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Research Article

Assessment of Body Composition, Endurance and Nutrient Intakes among Females Team Players in Sports Club

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Abstract

Aim: The aim of the study was to assess the body composition, endurance level and usual nutrient intakes in female players representing a Sports Club in Sharjah, United Arab Emirates.

Materials and Methods: Twenty-six adult female players aged between 15-24 years were selected from three different teams (basketball = 12, tennis = 4, volleyball = 10) using convenience sampling technique. All participants were assessed for body composition through bioelectrical impedance method, endurance level using step test and nutrient intakes using 24-hour recall method. Significant differences ($P < 0.05$) were determined among the three teams in relation to body composition, endurance levels and nutrient intakes.

Results: Body composition of players in three sports was significantly different in terms of body mass index, body fat mass, and percentage body fat and fitness scores. Tennis players had significantly higher body fat mass (28.5 ± 8.2 kg) and percent body fat (41 ± 7%) in contrast to that in basketball players (body fat mass: 19.2 ± 10.5 kg; percent body fat: 30.6 ± 7.9%) and tennis players (body fat mass: 13 ± 4.2 kg; percent body fat: 26.5 ± 6.5%), respectively. On the other hand, volleyball players had significantly higher fitness score (72.2 ± 3.5) as compared to basketball players (71 ± 6.7), and tennis players (63 ± 8.2).

On an average, volleyball players scored "very good" endurance level in contrast to "good" scores in basketball and tennis team players. However, this difference was not statistically significant.

The average intakes of all nutrients including energy, protein, vitamins and minerals were below the recommended intakes among players of all sports teams.

Conclusions: Body composition and endurance level differ with the type of sports. Volleyball team players had the lowest BMI, body fat mass as well as percent body fat and highest fitness score and endurance level. However, the overall nutrient intakes of the female players representing the three teams were less than the recommended allowances for highly active women and did not differ with the type of sports played.

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1. Introduction

Sport clubs have become an integral part of the social infra-structure of almost every nation, offering organized sports activities, thereby building skills and promoting health of the individuals [11]. Training through organized sports enables all the game players to develop comprehensive skills including physical, technical, mental, and tactical abilities [6]. The world's popular sports like tennis, basketball and volleyball also require varying levels of competence, high level of technical and tactical skills as well as suitable anthropometric characteristics for successful participation [6].

Anthropometric measurements, parameters of the body composition such as body fat, fat-free mass (FFM) and somatotype components are often used to evaluate these physical abilities [20]. Somatic traits and body composition are influenced by the training and type of sport pursued [2].

Lean body mass compared to total body weight is closely related to physiological parameters such as oxygen consumption, cardiac output, vital capacity, etc. [19]. Basketball and volleyball players are typically taller than the players of other games [20]. Moreover, mean body height and weight, body fat as well as fat free mass of basketball players were found to be higher than those of volleyball players [6].

Female sports players need to be well conditioned to meet the intense demands of the game. Endurance training of moderate to high intensity is crucial for achieving a higher level of performance of female sports players [17]. They must be quick to move, and have strength and power. The functional performance of any complex chain of torque transfers, that is, serve or ground strokes in tennis depends on several factors including technique, flexibility, muscle strength, speed, and power [18].

Sports players undergo special nutrient demands because of enhanced metabolic process developed through extensive exercise; repetitive cycle of food deprivation might lead to a nutritionally undesirable state and dehydration problems [8]. Female sports players need to consume enough energy and appropriate nutrition to maintain their competitive edge for training and competition. Further, nutritional problems related to micronutrients leads to substandard training and impaired performance [5].

Energy and nutrients intake among athletes are influenced by many factors; type of activity, intensity and duration in addition to body composition of the athletes. Carbohydrates are the master fuel for these athletes, its needs are similar among most types, varying between 6–10 g carbohydrates /kg body weight per day, accounting for 50–65% of total daily calories. Likewise, protein requirements vary with the type of activity and are estimated to be 1.2 to 1.4 g/kg body weight, 1.2–2.0 g/kg per day for

endurance and team sports respectively comprising of about 15–20% total calories. Dietary composition of fat is a contribution of ~ 20–35% of total calories, the majority should be in the form of unsaturated fats [9].

