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Research article

ANTHROPOMETRIC AND BODY COMPOSITION STATUS OF UNIVERSITY LEVEL INDIAN MALE TEAM GAME PLAYERS

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Abstract

The present study was conducted to assess anthropometric and body composition components of University level team game players belonging to Volleyball, Basketball, Handball and Hockey games. A total of 40 male team game players in the age range of 18 to 22 years were selected from Volleyball, Basketball, Handball and Hockey games. Ten male University level players from each game were selected from various colleges of Delhi University, India. In anthropometry, height and weight were measured and BMI was computed. Body Composition Components were measured using BODYSTAT machine which was based on bioelectric impedance method. Data was treated for descriptive statistics (mean ± standard deviation), One way analysis of variance (ANOVA) and significance was tested at 5% level of probability ($p<0.05$). The findings of the study indicated that that mean body weight of all team game male players was 67.45±9.78 kg. Mean height of all players was 174.45±6.02 cm and no significant differences among team games were observed with respect to any anthropometric variable studied. Mean BMI value of all team game players was found to be 22.11±2.67 kg/m2 which according to BMI classification for Asians was normal (WHO, 2000). Distribution according to BMI classification revealed that highest percentage (52.5%) of these players was placed in normal category followed by 27.5% in overweight category. Underweight and obese category also had 10% of total players respectively. Mean Waist to hip ratio (WHR) value for all groups was 0.88±0.06 which was n ormal and less than normal value of 0.90, however, 30% of the total players had WHR above 0.90. Body composition profile revealed no significant differences in any of the body composition components of players belonging to the teams studied. Mean Fat Free Mass (FFM) was found to be 53.97±6.16 kg and mean Body Fat Percent (BF%) was 19.85±4.28. While the body fat % of all the teams studied was much higher than the desired percentage, FFM was also comparatively

lower than reported by various other studies. Thus, body composition needs to be regularly monitored in order to bring necessary alterations in dietary and training regimes to attain best possible sports performance and getting health benefits.

Key words: *Anthropometric Profile, Body Composition, Team games, Fat free mass, Body fat percent.*

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INTRODUCTION

Success in sports, at any level of competition, is dependent on many physical factors. It is well reported that physical characteristics of athletes are integral factor that may affect their performance in sports. Body weight and height provide a first idea of player's morphological characteristics (Giordani et al., 2007). Volleyball and basketball players must be tall and these sports require constant jumping and quick movements so they need aerobic stamina along with agility and greater flexibility (Lidor and Ziv, 2010). Koley et al (2010) studied Anthropometric and physiological characteristics on Indian inter-university volleyball players and showed that male volleyball players were taller (6.63%) and heavier (7.31%) and female volleyball players were slightly taller (0.31%) and lighter (3.74%) than their control counterparts. The findings of various other studies have shown that certain anthropometric and characteristics are advantageous to the team game players, including greater height, higher body mass and better upper body strength (Kovaleski et al. 1980, Fry et al. 1991). Body composition including lower body fat and higher muscle mass can positively influence fitness components like endurance, strength, speed, agility and flexibility (Fleck et al. 1985). Components of body composition are important in improving maximal work capacity by affecting training-based alterations and some physiological parameters (Venkata et al. 2004).

To be successful in team games such as volleyball, handball, hockey and basketball, players' strength, endurance, speed, agility, and neuro-muscular skills can be enhanced by improving body composition variables through a proper conditioning programme. Uppal and Sharma (2002) in their study found out that leg power and agility are the two important motor fitness components for predicting badminton performance. Investigations undertaken by Shaker (1981), Ellena (1960), Dahl (1973), Atkinson (1977), Lamba (1980), Mishra (1983) and Amusa and Onyewadume (1987) in sports other than cricket have concluded that physical / motor fitness components play an important role in different games and sports and they have a direct relevance to performance (Tsunawake et al, 2003). Singh and Gaurav (2014) compared the physical characteristics between Indian male handball players at different level of

