Anthropometry and Physical Features of Bangladeshi Women National Level Kho-Kho and Football Players: A Frank Comparison

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DOI: https://doi.org/10.34256/ijk2416
Received: 10-02-2024; Revised: 28-03-2024; Accepted: 06-04-2024; Published: 30-04-2024

Resumen

Introducción: En Bangladesh, el fútbol es el juego de pelota más popular, pero el Kho-Kho no es tan popular como el fútbol. Kho-Kho es un juego popular en la India, pero día a día se está volviendo popular en Bangladesh. En estos dos juegos se utilizan grupos de músculos principales porque ambos implican correr, conducir, saltar, balancearse y movimientos de las manos. Métodos: En el presente estudio se estudiaron cuarenta jugadoras de fútbol de nivel nacional y cuarenta jugadoras de Kho-Kho de nivel nacional. La edad promedio es de 14 a 21 años y la edad de formación es de 2 a 6 años. Todas las medidas antropométricas y de masa corporal se realizaron con las pautas adecuadas. Resultados: La longitud media de las piernas de las jugadoras de Kho-Kho es de 89,14 (±4,44 cm) y la de las jugadoras de fútbol es de 86,92 (±8,91) cm. La longitud media de las piernas de las jugadoras de Kho-Kho es 2,22 cm más alta que la longitud media de las piernas de las jugadoras de fútbol, lo cual es estadísticamente significativo. También existe una diferencia significativa (p ≤0,05) cuando se compara el IMC promedio. El porcentaje de grasa promedio de las futbolistas es ligeramente mayor que el porcentaje de grasa promedio de las jugadoras de Kho-Kho, donde el porcentaje de grasa promedio de las jugadoras de fútbol es 22,09 ±4,05 y el de las jugadoras de Kho-Kho es 22,01 ±4,01. Conclusión: Los bangladéses Las jugadoras de Kho-Kho a nivel nacional tienen mejores físicos que las jugadoras de fútbol nacionales, mientras que la composición corporal de ambos grupos es muy similar.

Palabras Clave: Antropometría, Porcentaje de grasa, Comparación corporal, Jugadoras de fútbol, Jugadoras de Kho-Kho.

Abstract

Introduction: In Bangladesh Football is the most popular ball game but Kho-Kho is not that popular like Football. Kho-Kho is a popular Game in India but day by day it is becoming popular in Bangladesh. Major muscle groups are used in these two games because both games involve running, driving, jumping, swinging, and hand motions. Methods: Forty national-level women Football players and forty national-level women Kho-Kho players were studied in the present study. The average age is between 14 to 21 years and the training age is between 2 to 6 years. All the anthropometric measurements and body mass were carried out with proper guidelines. Results: The average leg length for Female Kho-Kho players is 89.14 (±4.44 cm) and that of Female Football players is 86.92 (±8.91) cm. The average leg length of women Kho-Kho players is 2.22 cm higher than the average leg length of women Football players which is statistically significant. There is also a significant difference (p ≤0.05) when average BMI is compared. The average fat percentage of Women Footballers is slightly higher than the average Fat % of women Kho-Kho players where the average fat percentage of women football players is 22.09 % ±4.05 and that of Kho-Kho players is 22.01 ±4.01. Conclusion: The Bangladeshi national-level women Kho-Kho players have better physiques than the national women Football players whereas the body composition of both groups is very close.

Keywords: Anthropometry, Fat percentage, Body Comparison, Women Football Players, Women Kho-Kho Players
Introducción

Bangladesh es un país de Asia Suroriental que se encuentra en el Golfo de Bengala. Actualmente, el fútbol (o Soccer) es el juego más popular en el mundo. El fútbol es el juego de pelota más popular en Bangladesh. El antiguo deporte indio de "Kho-Kho" ganó popularidad en Bangladesh después del 12º Juego del Asia del Sur y la Copa Asia Kho-Kho. Kho Kho es un deporte extremadamente complicado y táctico (Jaiswal, 2014). Los grupos musculares principales se utilizan en los dos juegos debido a que implican mucho correr, conducir, saltar y mover los movimientos de la mano (Kavanashri et al., 2023). Los jugadores deben estar en condiciones físicas óptimas, especialmente en términos de su habilidad para correr, moverse rápidamente y utilizar potencia explosiva (Shukla et al., 2023).

