

DETERMINATION OF FEMUR STATURE RATIO OF THE IJAW AND IKWERRE ETHNIC GROUPS IN NIGERIA

¹H. B. Fawehinmi, ²T. R. Ogoun and ³S. C. Okoseimiema

^{1, 3}Department of Human Anatomy
Faculty of Basic Medical Sciences
University of Port Harcourt, Nigeria.

²Department of Human Anatomy
Faculty of Basic Medical Sciences
University of Port Harcourt, Nigeria.

Corresponding Author: S. C. Okoseimiema (E-Mail:sonnytimi@yahoo.com)

Phone: +234-8055312433.

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ABSTRACT

The average Femur stature ratio of the Ijaw and the Ikwerre ethnic groups in Nigeria was studied. A formula for identification of the height of these ethnic groups from their femur lengths was established. Also, Sexual dimorphisms, ethnic differences or racial differences when comparing our result to works of other authors were examined. One thousand subjects (between the ages of 18-40years) were used for this study from the the following location: University of Port Harcourt, Rivers State, Niger Delta University, Bayelsa State, Choba community, Yenagoa and Amasoma community, Bayelsa State. The morphological measurements were Stature (height) and femur length from which the femur stature ratio was calculated. The mean value of femur stature ratio of the male Ijaws was 25.5 ± 0.72 which was significantly higher than 24.6 ± 0.77 for Ijaw females. The mean value of femur stature ratio of the male Ikwerre's was 23.6 ± 0.99 , while that of their females was 23.2 ± 0.92 . There was no significant difference in the femur stature ratio of the Ikwerre males and females ($P > 0.05$). When these results were compared between these two ethnic groups, there were ethnic differences. Thus, It was concluded that these parameters could be useful to the physical and forensic anthropologist for sex and race identification. Further study should be carried out in other ethnic groups in Nigeria.

Key words: Anthropologists, Femur stature ratio, Ijaw, Ikwerre.

INTRODUCTION

Anthropometry has become a tool for industrial designers who are responsible for determining the amount of leg room needed in an airplane, or the size of student desks in classroom. There are biologically and

statistically significant variations between human populations in body shape (Barry and Maria, 2010). Femur length bears a nearly constant relationship with stature in humans regardless of ethnicity or gender. Earlier study by (Feldesman, 1992) revealed

that, the femur/stature ratio average 26.75% in adult human and the ratio was used to predict stature from femur length and it yielded a remarkably accurate estimate. Human body size and body proportion are interpreted as markers of ethnicity, race, adaptation to temperature, nutritional history and socioeconomic status. In a study carried out by Feldesman and Fountain (1996), it was observed that the Blacks femur/stature ratio was significantly different from those of the Whites and the Asians. The study of Hugo and Cardoso (2009), observed that stature (cadaver length) was consistently underestimated, from a minimum of 2.9 cm to a maximum of 19.3 cm.

Femoral lengths and stature in Plio-Pleistocene hominids, study reports that femoral lengths of 31 Plio-Pleistocene hominids dated between 3.1 and 0.7 million years ago, and uses those lengths to estimate stature by way of the femur-stature ratio reported by (Feldesman et al., 1989). By this method the average female Australopithecus Afarensis is 105 cm and the average male is 151 cm (McHenry, 1991). The respective values are 115 and 138 cm for Australopithecus Africanus. Stature estimation of individuals from extinct human populations is a classic topic in anthropology. The estimations, using regression formulae generated from different reference samples, display different results. This fact is related to inter-population differences in body proportions, which is a phenotypic trait mainly correlated with climatic parameters (Trotter and Gleser, 1958).

Cardoso, (2009) suggested that stature estimation methods are not universally applicable and that environmental differences within a population (e.g.,

socioeconomic status differences) or differing levels of modernization and social and economic development between nations are an important source of variation in stature and body proportions of children. Daniel et al. (2011) carried out a study on the relationship between armspan and stature in Nigerian adults in Benue state. It was observed that there was a significant linear relationship between stature and armspan. Bhavna, (2009) carried out a study among Shia Muslims in India. The aim of the study was to reconstruct stature among male and female Shia Muslims of Delhi using lower limb dimensions. Mohanty *et al.*, (2001) carried out a research on the Sitting height, standing height, arm span and leg lengths of 505 healthy women. It was observed that the correlation of arm span and leg length with standing height were good.

