



Comparison of Body Composition Among the Selected Groups of Female Kabaddi Players

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Resumen

Introducción: El objetivo del presente estudio fue conocer la Composición Corporal de las jugadoras de Kabaddi. También fue comparar las características de composición corporal entre los grupos de jugadoras de Kabaddi.

Métodos: Un total de 101 jugadoras de Kabaddi de nivel nacional y universitario fueron seleccionadas como sujetos para el estudio. La mayoría de ellos eran jugadores de nivel nacional y muy pocos eran jugadores de nivel universitario, el rango de edad de los sujetos fue de 18 años a 25 años. Los sujetos fueron tomados de la Zona Este de la India. Los sujetos tenían experiencia en Kabaddi competitivo durante 10-12 años y también estaban activos jugando Kabaddi. Después de observar la posición de juego de cada sujeto, la vista del sujeto y la preocupación del entrenador, se dividieron en tres grupos Raider, Defender y All-rounder. La Composición Corporal se consideró como IMC, Densidad Corporal, % de Grasa Corporal, Grasa Corporal Total y Masa Corporal Magra. Se calcularon la Media, la Desviación Estándar, el Porcentaje y el ANOVA de una vía para diferenciar entre los grupos. **Resultados:** El resultado concluyó que el IMC de todas las jugadoras de Kabaddi estaba en el rango normal. El porcentaje de grasa corporal de las jugadoras de Kabaddi raider, defender y all-rounder fue del 23,34 %, 24,7 % y 23,8 %, respectivamente. La masa corporal magra de las jugadoras de kabaddi raider, defender y all-rounder fue de 42,94 kg, 42,05 kg y 42,82 kg, respectivamente. **Conclusiones:** Por último, no hubo diferencias significativas entre los diferentes grupos en las características de composición corporal de las jugadoras de kabaddi.

Palabras Clave: Composición Corporal, IMC, Densidad Corporal, % de Grasa Corporal, Masa Corporal Magra

Abstract

Introduction: The aim of the present study was to find out the Body Composition of female Kabaddi players, It was also to compare the body composition characteristics among the groups of female kabaddi players. **Method:** A total of 101 national and University-level female Kabaddi players were selected as subjects for the study. Most of them were national-level players and very few were university-level players, the age range of the subjects was 18 years to 25 years. The subjects were taken from the East Zone of India. The subjects had experience in competitive Kabaddi for 10-12 years and also they were active in playing Kabaddi. After observing each subject's playing position, subject's view, and coach's concern, they were divided into three groups Raider, Defender, and All-rounder. The Body Composition was considered as BMI, Body Density, % of Body Fat, Total Body Fat, and Lean Body Mass. Mean, Standard Deviation, Percentage, and One-Way ANOVA were calculated to differentiate among the groups. **Result:** The result concluded that the BMI of all female Kabaddi players was in the normal range. The Body Fat Percentage of female raider, defender and all-rounder Kabaddi players were 23.34 %, 24.7 %, and 23.8 % respectively. Lean Body Mass of female raider, defender, and all-rounder kabaddi players were 42.94 kg, 42.05 kg, and 42.82 kg respectively. **Conclusion:** Lastly, there were no significant differences among the different groups in the body composition characteristics of female kabaddi players.

Keywords: Body Composition, BMI, Body Density, % of Body Fat, Lean Body Mass.

Introduction

In modern sports, successful performance is determined by number of factors. For optimum performance at elite level, variety of areas must be addressed. Further, Kabaddi is the game where size, shape and body composition play an important part in providing distinct advantage for specific playing positions. These include the skill level, flexibility, endurance and most importantly the specific use of anthropometric measurements which plays a vital role in complex team based games. Since success in the game depends among other things, on how the individual characteristics of some players fit into the whole, thus creating a coherent team. Kabaddi is one of the complex technical team based game and performance differences between players of varying ability levels are different.