competition on a sample of forty eight (n=48), which included twenty four each, male inter-school level (N1=24, mean ± SD: age 18.12 ± 0.80 years, height 176.83 ± 5.83cm, weight 69.04 ± 6.99 kg, BMI 22.07 ± 1.89) and inter-college level (N2=24, mean ± SD: age 20.54 ± 0.93 years, height 181.29 ± 3.44cm, weight 74.04 ± 3.89 kg, BMI 22.53 ± 1.30) handball players who participated in inter-school competitions and inter-college competitions respectively. The results showed that inter-college level handball players had significantly greater power ($p<0.05$), speed ($p<0.05$), strength ($p<0.05$) and agility ($p<0.05$) than inter-school level male handball players. The inter-college level male handball players were also found taller and heavier as compared to inter-school level players.

Thus, the physical components of athletes largely determine their performance at all levels. Although height is a constant factor, body weight and body composition are regulatory factors that can influence athletic performance and have bearing upon various components of physical fitness like endurance, speed, strength, agility and flexibility. Hence, this study was conducted to assess anthropometric and body composition levels of male team game players to get an insight into their present status which could be rectified for better health and performances.

METHODS AND MATERIALS

Sample Selection

A total of 40 male team game players in the age range of 18 to 22 years were chosen from Volleyball (18.3 ± 0.68 years), Basketball (19.3 ± 2.0 years), Handball (20.2 ± 2.1 years) and Hockey (19.2 ± 1.23 years) games as subjects for the study. Only those players who had played their respective game for at least three consecutive years and followed the criterion of minimum participation at the University level of their respective game were selected. The subjects were taken from various colleges of Delhi University, India and purposive sampling technique was used for their selection.

Data Collection

Anthropometric Profile was assessed by body weight taken using electronic weighing scale; Height measured using anthropometric rod. Body Mass Index (BMI) was computed with weight (kg) and height (m) values using standard formula {BMI= Weight (kg)/height (m2)}.

Body Composition parameters measured included Body Fat percent (BF%), Fat Free Mass (FFM), Muscle Mass (MM), Bone Mass (BM), and Fat Mass (FM) and Body Composition Analyzer (BODYSTAT) based on the principle of bioelectrical impedance was used for the measurement of these indices.

Statistical Analysis

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. Percentages were computed and one way ANOVA was used to test the differences in the data among players of different team games studied. Data were analyzed using SPSS (Statistical Package for Social Science) version 22.0. A 5% level of probability was used to indicate statistical significance ($p<0.05$).

RESULTS AND DISCUSSION

RESULTS

TABLE – I

ANTHROPOMETRIC DATA OF MALE TEAM GAME PLAYERS (MEAN ± SD)

Variables	Volleyball (n=10)	Handball (n=10)	Hockey (n=10)	Basketball (n=10)	Total (n=40)
WEIGHT (kg)	66.16 ±10.61 (48.1-81.5)	69.87±10.02 (57.2-86.9)	66.02±8.49 (53.4-81.3)	67.75±10.92 (51.7-86.3)	67.45±9.78 (48.1-86.9)
HEIGHT (cms)	172.4±7.62 (159-182)	174.62±5.10 (168-183)	174.45±5.42 (167-183)	176.35±5.91 (170-189.5)	174.45±6.02 (159-189.5)
BODY MASS INDEX (kg/m2)	22.22±3.09 (17.40-26.60)	22.89±2.83 (19.80-29)	21.67±2.61 (16.80-24.8)	21.67±2.35 (17.9-24.5)	22.11±2.67 (16.80-29.0)
WAIST-HIP RATIO	0.89±0.56 (0.79-0.98)	0.89±0.04 (0.85-0.99)	0.88±0.04 (0.79-0.94)	0.87±0.045 (0.79-0.94)	0.88±0.05 (0.79-0.99)

*** Figures in ( ) parentheses represent range**

Table 1. revealed that mean body weight of all team game male players was 67.45±9.78 kg. Volleyball (66.16 ±10.61 kg) and hockey (66.02±8.49 kg) players had comparable mean body weights but lower than mean body weight of handball players (69.87±10.02 kg) and basketball players (67.75±10.92 kg). The mean height of all players was 174.45±6.02 cm and no significant differences among groups were observed with respect to any anthropometric variable studied.

