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NUTRITIONAL STATUS OF UNIVERSITY GRADUATE SPORTS STUDENTS

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Abstract

This study was carried out to determine the nutritional status of sports students at the Department of Physical Education and Sports Sciences, University of Mysore, India. Nutritional status of 91 students (N=91, M 82, F 9) was assessed using anthropometry, body composition analysis and diet survey. The mean Waist-Hip-Ratio (WHR) for boys and girls was 0.85 and 0.83, respectively. Majority of the students (66%) had body mass index (BMI) within normal range (18.5-22.9). The mean percentage body fat, mean fat and fat free mass, total body water contents were in normal range. The mean hemoglobin (Hb) was 13.9 and 12.8g/dl among boys and girls, respectively with 48.4% of the students with Hb level < 14g/dl. Their dietary intake included mostly cereals and intake of vegetables and green leafy vegetables were low. Although the nutritional status was satisfactory , the students lacked nutritional knowledge. Hence, along with regular sports training sessions, nutrition education must be included in the curriculum to make them self sufficient for making proper food choices, in order to improve their endurance and performance.

Keywords : Sports nutrition, nutritional assessment, nutrient intake, nutrition education

Introduction

Nutrition is an essential element of athletic performance, body composition goals, and general health. Examining scientific principles makes it easier for athletes and other physically active persons to eat a diet that prepares them for successful training and/or athletic competition[1]. The dietary supplement is characterized as a product which can be used to address physiological or nutritional issues arising in sport. It may provide a convenient or practical means of consuming special nutrient requirements for exercise, or it may be used to prevent/reverse nutritional deficiencies that

commonly occur among athletes[2]. Dietary supplement can be formulated by understanding the nutritional requirements and physiological effects of exercise which in-turn improves sports performance. The sports drink (carbohydrate-electrolyte replacement drink) is a well known example of a dietary supplement and it is noteworthy that the scientific attitudes towards the sports drink have changed over the past 20 years.

There is growing interest in functional foods for athletes, where the aim is not only to improve health, but also to improve performance in sport[3]. Food fortification is one of the strategies for the prevention and control of micronutrient malnutrition, along with other food based approaches[4,5]. The multiple fortifications of foods are the possible means of addressing deficiencies of two or more micronutrient in a cost-effective manner than a single micronutrient addition. This strategy is successful in developed countries, particularly in the fortification of cereals[6]. Sports drinks cater to meet the needs of most individuals in most situations. The main needs are to include carbohydrate to support metabolism, and to optimize hydration status by including sugars and sodium to stimulate absorption of water[3]. The commercial sports drinks mostly are designed to be consumed just before the sporting event, as their composition mainly is of simple carbohydrates. In order to improve nutritional status and increase endurance levels, adequate amount of macro and micronutrients sources has to be included in the diet. With this background, in the present study the nutritional status of University students of Physical education and sports science department were assessed.

Materials and Methods

Students from Department of Physical Education and Sports Sciences, University of Mysore, Mysuru, India, studying under and post graduate courses were assessed for their nutritional status. The screening included a total of 91 students (82 boys and 9 girls), aged between 21 – 25 yr and had been engaged in sporting events for period of more than 5 years. The curriculum had two training sessions, morning and evening each for 2 hr daily. The nutritional status of subjects was assessed by anthropometry, diet survey, measurement of body composition (total body protein, total fat and total body fluids) and hemoglobin estimation.

Anthropometric Assessment

The anthropometric measurements viz. height, weight, mid-upper arm, circumference, waist and hip circumferences, skin fold thickness taken at four sites i.e. triceps, Biceps, sub-scapular and suprailiac were recorded, Body Mass Index (BMI), mid upper arm muscle circumference (MUAMC) and waist hip ratio (WHR) were calculated as per the guidelines recommended by ICMR / WHO standards. Total body fat, percent body fat, fat free mass and total body water were analysed using Body Composition Analyser.