In performance and high performance sport, a great importance is given to the physical condition. It is in fact the preoccupation for the adaptation of the sportsman's body to growing physical and mental efforts, to which all the parts of the human body participate. The contemporary Kabaddi game, characterized by high intensity motor activities, places upon players a wide spectrum of requirements on all their capabilities. One can hardly single out any ability or a characteristic which is not engaged in the performance of Kabaddi players. Basic and specific motor abilities and cardio-respiratory capacities, such as explosive strength, required at the centre line. As well as agility and speed which indispensable for the efficient solving of game situations. A high level of aerobic capacity ensures the slower onset of fatigue and a fast recovery, whereas anaerobic capacity is responsible for endurance in high intensity repetitive activities (Devaraju and Needhiraja, 2013).

Team Kabaddi is a complex intermittent game, which requires players to have well developed aerobic and anaerobic capacities. Motor ability, sprinting, jumping, flexibility and throwing velocity represent physical activities that are considered as important aspects of the game and contribute to the high performance of the team. Successful performance requires explosive power of the legs and arms, sprint velocity (Shibili and Nasreen, 2014).

The specific characteristic of Kabaddi demands from players an effective participation in activities that need a good aerobic and anaerobic response. However, some authors report that Kabaddi is a sport that demands predominantly the motor capacities that depend on the anaerobic metabolism. Thus, it seems reasonable to affirm that the motor capacities strength & velocity and their ways of manifestation are crucial, since the technical and tactical capacities can be consistently superior when the Kabaddi players present high levels of adaptation of the anaerobic metabolism.

Kabaddi is an endurance game. Without endurance the player cannot perform well, in the same time the player's need all the characteristics i.e. speed, agility, flexibility etcetera. Nowadays most of the players having good height can perform well in the game situation. Without physical characteristics players cannot achieve the aim of the game, so physical characteristics is very essential for the better performance in Kabaddi. Here, the investigation took place on crucial physiological factors in Kabaddi as Body Composition (Rao, 2002).

So, the purpose of the study was to find out the Body Composition of female kabaddi players. Also it was to compare the body composition characteristics among the groups of female kabaddi players.

Material and Methods

A total of 101 national and university-level Kabaddi players were selected as subject for the study. Most of them were national level and very few were university-level players, the age range of the subjects was 18 years to 25 years, and those who volunteered to take part as the subjects for the study. The subjects were taken from the East-Zone of India. The players had experience in competitive kabaddi for 10-12 years and also they were active in playing kabaddi. After observing each subject's playing position and also taking subject's view, coach's concern, they were divided into three groups Raider, Defender and All-rounder.

Anthropometric Measurements

All the measurements had been done by following the standard methods described by The International Society for Advancement of Kinanthropometry (ISAK manual 2011).

The Body Composition was considered as BMI, Body Density and % Body Fat, Total Body Fat, and Lean Body Mass (Adhikari and McNeely 2015). The formulae used for finding the Body Composition are as follows:

- i. Calculation of Body Density for Female:

For 16 to 19 years age group:

Body Density (gm/cc) = $1.1549 - 0.0678 (X)$ (Durnin and Womersley 1974)

For 20 to 29 years age group:

Body Density (gm/cc) = $1.1599 - 0.0717 (X)$ (Durnin and Womersley 1974)

Where $X = \log(\text{biceps} + \text{triceps} + \text{Subscapular} + \text{suprailliac})$.

(The suprailliac name has been changed to suprasspinale to distinguish it from other skinfolds called "suprailliac", but taken at different locations.) (Carter and Heath 1990)

- ii. % of Body Fat = $[4.95 / \text{body density} - 4.5] \times 100$ (Siri, 1956)
- iii. Total Body Fat (kg) = $(\% \text{body fat} / 100) \times \text{body mass (kg)}$
- iv. Lean Body Mass (kg) = $\text{body mass (kg)} - \text{total body fat (kg)}$
- v. $\text{BMI} = \text{Kg per sq.m.}$

The scores were statistically analyzed in terms of Mean and Standard Deviation, Percentage, One-Way ANOVA, (By SPSS.22) as the measures of central tendency and variability and comparison respectively. Analysis of Variance (By SPSS.22) was calculated to differentiate among the groups. Tables and graphs were drawn out showing the results of the study. Discussions on results were done in the light of related literature and various theoretical frameworks.