In spite of the fact that nutrition is an influential determinant of athletics performance, female athletes often show poor dietary behavior that can affect their successful physical performance [7]. The diets of female athletes have been found to be inadequate in the consumption of carbohydrates and protein, as well as micronutrients like vitamin E, magnesium, folate, and zinc [10].

Female sports are gaining impetus in the United Arab Emirates (UAE), especially among the youth. Ladies sports clubs have been established to manage and develop the local talent and empower women with the knowledge and skills of different sports. Due to the lack of evidence on the physical status of the female sports players in the UAE, the present study was designed to assess the body composition, level of endurance and nutrient intakes among adult female players representing sports teams in s sports club.

2. Materials and Methods

A cross-sectional research design was adopted. Adult females representing the sport teams at Sharjah Ladies Club were assessed. The teams were coached by highly efficient and qualified trainers in order to improve the level of the athletes to reach international tournaments.

2.1. Sample

Twenty-six (26) adult female sports team members representing Sharjah Ladies Club including twelve (12) from basketball team, ten (10) from volleyball team and four (4) from tennis teams were selected.

All the players in the current study were members of competitive teams that contest for top honors in local, Arab and international championships. All players were informed about the aim of the study and signed a written consent before the data collection. The study was approved by the Department Research Committee, Clinical Nutrition and Dietetics department, College of Health Sciences, University of Sharjah. A pre-tested, semi-coded interview schedule was formulated and administrated on the sports team players.

2.2. Body Composition

It was assessed by using Bioelectrical Impedance Analysis (BIA) (Biospace Co. Ltd., Model: Inbody 230, Korea). The players were informed in advance about the protocol for measuring their body compositions. They were instructed to restrict physical exercise at least 1 day prior to the test. None of the players were pregnant or had metal implants. The test was performed in the morning after 10-12 hours of overnight fasting. Each player was made to stand on body composition analysis machine with the light clothing and no socks, stockings or metals on the body. It was ensured that each player stood on the machine in proper posture: bare feet maintaining contact with the electrodes and thumbs of the arms placed on the electrode pads on the top surface of the handle. The data were entered for each player's identification, age, height and sex by the researcher. Height was measured by Harpenden stadiometer using the following technique [13]. Weight, total body water (TBW), body fat mass, muscle mass, body mass index (BMI), percent body fat (%BF), basal metabolic rate (BMR), and fitness score were determined with the BIA machine for body composition.

2.3. Endurance

Modified Canadian Aerobic Fitness Test (mCAFT) was used to measure the level of endurance [12]. mCAFT is used as a multistage step test to assess sub-maximal exercise capacity. Each player was asked to perform a series of stepping sequences on a 20.3 cm step in time with a musical cadence. Starting stage or stepping sequence was determined according to the subject's age. Each stage lasted for 3 minutes and progressively became more challenging. To begin with, the resting blood pressure and resting heart rate of each player were measured. At the end of each stage, heart rate was measured, if it was below the 85% of predicted maximum heart rate, the player was allowed to proceed and the next stage started. On the other hand, the player was not allowed to move to higher stage if her heart rate reached above 85% of predicted maximum heart rate or any discomfort such as nausea, extreme leg pain, chest pain, or any adverse symptom was experienced. At the end of all stages, blood pressure and heart rate at four minutes post exercise were measured. An oxygen uptake value for the final stepping stage was taken from the Canadian Standardized Test of Fitness Operations Manual [7].

Originally, physical fitness is evaluated according to 5 categories (Need Improvement, Fair, Good, Very good and Excellent). However, in the present study, these were

merged into 3 categories (Need Improvement, Good and Very Good) to overcome the effect of small sample size.

