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FOOD INTAKE, BODY COMPOSITION AND ENDURANCE CAPACITY OF NATIONAL BASKETBALL TEAM PLAYERS IN I.R. OF IRAN

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ABSTRACT

In this descriptive cross-sectional study 14 national basketball team players attending the preparatory camp for the Asian games with mean age of 25.6 ± 3.1 yrs, height of 191 ± 6 cm, weight of 87.3 ± 8.1 kg and BMI of 23.9±1.7 were surveyed. The subjects underwent anthropometric, aerobic power, body fat content and VO_2max measurements in three stages of the training period (before training, during training and before the actual competition). In two stages (before and during training) nutritional assessment and food intake using weighing method in 7 intermittent days was made.

Anthropometric measurements showed body weight and BMI changes during the period of study to be negligible and non-significant.

Subcutaneous fat was reduced significantly ($p< 0.02$). Also VO_2max increased appreciably ($p<0.001$) from 42.3± 3.3 in the first stage to 44.3 ± 4.4 and 44.5 ± 2.2 mL/Kg body weight per minute in the second and third stage respectively which demonstrates the positive role of exercise on maximum oxygen uptake or VO_2max. The results of quantitative food intake assessment showed the energy intake to be at 3900 kcal per day.

At this stage carbohydrate, fat and protein provided 50, 35 and 15% of energy respectively. In the second stage energy intake was 3600 kcal with 55, 30 and 15% of energy coming from carbohydrate, fat and protein respectively which were in the normal range in both stages.

Regarding vitamins and minerals, intake of iron, calcium and ascorbic acid was above the range, while thiamin, riboflavin and niacin were within the range and vitamin A as well as B_6 were below the recommended levels.

Further research regarding nutrient intake monitoring, nutrition education of athletes and coaches as well as international nutrition research offering a defined menu in preparatory camps is necessary.

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INTRODUCTION

There is a close relationship between nutritional practices and athletic performance, which lead to success. Nutrition is considered as one of the main factors as

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others like genetics and exercise, in this regard.[1,2] Besides proper nutrition, physiological capacity and fitness including aerobic power expressed as maximum oxygen consumption (VO_2 max) are important in athletic performance and success, distinguishing athletes in many sports activities from their competitors. Research has shown that improvement in VO_2max through proper nutrition planning, exercise, technical education and body building can result in maximum physical capacity.[3]

Proper nutrition based on type of activity and the needs of athletes especially during preparatory camps for national, regional and global competition is vital.[4] As basketball is a medal–winning sport in our country and nutrition has shown a positive influence on their success, in this study the nutritional status of male basketball players present in the Olympics camp was assessed by using food intake, anthropometry, body fat as well as physical fitness or aerobic ability by measuring VO_2max in the subjects during July and August 1998.

As many other related factors such as motivation, training, and health status are considered, the results of nutritional study in this study would be used for future planning and programming in order to bring the national teams up to par with their international competitors.

MATERIAL AND METHODS

In this cross-sectional descriptive study, 14 national basketball team players attending the preparatory camp for the Asian games were surveyed in three stages (before, and during training and competition). Height and weight were measured and body mass index (BMI) calculated. Skinfold thickness and VO_2max were determined. Seven - day food intake was recorded in two stages in the camp. Height was measured without shoes using a plastic tape measure. The subjects were weighed with minimum clothing on a lever scale.[5] Skinfold thickness was measured using Harpenden caliper at biceps, triceps, subscapular and suprailiac locations.[6] Harvard Step test[7] was employed to measure VO_2max.[8] These tests were performed at the beginning and in the end of each stage. Food intake was assessed in two stages for 7 intermittent days, each day recording 3 main meals as well as mid-morning, afternoon and after dinner snacks. Mean daily energy and nutrient intakes were analyzed using Nutritionist IV software. For chemical analysis of the food, the duplicate meals in plastic containers were frozen and transferred to the Institute's experimental food laboratory where Kjeldal and Suxelle measured protein, fat and carbohydrates and moisture for protein and fat respectively. Carbohydrate was calculated by difference.[9]

In the beginning 20 basketball players present in the camp with mean age 25.6 ± 3.1 years, weight 87.3 ± 8.1 kg, height 191±6 cm and BMI 23.9 were surveyed .At the end of this stage, six were eliminated from the competition list due to their physical difficulties and their final entrance records and therefore the remaining 14 were followed up in the second and third stages.