Results

The analyzed data have been elaborated and presented one by one for better understanding. The mean value of Body Composition of female kabaddi players have been presented in Table 1.

Table 1. Mean value of Body Composition of female kabaddi players

Kabaddi Players (Female)	Body Composition				
	BMI (Kg/sq.m)	Body Density (gm/cc)	Body Fat %	Total Body Fat(kg)	Lean Body Mass(kg)
	22.81	1.05	23.85	13.54	42.60

Table 1 shows the result of body composition shows that the BMI level- 22.81kg/sq.m., Body density- 1.05gm/cc, Body Fat %- 23.85, Total Body fat- 13.54 kg and Lean Body Mass- 42.10kg.

Table 2. Mean and S.D. of Body Mass Index of Different Female Kabaddi Groups

BMI (Kg/sq.m)					
Raider		Defender		All-rounder	
Mean	S.D.	Mean	S.D.	Mean	S.D.
22.52	±3.02	23.23	±3.58	22.59	±3.31

Table 2 shows the mean and standard deviation value of body mass index of different female kabaddi groups. The mean and S.D. of body mass index of raider, defender and all-rounder were 22.52 ± 3.02 , 23.23 ± 3.58 and 22.59 ± 3.31 respectively.

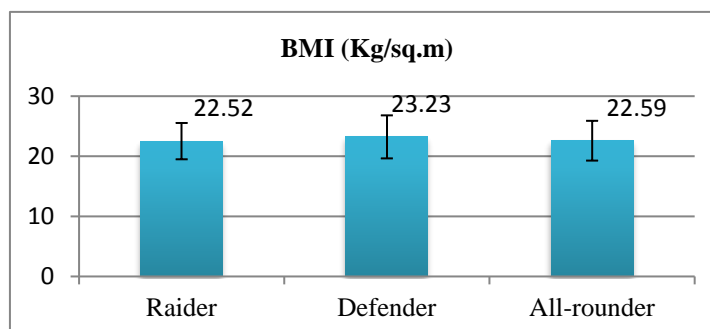
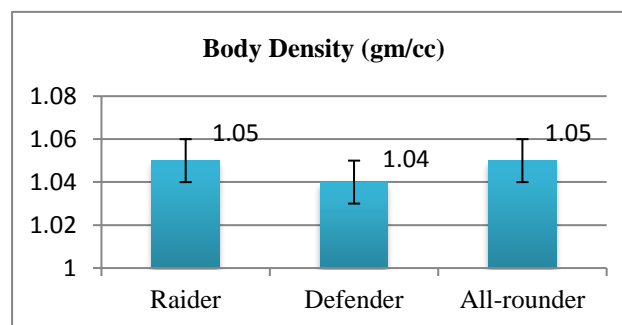


Figure 1. Graphical presentation of Mean and S.D. of Body Mass Index of different female kabaddi groups

Table 3. Mean and S.D. of Body Density of different female Kabaddi groups

Body Density (gm/cc)					
Raider		Defender		All-rounder	
Mean	S.D.	Mean	S.D.	Mean	S.D.
1.05	±0.01	1.04	±0.01	1.05	±0.01

Table 3. shows the mean and standard deviation value of body density of different female kabaddi groups. The mean and S.D. of body density of raider, defender and all-rounder were 1.05 ± 0.01 , 1.0 ± 0.01 and 1.05 ± 0.01 respectively.

**Figure 2.** Graphical presentation of Mean and S.D. of Body Density of different female Kabaddi Groups**Table 4.** Mean and S.D. of Body Fat Percentage of different female kabaddi groups

Body Fat %					
Raider		Defender		All-rounder	
Mean	S.D.	Mean	S.D.	Mean	S.D.
23.34	±3.74	24.7	±4.87	23.38	±4.62

Table 4 shows the mean and standard deviation value of body fat percentage of different female kabaddi groups. The mean and S.D. of body fat percentage of raider, defender and all-rounder were 23.34 ± 3.74 , 24.7 ± 4.87 and 23.38 ± 4.62 respectively.

