Physical characteristics and dietary intake of Malaysian national basketball players

Wan Nudri WD[1], Ismail MN[2] and Zawiah H[2] *[1]Division of Human Nutrition, Institute for Medical Research, 50588 Kuala Lumpur; [2]Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur*

Abstract

A review of the literature indicated rhar no research has been conducted on the physical characteristics and dietary intake of Malaysian national basketball players. Information on physical characteristics and food intake of 11 male and 13 female Malaysian national basketball players were obtained during centralised training. Weight and height were measured using the SECA beam balance with height attachment. Skinfold thickness was measured using rhe Harpenden calipers at 4 sites (biceps, triceps, subscapular and suprailiac). The percentage of body fat was calculated from the sum of the 4 skinfold thickness measurements. Food intake was recorded as a mean of 3-days weighed food intake and the nutrient contents were calculated using a local food composition table. Based on weighr and height (BMI), most of the male subjects (82%) and all female subjects (100%) were classified as normal (BMI 20.0 - 25.0). The percentage average body far for male and female athletes were 14.1 ± 2.3% and 25.6 ± 4.7%, respectively. The mean daily energy intake for male subjects was 3671 ± 291 kcal or 81% of Malaysian RDA (Recommended Dietary Allowances) adjusted for athletes. The mean percentage contribution of energy from protein, fat and carbohydrate were 16%, 27% and 57%, respectively. The mean daily intake of other nutrients namely protein, calcium, iron, vitamin A, riboflavin, niacin and vitamin C met or exceeded 100% RDAs, except for thiamine which was 1.68 ± 0.25 mg or 94% RDA. For female athletes, the mean daily energy intakewas 2470 ± 369 kcal or 86% of Malaysian RDA. The mean percentage contributions of energy from protein, fat and carbohydrate were 13%, 24% and 63%, respectively. The mean intake of iron was also lower than the RDA, thar is 14.4 ± 3.0 mg or 50% RDA, while mean intake of other nutrients mer or exceeded 100% RDA. The inadequacy of energy and thiamine intake by male subjects and energy and iron intake by female subjects indicates the need to pay serious attention in the meal preparation and planning for Malaysian national basketball players during centralised training.

Key words: Physical characteristics; dietary intake; basketball players

Introduction

Successful physical performance is dependent on a variety of factors, including physical characteristics and nutritional status of participants (Mathur & Salokun, 1985; American Dietetic Association, 1980; Ferro-Luzzi & Venerando, 1978). The nutritional status of the athletes may differ widely with respect to the ideal pattern of a healthy and adequately-nourished individual because of a number of factors related to the sport, ro the anthropometric characteristics peculiar to and conditioning for rhe performance of a specific sport, and to the adaptive changes induced by training (Ferro-Luzzi & Venerando, 1978).

Proper nutrition is very imporrant for an athlete's good health, conditioning and performance (Consolazio & Johnson, 1972). Inappropriate nutrition may cause sport's injuries and the effects are more serious in athleres than in sedenrary people (Brouns *et al.*, 1986). Although nutrition research in Malaysia started since 1930's, there is very limited information available on sports nutrition (Ismail, 1988; Ismail *et al.*, 1995). The purpose of the presenr study was to collecr baseline data on physical characteristics and dietary intakes of Malaysian male and female national basketball players during centralised training.

Subjects and Methods

This study was conducted on Malaysian national athletes undergoing centralised training for SEA games competition. All the Malaysian national basketball players which comprised of 11 males and 13 females were selected for this study. The height and body weight of each subject (barefooted and in lighr clothing) were measured to the nearest 0.5 cm and 0.1 kg, respectively, using the SECA beam balance with height attachment. Skinfold thickness measurements were taken using the Harpenden calipers (British Indicators, UK) at 4 sites (biceps, triceps, subscapular and suprailiac) as recommended by Durnin & Rahaman (1967). Far content as a percentage of body weight, was calculated from the sum of 4 measuremenrs of skinfold thickness (Durnin & Womersley, 1974). The body mass index (kg/m^2) and lean body mass (kg) were also calculated for each subject.

Dietary intakes were assessed using a 3-day weighed food intake technique which was done on 3 consecu

tive days during centralised training. Subjects were instructed on the procedures in recording food intake. A 3-day weighed food intake was compiled by providing a dietary scale (Kubota, 1 kg ± 5 g) on each table at the dining-room and a nutritionist was in attendance during meal times to assist the subjects. All meals were provided by a caterer. Subjects were free to make individual selections and eat as many portions as desired. Subjects were asked to be honest in their selection of meals during the study since the data obtained would be necessary to them. The nutrient composition of the meals was calculated using a local food composition table (Tee *et al.*, 1988) and reported as a mean of 3 days food intake. The adequacy of nutrient intake was assessed by comparing it with the Malaysian RDA (Teoh, 1975). Statistical difference in nutrient intake of male and female subjects was assessed by *t*-test.