The mean BMI value of all team game players was 22.11±2.67 kg/m^2. Mean BMI values of volleyball (22.22±3.09) and handball (22.89±2.83) players were almost similar and slightly higher than the values of hockey (21.67±2.61) and basketball (21.67±2.35) players. The mean Waist to hip ratio (WHR) value for all groups was 0.88±0.06.

FIGURE - 1
MEAN BODY WEIGHTS AND MEAN HEIGHTS OF MALE PLAYERS OF TEAM GAMES STUDIED

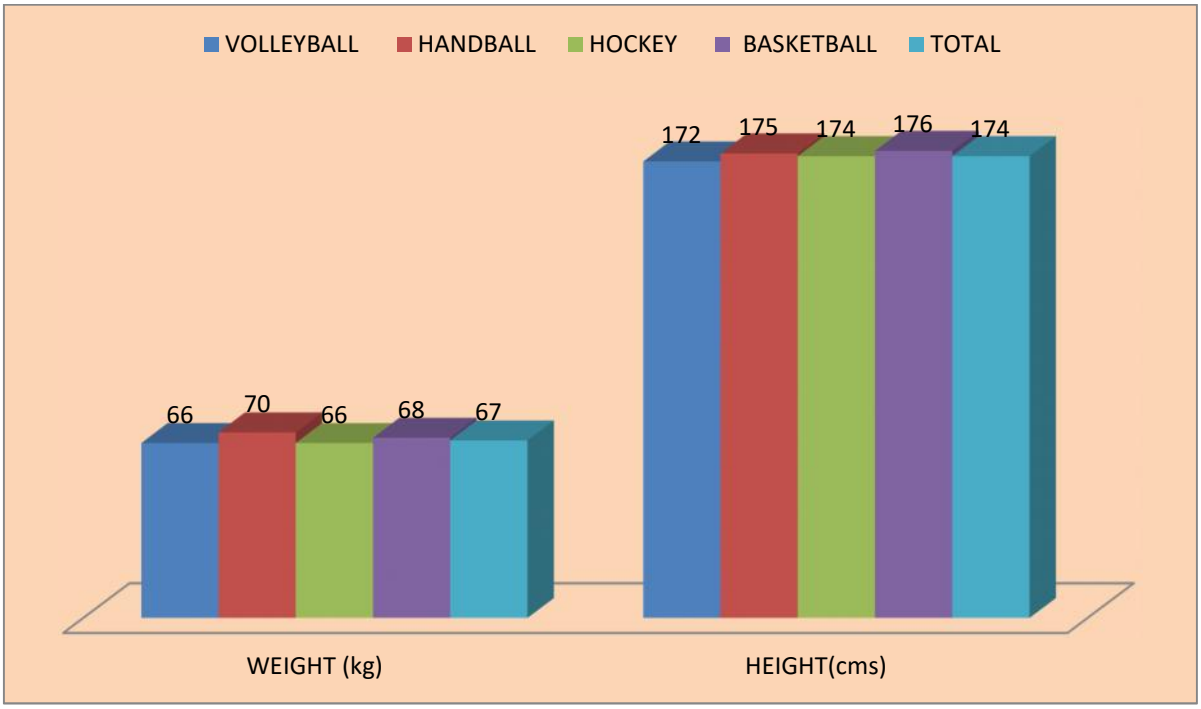


TABLE - II
DISTRIBUTION OF MALE TEAM GAME PLAYERS ACCORDING TO BODY MASS INDEX (kg/m^2) CLASSIFICATION FOR ASIANS

CLASSIFICATION	VOLLEYBALL (n=10)	HANDBALL (n=10)	HOCKEY (n=10)	BASKETBALL (n=10)	TOTAL (n=40)
Below18.5 Underweight	1(10%)	0	2(20%)	1(10%)	4(10%)
18.5 – 22.9 Normal	6(60%)	5(50%)	5(50%)	5(50%)	21(52.5%)
23.0-24.9 Overweight	0	4(40%)	3(30%)	4(40%)	11(27.5%)
Above 25 Obese	3(30%)	1(10%)	0	0	4(10%)
32.5-35.0 Moderate Obesity	0	0	0	0	0
Above 35.0 Morbid Obesity	0	0	0	0	0

Distribution according to BMI classification presented in table - II , highest percentage (52.5%) of these players were placed in normal category followed by 27.5% in overweight category. Underweight and obese category also had 10% of total players respectively.

TABLE-III:
BODY COMPOSITION OF MALE TEAM GAME PLAYERS

VARIABLES	VOLLEYBALL (n=10)	HANDBALL (n=10)	HOCKEY (n=10)	BASKETBALL (n=10)	TOTAL (n=40)
FAT FREE MASS (KG)	51.82±7.30 (40.4-59.9)	56.51±6.03 (47.2-64.8)	53.18±4.88 (45.1-61.6)	54.37±6.15 (46.1-66.5)	53.97±6.16 (40.4-66.5)
FAT (KG)	14.14±4.30 (7.7-21.6)	14.380±4.46 (9.3-23.5)	12.80±4.14 (6.1-19.7)	13.35±5.47 (5.7-21.4)	13.67±4.49 (5.7-23.5)