Dietary Assessment

Dietary intake of the subjects - Diet survey was carried out to gather information regarding dietary habits of the subjects, using 24 h diet-recall method and then computing the adequacy for both food and nutrients. Percentage adequacy of carbohydrate, protein and fat were computed, based on the recommendations for sports persons i.e. 60-

70%, 12-15% and 20-30% of the total daily calorie requirement respectively[7]. Percentage calorie adequacy was computed based on the recommended daily calorie intake (30-35 Kcal x Kg BW) as per the ICMR / WHO guidelines. The haemoglobin (Hb) levels were analyzed by Drabkin's method[8]. The study used free living, randomized design and was approved by Institutional Human Ethics Committee (IHEC-UOM No.14 /Res/2009-10).

Results

The mean anthropometric parameters and haemoglobin status of graduate and post graduate sports student are represented in Table 1. The mean body mass index (BMI) of the students was 21.4 indicating that majority of the students had normal body weight. 66.4% of the students had BMI within normal range, 12% were under weight, 10.8% were overweight and 10.8% were obese (Figure 1). The mean waist /hip ratio of boys was 0.85 and girls 0.83 indicating majority of them had a normal waist/hip ratio (<0.9) and therefore had no abdominal obesity. Mean Mid upper arm circumference (MUAC) of the boys was 26.7 cm which show that most of them had a mid upper circumference below normal range (27.32 cm). The mean hemoglobin levels of boys and girls was 13.9 and 12.8 g/dl which was within the normal range, however it was also observed that few students had haemoglobin levels below the normal range.

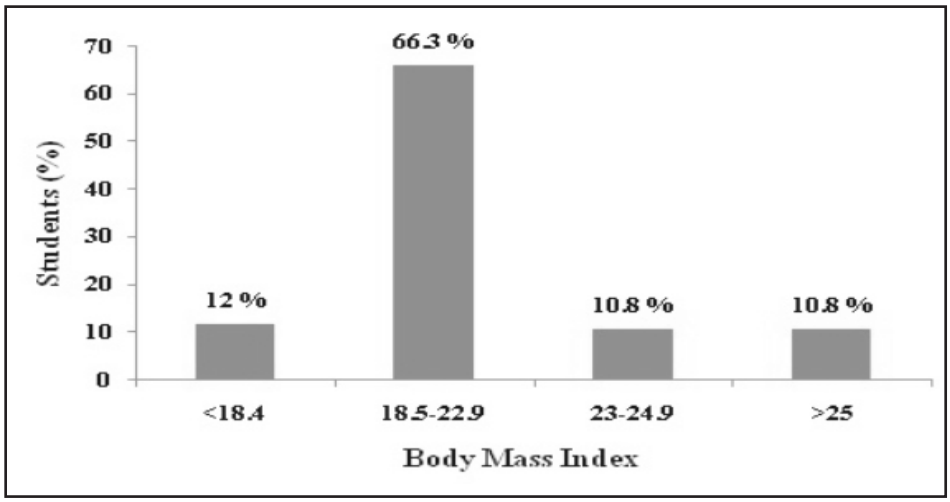
Along with the anthropometric measurements, the students were also subjected to body composition analysis (BCA), to determine other parameters viz. Basal metabolic Rate (BMR),

Table 1. Mean Somatic status, Body composition and Hemoglobin values of Subjects

Parameters	BOYS (N=82)	GIRLS (N= 9)
Height (cm)	172.6	164.2
Weight (kg)	63.5	52.5
BMI	21.4	19.5
Waist circumference (cm)	77.6	75.3
Hip circumference (cm)	90.8	90
Waist-to-hip ratio	0.85	0.83
Mid upper arm circumference (cm)	26.7	23.8
Skinfold thickness		
a) Triceps	8.1	7.0
b) Biceps	4.3	3.8
c) Sub-scapular	10.4	10.3
d) Suprailiac	10.2	9.8
Basal Metabolic Rate	1,604	1330
% Body Fat	10.8	17.8
Fat Mass (kg)	7.0	9.4
Fat Free Mass (kg)	54.4	41.2
Total Body Water (kg)	39.8	30.2
Hemoglobin (g/dl)	13.9	12.8