Ibegbu et al. (2013) studied association of hand length with height in Nigerian school children of Gbagyi tribe of Abuja. The study derived a linear regression and a multiple linear regression equations for Gbagyi School children of Nigeria from which height, age and hand length could be predicted if one factor is known. Didia et al., (2009) estimated the stature for Nigerians from long limbs. In their study, they established a formulae specific to Nigerians. Igiri et al. (2008), studied the height and weight of Nigerians resident in Calabar Metropolis in Cross River State of Nigeria. Young Adults were used in this study. Danborn and Elukpo (2008), conducted a study on the hand and foot lengths, stature ratio and indices for sex differences. Data for the study were obtained from randomly selected students of the Ahmadu Bello University, Zaria, Nigeria. Adefolaju *et al.*(2006) investigated sexual dimorphism in stature (height) of a

population of northern Nigerians resident in the Ilorin Township.

Despite the anthropological and forensic importance of Femur stature ratio in our society, there is no reference value for the Ijaw and the Ikwerre ethnic groups in Nigeria. Femur stature ratio values for Nigerians are scarce. This study was carried out to determine the average femur length and stature of the Ijaw and the Ikwerre people. It was also aimed at determining the Femur stature ratio and to examine if there is a relationship between these two parameters in these ethnic groups. This study seeks to establish a formula for identification of the height of these ethnic groups from their femur lengths. Finally, this study was carried out to examine if there are sexual dimorphism, ethnic differences or racial differences when comparing our result to works of other authors.

MATERIALS AND METHODS

This study was carried out on one thousand subjects (500 Ijaws and 500 Ikwerres, 250 males and 250 females for Ijaw and 250 male and 250 female Ikwerre) between the ages of 18-40years. The subjects were either Ijaw or Ikwerre ethnic origin by both parents and grandparents. The subjects were selected from University of Port Harcourt, Niger Delta University, Choba, Yenagoa and Amassoma communities.

Stature (height) of the subjects was measured using a steel meter rule with the subjects standing straight with both hands by the sides. The ruler is placed on top of the subject's vertex to indicate the upper margin. The distance between the vertex

and the floor is the height recorded in centimetre.

Femur length was measured With lower limb extended at the hip and the knee, measured from the lateral-most bony point at the hip joint (e.g. greater trochanter of femur) along the lateral side of the limb to the lateral-most extension of the knee (i.e., lateral epicondyle of the femur), this should occur at approximately the mid point of the kneecap (patella) when the leg is extended.



Photo Plate 1: Measurement of Femur Length

Femur to stature ratio was calculated as the length of the femur divided by the stature (height) multiply by one hundred.

i.e $100 \times \text{Length of femur} / \text{Stature (height)}$

All linear measurements were in centimetres for each parameter. The data on the measured parameters were analyzed using the z-test to determine the sex differences and ($p < 0.05$) was taken as being statistically significant. A correlation study was also carried out between the stature of subjects and their femur length. A regression analysis was also carried out to predict the

Stature (height) of the Ijaw and Ikwerre males and females from their femur length.

The subjects were informed of the importance of the study before measurements were taken.

PRECAUTIONS

The following precautions were taken during the measurement.

1. Foot wears were removed before taken measurement of stature.
2. All the measurements were performed twice for precision purpose
3. Readings were taken to 2 decimal places

RESULTS

The result of the mean, standard deviation of the femur length and stature of the Ijaws and the Ikwerre's are shown in table 1. It was observed that the Ijaw males had a significantly higher height than the Ijaw females ($P < 0.05$). Thus, there was sexual dimorphism. The Ijaw males also had a significantly higher height than the Ikwerre males ($P < 0.05$). This shows ethnic variation in height. The Ikwerre males had a significantly higher height than the Ikwerre females ($P < 0.05$). Thus, there was sexual dimorphism too. The femur length of the Ijaw males was significantly higher than that of the Ijaw females ($P < 0.05$). This femur length value was also higher than that of the Ikwerre males femur length ($P < 0.05$). This also shows ethnic variation in femur length. Table 2 shows the femur stature ratio for the Ijaws and the Ikwerre people. It was observed that the Ijaw males had a significantly higher femur stature ratio than the Ijaw females ($P < 0.05$). The Ijaw males also had a significantly higher femur stature ratio than that of Ikwerre males ($P < 0.05$). The Ijaw females also had a significantly higher femur stature ratio than the Ikwerre females ($P < 0.05$). Table 3 also shows the

