon.

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To find out resting energy expenditure (REE) and total energy expenditure (TEE), the study was conducted on 25 apparently healthy Myanmar elderly people (11 males and 14 females) from Hninsigone home for the aged, Yangon. Stratified random sampling was used in accordance with age and sex. Energy cost of each activity was measured by indirect calorimetry method and time usage for each activity was recorded by minute-to-minute registration. REE were found to be 1022.79 ± 314.52 kcal/d in males and 848.06 ± 378.69 kcal/d in females. Both males and females spent half of the day lying/sleeping and one third of the day sitting. TEE were 1812.27 ± 334.80 kcal/d in males and 1484.70 ± 480.96 kcal/d in females and energy expenditure for physical activity (EEPA) were 608.25 kcal/d in males and 488.17 kcal/d in females. TEE were found to be 1.77 times REE in males and 1.75 times REE in females. It was found that the elderly people from our study had lower REE and TEE when compared to Myanmar adults and Caucasian elderly people.

INTRODUCTION

In developed as well as developing countries, many elderly people are now being maintained in the community. Thus, the provision of health care to the elderly people should be an important aim of the health service. Among the problems concerned with care of the elderly people, those at age over 75 are at greatest risk for malnutrition [1]. However, there has been a limited information concerning energy requirement of elderly compared with other groups. Assessment of total energy expenditure is necessary to define suitable level of energy intake and energy expenditure for prevention and treatment of malnutrition and obesity and to determine appropriate recommendation on dietary needs of different population groups. Energy requirement of human can be determined by measuring energy intake during a period of stable body weight and body composition. Energy intake can be estimated from dietary intake records. However, the current recommendation on energy requirements, based upon the studies of weighed food was significantly underestimated [2]. WHO/ FAO/UNU recommended that the determination of energy requirement should be based upon direct measurement of energy expenditure performed under free-living condition.

Therefore, the present study aimed to find out total energy expenditure of Myanmar elderly persons from home for the aged in order to define suitable level of energy intake.

MATERIALS AND METHODS

Subjects

The study was conducted on 25 apparently healthy Myanmar elderly people (11 males

and 14 females) from Hninsigone home for the aged, Yangon. Stratified random sampling was used in accordance with age and sex. None of the subjects suffered from acute illness, overt diseases or gave history of endocrinopathy and all were able to walk and dress unaided.

Anthropometric and body composition assessment

Body weight was measured to the nearest 0.1 kg with bathroom scale weighing machine, calibrated with standardized weights and the weight was recorded. Body height was measured to the nearest 0.1 cm using a stadiometer. Body Mass Index (BMI) was calculated as weight / height^2 (kg/m^2). Skin-fold thickness at biceps, triceps, sub-scapular and suprailiac were measured on the left side of the body using a Harpenden caliper by a well-trained technician. Body fat percent was calculated by using the formula described by Durnin and Rahaman, 1967 [3].

Measurement of energy expenditure

1. *Resting Energy Expenditure (REE)*

It was measured four hours after breakfast in the morning by respiratory gas analysis and by using a facemask system for breath collection. Flow rate was measured by Portable Respiratory Air Monitor (Harvard) and oxygen content of expired air was analyzed by Oxygen analyzer (Miniox, USA). Energy expenditure was calculated using RQ as 8.2 [4].

2. *Total Energy Expenditure (TEE)*

Energy cost of each activity per minute was measured during each activity by indirect calorimetry method mentioned above. Time usage for each activity was recorded by minute - to- minute registration. Recording was performed by trained research assistants who stayed with the subjects for two consecutive days from 6 am to 6 pm. Observation was done without awareness of observed individual. The recall method was used to determine activities carried out when the assistants were not present. TEE was then calculated.

Statistical analysis

Data were expressed as mean ± SD. Comparison was made using Student 't' test for unpaired samples (two tailed). Differences were considered significant if $p<0.05$.

RESULTS

Table 1 shows general characteristics of the subjects.

Table 1. General characteristics of the subjects

	Male	Female
Age (yr)	81.18 ± 4.28	81.00 ± 5.95
Height (cm)	155.47 ± 3.98	146.38 ± 5.10
Weight (kg)	45.63 ± 6.13	40.46 ± 6.88
BMI	18.9 ± 2.3	18.6 ± 3.3
Body Fat Percent (%)	18.72 ± 3.36	27.35 ± 4.40
Fat Mass (FM)	8.70 ± 2.55	11.20 ± 3.90
Fat Free Mass (FFM)	36.93 ± 3.97	28.63 ± 3.68
Number of subjects (n)	11	14

From the time usage pattern of the elderly Table 2, it was observed that half of the day was occupied with lying/sleeping activities and one third of the day with sitting activities (Table 2).

Table 2. Time usage pattern of the elderly from Hninsigone home for the aged

Activity	Male	Female
Lying / Sleeping (minutes)	639.64 ± 80.79	620.11 ± 205.43
Sitting (minutes)	464.05 ± 101.12	501.96 ± 88.35
Standing (minutes)	139.45 ± 59.19	106.11 ± 46.81
Walking (minutes)	150.73 ± 56.41	129.32 ± 42.96
Others (minutes)	46.09 ± 13.15	47.07 ± 13.35

When the body composition and energy expenditure of elderly males and females were compared with those of adult Myanmar (Bamar) males and females [5]

respectively (Table 3), elderly male and female were found to have lower body weight, lower fat free mass, lower REE and TEE.

