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A Study on the Nutritional Status of Physically Active Men in Kota Bharu

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ABSTRACT

A cross-sectional comparative study was conducted to determine the nutritional status among physically active groups in Kota Bharu. The study population comprised 83 adult male athletes from 8 different types of sports (athlete group), 80 active men who exercised a minimum of 30 min per day for at least 3 times per week (exercise group), and 80 inactive men (sedentary group). All the respondents were aged between 18 to 44 years. Measurements taken from the respondents were anthropometric measurements, systolic (SBP) and diastolic (DBP) blood pressure, and serum total cholesterol (TC). The results showed that the combined prevalence of pre-obese (BMI 25.0-29.9) and obese (BMI ≥30.0) was 21.7% in athletes, 29.9% in exercise group, and 47.5% in sedentary group. The mean (± SD) percentage of body fat in athletes was 15.7 ± 5.4%, which was lower compared to the exercise (18.9 ± 5.5%) and sedentary (20.6 ± 5.8%) groups. The incidence of waist-to-hip ratio above 0.9 in athlete, exercise and sedentary groups was 9.6%, 18.7% and 31.3%, respectively. The incidence of hypertension (SBP ≥140 and/or DBP ≥90 mmHg) was 13.2% in athletes, 17.5% in exercise group and 42.5% in the sedentary group. The TC values showed that the prevalence of "high risk" individuals (TC ≥6.20 mmol/l) was also lower in athletes (20.5%), compared to the exercise (36.2%) and sedentary (47.5%) groups. The study revealed that individuals who are actively involved in physical activity, particularly in sport activities have better nutritional status compared to sedentary people. However, the nutritional status in the athlete and exercise groups was still unsatisfactory. The incidence of poor health status related to over nutrition in the active groups was rather high and needs attention from health professionals. Further studies are needed to determine nutritional practices among physically active groups.

INTRODUCTION

Rapid socioeconomic growth in Malaysia over the past two decades has brought significant changes in the lifestyle of communities, especially with regard to physical activities and food practices (Tee, 1999). These factors have contributed to the development of a greater prevalence of non-communicable diseases such as coronary heart disease, hypertension, diabetes mellitus and certain types of cancers (WHO, 1990). In view of the increased prevalence of diet-related chronic diseases amongst Malaysians, the Ministry of Health Malaysia initiated the Healthy Lifestyle (HLS) Campaign in 1991. Although the yearly focus of the HLS campaigns is different, the emphasis of most of these campaigns is on a healthy dietary pattern and performing regular physical activities (Abu Bakar & Tee, 1998).

The benefits of regular physical activity include controlling obesity and its complications, improvement of blood lipid profile lowering risk factors of chronic diseases, and improving human functional status, psychological state, and capacity to cope with stress (Shephard, 1989; Chen, 1995). Although the benefits of regular physical activity on nutritional and health status has been widely recognised, nutritional studies on physically active groups in this country are still lacking. In Malaysia nutritional studies have been first undertaken in 1911 (Tee, 1980). However, most of the studies focused on the general population, primarily on sedentary groups (Tee, 1980; Tee, 1984; Tee & Cavalli-Sforza, 1993). Some nutritional studies have been done among selected group of athletes (Ismail Wan Nudri & Zawiah, 1995a; Wan Nudri, Ismail & Zawiah, 1996; Wan Nudri, Ismail & Zawiah, 1997; Ismail, Wan Nudri & Zawiah, 1997; Rabindarjeet, 1997; Nik Shanita & Hera, 1999; Reeves *et al*., 1999). However, such studies have not been carried out among normal individuals who lead an active lifestyle. The objective of this study is to assess the nutritional status of the athletes and exercise groups and also to compare them with the sedentary group.

MATERIALS AND METHODS

This study was carried out among 243 male respondents aged 18 to 44 years. The respondents comprised 83 sportsmen from 8 different types of sports and who had participated in various levels of competitions (athlete group), 80 active men who regularly performed exercise during the last 3 months (exercise group) and 80 inactive men who reported no physical exercise during the last 3 months (sedentary group). The athletes were randomly selected from the Kelantan State Sports Council and several sports associations. The athletes selected were those who were actively involved in sports training for competition purpose with a minimum of 30 min per day and at least 3 times per week during the last 3 months. The respondents of the exercise and sedentary groups was randomly selected from several government departments in Kota Bharu. The classification for the athlete, exercise (active) and sedentary groups was based on the criteria suggested by Foss & Keteyian (1998) and Stofan *et al*. (1998). All respondents had no history of chronic diseases.