All the measurements are mean of triplicate values

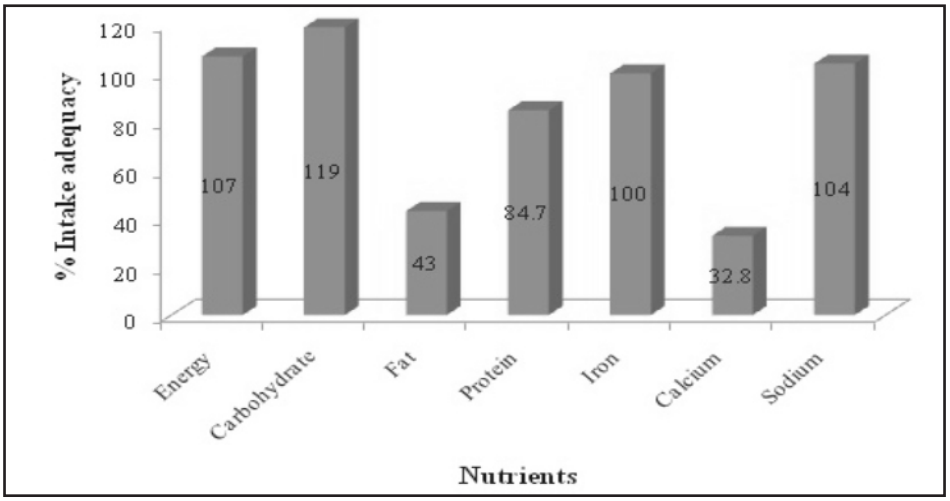
FIG.1 Classification of BODY MASS INDEX of the subjects



percentage body fat, total fat Mass (Kg), Fat free mass (FFM) and total body water (Tbw) (Table 2). According to body composition analysis, the mean percentage body fat was 10.8% which was within the normal range (8-20%). Mean fat mass was 7 Kg which was also within normal range (5-15Kg). This shows that the body fat composition of the students was normal. Fat free mass and total body water were 54.5 Kg and 39.8 Kg respectively and within normal ranges.

The dietary intake assessed through food frequency questionnaire showed that majority (75%) of students consumed wheat and wheat products four times a week. Rice was consumed daily by all the respondents, indicating that it was the main staple food for the students. Ragi

Figure 2. Percent adequacy of Nutrient intake of subjects



(finger millet) was the third most consumed cereal with a frequency of twice a week. Red gram dhal was consumed daily and peas by 66.6% students, four times a week. Green leafy vegetables were consumed less frequently, with 58.3% consuming it once a week. However, other vegetables were consumed on a daily basis by 91.6% students. 75% students consumed roots and tubers thrice a week, fruits being poorly consumed only once in a week. Consumption of egg and poultry was reported as once in a month in 83% of the subjects, it was also observed that other types of meat were never consumed.

The nutrient intake of the subjects is given in Figure 2. The mean calorie intake of the subjects was 2,923 Kcal per day which was adequate to meet the recommended daily allowance (RDA) of 2900 Kcal for the Sports personnel of the age group. Mean carbohydrate intake was 605.58g slightly above the RDA of 507g for the carbohydrates. This level was adequate to maintain muscle glycogen levels at normal levels and present muscle glycogen depletion for the endurance sports persons. Mean fat intake was 28g per day which was far below the RDA of 64g or 20% of total calorie. Fat intake therefore needed to be increased to the level of RDA in order to spare protein in strenuous and long duration games. The mean protein intake was 61.73g , below the RDA of 72g. Therefore, there is a need to increase protein intake to the RDA level to safeguard against tissue breakdown and muscle wasting. This is also important to maintain nitrogen balance.