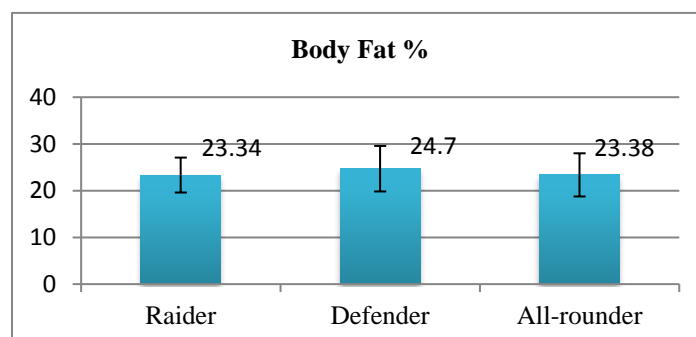
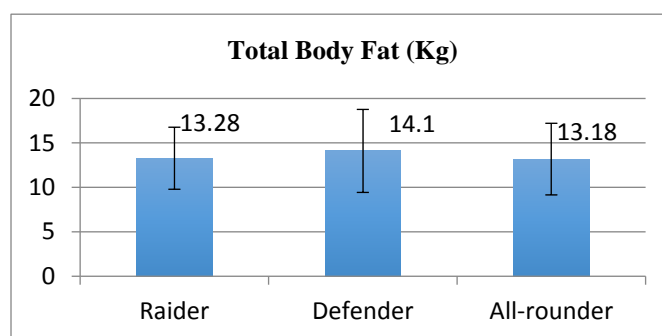
**Figure 3.** Graphical presentation of Mean and S.D. of Body Fat Percentage of different female Kabaddi group

Table 5 shows the mean and standard deviation value of total body fat of different female kabaddi groups. The mean and S.D. of total body fat of raider, defender and all-rounder were 13.28 ± 3.49 , 14.10 ± 4.67 and 13.18 ± 4.03 respectively.

Table 5. Mean and S.D. of Total Body Fat of different female kabaddi groups

Total Body Fat (Kg)					
Raider		Defender		All-rounder	
Mean	S.D.	Mean	S.D.	Mean	S.D.
13.28	±3.49	14.10	±4.67	13.18	±4.03

**Figure 4.** Graphical presentation of Mean and S.D. of Total Body Fat of different female Kabaddi Groups**Table 6.** Mean and S.D. of Lean Body Mass of different female Kabaddi groups

Lean Body Mass (Kg)					
Raider		Defender		All-rounder	
Mean	S.D.	Mean	S.D.	Mean	S.D.
42.94	±4.23	42.05	±5.55	42.82	±4.41

Table 6 shows the mean and standard deviation value of lean body mass of different female kabaddi groups. The mean and S.D. of lean body mass of raider, defender and all-rounder were 42.94 ± 4.23 , 42.05 ± 5.55 and 42.82 ± 4.41 respectively.

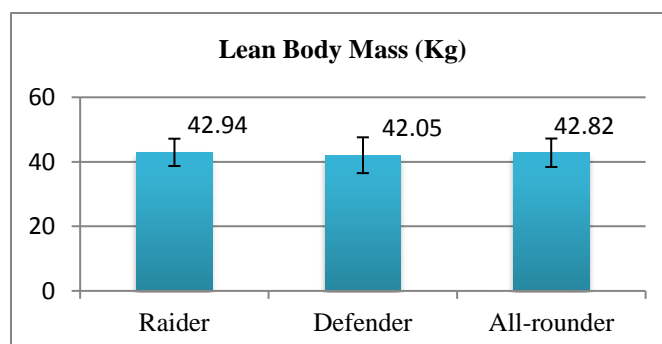
**Figure 5.** Graphical presentation of Mean and S.D. of Lean Body Mass of different female Kabaddi groups

Table 7 shows that in respect of Height, Weight, BMI, Body Density, Body Fat %, Total Body Fat and Lean Body Mass, the F-ratios were found 1.812, 0.001, 0.442, 1.012, 1.015, 0.481 and 0.339 respectively. On the other hand, the 'p' values were found 0.169, 0.99, 0.644, 0.367, 0.366, 0.620 and 0.713 respectively which were not significant at 0.05 level of confidence. So, the result indicates that there were no significant differences among the different groups in body composition characteristics of female kabaddi players.