Results

The physical characteristics of the male and female subjects are presented in Table 1. For male subjects, the mean height and body weight was 1.88 ± 0.05 m and 84.3 ± 5.2 kg, respectively, while the mean body mass index (BMI) was 23.9 ± 1.4 kg/m^2. For female subjects, the mean height and body weight was 1.70 ± 0.07 m and 61.4 ± 5.4 kg, respectively, while the mean BMI was 21.2 ± 1.4 kg/m^2. The mean body fat for male and female subjects was 14.1 ± 2.3% and 25.6 ± 4.7%, respectively.

The mean daily nutrient intakes from food source of male and female subjects as compared to the Malaysian RDA are shown in Table 2. Some adjustments were made in RDA for energy, protein, thiamine, riboflavin and niacin as suggested by Teoh (1975) consistent with increased physical activities of the subjects. In general, the mean intake of all selected nutrients was significantly higher for male than female subjects. The mean energy intake for male and female subjects were 3671 ± 291 kcal/day and 2470 ± 369 kcal/day, respectively. The mean energy intake for male subjects was 81% of Malaysian RDA and for female subjects was 86% RDA.

Due to the greater intake of energy by male subjects, the protein, fat and carbohydrate intake was greater for males than the female subjects. The male and female subjects consumed, respectively, 147.0 ± 28.8 g/day (175% RDA) and 83.1 ± 12.2 g/day (136% RDA) of protein. The mean percentage contribution of energy from protein, fat and carbohydrate for male subjects was 16%, 27% and 57%, respectively, while for female subjects was 13%, 24% and 63%, respectively. The mean intake of selected minerals and vitamins of male and female subjects met or exceeded 100% RDA with the exception of thiamine for males (94% RDA) and iron for females (50% RDA).

Discussion

Anthropometric data based on the classification by Bray (1979), revealed that 9 of the male subjects were classified as normal (BMI 20.0 - 25.0) and the other 2 subjects were classified as overweight (BMI 25.1 - 29.9), while all of the female subjects studied were classified as normal (BMI 18.6 - 23.8). However, the two overweight male subjects were not due to exessive body fat but due to muscle mass. Their body fat was 16.3% and 18.5%, respectively, which was classified as normal body fat (Getchell, 1983). Hence they could not be classified as overweight. The mean percentage of body fat of male and female subjects were 13.8% and 24.7%, respectively, which were lower when compared to non-athlete subjects (university students and university staff) who weighed much less as reported by Ismail & Zawiah (1989) using a similar technique. The study reported that the mean body fat of 21 male (mean weight = 55 kg) and 37 female (mean weight = 47 kg) university students were 16.5% and 27.4%, respectively, while the mean body fat of 16 male (mean weight = 60 kg) and 7 female (mean weight = 52 kg) university staff were 15.7% and 27.7%, respectively.

Although the mean height, body weight and BMI of male subjects in the present study were much higher when compared to Malaysian national sepaktakraw players (Ismail *et al.*, 1995), the mean body fat was lower.

Table 1. Physical characteristics of Malaysian national basketball players.

	Male (n = 11)		Female (n = 13)	
	Mean ± SD	Range	Mean ± SD	Range
Age (yr)	24.4 ± 3.3	19 - 32	21.6 ± 1.9	19 - 25
Height (m)	1.88 ± 0.05	1.80 - 1.99	1.70 ± 0.07	1.60 - 1.84
Weight (kg)	84.3 ± 5.2	78.0 - 96.7	61.4 ± 5.4	53.1 - 74.9
BMI (kg/m^2)	23.9 ± 1.4	21.5 - 27.1	21.2 ± 1.4	19.0 - 23.8
Body fat (%)	14.1 ± 2.3	9.4 - 18.5	25.6 ± 4.7	16.4 - 32.2
LBM (kg)	72.4 ± 3.6	68.1 - 78.8	45.6 ± 3.4	41.8 - 55.1

Table 2. Mean daily nutrient intake of Malaysian national basketball players.