Mean iron intake was 50 mg per day which was adequate to meet the RDA of 50-75 mg for the sports persons and to prevent sports anaemia. However, since 50 mg is on the border line of the range, 41.6% of the students were consuming less than the RDA. The mean calcium intake was 328.36 mg a day, which was below the RDA of 1000 mg. Therefore, there is a need to increase calcium intake to achieve the RDA so as to enhance bone strength and maintain normal calcium metabolism. The mean sodium intake was 2500 mg which was adequate to maintain sodium balance and prevent sodium depletion due to excessive loss during the physical activity.

Discussion

Nutrient intake of sports personnel is a critical determinant of their performance and ability to compete. The link between nutrition and physical performance has been well established over the years. Performance may be enhanced by an optimal diet. The ideal dietary intake is dictated by numerous factors, including the environment, the type of physical activity, the duration of exercise and the timing of ingestion as it relates to performance. Mean while, the quest for a beverage with the “perfect” nutrient composition for optimal endurance performance continues.

In this survey it was observed that, although the caloric intake of students was meeting the demands, the intake of nutrients as energy sources was not balanced. This was mainly due to lack of nutrition knowledge in students, hence balanced macronutrient intake was not observed. Most of the students were consuming commercial sport drinks prior to session or during the events to improve their performance. A study undertaken to assess the nutritional status of under graduate student also showed the similar observation. Their BMI was in normal range with some exceptions, but they lacked nutritional knowledge.

Nutrition awareness plays an important role in sports performance. The common nutrition related problem is insufficient consumption of foods yielding energy. The nutrients like carbohydrate, protein, fats, vitamin, minerals and water have specific functions providing nourishment for the body. It is critical for the sports personnel to recognize the function of each nutrient under physical, mental and emotional strains of events. Each sport has different duration and intensity, requires different levels of endurance, hence intake of principle source of energy to meet the increasing demands is of great importance. Studies have shown that changing dietary approaches and including diet high in carbohydrates, moderate protein and low fat can enhance the performance and endurance levels[9].

Studies have confirmed that dietary carbohydrate or carbohydrate-electrolyte loading improves endurance performance during prolonged running, physical and mental function during intermittent exercise similar to that of many competitive team sports. It also helps in preparation for endurance races and delaying the onset of fatigue[10 – 15]. There are numerous sports supplements available that claim to increase lean body mass. However, for these sports supplements to exert any favourable changes in lean body mass, they must influence those factors regulating skeletal muscle hypertrophy (i.e., satellite cell activity, gene transcription, protein translation). If a given sports supplement does favourably influence one of these regulatory factors, the result is a positive net protein balance. [16]

Apart from macronutrients the supplement should be a good source of iron and calcium, these micronutrients constitute a small fraction of the entire diet but play important roles in different metabolic processes. Calcium deficiency leads to weak bones and teeth, osteoporosis, reduced ability of blood clotting and several other symptom[17] iron deficiency results in anaemia and reduced ability to do physical work [18]. Exercise is a strenuous activity and results in a number of metabolic changes in the body. Endurance athletes experience haematological disturbances due to mechanical haemolysis, intestinal bleeding, haematuria, sweating, iron deficiency and poor absorption of iron[19]. Poor haematological status necessitates an increase in cardiac output to maintain oxygen delivery to tissues[20], decreases the blood gas transport and muscle enzyme activity[21].

One of the key issues related to sports personnel is the caloric intake post retirement. The physical activity will be normal, but the caloric intake cannot be reduced instantly, hence proper energy balance has to be maintained to sustain the changing nutritional needs. Nutrition education along with improving nutritional status and increasing endurance levels during events, also provides them with the knowledge to include nutrients from all natural sources enabling them to cope up with reduced nutritional demands gradually without much change in the dietary pattern.

Diet can be modified for different phases of training and competition, and due to nutrient deficiency endurance training can aggravate a transitory lack of physiological and biochemical adaptations. Including nutrient rich sources along with the supplementations can potentially address the nutrient needs, thereby improving endurance and performance in any sporting event. This has to be implemented by training the students by nutritionists, health professionals and physicians as part of their curriculum.

Conflict of Interests

Authors declare that they have no conflict of interests.

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