stature and femur length of present study and that of Shia Muslims in India. It was observed that there were ethnic and racial differences in these parameters. Figure 2 shows a bar chart of the mean femur stature ratio of the Ijaw and the Ikwerre subjects. Figure 3 shows a correlation between the stature and femur height of Ijaw females. There was a positive correlation between these two parameters ($P < 0.05$). Figure 4 shows the correlation between the stature and femur length of Ijaw males. There was also a strong positive correlation between these two parameters ($P < 0.05$). Figure 5 shows a correlation between the stature and femur length of the Ikwerre females. There was a positive correlation between these two parameters ($P < 0.05$). Figure 6 shows the correlation between the stature and femur length of Ikwerre males. There was also a positive correlation between these two parameters ($P < 0.05$). Table 4 shows linear regression equation for height (stature) of the Ijaws and Ikwerre people. There were ethnic variations. Table 5 Shows the Mean Femur Stature Ratio of Present study and previous study carried out by other authors. It was observed that there were racial and ethnic differences.

Table 1: Showing Mean Femur Length and Stature of Ijaw and Ikwerre Subjects

Measurement	Male		Female	
	Ijaw	Ikwerre	Ijaw	Ikwerre
Stature (Height)	175.12±7.76cm	164.50±8.13cm	166.30±8.29cm	156.40±7.20cm
Femur Length	46.72±2.82cm	39.50±2.20cm	40.90±2.34cm	37.80±2.81cm

Table 2: Showing Femur/Stature Ratio for Ijaw and Ikwerre Subjects.

Measurement	Male		Female	
	Ijaw	Ikwerre	Ijaw	Ikwerre
Femur/Stature Ratio (%)	25.5±0.72	23.6±0.99	24.6±0.77	23.2± 0.92

Table3: Showing the Stature and Femur Length of Present Study and that of ShiaMuslims in India.

Ethnic group	Mean Stature (Height)cm (SD)	Mean Femur Length (cm)(SD)
Male shia muslims in India (Bhavna, 2009)	167.66 ±5.69	41.71±1.96
Female shia muslims in India (Bhavna, 2009)	154.40±4.91	38.93±1.62
Ijaw males (present study)	175.12±7.76	46.72±2.82
Ijaw females (present study)	166.30±8.29	40.90±2.34
Ikwerre males (present study)	164.50±8.13	39.50±2.20
Ikwerre females (present study).	156.40±7.20	37.80±2.81