MUSCLE MASS (KG)	48.46±6.93 (37.6-56.1)	51.96±5.72 (44.1-60.8)	49.74±4.58 (42.1-57.5)	50.91±5.8 (43-62.4)	50.268±5.75 (37.6-62.4)
BONE (KG)	3.35±0.39 (2.74-3.78)	3.54±0.32 (3.10-4.05)	3.42±0.26 (2.99-3.88)	3.49±0.33 (3.04-4.14)	3.45±0.33 (2.74-4.14)
PROTEIN (KG)	10.67±1.51 (8-12)	11.44±1.27 (10-13)	10.95±1.005 (9-13)	11.24±1.35 (10-14)	11.11±1.292 (8-14)
BODY FAT (%)	21.08±3.92 (14.5-26.5)	20.23±3.61 (15.5-27.1)	19.05±4.19 (10.8-24.3)	19.04±5.4 (10.7-27.8)	19.85±4.28 (10.7-27.8)

*** Figures in ( ) parentheses represent range**

Table -III describes the body composition profile of male team game players. No significant differences were observed in any of the body composition components among male team game players. The mean Fat Free Mass (FFM) was 53.97±6.16 kg and mean Body Fat Percent (BF%) was 19.85±4.28. The lowest mean FFM (51.82±7.30 kg) was observed in Volleyball players and highest mean FFM (56.51±6.03 kg) in handball players. Mean body fat% values of basketball players (19.04±5.4 %) and hockey players (19.04±5.4 %) were comparable and lower than the volleyball players (21.08±3.92 %) and handball players (20.23±3.61%).

TABLE 5
ANALYSIS OF VARIANCE (ANOVA) OF ANTHROPOMETRIC AND BODY COMPOSIITION VARIABLES

Variable	F	Sig.
Weight (kg)	0.236	0.870
Height (cms)	0.704	0.556
Body mass index	0.466	0.708
Waist hip ratio	1.205	0.322
Fat free mass (kg)	1.029	0.391
Fat (kg)	0.177	0.911
Muscle mass(kg)	0.819	0.492
Bone (kg)	0.803	0.500
Body fat (%)	0.557	0.647
Protein (kg)	1.096	0.363