El cuerpo humano es el objeto de estudio más estudiado de la ciencia (Harris et al., 2002; Arafat et al., 2023). Según un reciente estudio, los científicos del deporte del mundo entero están poniendo mayor atención en determinar las habilidades de un jugador, sus capacidades y débiles, y en la creación de los mejores planes de entrenamiento de los atletas (Hadzic et al., 2012). La Fisiología, Bioquímica, Medicina, Biomecánica, Antropometría, Sociología y Psicología son ejemplos de ciencias del deporte reconocidas que han sido mejoradas, investigadas y utilizadas en los deportes competitivos (Weinberg & Gould, 2007). Las anteriores investigaciones intentaron encontrar una relación entre el tipo del cuerpo y la composición corporal y el nivel de rendimiento (Bhatnagar et al., 1984; Bayios, 2006; Artioli et al., 2009; Hagberg et al., 2010; Kim et al., 2011). El éxito en los deportes ha sido asociado con características antropométricas específicas, composición corporal y somatotipo (Heath & Carter, 1990; Duquet & Carter, 2001).

El método más utilizado para evaluar la composición corporal tanto general como entre los atletas es la antropometría (Pavlovic et al., 2021). Las características antropométricas (AC) definen las dimensiones del cuerpo humano y esqueleto (peso corporal, altura, medición de grasa de la piel, circunferencia del cuerpo y diferentes diámetros del cuerpo) permitiendo una predicción individual o combinada de la composición corporal, contenido energético, grasa regional, masa corporal y masa grasa (Molla, 2017). La antropometría es la ciencia de obtener medidas sistemáticas del tamaño del cuerpo humano, forma y proporciones. Algunos investigadores han señalado que algunas características antropométricas y composición corporal están asociadas con el rendimiento en los deportes de élite (Knechtle et al., 2008; Arrese et al., 2006).

En Bangladesh es un país de ingresos bajos, por lo que la presente investigación contribuye a indicar las características antropométricas de las jugadoras de fútbol y Kho-Kho nacionales. La investigación también compara las características antropométricas entre jugadoras de fútbol y jugadoras de Kho-Kho nacionales en Bangladesh. La conocimiento de la presente investigación ayuda a los entrenadores y a los preparadores a preparar a los jugadores para la competición y a hacer programas de entrenamiento superiores.

Materiales y Métodos

Objetivos

Solo ochenta jugadoras de fútbol y jugadoras de Kho-Kho nacionales fueron reclutadas para la presente investigación. Entre ellas, cuarenta (40) eran jugadoras de fútbol nacionales y el resto, cuarenta (40) eran jugadoras de Kho-Kho nacionales de todo el país. Los datos se recopilaron en varios días en varios eventos en varios lugares. La edad promedio estaba entre 14 y 21 años y la edad de entrenamiento entre 2 y 6 años.

Mediciones antropométricas

Todos los mediciones antropométricas y la masa corporal fueron realizadas siguiendo las guías correctas. La masa corporal se midió con una balanza digital, la altura fue medida con un estadiómetro girafa (giraffe-height measuring stand) y la altura sentada se midió con el cuerpo en contacto con el estadiómetro girafa. El brazo y la pierna fueron medidas con un cinta medidora no estirable con una precisión de 0.1 cm. La grasa de la piel se midió con calipers de la piel con una precisión de 0.2 mm.

Compensación corporal

Solo dos componentes (grasa y masa libre de grasa) se midieron para la composición corporal de los participantes por medición de grasa de la piel.

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Calculations

a. Body Mass Index (BMI): Calculated using the equation given by Garrow & Webster, considering the body mass and height (Kavanashri et al., 2023).

\[ \text{BMI (kg/m}^2\text{) = Body mass (Kg) / Height (m}^2\text{)} \]

b. Body Surface Area (BSA): Du Bois & Du Bois equation was used which is based on the measured values of body mass and height (Kavanashri et al., 2023).

\[ \text{BSA} = 0.007186 \times \text{Body mass}^{0.425} \times \text{Height}^{0.725} \]

c. Body density (Db) (Db) = c - m \times \log \text{of sum of skinfolds (Triceps+ Biceps+ Subscapular+ Supraspinale)}

Where, the c and m values differ with the age and gender of the individual (Kavanashri et al., 2023).

d. Percent Body Fat (PBF)

\[ \text{PBF} = \left(\frac{4.95}{\text{Db}} - 4.5\right) \times 100 \]

(Where Db is Body density) (Kavanashri et al., 2023).

e. The fat mass and Fat free mass (FFM) was then obtained using the following equations:

\[ \text{Fat mass (kg)} = \left(\frac{\text{Body mass}}{100}\right) \times \text{Percent body fat} \]

\[ \text{FFM (kg)} = \text{Body mass} - \text{Fat mass (kg)} \]

(Where Db is Body density) (Kavanashri et al., 2023).