RESULTS

Table I shows mean anthropometric, skinfold thickness and VO_2max in the subjects. Anthropometric measurements show the alterations in weight were insignificant during the study period. Subcutaneous fat decreased (p<0.02) while VO_2max increased (p<0.01).

Table I. Anthropometry, skinfold thickness and VO_2max in the subjects.

Stage of study	Index			
	Weight (Kg)	BMI (Kg/m²)	Skinfold thickness (mm)	VO_2max (mL.Kg⁻¹.min⁻¹)
First stage (before training)	87.3± 8.1	23.9 ± 1.7	42.9 ± 13.7	42.3 ± 3.3
Second stage (during training)	86.5± 5.7	23.7± 1.4	38.3± 8.7	44.3± 4.4
Third stage (before competition)	87.2± 7.5	23.6± 1.7	34.6± 9.9 *	44.5± 2.2 #

*p< 0.001 #p< 0.02

Table II. Mean energy, protein, fat and carbohydrate intake in the subjects.

Nutrient	Stage of study	
	First stage	Second stage
Energy (Kcal)	3917 ± 505	3604 ± 455
Protein (gm)	144± 17	132± 12
Fat (gm)	159± 14	124± 19
Carbohydrate (gm)	484 ± 94	499 ± 77

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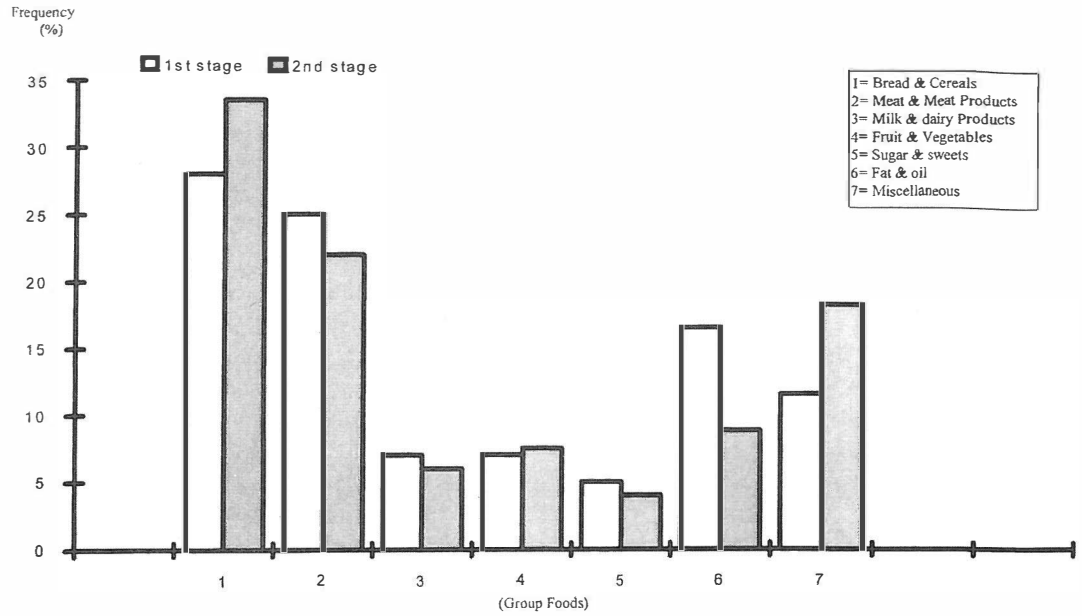


Fig. 1. Percentage calorie intake from various food groups in two stages of the camp.

Quantitative food intake analysis showed energy intake in the first stage to be 3900 kcal, 50% from carbohydrates, 15% from protein and 35% from fat in the diet. In the second stage average daily energy intake was 3600 kcal, 55% from carbohydrate, 15% from protein and 30% from fat.

The mean energy, protein, fat and carbohydrate intake in the subjects are presented in Table II. The vitamin and mineral intakes including iron, calcium and vitamin C were above, that of thiamine, riboflavin and niacin were within and that of vitamin A and B_6 were below the recommended levels (Table III).

The percentage calorie intake from various food groups in two stages of the camp are shown in Fig. 1.

