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ASSESSMENT OF ANTHROPOMETRIC PROFILE, DIETARY INTAKE AND ENERGY EXPENDITURE OF FEMALE FOOTBALLERS IN RELATION TO PLAYING POSITION

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ABSTRACT

The aim of this study was to assess the Assessment of Anthropometric Profile, Dietary intake and Energy Expenditure of Female Footballers in relation to playing position. The subjects for this study were thirty-two girls (16 - forwards and 16- midfielders) aged 18 to 24 years, from Haryana (kuruksherta and Hisar Districts). Descriptive research design was used in this study. The dietary intake was assessed for each subject by 24-hour dietary recall method for three consecutive days. A well-planned questionnaire containing all requisite queries were prepared. The dietary assessment was made by using computerized nutritional analysis by software named "dietcal 10.0 version" 2020 by the (PROFOUND TECH SOLUTIONS). Comparison of macro nutrient intake was made with recommended dietary allowances (RDA 2010). However, Micro nutrient intake was compared with Estimated Average Requirement – EAR (minimum recommendation). Moreover, energy expenditure was assessed by (Harris and Benedict equation) formula. Mean standard deviation and t-test was employed with the help of IBM SPSS Statistics 22 statistical package. Mean daily energy intake of (2762.39±596.07) kcal (carbohydrate -68%, protein 15 %, fats 16 %) was observed. In addition, the energy expenditure of 3307.02±923.29 was noticed. There were significant differences in dietary and energy expenditure related to playing position.

KEYWORDS: *dietary intake, Female football players and Anthropometrics profile.*

INTRODUCTION :

Soccer is currently the world's most popular sport; it is classified as an intermittent and high-intensity team sport that requires high levels of muscle strength, endurance, agility and speed. Moreover, to requiring exactly specialized skills, other movements performed in the game of football, such as running, jumping, kicking, and short sprinting, also demands high energy, long recovery and might expose athletes to overtiredness (Bangsbo et al., 2006; Russell et al., 2014, 2016; Stølen et al., 2005; Williams and Rollo, 2015). Currently, around 29 million females play football, which is around 10% of the total number of male and female footballers worldwide. (FIFA, 2012; FIFA big count 2006; 2007). The number of registered woman players (at the adolescence and senior level) improved in more than 50% in 2006 related to the previous FIFA Big Count in 2000. Furthermore, the number of specialized and recreational leagues international competition for female players have increased significantly in recent years.

Anthropometry has been used to recognize physical characteristics of sportspersons in the field of sports sciences, which objectives development of athletic performance. (Meszaros, T. 2000). Physical demands differ accordingly towards training status, playing position and the athlete's specific strategic roles (Arnason et al., 2004; Bangsbo et al., 2006; Iglesias-Gutie´rrez et al., 2012). Dietary strategies to improve performance includes optimizing consumptions of macronutrients, micronutrients and fluids,

further adjusting their composition and spacing throughout the day (Beck et al., 2015; Maughan et al., 2004). It is well known that balancing energy intake with energy expenditure is important to prevent an energy deficit or excess (Thomas et al., 2016). In this sense, carbohydrate is measured as limiting aspect for performance, since it is a basic fuel used for muscle contraction, the central nervous system and muscle glycogen storage (Russell et al., 2014; Thomas et al., 2016; Williams and Rollo, 2015). According to Nutrition and Hydration Guidelines for Excellence in Sports Performance recommendations, carbohydrates have to contribute 55% of total energy intake (Nutrition and Hydration Guidelines, 2007)

Dietary proteins contribute towards the maintenance, repair and combination of skeletal muscle proteins, as well as increasing structural changes in tendons and bones (Thomas et al., 2016; van Loon, 2014). The Indian Council of Medical Research recommends a daily protein requirement for Indian sedentary individual of 0.8 g/kg body weight (Narasinga & Sivakumar, 2010) for endurance athletes. For bodybuilders, it can be go up proximate 1.0 to 1.5 grams per kilogram of body weight (Nutrition and Hydration Guidelines, 2007)

Fat provides energy, essential fatty acids (especially n-3) and facilitates the absorption of fat-soluble vitamins (Thomas et al., 2016). Nutrients are also essential for the immune system response to pathogens and immunological repair function in stages of intense training (Maughan et al., 2004; Nieman and Bishop, 2006; Reinke et al., 2009); Beck et al., 2015). Dietary intake of fat should not be more than 30% of total daily caloric intake (Nutrition and Hydration Guidelines, 2007). Furthermore, many metabolic pathways, where micronutrients are required, are stressed through exercise. Micronutrients such as calcium, iron, vitamin D and some antioxidants play an essential role in metabolism and in the maintenance of tissue function, moreover contributing in muscle biochemical adaptations (Bangsbo et al., 2006; Koundourakis et al., 2014; Mountjoy et al., 2014; Beck et al., 2015; Eskici, 2016; Thomas et al., 2016).