2.4. Nutrient Intakes

Nutrient intakes were estimated from the 24-hour dietary recall method. This method was preferred over the other dietary assessment methods because of its advantages. It involves little respondent burden; because of the immediacy of the recall period, respondents are able to recall most of their dietary intake. Also, those who agree to give 24-hour dietary recalls are more likely to be representative of the population than are those who agree to keep food records. In contrast to record methods, dietary recalls occur after the food has been consumed, so there is less potential for the assessment method to interfere with dietary behavior [21].

Each player was asked to recall in detail all the food items and drinks consumed during period of time in the last 24-hours (previous day). The researchers recorded this information for later coding and analysis [13]. Nutrient intakes were calculated and compared with the dietary reference intakes (DRIs) for their age and sex through ESHA Food Processor Software (ESHAPortSQL 2012). Thirteen nutrients have been reported, namely, energy, protein, thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, vitamin A, folate, vitamin C, calcium, magnesium, iron and zinc and compared with the dietary reference intakes (DRIs) was estimated [22].

2.5. Statistical Analysis

The data was subjected to descriptive statistics using Statistical Package for the Social Sciences SPSS 17 Version program (SPSS, USA). Body composition, endurance and nutrient intakes variables were expressed as means and standard deviations. One-way ANOVA test was used to determine if significant differences ($p < 0.05$) existed among the three teams in relation to body composition variables and nutrient intake. Chi square test was used to determine the association in endurance level variables among the players from different sport teams. When there was a significance difference variable, a post hoc test (Least Square Difference) was used to identify specific differences among the teams.

3. Results

The average age of the players was 19.8 years ranging between 18-24 years. Majority of the players were Emirati nationals (n = 20) and the rest were expatriates from other countries (n = 6).

3.1. Body Composition

The means and standard deviations of body composition for the players in three sports teams are presented in Table 1. In addition, the critical differences in their body composition are depicted in Table 2. As evident, the heights of the players ranged from 151-185 cm with the mean height of basketball players being relatively higher than the tennis and volleyball players. However, this difference was not statistically significant. Similarly, the basketball players weighed heavier (57 ± 8.2 kg) as compared to tennis players (52.6 ± 3.2 kg) and volleyball players (52 ± 4.6 kg) with no significant differences among the teams.

BMI ranged from 17 kg/m^2 to 39 kg/m^2, average being 22 ± 0.9 kg/m^2 (Table 1). The tennis players had significantly higher BMI than the basketball and volleyball players. Specifically, this significant difference was observed between the BMI values of tennis and volleyball players (Table 2). According to WHO [23] classification, the average BMI indicated that the tennis players were overweight in contrast to the other teams who were found to be in the normal BMI category. Similar trend was evident in the body fat mass of the players in three sports with a significantly higher in tennis players (28.6 ± 8.2 kg) in contrast to basketball (22.6 ± 1.08) kg and volleyball players (13 ± 4.2 kg). Significant difference in fat mass existed between tennis and volleyball players. Further, tennis players had significantly higher %BF (40.9 ± 6.9 %) as compared to basketball (30.6 ± 7.9 %) as well as volleyball players (26.6 ± 6.5 %).

Fitness score of the female sports team players was 70.2 ± 0.4, on average (Table 1). Volleyball and basketball players had significantly higher fitness scores than the tennis players (72.2 ± 0.4; 71 ± 0.4; 63 ± 0.5, respectively).

3.2. Endurance

On an average, the female players in the three teams scored "good" level of endurance (Table 3). Volleyball players showed "very good" endurance that was relatively higher