The height and body weight of the respondents (barefooted and in light clothing) were measured to the nearest 0.5 cm and 0.1 kg, respectively, using the Seca weighing balance with height attachment. The body mass index or BMI (kg/m^2) was calculated for each respondent. Body weight classification of respondents based on BMI was determined as described by WHO (1998). Waist and hip circumferences were measured using a non-stretchable tape to the nearest

0.1 mm. Waist circumference was measured at the mid-point between the iliac crest and the lower rib margin, while hip measurement was taken as the maximum circumference around the buttocks posteriorly and pubic symphysis anteriorly. The waist-to-hip ratio (WHR) was calculated for each respondent. The WHR cut-off point of greater than 0.9 as an indication of central obesity was used as recommended by Bray (1990). Skinfold thicknesses of biceps, triceps, subscapular and suprailiac were measured using the Harpenden Calipers (British Indicators, UK) as recommended by Durnin & Rahaman (1967). Fat content as a percentage of body weight was calculated from a sum of four measurements of skinfold thickness (Durnin & Womersley, 1974). The classification of body fat of the respondents was determined as suggested by Garrow (1987).

Systolic and diastolic blood pressures were measured using the Accoson Sphygmomanometer (UK). Classifications of systolic and diastolic blood pressures were determined as described by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (1997). A total of 5 ml of fasting venous blood sample was taken from each respondent at early morning. The blood was collected in tubes containing EDTA and was centrifuged at 2,500 rpm for 10 min to obtain serum. Serum was separated into eppendorf tubes (2.5 ml) and then stored at 4°C until analysis. Analysis of serum total cholesterol (TC) was done within two to three days using standard enzymatic method (CHOD-PAD) with a commercially available test kit (Boehringer Mannheim Gmbh, Germany).

Statistical analysis was done using the SPSS version 9.0. Analysis of Covariance (ANCOVA) was used to determine differences of mean values between all groups. All values are expressed as mean ± SD.

RESULTS AND DISCUSSION

The physical characteristics of the respondents are shown in Table 1. The athlete and the exercise groups were significantly taller and thus had significantly lower BMI than the sedentary group. The BMI classification according to WHO (1998) is shown in Table 2. The combined prevalence of pre-obese (BMI 25.0-29.9 kg/ m^2) and obese (BMI ž 30.0 kg/m^2) were 21.7% in athletes, which was lower compared to 29.9% in exercise group, and 47.5% in sedentary group. This study was carried out in Kota Bharu town, Kelantan, which might be considered an urban area. The prevalence of combined pre-obese and obese among the athletes of this study was also lower than the reported figures of 29.5 to 45.0% among the general population in other urban areas in Malaysia (IMR, 1995; Aziz *et al*., 1996; Fatimah *et al*., 1995; Ismail *et al.*, 1995b).

The athlete group had the lowest mean percentage body fat compared to the other groups (Table 3). By using a similar technique, the mean percentage of body fat of the athlete group (15.7 ± 5.4%) was slightly lower than soldiers (16.4 ± 3.4%) with comparable age as reported by Ismail, Isa & Janudin (1996). In an earlier study, Ismail & Zawiah (1988) reported that the mean percentage of body fat of university students was 16.5 ± 3.4%, which was also higher than the athlete group of this study, despite the university students being much younger.

Table 1. Physical characteristics of the respondents (presented as mean ± SD)

Variables	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Age (yr)	28.4 ± 6.8	29.4 ± 6.9	29.9 ± 7.2
Weight (kg)	64.2 ± 9.7	65.4 ± 11.1	66.2 ± 14.1
Height (cm)	168.6 ± 5.4 ^{a}	167.1 ± 5.9 ^{a}	165.0 ± 5.1 ^{b}
BMI (kg/m^2)	22.6 ± 2.9 ^{a}	23.4 ± 3.5 ^{a}	24.3 ± 4.6 ^{b}

BMI = body mass index

^{a,b} For each row, different superscript letters indicate significant difference between groups ($P < 0.05$, ANCOVA)

Table 2. Classification of body mass index of the respondents

Classification	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Underweight (BMI <18.5 kg/m^2)	5 (6.0)	7 (8.8)	10 (12.5)
Normal (BMI 18.5–24.9 kg/m^2)	60 (72.3)	49 (61.3)	32 (40.0)
Pre-obese (BMI 25.0–29.9 kg/m^2)	17 (20.5)	21 (26.2)	29 (36.3)
Obese (BMI ≥ 30.0 kg/m^2)	1 (1.2)	3 (3.7)	9 (11.2)

* WHO (1998)

Values in parentheses denote percentages of respondents

The incidence of 'high fat' (body fat > 22.0%) among the respondents in this study was lowest in the athletes (13.3%) compared to almost half (46.2%) of the sedentary group. Persons with excess body fat have an increased risk of developing a number of chronic diseases, namely hypertension, non-insulin diabetes mellitus, cardiovascular diseases and certain types of cancers (Pi- Sunyer, 1991). Excess body fat also has a significant deterrent effect on physical performance (Leelarthaepin, Chesworth & Boelyn, 1983).