In addition, the Energy expenditure also changes according to training load, and has to be considered for the adjustment of energy intake when planning dietary strategy (Bangsbo et al., 2006; Beck et al., 2015; Thomas et al., 2016).

STATEMENT OF THE PROBLEM

The title of the problem considered for analysis was definite as "**Assessment of Anthropometric Profile, Dietary intake and Energy Expenditure of Female Footballers in relation to playing position**".

OBJECTIVES OF THE STUDY

- To compare the Anthropometric Variables between Forward and Midfielder Football Players.
- To find out the dietary intake and energy expenditure of forward and midfielder football players.
- To compare the macronutrients of forward and midfielder football players with ICMR.
- To compare the micronutrients of forward and midfielder football players with the Estimated Average Requirement – EAR (minimum recommendation).

HYPOTHESES

There will be no significant difference in Anthropometric variables, dietary intake and energy Expenditure of Forward and Midfielder Football players.

There will be no significant difference in dietary intake with that recommended by ICMR.

DELIMITATIONS

- The study is delimited to those forwards and midfielders, who have at least participated at the inter university level football competition.
- The study is delimited to Female groups only.

- The study is delimited to age ranging between 18 to 25 years.

METHODOLOGY

The objective of the study was to determine the "Assessment of Anthropometric Profile, Dietary intake and Energy Expenditure of Female Footballers in relation to playing position". The study was conducted on 32 female football players university level (16- forwards and 16- Midfielders) from Haryana (kuruksherta and Hisar) District. The age of subjects ranged between 18 to 24 years. Descriptive research design was used in this study. The dietary intake was assessed for each subject by 24-hour dietary recall method for three consecutive days. A well-planned questionnaire containing all requisite queries was prepared. The dietary assessment was made by using computerized nutritional analysis by software named "dietcal 10.0 version" 2014 by the (PROFOUND TECH SOLUTIONS). Comparison of macro nutrient intake was made with recommended dietary allowances (RDA) 2010 and Micro nutrient intake was compared with Estimated Average Requirement – EAR (minimum recommendation). Moreover, energy expenditure was assessed by (Harris and Benedict equation) formula. Mean standard deviation and t-test was employed with the help of IBM SPSS Statistics 22 statistical package. All subjects were informed of the purpose of the study and signed written informed consent.

Selection of Variables

The players selected for sample were provided with Anthropometric, daily energy intake and energy expenditure Performa. For determining the calories intake, a record of everything eaten and drunk along with the specific amount has recorded. To determining the caloric expenditure, every activity done by the player in the whole day e.g. walking, running, exercising etc. was recorded.

Tools

In this study investigator used the Anthropometric rod, weighing machine and Steel tape that are considered standard tools for collecting anthropometric data on human subjects.

Statistical Analysis

After the collection of relevant data, it was processed and analysed with descriptive statistics. To compare the data, t test was employed. The level of significance was set at 0.05 percent.

RESULTS

The anthropometric characteristics of the two main groups of the female football players (forwards and midfielders) are summarized in table 1. There were no significant differences between age, height, weight and BMI of the football players depending on the position they play.

Table 1: Anthropometric Characteristics of the study group (n = 32) divided into forwards and midfielders' playing position in football.