Table 7. ANOVA of Height, Weight and Body Composition among the different groups of female Kabaddi players

Variable	Source of Variance	Sum Squares	Df	Mean Square	F- ratio	Sig.
Height	Between Groups	134.771	2	67.385	1.812	0.169 ^{NS}
	Within Groups	3643.982	98	37.183		
	Total	3778.752	100			
Weight	Between Groups	0.090	2	0.045	0.001	0.99 ^{NS}
	Within Groups	6365.189	98	64.951		
	Total	6365.278	100			
BMI	Between Groups	9.891	2	4.945	0.442	0.644 ^{NS}
	Within Groups	1097.470	98	11.199		
	Total	1107.361	100			
Body Density (gm/cc)	Between Groups	0.000	2	0.000	1.012	0.367 ^{NS}
	Within Groups	0.010	98	0.000		
	Total	0.010	100			
Body Fat %	Between Groups	41.600	2	20.800	1.015	0.366 ^{NS}
	Within Groups	2007.896	98	20.489		
	Total	2049.496	100			
Total Body Fat (Kg.)	Between Groups	16.660	2	8.330	0.481	0.620 ^{NS}
	Within Groups	1698.395	98	17.331		
	Total	1715.055	100			
Lean Body Mass	Between Groups	15.764	2	7.882	0.339	0.713 ^{NS}
	Within Groups	2278.599	98	23.251		
	Total	2294.363	100			

NS Not Significant at 0.05 level of confidence.

Discussion

The aim of the study was to find out the Body Composition of female kabaddi players. Also, it was to compare the body composition characteristics among the groups of female kabaddi players. The BMI of all female kabaddi players was found 22.81Kg/sq.m (Table 1.) which means normal weight (according to WHO), the BMI of female raider, defender and all-rounder kabaddi players were found 22.52 Kg/sq.m, 23.23 Kg/sq.m and 22.59 Kg/sq.m (Figure 1.) respectively, which means normal weight, Body Density of all female kabaddi players was found 1.05 gm/cc (Table 1.), Body Density of female raider, defender and all-rounder kabaddi players were found 1.05 gm/cc, 1.04 gm/cc and 1.05 gm/cc (Figure 2.) respectively, Body Fat Percentage of all female kabaddi players was found 23.85% (Table 1.), Body Fat Percentage of female raider, defender and all-rounder kabaddi players were found 23.34 %, 24.7 % and 23.8 % (Figure 3.) respectively, Total Body Fat of all female kabaddi players was found 13.54 kg (Table 1.), Total Body Fat of female raider, defender and all-rounder kabaddi players were found 13.28 kg, 14.10kg and 13.18 kg (Figure 4.) respectively, Lean Body Mass of all female kabaddi players was found 42.60 kg (Table 1.), Lean Body Mass of female raider, defender and all-rounder kabaddi players were found 42.94 kg, 42.05 kg and 42.82 kg (Figure 5.) respectively. It was also found that there were no significant differences (Table 7.) among the different groups in body composition characteristics of female kabaddi players.

Conclusion

- The BMI of all female kabaddi players was in normal weight.
- Body Fat Percentage of female raider, defender and all-rounder kabaddi players were 23.34 %, 24.7 % and 23.8 % respectively.
- Lean Body Mass of female raider, defender and all-rounder kabaddi players were 42.94 kg, 42.05 kg and 42.82 kg respectively.
- There were no significant differences among the different groups in body composition characteristics of female kabaddi players.

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Conflicts of Interest

The Authors declares no potential conflicts of interest in connection with this research.

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