FIGIURE - 2
MEAN FAT FREE MASS (kg) AND BODY FAT% OF MALE PLAYERS OF DIFFERENT TEAM GAMES STUDIED

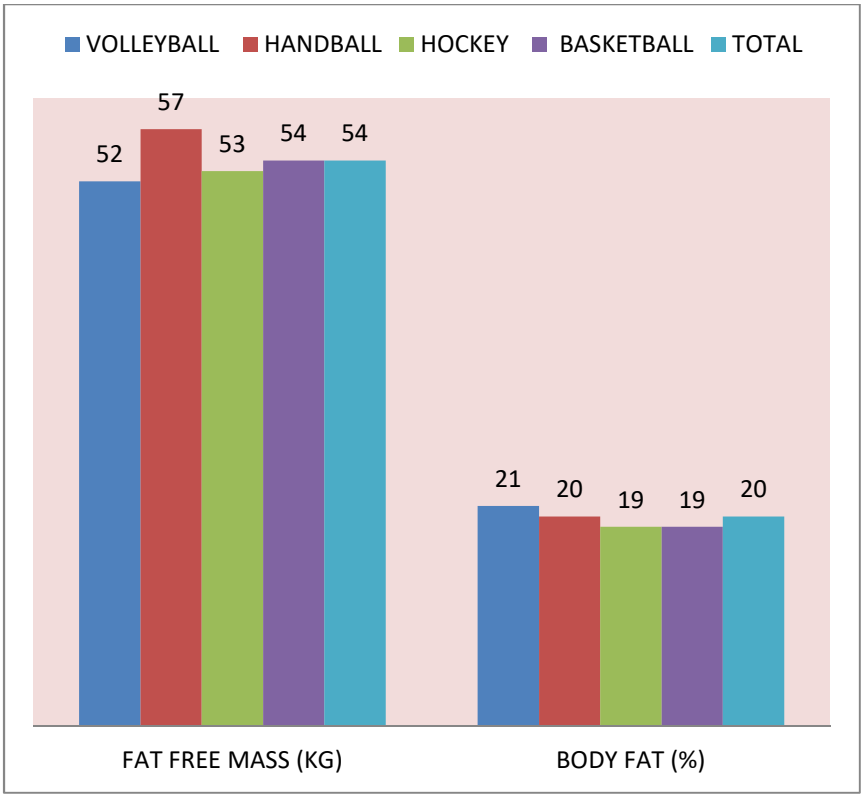
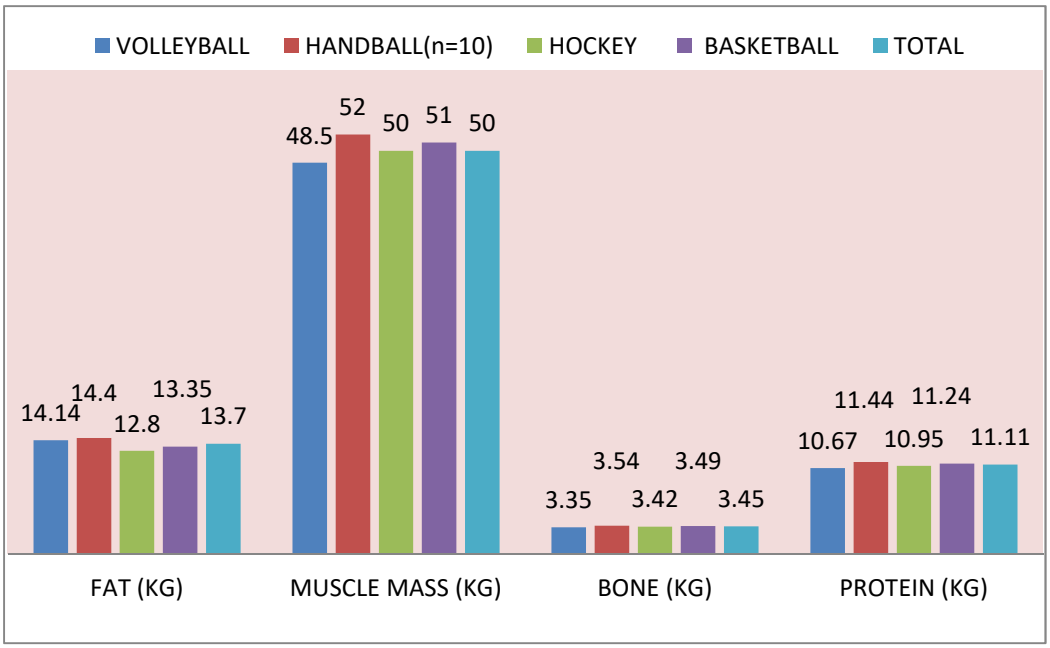