		Forwards (N=16)	Midfielders (N=16)	All players	Test	P-value	Significant
Age (Years)	Mean±SD	19.94±1.81	19.00±0.73	19.47±1.44	1.925	0.064 [a]	NS
Height (m)	Mean±SD	1.59±0.07	1.60±0.06	1.60±0.06	0.760	0.453 [a]	NS
Weight (kg)	Mean±SD	48.05±4.71	50.38±6.12	49.21±5.50	1.207	0.237 [a]	NS
BMI (kg/m^2)	Mean±SD	18.91±1.22	19.95±2.15	19.43±1.80	1.692	0.101 [a]	NS
<18.5 (kg/m^2)	N (%)	5 (31.25%)	2 (12.50%)	7 (21.88%)	2.864	0.091[b]	NS
18.5-24.9 (kg/m^2)	N (%)	11 (68.75%)	14 (87.50%)	25 (78.13%)			
25.0-29.9 (kg/m^2)	N (%)	0 (0%)	0 (0%)	0 (0%)			
≥30 (kg/m^2)	N (%)	0 (0%)	0 (0%)	0 (0%)			

Table .2 shows the average intake of the nutrients of football players with reference to energy, carbohydrate, fibre, protein, fat, saturated fatty acids, monounsaturated fatty acids, polyunsaturated fatty acids, n-6, n-3, and cholesterol compared to recommended dietary allowances (RDA) given by ICMR. (Srilakshmi, 2014). The average nutrient intake i.e., energy, protein, fat, Polyunsaturated fatty acids, n-6, n-3 and cholesterol were observed to be lower than the RDA value. The average nutrient intake of energy was found to be (2762.39 kcal/day), Protein (86.77gm/day), Fat (93.62gm/day), PUFA (8.31mg/day), n-6, n-3 (5.87±2.38, 1.31±1.36), cholesterol (136.48 mg/day). However, the carbohydrates, Fibres, SFA, MUFA intake were higher than the RDA. The percentage of carbohydrates was (69%), Fibres (50.12g), SFA intake (50.16mg/day), MUFA intake (20.82mg/day). Moreover, energy expenditure value was significantly different as compared to the RDA value. The average of energy expenditure of (3307.02±923.29) kcal/day was observed. On applying t- test, significant difference was found between energy intake of the subjects and RDA.

Table 2: Energy and nutrient intake (mean ± SD) in the study group (n = 32) divided into forward and midfielder's players playing position.

Nutrient	Forwards (n=16)	Midfielders (n=16)	All players (n=32)	t-test	p value	RDA Recommendation	Sign.
		Energy					
Kcal/day	2742.51±691.99	2782.26±504.56	2762.39±596.07	7.949	.001	3600	S
		Energy Expenditure					
Kcal/day	3198.56±861.13	3415.49±997.55	3307.02±923.29	4.258	.001	2612	S
		Carbohydrates					
g/day g/kg b.w %of energy Fiber (g)	386.66±84.16 8.07±1.67 0.69±0.05 49.61±11.6	382.03±57.87 7.68±1.41 0.68±0.06 50.64±8.48	384.35±71.09 7.87±1.53 0.69±0.05 50.12±10.03	6767.6 11.34	.001 .001	45-65% 30g/d	S S
		Protein					
g/day g/kg b.w. %of energy	83.47±24.61 1.75±0.52 0.15±0.01	90.06±29.74 1.81±0.61 0.16±0.03	86.77±27.06 1.78±0.56 0.15±0.03	5338.68	.001	20-35%	S
		Fat					
g/day g/kg b.w. %of energy	91.99±36.18 1.93±0.80 0.16±0.04	95.24±29.20 1.91±0.63 0.17±0.03	93.62±32.39 1.92±0.70 0.16±0.04	3740.20	001	10-35%	S
		SFA					
g/day %of energy	52.09±20.89 0.66±0.08	48.22±15.48 0.62±0.12	50.16±18.20 0.62±0.11	15.59	.001	<10% of total energy	S
		MUFA					
g/day %of energy	19.14±10.74 0.24±0.05	22.49±13.17 0.26±0.10	20.82±11.95 0.25±0.08	9.85	.001	10% of total energy	S
		PUFA					
g/day %of energy n-6 n-3	7.63±4.22 0.10±0.04 4.90±1.62 0.75±0.30	9.00±4.23 0.11±0.03 6.83±2.68 1.86±1.75	8.31±4.22 0.11±0.03 5.87±2.38 1.31±1.36	11.13 9.78 3.35	.001 .001 .002	10% of total energy 4-10% 0.5-1%	S S S
Cholesterol (mg)	78.62±99.38	194.34±416.18	136.48±302.69	2.85	.008	300mg/d	S

SD- standard deviation; B.W- body weight; SFA- saturated fatty acids; MUFA- monounsaturated fatty acids; PUFA- polyunsaturated fatty acids; S- significant differences; SFA, PUFA and MUFA intake are referred as percentage of total energy intake Source: Hernandez and Nahas, 2009.