Table 3. Comparison of body composition and energy expenditure of elderly males and females with those of adult Bamar males and females from South Dagon Township, Yangon.

	Male			Female		
	Elderly (n=11)	Adult (n=22)	'p' value	Elderly (n=14)	Adult (n=16)	'p' value
Age (yr)	81.18 ± 4. 28	19-60		81.00 ± 5.95	19-43	
Weight (kg)	45.63 ± 6.13	51.96 ±6.02	0.007	40.46 ± 6.88	45.94 ±6.04	0.02
Body fat %	18.72 ± 3.36	10.52 ±2.86	0.000	27.35 ± 4.4	25.76 ±6.54	0.45
REE (Kcal / min)	1022.79 ±314.52	1906.3 ±77.12	0.012	848.06 ±378.69	1215.1 ±37.31	0.08
TEE (Kcal / min)	1812.27 ±334.8	2818 ±114	0.001	1484.7 ±480.96	2475 ±76	0.01

Table 4. Comparison of body composition and energy expenditure of Myanmar elderly males and females with those of elderly males and females from the United Kingdom (UK)

	Elderly male			Elderly female		
	Myanmar n = 11	UK n = 23	'p' value	Myanmar n = 14	UK n = 10	'p' value
Age (yr)	81.18 ± 4.28	82.00 ± 3.00	0.521	81 ± 5.95	73 ± 3	0.051
Weight (kg)	45.63 ± 6.13	72.4 ± 10.5	0.0001	40.46 ± 6.88	60.00 ± 7.2	0.0000
Body fat %	18.72 ± 3.36	30.40 ± 4.60	0.0000	27.35 ± 4.40	34.23 ± 2.30	0.0000
FFM (kg)	36.93 ± 3.97	50.2 ± 6.2	0.0000	28.63 ± 3.68	38.3 ± 4.4	0.0000
REE (Kcal /min)	1022.79 ± 314.52	1435.41 ±119.62	0.0648	848.06 ± 378.69	1222.49 ± 90.91	0.0787
TEE (Kcal /min)	1812.27 ± 334.8	2200.96 ± 334.93	0.003	1484.7 ±480.96	2203.4 ± 354.07	0.0004

Table 4 shows comparison of body composition and energy expenditure of Myanmar elderly male and female with those of elderly male and female from the United Kingdom [2,6]. Here also, Myanmar elderly males and females had lower body weight, lower fat free mass, lower REE and TEE compared with those of elderly males and females from the UK.

DISCUSSION

In the present study, both REE and TEE of elderly people were lower than those of adults as well as those of Caucasian elderly people. In other words, energy requirement of Myanmar elderly people from Hnin-sigone home for the aged was low.

Several factors contribute to the amount of energy requirement (energy expenditure) by an individual: basal metabolic rate (BMR), physical activity and to a lesser extent diet-induced thermogenesis (DIT). The basal metabolic needs are the energy requirement at complete rest and these are closely related to body composition. The energy required above the basal needs is determined by the level of physical activity. The DIT is the rise in metabolic rate as a consequence of eating and it accounts for about 10% of the energy intake. In general, energy expenditure decreases with increasing age, first because of a decrease in BMR [7].

Schock *et. al.* (1963) attributed a reduction in fat free mass (FFM) with ageing is one of the contributing factors of low BMR in elderly [8]. In the present study, it was also found that FFM of the elderly people was lesser than that of the adults and even among the study groups; the older the age, the lesser was the FFM. In addition, low energy expenditure in elderly is the consequence of a reduction in intensity of physical activity or time spent on physical activity or both [9]. In the present study, reduction in intensity of physical activity as well as time spent on physical activity was observed. Since this study was conducted on institutionalized elderly people, their activities were dictated by the institutional schedule: five hours of the day for meditation, seven and half hours for sleeping, two hours for eating and nine and half hours for leisure. Most of the subjects

spent their leisure time talking, sitting, lying and sleeping rather than walking from place to place. Therefore, half of the day was occupied with lying /sleeping and one third of the day sitting. Only very few persons were very active in that they fully occupied themselves with doing something or walking about.

In the present study, lower resting energy expenditure as well as lesser physical activity could be responsible for lower total energy expenditure.

In addition, there were many controversies over the current recommended daily requirement (RDA) for elderly by FAO/WHO/UNU [10]. That was 1.5 times the BMR. A study with doubly-labelled water (DLW) method in a group of fifteen elderly males of mean age 69 ± 19 years in USA suggested that TEE (1.75 times BMR) may be significantly higher than RDA [6]. In another study of ten elderly females (aged 73 ± 3 years) from UK, TEE was estimated to be a mean of 1.8 times BMR [2]. In the present study, even though REE and TEE were low, the findings were in agreement with those reports that TEE of elderly male was 1.77 times REE and that of elderly female was 1.75 times REE. Therefore, the current RDA recommended by FAO/WHO/UNU for elderly might be lower than what it is supposed to be. This study indicated that the energy requirement of the elderly people from Hninsigone home for the aged was low. The WHO's recommended daily allowance for elderly of 1.5 times the REE might have been underestimated.

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