The higher mean height measurement and lower mean BMI and percentage body fat among the athletes compared to the other groups were similar to a previous study among athletes and non-athletes in this country (Wan Nudri *et al*., 1996). Several studies from other countries have also reported that athletes are taller and have a lower mean BMI and percentage of body fat compared to non-athletes (Mathur & Salokun, 1985; Leelarthaepin *et al*., 1983; Nowak, Knudsen & Schulz 1988).

The mean waist-to-hip ratio (WHR) among the respondents is shown in Table 4. The athletes had significantly lower mean WHR compared to others. The incidence of WHR above 0.9 (indicative of central obesity) was 9.6% in athletes, which was lower compared to the exercise (18.7%) and sedentary (31.3%) groups. WHR provides an index of regional fat distribution and has proven value as a guide to health risk. According to Bray (1990), men who had a WHR value of above 0.9 have higher risks of mortality due to diabetes and cardiovascular diseases. Fat distribution was a more important risk factor for morbidity and mortality than overweight per se and had a relative risk ratio of ≥ 2 (Bray, 1990). Studies on WHR measurements of adult

populations are scarce in the country. The available data as reported by Ng, Tee & Azriman, (1995), Ng *et al*. (1997) and Khor *et al*. (1999) showed that the mean WHR of general populations ranged from 0.84 to 0.91, which was higher than the mean WHR (0.82) of the athletes in the present study.

Table 3. Body fat content of the respondents

	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Body fat (%)*	15.7 ± 5.4[a]	18.9 ± 5.5[b]	20.6 ± 5.8[b]
Body Fat (BF) status**:			
Low fat (BF <12.0%)	24 (28.9)	13 (16.3)	8 (10.0)
Average (BF 12.0-22.0%)	48 (57.8)	41 (51.2)	35 (43.8)
High fat (BF >22.0%)	11 (13.3)	26 (32.5)	37 (46.2)

* Mean ± SD

[a,b] For each row, different superscript letters indicate significant difference between groups (P < 0.05, ANCOVA)

** Garrow (1987)

Values in parentheses denote percentages of respondents

The mean systolic and diastolic blood pressures were not significantly different between athletes and exercise group (Table 5). However, both of the active groups had significantly lower mean systolic and diastolic blood pressures compared to the sedentary group. Based on the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (1997), the incidence of hypertension was 13.2% in athletes, which was the lowest compared to 17.5% in exercise group and 42.5% in sedentary group (Table 5). A study by Khoo *et al*. (1996) among urban male adults reported that the prevalence of hypertension was 29.6%. Ng *et al*. (1995) reported that the prevalence of hypertension among rural male adults was 23.7%. The nationwide Second National Health and Morbidity Survey conducted by the Ministry of Health in 1996 on 22,984 respondents over 30 years of age, reported that the prevalence of hypertension was 29.9% (self-reported, 14.0% and undiagnosed, 15.9%) (Ministry of Health Malaysia, 1997). These previous studies show that the prevalence of hypertension was lower compared to the athlete and exercise groups of the present study. A study by Blair *et al*. (1984) among healthy normotensive men and women, after 1 to 12 years follow up, reported that the risk of developing hypertension was 20 to 50% higher in healthy individuals who do not do much exercise, than in those who exercise regularly. Exercise training also results in significant reductions in resting blood pressure in hypertensive patients and in individuals who are borderline hypertensive (Tipton, 1991). Hypertension is one of the risk factors of cardiovascular diseases (WHO, 1996).