Results

**Table 1. Anthropometric Measurement of two group players**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Kho-Kho Players (N=40)</th>
<th>Football Players (N=40)</th>
<th>‘T’ Value</th>
<th>Mean difference</th>
<th>SE</th>
<th>‘P’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>18.86 ±4.07</td>
<td>17.82 ±3.63</td>
<td>1.16</td>
<td>1.04</td>
<td>0.86</td>
<td>0.25</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>153.90 ±4.69</td>
<td>153.00 ±6.05</td>
<td>0.74</td>
<td>0.9</td>
<td>1.21</td>
<td>0.46</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>48.59 ±3.95</td>
<td>48.50 ±3.67</td>
<td>0.11</td>
<td>0.09</td>
<td>0.85</td>
<td>0.92</td>
</tr>
<tr>
<td>Arm Length (cm)</td>
<td>69.19 ±2.83</td>
<td>68.94 ±2.57</td>
<td>0.41</td>
<td>0.25</td>
<td>0.60</td>
<td>0.68</td>
</tr>
<tr>
<td>Forearm Length (cm)</td>
<td>38.82 ±2.53</td>
<td>39.97 ±1.27</td>
<td>2.57</td>
<td>1.15</td>
<td>0.45</td>
<td>0.01</td>
</tr>
<tr>
<td>Leg Length (cm)</td>
<td>89.14 ±4.44</td>
<td>86.92 ±8.91</td>
<td>2.12</td>
<td>2.22</td>
<td>1.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Sitting Height (cm)</td>
<td>79.08 ±3.61</td>
<td>79.92 ±2.90</td>
<td>1.15</td>
<td>0.84</td>
<td>0.73</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**The level of significance at P<0.05**

**Table 2. Body composition of two group players**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Kho-Kho Players (N=40)</th>
<th>Football Players (N=40)</th>
<th>‘T’ Value</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>20.50 ±1.75</td>
<td>20.70 ±1.92</td>
<td>0.51</td>
<td>0.41</td>
</tr>
<tr>
<td>BSA (kg/sqm)</td>
<td>1.55 ±0.05</td>
<td>1.55 ±0.06</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>Density (g/m³)</td>
<td>1.01 ±0.02</td>
<td>1.01 ±0.03</td>
<td>0.00</td>
<td>0.006</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>22.01 ±4.01</td>
<td>22.09 ±4.05</td>
<td>0.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Fat (kg)</td>
<td>13.17 ±3.07</td>
<td>13.17 ±3.11</td>
<td>0.00</td>
<td>0.69</td>
</tr>
<tr>
<td>FFM (%)</td>
<td>77.96 ±4.02</td>
<td>77.96 ±4.06</td>
<td>0.00</td>
<td>0.90</td>
</tr>
<tr>
<td>FFM (kg)</td>
<td>46.68 ±3.55</td>
<td>46.45 ±3.92</td>
<td>0.00</td>
<td>0.84</td>
</tr>
</tbody>
</table>

**The level of significance at T<0.05**

In the table number1 average age of national level women kho-kho players is 18.86 ±4.07 years and football players is 17.82 ±3.63 years where mean difference is 1.04 years. In height kho-kho players is 153.90 ±4.69 cm and football players is 153.00 ±6.05 cm where mean difference is 0.74 cm.
players is 153.00 ±6.05 cm where mean difference is 0.9 cm. Average weight for women kho-kho players is 48.59 ±3.95kg and football players is 48.50 ±3.67 kg where mean difference is 0.09 kg. In time of arm length of kho-kho players is 69.19 ±2.83 cm and football players is 68.94 ±2.57 where mean difference is 0.25cm. Average forearm length for women Kho-Kho players is 38.82 ±2.53 cm and football players is 39.97 ±1.27 cm where mean difference is 1.15 cm and football players is greater forearm length than the Kho-Kho players that is statistically significant. In leg length for Kho-Kho players is 89.14 ±4.44 cm and football players is 86.92 ±8.91cm where mean difference 2.22cm and Kho-Kho players is greater leg length than the football players that is statistically significant. Finally sitting height of Kho-Kho players is 79.08 ±3.61cm and Football players is 79.92 ±2.90 cm where mean difference is 0.84 cm.