**FERMUR/STATURE RATIO
%****Figure 2: Showing mean femur stature ratio of the Ijaw and the Ikwerre subjects.**

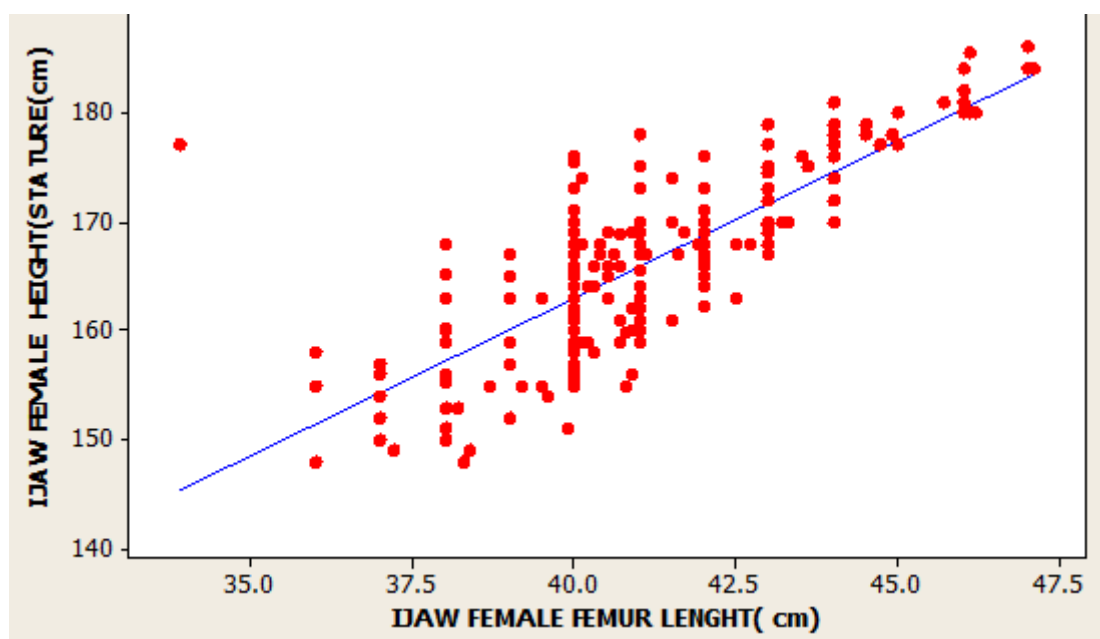


Figure3: Pearson Correlation of Ijaw Female Height (Stature) and Ijaw Female Femur Length $r= 0.793$

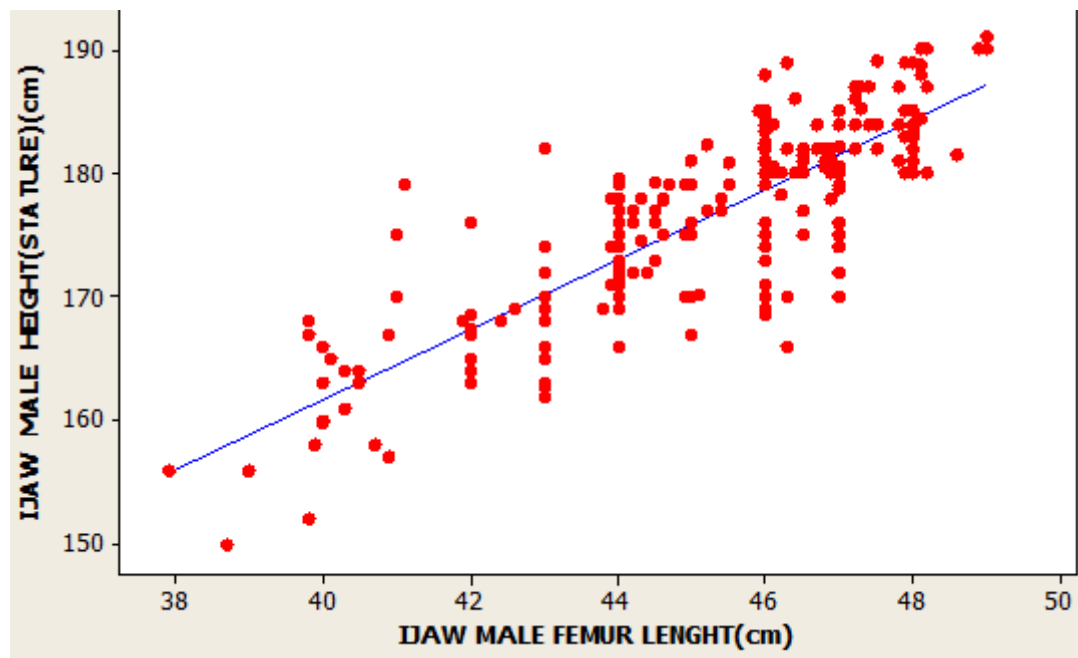


Figure 4: Pearson Correlation of Ijaw Male Height (Stature) (cm) and Ijaw Male Femur Length $r= 0.832$