Table 3. Presents the Intake of selected vitamins and minerals in the diets of the study group as well as of subgroups. The content of Vitamin Retinol (µg) 25.13%, Ascorbic Acid (mg) 56.36%, A-Tocopherol (mg) 22.00%, sodium(mg) 21.00%, potassium(mg) 20.57% and calcium (mg) 22.50% of the diets below EAR/AI. The average content of these compounds was observed to be less than recommended dietary allowance values.

Table 3: Vitamin and mineral intake in the study group (n = 32) divided into forwards and midfielders

Nutrient	Forwards (n =16)				Midfielders (n = 16)			All Players (n = 32)			
	EAR/AI	Mean ±SD	Median	% of the EAR/AI	Mean ±SD	Median	% of the EAR/AI	Mean ±SD	Median	% of the EAR/AI	% of the diets below the EAR/AI
Retinol (µg)	390	491.39±184.17	432.57	126.00	487.39±233.64	402.79	124.97	489.39±206.95	425.43	125.49	25.13
Ascorbic Acid (mg)	55	144.20±62.14	131.72	262.18	132.71±56.45	124.57	241.28	138.45±58.69	126.49	251.73	56.36
A-Tocopherol (mg)	10.	3.83±1.65	4.05	313.81	4.11±2.38	3.39	304.24	3.97±2.02	3.77	309.02	22.00
Sodium (mg)	2000	459.72±469.46	349.91	980.70	384.57±218.10	347.26	674.42	422.14±362.10	349.91	677.56	21.00
Potassium (mg)	3500	4093.91±1151.18	4213.40	92.25	4187.72±729.40	4207.56	86.76	4140.81±949.17	4207.56	89.50	20.57
Calcium (mg)	800	1504.38±639.89	1327.68	188.05	1367.02±538.47	1242.21	170.88	1435.70±585.91	1301.52	179.46	21.50

a – EAR – Estimated Average Requirement, b – AI – Adequate Intake, SD – standard deviation.

DISCUSSION

According to Charzewska et al. (2010), the percentage of energy from carbohydrates in sportspersons during training and competition activity, should be maintained at 60–70%. An analysis of diets of female football players showed carbohydrate intake (69%) more than recommended group. This means that the supply of carbohydrates should be persistent at a level of 6 - 10 g per kg of body weight, when the players are in the period of training, i.e. the improvement of physical fitness (strength, speed, power). Burke et al. (2001) suggested that athletes, who trained at average intensity, for not as much of as 60 minutes, must have been consume 5 to 7 g of carbohydrates per kg of body weight daily. If the exercise is more intensive, and their duration is extended to 3 hours, the intake of carbohydrates has to be increased to 7 to 10 g per kg of body weight (Burke et al. 2001). A sufficient consumption of carbohydrates in the intake of athletes is very important for maintaining proper blood glucose equal in exercise, and to supplement the damage of glycogen after exercise. The high expenditure of limited ATP resources in the human body (approximately 100 grams) during physical exercise complies with the continued benefit of its resources at the expense of phosphocreatine, fatty, muscle and liver glycogen. Because of metabolism and accumulation of products, which may decrease the performance of psychomotor. (Klich 2013).

According to Tarnopolsky (2008), the smallest intake of protein needed to improve muscle recovery after a workout should be 0.8 g kg/body weight. In the case of endurance activity or sports, a protein recommended intake the amount of 1.2–1.4 g/kg/body weight, whereas in strength sports activities 1.2–1.7 g/kg of body weight protein required (Charzewska et al. 2010). An analysis of diets of female football players in the present study showed protein intake (15%) these value below than recommended dietary allowances (RDA) value. The percentage of energy from proteins for the athletes should be maintained at 10–15%. This is sufficient to maintain physique and to aid recovery, and it is important not to produce too much acidity in the body, which can lead to reduced physical performance and various diseases.

According to Eberle (2000), a diet containing approximately 1 g of fat per 1 kg of body weight stimulates the synthesis of enzymes in the muscles required to metabolize fat during exercise. An

analysis of diets of female football players showed fat intake (16%) of these values below than recommended dietary allowances (RDA) value. Consumption by the player's 1.9 g fat per kg of body weight is unfavourable and only hinders their general performance. Chylomicronaemia, which occurs after excessive intake of fat, adversely affects the speed of blood flow and this, in turn, impairs muscle function (Celejowa 2008).