Body composition	Total players (n = 26)	Basketball players (n = 12)	Tennis players (n = 4)	Volleyball players (n = 10)	P value
variables	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
Height (cm)	160 ± 6.8	162.3 ± 8.4	158 ± 3.4	158.4 ± 5.2	0.335
Weight (kg)	54.6 ± 6.7	57.2 ± 8.2	52.6 ± 3.2	52.2 ± 4.6	0.182
BMI (kg/m^2)	22.2 ± 0.9	22.6 ± 1.08	27.5 ± 0.8	19.6 ± 0.47	0.018*
Percentage Body Fat (%)	30.6 ± 8.5	30.6 ± 7.9	40.9 ± 6.9	26.6 ± 6.5	0.011*
Body Fat Mass (kg)	18.4 ± 9.5	19.2 ± 10.5	28.6 ± 8.2	13.3 ± 4.2	0.017*
Muscle Mass (kg)	20.9 ± 3.4	22 ± 4.5	21.7 ± 1.6	19.3 ± 1.2	0.156
Total Body Water (kg)	28.4 ± 4.2	29.8 ± 5.6	29.4 ± 2.07	26.3 ± 1.5	0.144
Basal Metabolic Rate (kcal)	1208 ± 125.3	1248.8 ± 165.7	1237 ± 61.7	1147 ± 46	0.148
Fitness Score	70.2± 0.4	71 ± 0.4	63 ± 0.5	72.2 ± 0.4	0.044*

Table 1: Body composition of female team players. * Significant at $P < 0.05$; SD: Standard deviation.

(456 ± 54.3) as compared to basketball (383 ± 84.6) and tennis (384 ± 51.2) players. However, the difference was not statistically significant.

3.3. Nutrient Intakes

Nutrient intakes of the female players are presented in Table 4. As evident, the results revealed that consumption levels of most of the nutrients were below the recommendations with no significant differences in nutrient intakes amongst the female players in the three sports teams.

4. Discussion

The present study highlighted the body composition, endurance as well as nutrient intakes among basketball, tennis and volleyball female players. Our findings were consistent with the results of Gaurav et al. [6]. They also reported that the basketball players were significantly taller than volleyball players. In addition, tennis players were

Body composition parameters			Mean Difference	Std. Error	P value
BMI (kg/m^2)	Basketball	X Volleyball	2.955	1.848	0.12
	Tennis	X Basketball	4.875	2.491	0.06
	Tennis	X Volleyball	7.830*	2.553	0.01
Body fat %	Basketball	X Volleyball	4.048	3.126 4.216 4.320	0.21 0.02 0.00
	Tennis	X Basketball	10.342* 14.290*		
	Tennis	X Volleyball			
Body Fat Mass (kg)	Basketball	X Volleyball	5.962	3.574	0.11
	Tennis	X Basketball	9.333	4.819	0.06
	Tennis	X Volleyball	15.295*	4.938	0.01
Fitness Score	Basketball	X Tennis	8.000*	3.438	0.03
	Volleyball	X Basketball	1.2	2.550 3.523	0.64
	Volleyball	X Tennis	9.200*		0.02

Table 2: Comparison of body composition among female team players (n = 26). * Significant at $p < 0.05$.

Sport Team	Endurance Score	Endurance Level		
	Mean ± SD	Need Improvement	Good	Very Good
		350 or less – 377	378 – 419	420 - 472 or more
		N (%)	N (%)	N (%)
Basketball	383± 84.6	4 (33%)	4 (33%)	4 (33%)
Tennis	384 ± 51.2	2 (50%)	1 (25%)	1 (25%)
Volleyball	456 ± 54.3	1 (10%)	0	9 (90%)
Total	412 ± 76.1	7 (27%)	5 (19%)	14 (54%)

Table 3: Endurance level of female players in sports teams (n = 26).