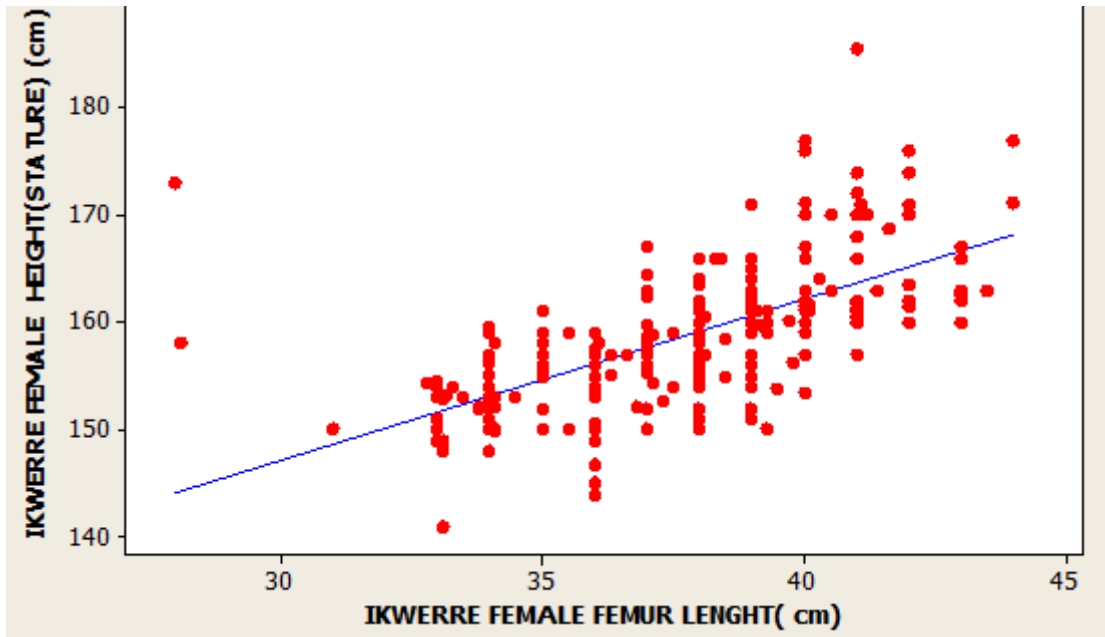


Figure 5: Showing Pearson Correlation of Ikwerre Female Height (Stature) and Ikwerre Female Femur Length $r = 0.63$

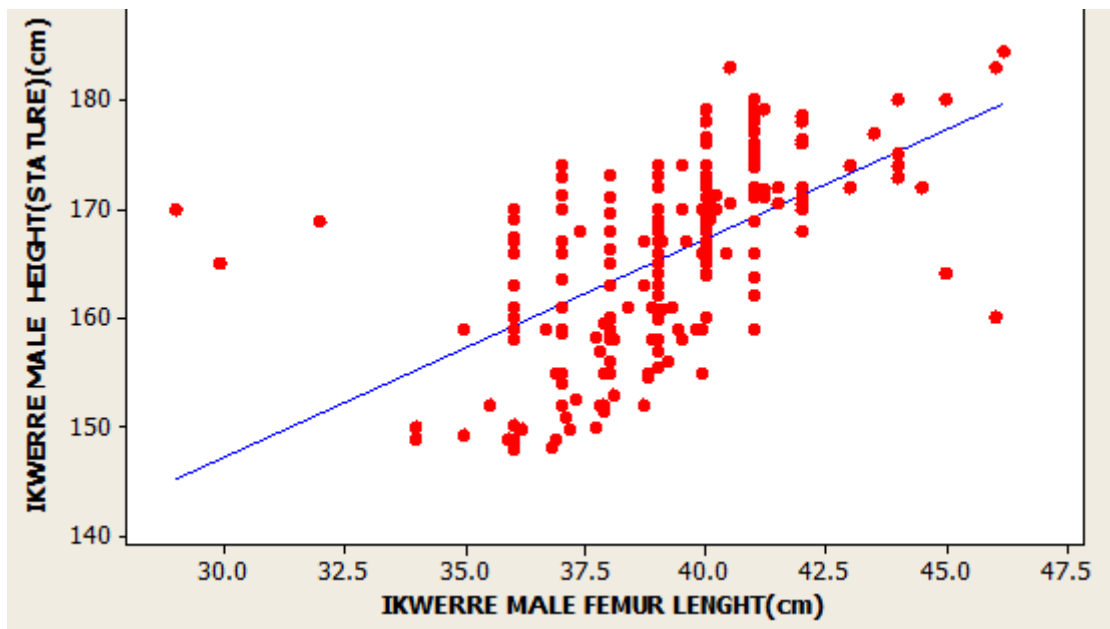


Figure 6: Showing Pearson Correlation of Ikwerre Male Height (Stature) (cm) and Ikwerre Male Femur Length. $r = 0.578$

Table 4: Showing Linear Regression Equation for Height (Stature)

Variable	Regression Equation
Ijaw Female Femur Length(cm)	Ijaw Female Height(Stature) = 47.5 + 2.89 IjawFemale Femur Length(cm)
Ijaw Male Femur Length(cm)	Ijaw Male Height(Stature)(cm) = 49.0 + 2.82 Ijaw Male Femur Length(cm)
Ikwerre Female Femur Length(cm)	Ikwerre Female Height(Stature) = 102 + 1.50 Ikwerre Female Femur Length(cm)
Ikwerre Male Femur Length(cm)	Ikwerre Male Height(Stature)(cm) = 87.2 + 2.00 Ikwerre Male Femur Length(cm)