The mean food intake and their calories in the subjects showed that bread and rice provided 30% of daily energy need (Table IV). There was a significant correlation between VO_2max with subcutaneous fat and weight (p<0.02), BMI with subcutaneous fat (p<0.02), and body weight with carbohydrates, protein and fat in the diet (p<0.02).

Table III. Mean vitamin and mineral intake in comparison with the recommended levels in the subjects.

Nutrient	Stage of study	
	First stage	Second stage
Iron (mg)	30.9 ± 5.5 (281)	28.6 ± 7.2 (263)
Calcium (mg)	1080± 176 (132)	891.9 ± 1.5 (111)
Vitamin A (μg)	438.7± 112 (44)	422.6± 98 (42)
Vitamin C (mg)	411± 26 (685)	485.7± 31 (810)
Vitamin B_1 (mg)	2.4± 0.5 (160)	2.1± 0.4 (140)
Vitamin B_2 (mg)	2.3± 0.3 (128)	1.8± 0.02 (100)
Niacin (mg)	34.2± 6.5 (122)	28± 6.8 (100)
Vitamin B_6 (mg)	1.2± 0.1 (60)	1.4± 0.4 (70)

The recommended levels (RDA) are in parentheses.

DISCUSSION

In this study a reduction in subcutaneous fat during the preparatory period was observed as with other studies.[10] On the other hand previous studies reported the changes in subcutaneous fat thickness to depend on the original fat content in the basketball players, in that, those with the least subcutaneous fat only gained weight while those with average fat thickness lost some body fat as well as gaining weight during the exercise period.[11] A significant increase in VO_2max at the end of the training period was observed similar to previous studies.[12,13] Other studies have recommended exercise at 50% VO_2max for 15 minutes, three times per week for 3 to 9 month periods based on American College of Sports Medicine, in order to achieve maximum aerobic activity.[14]

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Table IV. Mean food intake and their calories in the subjects

Food	First stage		Second stage	
	g/day	Cal / day	g/day	Cal / day
Bread	215	630	263	489
Rice	365	442	510	527
Other cereals	23	35	173	178
Meat	117	312	118	328
Poultry	232	405	98	260
Fish	-	-	-	-
Other meat products	57	163	-	-
Egg	61	108	111	202
Milk	133	80	175	126
Yoghurt	267	130	66	39
Cheese	16	40	19	51
Ice-cream	15	32	-	-
Other dairy products	-	-	-	-
Fruits	482	160	480	163
Vegetables	400	121	350	109
Beans (legumes)	-	-	-	-
Sugar	25	128	12	43
Jam	9	39	24	76
Sweets	27	33	25	30
Fat & Oil	3	25	-	-
Butter	9	65	16	118
Drinks	-	-	498	203
Fruit Juice	756	375	761	403
Nuts	-	-	-	-
Tomato sauces	23	57	24	60

In general, those with regular and continued exercise, besides increasing maximum oxygen uptake, will be able to engage in more physical activity with less fatigue. Also, return to the original physiological state will occur faster in these individuals. The energy expenditure of playing basketball is considered to be 360 - 660 kcal per hour.[15] Therefore, 540 - 990 kcal is needed for each 1.5 hr of practice in the morning and in the afternoon, adding to 1500-2000 kcal above the normal requirement. The recommended energy intake is 4500-5000 kcal for male basketball players.[16] The present study shows total energy intake for these players was lower than the recommended range. Others have reported similar findings.[17,18,19] Our data demonstrates the percentage of energy received from carbohydrates was within the acceptable usual range.[16] Similar results have been shown during training and before competition in basketball players.[19,20] Protein intake in our subjects was within the recommended levels.[20,21]

In heavy physical activity up to 17% of energy was derived from proteins, about 50% above the RDA.[16] The percentage of the energy received from fat was within the recommended level, which is below 30% total energy.[22] As for vitamins and minerals no considerable variation in iron, calcium and vitamin C was observed and the mean intake was above the RDA. Although thiamine, riboflavin and niacin intakes were lower in the second stage, they were within the recommended range in both stages. Vitamins A and B_6 were below the recommended level during the survey period.

Food frequency recall showed the majority of the athletes consumed dairy and milk groups 3-5 times per week while cereals, vegetables and fruits were consumed daily. This is similar to the observations of previous studies.[23]

In conclusion although nutrient intake with the exception of vitamin A and B_6, were generally within the recommended levels, further research is needed to determine the relationship between the type, duration and severity of sports activities with the actual needs of the athletes as well as interventional nutrition studies to arrive at a suitable dietary plan to achieve maximum physical fitness for heavy sports activities.