	Male (n=11)					Female (n=13)				
	Mean ± S.D.	Range	RDA[a]	%RDA	%<RDA	Mean ± S.D.	Range	RDA[a]	%RDA	%<RDA
Energy (kcal)	3671 ± 291	3024 - 4055	4540	81	100(11)[b]	2470 ± 369[c]	1922 - 3172	2870	86	77(10)[b]
Protein (g)	147.0 ± 28.8	111.6 - 203.6	84	175	0(0)	83.1 ± 12.2[c]	65.2 - 104.0	61	136	0(0)
Fat (g)	111.2 ± 18.5	87.4 - 147.6	-	-	-	64.1 ± 9.4[c]	50.4 - 79.8	-	-	-
Carbohydrate (g)	520.7 ± 46.5	448.0 - 603.4	-	-	-	390.3 ± 63.0[c]	302.0 - 510.9	-	-	-
% kcal protein	16 ± 2	13 - 21	-	-	-	13 ± 1	12 - 17	-	-	-
% kcal fat	27 ± 3	22 - 33	-	-	-	24 ± 1	20 - 26	-	-	-
% kcal carbohydrate	57 ± 5	50 - 64	-	-	-	63 ± 2	57 - 67	-	-	-
Calcium (mg)	944 ± 122	736 - 1065	450	210	0(0)	638 ± 163[c]	389 - 1028	450	142	15(2)
Iron (mg)	23.0 ± 3.2	19.2 - 28.3	9	256	0(0)	14.4 ± 3.0[c]	9.9 - 22.0	28	50	100(13)
Vitamin A (µg RE)	1815 ± 197	1503 - 2289	750	242	0(0)	1220 ± 172[c]	915 - 1496	750	163	0(0)
Thiamine (mg)	1.68 ± 0.25	1.40 - 2.16	1.8	94	73(8)	1.35 ± 0.24[c]	1.02 - 1.87	1.1	127	8(1)
Riboflavin (mg)	2.8 ± 0.33	2.27 - 3.33	2.7	104	27(3)	2.03 ± 0.42[c]	1.33 - 3.03	1.7	118	15(2)
Niacin (mg NE)	44.5 ± 12.4	28.0 - 62.7	30.0	149	9(1)	22.5 ± 9.2[c]	13.0 - 41.9	18.9	119	54(7)
Vitamin C (mg)	250 ± 90	112 - 417	30	833	0(0)	173 ± 88[c]	88 - 337	30	577	0(0)

[a] Malaysian RDA (Teoh, 1975)(energy values adjusted based on 'very active activity', i.e. 17% above moderate activity @ 54 kcal/kg body weight for male and 47 kcal/kg body weight for female; protein values 1.0 g/kg body weight; thiamine 0.4 mg/1000 kcal; Riboflavin 0.6 mg/1000 kcal ; niacin 6.6 mg NE/1000 kcal)

[b] Values in parentheses indicate number of subjects

[c] Significantly difference at $p < 0.05$

The study on 17 Malaysian national sepaktakraw players, aged between 20 - 28 years, reported that the mean height, body weight and BMI was 1.73 ± 0.05 m, 64.7 ± 4.9 kg and 21.6 ± 1.6 kg/m^2, respectively, while the mean body fat was 15.2 ± 2.8%. The difference in anthropometric measurements of both groups of athletes was in line with the requirement for that particular kind of sport. Specific sports require different body types and weight for maximal performance (American Dietetics Association, 1987).

Table 3 presents the mean anthropometric measurements of Malaysian male and female national basketball players when compared to others in selected countries. In general, the mean weight and height of Malaysian national basketball players were comparable, but their percentage of body fat was highest when compared to basketball players in selected countries. It has been reported that athletes with lower body fat had higher maximun oxygen uptake (VO_{2max}), while the excess body fat was reported to be a deterrent to the endurance and physical performances (Smith, 1984).

The mean energy intake for males was significantly higher than females. However, when expressed as per kg body weight, the mean intake was less marked, that is 43.5 kcal/kg and 40.2 kcal/kg, respectively. The mean energy intake for male and female subjects was below than Malaysian RDA. All (100%) male subjects and 10 (77%) out of 13 female subjects studied, recorded a mean energy intake below 100% RDA. The insufficient intake of energy during centralised training was also reported by Ismail *et al.* (1995) for Malaysian national sepaktakraw players, which was 2784 ± 373 kcal/day or 79% RDA. However, the mean energy intake of the national male and female basketball players was in the range reported in the literature for male (3558 - 4763 kcal/day) and female (1730 - 4763 kcal/day) basketball players of selected countries (Short & Short, 1983; Porcello, 1983; Nowak *et al.*, 1988; Hickson, 1986; Grandjean, 1989).