Table 4. Waist-to hip ratio (WHR) of the respondents

	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Waist-to-hip ratio*	0.82 ± 0.06 [a]	0.85 ± 0.05 [b]	0.87 ± 0.06 [b]
WHR status:			
Desirable (WHR £ 0.90)	75 (90.4)	65 (81.3)	55 (68.7)
High risk[#] (WHR > 0.90)	8 (9.6)	15 (18.7)	25 (31.3)

* Mean ± SD
a,b For each row, different superscript letters indicate significant difference between groups (P < 0.05, ANCOVA)
Risk of diabetes and cardiovascular disease (Bray, 1990)
Values in parentheses denote percentages of respondents

Table 5. Systolic and diastolic blood pressure (BP) of the respondents*

	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Systolic BP (mmHg)*	120.7 ± 11.1[a]	121.3 ± 10.8[a]	128.9 ± 15.3[b]
Diastolic BP (mmHg)*	77.8 ± 6.7[a]	78.9 ± 8.6[a]	83.9 ± 10.5[b]
Status of blood pressure[#]:			
Normal[1]	59 (71.0)	50 (62.5)	33 (41.3)
High normal[2]	13 (15.7)	16 (20.0)	13 (16.3)
Hypertension[3]	11 (13.2)	14 (17.5)	34 (42.5)

* Mean ± SD
a,b For each row, different superscript letters indicate significant difference between groups (P < 0.05, ANCOVA)
Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (1997)
1 Systolic < 130 mmHg and diastolic < 85 mmHg
2 Systolic 130 – 139 mmHg and/or diastolic 85 – 89 mmHg
3 Systolic ≥ 140 mmHg ; diastolic ≥ 90 mmHg
Values in parentheses denote percentages of respondents

The athletes had a lower mean value of serum total cholesterol (5.38 ± 0.93 mmol/L) compared to the sedentary group (6.11 ± 1.25 mmol/L) ($p < 0.05$) (Table 6). This finding was similar to those reported in previous studies among active and nonactive subjects (Marti *et al*., 1991; Raitakari *et al*., 1997). According to the NCEP (1993), individuals with TC value of 6.2 mmol/L or above are classified as "high blood cholesterol" and have a higher risk of coronary heart disease. The prevalence of TC value of 6.2 mmol/L and above (high risk) was 20.5% in athletes, while the prevalence in the exercise and sedentary groups was higher, i.e. 36.2% and 47.5%, respectively (Table 6).

The results of this study suggest that the active groups, especially athletes have a better nutritional status than the sedentary group. However, the overall nutritional status of the athlete and exercise groups was still unsatisfactory. Among the athletes and exercise groups, the incidence of excess body weight (21.7% and 29.9%, respectively), excess body fat (13.3% and 32.5%), high WHR (9.6% and 18.7%), hypertension (13.2% and 17.5%) and high blood cholesterol (20.5% and 36.2%) were rather high and need serious attention from health professionals in the country. The nutritional problem of the active groups could be due to poor eating habits. Further studies among the active groups are needed to verify this problem. If this finding is verified, the nutrition education program should be strengthened for these groups.

Performing regular physical activity, without adopting healthy eating habits cannot guarantee good health. According to Blair *et al*. (1996), an individual who performs regular physical activities is not immune from a heart attack or stroke if he or she does not practicse consuming a balanced diet. Therefore, nutrition education is very important for active individuals as well as the general population to achieve optimal health. Furthermore, for active individuals or athletes, bad nutrition may impair the ability to undertake physical activity or their athletic performance (Maughan, 1995).

Table 6. Serum total cholesterol levels (TC) of the respondents

	Athletes (n = 83)	Exercise (n = 80)	Sedentary (n = 80)
Total cholesterol (mmol/L)*	5.38 ± 0.93[a]	5.78 ± 1.26[ab]	6.11 ± 1.25[b]
Status of total cholesterol[#]:			
Desirable[1]	36 (43.4)	29 (36.2)	18 (22.5)
Borderline[2]	30 (36.1)	22 (27.5)	24 (30.0)
High risk[3]	17 (20.5)	29 (36.2)	38 (47.5)

* Mean ± SD

[a,b] For each row, different superscript letters indicate significant difference between groups ($P < 0.05$, ANCOVA)

NCEP (1993)

1 TC £ 5.17 mmol/L

2 TC 5.18 – 6.19 mmol/L

3 TC ≥ 6.20 mmol/L

Values in parentheses denote percentages of respondents

CONCLUSIONS

This study showed that the physically active groups, especially athletes have a better nutritional status than the sedentary group. Though the trend of the results were as expected, the nutritional status of the athlete and exercise groups was still not satisfactory. The incidence of poor health status related to over nutrition in the active groups was rather high and needs the attention of the health professionals in this country. Further studies are needed to determine nutritional practices among physically active groups.

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