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REFERENCES

1. Driskell JA: Sports Nutrition. Washington DC, CRC Press, LIC, 2000.
2. McArdle WD, Katch FI, Katch VL: Sports and Exercise Nutrition. Philadelphia: Lippincott, Williams & Willkins, 1999.
3. Singh VNA: Current perspective on nutrition and exercise. J Nutr 122: 760-764, 1992.
4. Wolinsky I: Nutrition in Exercise and Sport. Washington DC, CRC Press, LIC, 1998.
5. James WPT, Ferro - Luzzi A, Waterlow JC: Definition of chronic energy deficiency in adults. European J Clin Nutr 42: 969-981, 1988.
6. Durnin JVGA, Womersley J: Body fat assessed from total body density and its estimation from skinfold thickness. Measurement of 481 men and women aged from 16 to 72 years. Br J Nutr 3: 77-97, 1974.
7. Fax EL, Mathews DK: The physiological basis of physical education and athletics. Philadelphia: Saunders College Publishing, pp.11-32, 1981.
8. Astrand P, Rodahl K: Textbook of Work Physiology. Tests of Anaerobic and Aerobic Power. New York: Mc Graw-Hill, pp. 626-627, 1978.
9. WHO: Guidelines for the study of dietary intakes of chemical contaminant. GEMS: Global Environmental Monitor-

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ing System, Joint FAO/WHO Food Contamination Monitoring Programme, World Health Organization, 1995.
10. Bolonchuck WW, Lukaski HC, Siders WA: The structural, functional, and nutritional adaptations of college basketball players over a season. J Sports Med Phys Fitness 31(2): 165-172, 1991.
11. Burk L: The complete guide to food for sports performance. Sidney: Allen & Unwin, 1995.
12. Jensen CA, Weaver CM, Sedlock DA: Nutritional assessment and work capacity in exercising young men. J Nutr Biochem 2: 358-361, 1992.
13. Colemen AE, Kreuzer P, Friedrick DW, Jurenal JP: Aerobic and anaerobic responses of male college freshmen during a season of basketball. J Sports Med Phys Fitness 14: 26-31, 1984.
14. Lukaski HC, Bolonchuck WW: Maintenance of aerobic capacity and body composition of volunteers residing on a metabolic research unit. Sports Med Phys Fitness 29(3): 273-8, 1989.
15. Nieman DC: The immune response to prolonged cardiorespiratory exercise. Am J Sports Medicine 24(6 suppl.): 98-103, 1990.
16. Rogozkin VA: Principles of Athlete's Nutrition, In: Simpopoulos AP, Pavlou KN, (eds), Nutrition and Fitness for Athletes. World Rev Nutr Diet Basel: Kargar, 71:54-162, 1993.
17. Hickson JF, Schrader J, Cunningham Trischler L: Dietary intakes of basketball and gymnastics athletes. J Am Diet Assoc 2: 251-253, 1986.
18. Bangsbo J, Thorsoe F: The effect of carbohydrate diet on intermittent exercise performance. Int Sports Med 13:152-157, 1992.
19. Giada F, Zuliani G, Boldo - enzi G, et al: Diet and body composition in athletes practicing mixed and anaerobic activities. J. Sports Med Phys Fitness 36: 211-216, 1996.
20. Hassapidou M, Kelftoui K, Efstratiou E, Kitsou S: Nutrition assessment of a team of basketball players. Nutrition and Fitness for Athletes 71: 176, 1993.
21. Butterfield GE, Calloway DH: Physical activity improves protein utilization in young men. Br J Nutr 51: 171-184, 1984.
22. Costill DI, Miller JM: Nutrition for endurance sports. Carbohydrate and fluid balance. Int J Sports Med 1: 2-14, 1988.
23. Gonzalez - Gross M, Drtega RM, Andres P, Requejo AM, Herradou MA: Dietary patterns of a group of football players in Madrid (Spain). In: Simpopoulus AP, Pavlou KN (eds), Nutrition and Fitness for Athletes. Rev Nutr Diet Basel: Karger, 71: 174-75, 1993.

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