FIGURE - 3
MEAN FAT (kg), MUSCLE MASS (kg), BONE (kg) AND PROTEIN (kg) OF DIFFERENT TEAM GAMES STUDIED



DISCUSSION ON FINDING

Specific anthropometric characteristics are essential for various sports and body composition parameters also play an important role in determining the performance at any level. In this study anthropometric and body composition status of University level male team game players was studied. It was found that basketball players were the tallest in all team games studied and volleyball players were the shortest. Height is an advantage in both basketball as well as volleyball games. Hence, it should be considered at the level of selection of players and can add to the performance of athletes. Ghobadi et al (2013) compared the Anthropometry of World-Class Elite Handball Players According to the Playing Position From Men's Handball World Championship 2013 and reported Asians having mean height of 185.30±5.62, mean weight 87.70±9.47 and mean BMI of 25.52±2.34. In this study, mean height, mean body weight, and therefore, BMI of handball players as well as of other team game players, were less than reported by Ghobadi et al (2013). However, the mean BMI value of all team game players in the present study was 22.11±2.67 kg/m^2 which according to BMI classification for Asians was normal (WHO, 2000). The mean BMI values of volleyball (22.22±3.09) and handball (22.89±2.83) players were almost similar and slightly higher than the values of hockey (21.67±2.61) and basketball (21.67±2.35) players. Distribution according to BMI classification , showed highest percentage (52.5%) of these players in normal category followed by 27.5% in overweight category. Underweight and obese category also had 10% of total players respectively. In athletes, particularly in males with higher muscle mass BMI has inherent limitation of categorizing them in overweight or obese category of its classification. Hence, body composition of players should be monitored to ascertain the level of muscle mass and fat mass. The region of fat accumulation in the body is a determinant of health risks. More fat in abdominal region is not only indicative of associated health problems but also may affect the performance of athletes. Although mean Waist to hip ratio (WHR) value for all groups was normal (0.88±0.06) and less than the cut-off for WHR (0.90) as suggested by WHO (2011) however, distribution of subjects according to cut-offs for normal values, 30% of the total male team game players had WHR above normal.

Generally for male team game players desired BF% is 6-12% (Jeukendrup and Gleeson, 2010). In the present study, the body fat % of all the team studied was much higher than the desired percentage. Even for non-player men, the normal range of body fat percentage is 8-21%, but in the present study, most of the players had mean body fat percent (19.85±4.28) on the higher value of the normal range or above that. In a study by Berdejo-del-Fresno (2012) the body fat % was also reported to be 19.01±2.34 in elite basketball players of England which was closer to the value of mean BF% reported in the present study. Ramos-Campo et al (2014) revealed that basket ball players had BF% 12.93±4.26 and skeletal muscle mass (kg) was 56.19±7.29 kg. The mean Fat Free Mass (FFM) in the present study was 53.97±6.16 kg. Higher Fat Free Mass or Muscle Mass is associated with higher strength and aerobic power.

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CONCLUSIONS

Hence the training should be directed towards increasing muscle mass and reducing fat mass as body composition is a variable that can be modified by training and diet (Ramos-Campo et al, 2014). Thus, body composition needs to be regularly monitored in order to make necessary dietary alterations, plan supplementation strategies and also assessing the right training workload.

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