The mean energy intake of Malaysian national basketball players in the present study was higher when compared to university students (2152 kcal/day for male and 1590 kcal/day for female) and university staff (1977 kcal/day for male and 1553 kcal/day for female) who were non-athletes as reported by Ismail & Zawiah (1989). In general, by virtue of the high energy expenditure, the subjects in training will require a greater energy intake than the more sedentary person. Subjects who greatly increase their energy expenditure, automatically increase their appetite which resulting in the ingestion of more food (National Dairy Council, 1975).

The percentage calories from fat and carbohydrate for male subjects was within the recommended range (fat 10-30% and carbohydrate 55-75%), while the percentage calories from protein was slightly higher than recommended (10 - 15%) (WHO, 1990). The percentage calories from protein, fat and carbohydrate for female subjects was within the recommended range. The mean protein intake for male and female subjects when expressed per kg body weight was 1.74 g/kg and 1.35 g/kg, respectively, which could be considered high. The high intake of protein is not recommended because it will increase the water requirements since additional fluid is required to eliminate the nitrogen by-product in the urine. The high intake of protein also reported did not change in physical fitness and work performances (Consolazio, 1971).

The mean intake of selected vitamins and minerals

Table 3. Mean physical characteristics of Malaysian national basketball players as compared to others in selected countries.

	Age (yr)	Height (m)	Weight (kg)	BMI (kg/m^2)	Body fat (%)	Reference
Male						
South Australia (n=11)[a]	25.7	1.90	82.1	22.7	9.7	Withers *et al.* (1987a)
U.S.A. (n=12)[b]	20.0	1.89	79.9	22.4	10.8	Mayhew *et al.* (1981)
U.S.A. (n=16)[b]	18.9	1.92	83.4	22.6	10.6	Nowak *et al.* (1988)
Malaysia (n=11)[a]	24.4	1.88	84.3	23.9	14.1	Present study
Female						
South Australia (n=18)[a]	22.9	1.75	68.0	22.2	20.1	Withers *et al.* (1987b)
U.S.A. (n=10)[b]	19.4	1.78	71.7	22.6	24.4	Nowak *et al.* (1988)
Nigeria (n=30)[b]	20.6	1.66	61.7	22.4	16.8	Mathur & Salokun (1985)
Malaysia (n=13)[a]	21.6	1.70	61.4	21.2	25.6	Present study

[a] National basketball players
[b] University basketball players

of male and female subjects was adequate, except thiamine for males and iron for females. Eight out of 11 male subjects studied recorded a mean thiamine intake below 100% RDA. Thiamine is important in several biochemical reactions in the cell. Thiamine deficiency could impair carbohydrate metabolism, the major energy process in sustained high-level aerobic exercise. It was noted that a mean iron intake of all female subjects was below 100% RDA. Unfortunately, the blood biochemical test was not done during the study to confirm whether insufficient intake of iron caused iron-deficiency anaemia. Studies on humans have demonstrated that iron-deficiency anaemia can impair physical performances (Beutler *et al.*, 1960; Anderson & Barkve, 1970).

The data also shows that the mean intake of vitamin C by male and female subjects was extremely high, which were 250 mg/day or 833% RDA and 173 mg/day or 577% RDA, respectively. The high intake of vitamin C was due to the consumption of fruits like oranges, papayas and apples during centralised training. Vitamin C plays an important role in the formation of collagen, a critical protein in connective tissue, and assists in the absorption of iron. It is also beneficial in the metabolic reactions of amino acids, and in the synthesis of catecholamines and the anti-inflammatory corticoids of the adrenal gland (Williams, 1982). However, the supplementation of 250 mg/day vitamin C either in tablet form or in orange juice reported no improvement on physical performances (Bender & Nash, 1975).

Conclusions

Anthropometric data revealed that Malaysian national basketball players were normal, however, the mean body mass index and body fat were slightly higher when compared to values for basketball players in selected countries. The mean nutrient intake of subjects during centralised training met or exceeded the RDA, except for energy and thiamine intake for males and energy and iron intake for females. The inadequacy of energy and thiamine intake by male subjects and energy and iron intake by female subjects indicates the need to pay serious attention in the meal preparation and planning for national basketball players during centralised training. Future research are recommended to compare the nutritional status and physical activity of the athletes during training season and out of training season. It would also be useful to identify the nutritional status by blood and urinary biochemical indices to identify nutritional problems facing the athletes.

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