Table5: Showing Mean Femur/Stature Ratio of Present and Past studies

Researchers	Ethnic Group	Male	Female
Present Study, 2012	Ijaw	25.50 ± 0.72	24.60 ± 0.77
	Ikwerre	23.60±0.99	23.20 ± 0.92
Feldesman and Lundy (1988)	All over the world	26.74	26.74
Feldesman et al.(1990)		27.19±0.47	27.05±0.29
Feldesman, 1992.		27.44	27.16

DISCUSSION

Anthropometric parameters such as Femur Length, height and Femur/Stature Ratio are used to examine ethnic differences. The human body size and body proportion are interpreted as markers of ethnicity, race, adaptation to temperature, nutritional history and socioeconomic status. Discrete populations of living humans, however, present a diversity of body sizes and shapes. Mean stature for populations of adults varies from minimum values for the Efe Pygmies of Africa at 144.9 cm for men and 136.1 cm for women to the maximum values for the Dutch of Europe at 184.0 cm for men and 170.6 cm for women (Barry and Maria,

2010). In this study, the mean stature is significantly higher than the pygmies of Africa, but lower than that of the Dutch people of Europe. Daniel et al.(2011), worked on Nigerians in Benue state and had a mean stature for males as 167.4 cm and for females as 160.2 cm. Our mean stature value in this study for the Ijaws is higher than their result for both males and females. But the result of Daniel et al.(2011) for mean stature is higher than that of the Ikwerre males and females. Bhavna, (2009) carried out a study among Shia Muslims in India. When comparing our result with that of Bhavna, (2009), it was observed that the Ijaw males and females had a larger

stature and femur length than that of the Shia Muslims in India. This shows that there are ethnic differences in stature and femur length of these ethnic groups.

Mohanty *et al.* (2001), carried out a correlation between sitting height, arm span and leg length and observed a positive correlation between these parameters. Our study is in line with it, as there was a positive correlation between the height of all the ethnic groups and the femur length.

The result from Ibegbu *et al.*, (2013) on Nigerians shows that there was a positive correlation between height and the parameters used against it. Our study was also in line with this as there was a positive correlation between the height of these two ethnic groups and their femur length. In the study carried out by Didia *et al.* (2009), regression models were used to establish formulae specific to Nigerians. General formulae for males and females were established. In this study, our result compares favorably with that of Didia *et al.* (2009) and can be relied upon. Igiri *et al.* (2008), observed that the males had a larger height than the females in their research. This study is in line with their study as the heights of the male Ikwerre and Ijaw males were larger than their female counterparts. This is also in line with the study of (Adefolaju *et al.*; 2006) as there was sexual dimorphism in the stature (height) of a population of northern Nigerians resident in the Ilorin Township. Danborno and Elukpo (2008), also observed that males had a significantly higher height than females in their research. This is in line with our study as the males in the present study have a significantly higher height than the females.

The result of mean femur/stature ratio by Feldesman (1990) regardless of age, ethnicity and gender boundaries was

significantly higher than the result of this present study. The result of Maresh (1970) also showed a larger femur stature ratio for males and females when compared to our result. Comparing our result with that of Anderson *et al.* (1963), it was observed that our result was lower than their result in both males and females.

This result went contrary to his later finding with femur/stature ratio of 27.44 for male and 27.16 for female. These results suggest that stature estimation methods are not universally applicable and that environmental differences within a population (e.g., socioeconomic status differences) or differing levels of modernization and social and economic development between nations are an important source of variation in stature and body proportions.

The relevance of the use of femur length and stature measurement cannot be over emphasized in ethnic and racial identification. Factors such as ethnic group, gender and regional factors must be taken into consideration when using these anthropometric characteristics for prediction. When working on an anthropometric data that has to do with the femur length and height of the Ijaw and the Ikwerre ethnic groups, the formula given in this research work should be given cognizance. Further research should be carried out in other ethnic groups in Nigeria.

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Address correspondence and reprint requests to: Professor SP Mohanty, Department of Orthopedics, Kasturba Medical College, Manipal 576 119, Karnataka, India. E-mail: sp_mohanty@hotmail.com. Kasturba Medical College and Hospital, Manipal, Karnataka, India.

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