In the Table number 2 fat percentage of football is little higher than the kho-kho players where fat percentage of football players is 22.09 ±4.05and kho-kho players is 22.01 ±4.01 that is statistically significant. At the same time fat free mass is greater in kho-kho players (46.68 ± 3.55 kg) than the football players is (46.45 ± 3.92 kg) that is statistically significant. In the table number 2, without BMI (kg/m2) all parameters are statistically significant difference in value t<0.05.

Discussion

Football or soccer and kho-kho is a game that requires motor fitness and game related performance. To succeed in elite football and Kho-Kho players require a high level of physical (motor) fitness to cope with the demands of the game and to allow for their technical and tactical skills to be used to their full throughout a match (Arafat et al., 2020). Playing additional games is thought to improve physical fitness, particularly motor fitness. More emphasis is being placed on skill practice and conditioning, as well as the use of other useful tools, to help players improve their physical fitness (Jaiswal, 2014).

Because morphological traits are mostly influenced by genetics, they are the most significant component (Norton &Olds, 2001). An athlete's morphological state, or their body composition and structure, is ascertained by their anthropometric measurements. It is commonly acknowledged that morphology and performance are generally correlated (Jaiswal, 2014). However, a few parameters, such as height, arm length, body fat percentage, and muscle mass variable, seem to indicate a different level of ability.

In the present research clearly shown that kho-kho players are taller than that of football players. A previous results show that kho-kho players were taller as compared to the controls (Jaiswal, 2014). In all age categories, Kho-Kho players are significantly taller than controls in another study, and they also tend to be more ectomorphic (Dhayanithi & Ravikumar, 2002). In this case our present result is fully supported with the pervious study. In present research also find out that total leg length of kho-kho players is greater than the football players that is statistically significant and average forearm length for women Kho-Kho players is lower forearm length than the football players that is statistically significant.

In the time of body composition fat percentage of football players is little higher than the kho-kho players that is statistically significant. At the same time fat free mass is greater in kho-kho players than the football players that is statistically significant (Parizkova, 1977; Burris, 2003). Some previous study clearly concept that body weight, body fat, body mass index, oxygen consumption, cardiac output are closely related with each other and it is major condition of good performance. A researcher concept that total leg length is grater of a Kho-Kho players than the normal or sports person (Parizkova, 1977; Burris, 2003).

In previous a study on international level or develop country female football players clearly report that height159.9 ± 6.4 cm, body mass 56.9 ± 9.6 kg and body fat percentage 22.2 ± 5.6% (Coopoo et al., 2019). The findings show that female football players competing at the international level and in developing nations had superior anthropometric traits than football players competing at the national level in Bangladesh.

In this study result indicate average height is slightly high in Kho-Kho players than the football players, in Kho-Kho players average leg length is better than the football players. But football players forearm length is better than the Kho-Kho players and total arm length in Kho-Kho players is greater than football players. In time of body composition both Kho-Kho and football players all parameters are slightly difference.

There is no financial assistance or involvement from any government or non-government organization in this study. Time and data collection instrument were limiting factor for this study. Only age, height, weight, arm length, forearm length, leg length and sitting height were selected to analyze anthropometric profile. In future research more subject and parameters will be collected for more fruitful analysis and results. In this study suggest to all players and coaches that conscious about physical condition and fitness.
Conclusion

In this study highlights that Bangladeshi nation level women kho-kho players is better physique condition than the national level women football players. Although height, weight, arm length and leg length in national level women kho-kho players is superior to the national level women football players. At the same time sitting height and forearm length of national level women football players is superior to the national level women kho-kho players in Bangladesh. At body composition national level women kho-kho players and national level women football players not highly difference in this research.

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Funding

No funding was received for conducting this study.

Conflicts of Interest

The authors have no conflicts of interest to declare that they are relevant to the content of this article.

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