Nutrient	Total	Basketball players	Tennis players	Volleyball players	DRIs	P value
		(Mean ± SD)	(Mean ± SD)	(Mean ± SD)		
Energy (kcal/d)	1930 ± 816	1836 ± 768	1445 ± 693	2139 ± 864	2403	0.23
Protein (g/kg/d)	57 ± 21.3	52 ± 19	53 ± 26	65 ± 22	46	0.22
Thiamine (mg/d)	0.6 ± 0.6	0.5 ± 0.7	0.4 ± 0.5	0.7 ± 0.6	1.1	0.62
Riboflavin (mg/d)	0.7 ± 0.7	0.8 ± 0.9	0.7 ± 0.6	0.6 ± 0.5	1.1	0.76
Niacin (mg/d)	8.7 ± 8.2	8.5 ± 9.1	8.8 ± 11	8.9 ± 6.7	14	0.99
Vitamin B_6 (mg/d)	0.6 ± 0.7	0.6 ± 0.8	0.7 ± 0.9	0.5 ± 0.7	1.3	0.98
VitaminB_{12} (μg/d)	2.0 ± 4.9	2.3 ± 6.8	2.0 ± 3.7	0.3 ± 0.5	2.4	0.36
Folate (μg/d)	82 ± 116	66 ± 61	95 ± 137	96 ± 160	400	0.81
Vitamin C (mg/d)	36 ± 33	43 ± 38	28 ± 18	30 ± 31	75	0.62
Calcium (mg/d)	292 ± 192	360 ± 207	182 ± 124	253 ± 178	1000	0.21
Magnesium (mg/d)	35 ± 23	35 ± 17	48 ± 40	29 ± 21	310	0.38
Iron (mg/d)	7.2 ± 5.8	8.0 ± 7.4	5.8 ± 3.9	6.7 ± 4.3	18	0.77
Zinc (mg/d)	2.2 ± 3.0	2.8 ± 3.4	3.0 ± 4.8	1.2 ± 1.4	8	0.38

Table 4: Nutrient intakes of female team players (n = 26). Dietary Reference Intakes [23].

significantly heavier than volleyball players in our study. However, Gaurav et al. [6] did not find significant difference between BMIs of basketball players and the volleyball players.

Further, our study found significant differences in body fat mass of the players in three teams; volleyball players had lower body fat mass than players from other teams. Likewise, basketball players had significantly higher body fat mass as compared to volleyball players [6]. In contrast, Moysi et al. [1] reported that tennis players had lower fat mass and less fat accumulated in the trunk area.

Moreover, the present study established that the %BF in the tennis players was significantly higher (40.9%) than basketball (30.6%) and volleyball players (26.6%). Malousaris *et al.* [14] also reported that %BF for female volleyball players varied between 11.7% and 27.1%.

Muscle mass did not vary among the female players from different teams in our study. According to Ermin [4], there were no signi?cant differences in lean body mass between the female tennis players and non-tennis players. Arabi et al. [1] showed that lean body mass was greater in boys than girls, whereas fat mass was greater in girls than boys.

Volleyball players had the highest fitness score and endurance level. While the fitness score of volleyball players was significantly higher than tennis players, the difference in the endurance level of the three team players was not statistically significant. On the contrary, Byoung and Ju-Hak [3] reported that basketball players have higher endurance level than volleyball players attributing this difference to the practice of the physical activity and endurance training.

The present study showed that the overall energy, vitamins and minerals intakes of most the players were less than the recommended allowances. However, the average intakes of protein and zinc were adequate and marginally exceeded the DRIs. Further, similar nutrient inadequacies existed in the players across different players. The mean energy intake was 1930 kcal/day in contrast to recommended 2139 kcal/day with an energy deficit of almost 200 kcal/day. Hinton et al. [1] reported adequate energy intake in female sports players. The protein intake was 57 g/day in our players in comparison to 87.8 g/day Similarly, the mean intakes of the vitamins and minerals (except zinc) were relatively lower to the intakes of university female sports players in Columbia [10]. Garcin et al. [5] demonstrated a low energy intake, imbalance of protein and fat and insufficient minerals and vitamins in sport players. Marquart et al. [2] also supported the current findings and demonstrated that physically active individuals, as compared with their less active counterparts, fail to consume a diet that contains adequate amounts of vitamins and minerals, which leads to marginal nutrient deficiency and results in substandard training and impaired performance.

5. Conclusion

The differences in body composition were obvious among the players in the three teams. Tennis players had higher BMI, body fat mass and percent body fat; volleyball players had higher fitness score as well as endurance level. The overall intakes of

energy and micronutrients among the three teams were less than the recommended allowances and did not differ with the type of sports played.

Due to time constraint, the present study was limited to a sports club in one emirate of UAE, it is recommended that a large-scale study should be designed to include a representative sample at the national level.

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