Fat cannot be eliminated from the diet, as it causes a lack of essential fatty acids (EFA) as well as the presence of symptoms of poor absorption of fat-soluble vitamins. An important consideration should be the adequate quality of dietary fats. While analysing the diet of athletes, it is important to study the influences such as the contribution of SFA, MUFA, PUFA, n-6 to n-3 ratio and cholesterol intake. A percentage of energy from SFA amounting to 14.6% is greater than the national goal, which recommend less than 10% energy form SFA. The majority of fats in the diet should provide MUFA, the consumption of which can range level 20% of the total energy. MUFA intake by respondents was dependable with this recommendation. He essential fraction of dietary fat is also PUFA, both n-6 and n-3, but in a ratio that cannot exceed 4-6: 1 (Ziemlanski 2001, Biesalski and Grimm 2012; Klosiewicez-Latoszek et al. 2008). Among them are EEA that the body cannot synthesize on its own and must be provided in the diet.

An adequate intake of PUFA is actually important. As a minimum 6% of nutritional energy must come from PUFA, but the consumption of these substances should not be greater than 10% of total energy, Due to their high content of unsaturated bonds that can stimulate the oxidant activity. The ratio of PUFA n-6 to n-3 is extremely important, as it plays a crucial role in regulating the permeability of cell membranes, gene appearance and lipid levels in blood plasma. Among the study group PUFA intake was slightly low (6.6%), while the ratio of n-6/n-3 was too much high. Improper intake of these fatty acids can lead to difficulty in blood flow, as well as cause inflammation, making it difficult to process after workouts (Biesalski and Grimm 2012; Klosiewicez-Latoszek et al. 2008).

According to current knowledge, the source of cholesterol in the diet of healthy individuals should not exceed 300 mg per day (Jarosz 2012). Analysis of the present study group's diet showed reduced cholesterol intake in excess of that requirement. Excessive supply of this compound can cause an increase in blood serum cholesterol, resulting in hypercholesterolemia and undesirable changes in the cardiovascular system. (Jarosz 2012).

Daily delivery of dietary antioxidants vitamins C, A, E, relieves muscle damage and improves the body's physical ability to reduce oxidative protection and reduce the formation of ROS. Specific requirements of vitamins present after training increase protein re-synthesis, deficiency can slow down the process of reconstruction (sadowska- krepa and klapcinska 2005). Very low consumption of fruits and vegetables and deficiency of related vitamins can lead to fatigue, injury tendency, and weakened immune system and increases the time required for the regeneration of the body. (Watson et al. 2005). Although, the average intake of antioxidant vitamins by athletes was higher than the recommended amount, 23% of them did not have adequate intake of vitamin C. Lack of ascorbic acid, which is a catalyst in the transformation of intermediate carbohydrates, reduces efficiency and adaptation. Change in temperature. (sadowska- krepa and klapcinska 2005).

Martínez et al. (2011) observed carotenes, vitamin A, vitamin E, vitamin D, and folic acid deficiency in both boys and girls; girls also had insufficient intake of iron and calcium. Calcium and vitamin D are key nutrients for players, primarily due to their roles in maintaining bone health. Their inadequate delivery to the body can cause bone loss and lead to a risk of bone damage and injury. In addition, calcium is a mineral that plays an important role in the bodies of physically active women: it takes part in blood clotting, muscle contractions, protein consumption, nerve transmission, and cellular communication. (Rossi, K.A. 2017; Dobrowolski, H et al 2019). During periods of increased muscle function, the body loses significant amounts of sodium and potassium, so they are an essential element of proper post-workout recovery. These elements are involved in the maintenance of proper excellence of nerve and muscle cells and regulate the permeability of cell membranes. (Celejowa 2008).

CONCLUSIONS

The diets of the studied football players were improperly balanced, mainly because of insufficient intake of fats, protein, and excessive amount of carbohydrates and fibres. The energy expenditure value of the all players seems to be high compared to the recommend dietary allowances. The improper proportion of nutrients in the diets of the study group may decrease the endurance and strength of the players, and therefore decrease the opportunities to achieve good results during matches. The differences in the type of training and the specificity of the player's position within these two groups should be included in the dietary guidelines.

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