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Estimation of Stature from Lower Limb Measurement in Urhobos of Southern Nigeria

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ABSTRACT

Stature reconstruction forms part of forensic anthropological analysis for the purpose of identification of an individual. The aim of this study was to derive regression formulae for the estimation of total height and thereafter to predict stature in Urhobos of Nigeria using bones of the lower limb. The sample comprised of 338 male Urhobos and 296 female Urhobos, age ranged 18-30years. For each individual total height, maximum length of femur, tibia and fibula was taken and these were used to produce correlation as well regression formulae. In both gender pearson's regression formulae were obtained and tibia was found to be the most accurate predictor of stature. The derived formulaes are population specific and are designed for use in forensic analysis; it is also useful to theoretical and practical issues in forensic anthropology.

Key Words: Stature, Estimation, Anthropology.

Forensic anthropology is a branch of physical anthropology that involves the examination of skeletal remains for medico-legal reasons (Dayal et al 2008). The forensic anthropologist is usually asked to provide information that may be useful to confirm, or assist in determining the identity of an individual from skeletal remains (Scheuer 2002). Human identification is the recognition of an individual based on physical characteristic unique to the individual. One of the four main attributes of biological identity is stature. Stature like any other phenotypic trait is determined by a combination of genetic and environmental factors. Stature clearly constitutes an essential element in the description of human population or individuals (Thomas 1986). It is one of the most important and useful anthropometric parameters that determines the identity of individuals, It provides insight into various aspect of population, such as health, nutrition and genetic pattern (Jibonkumar 2006). Stature prediction occupies relatively a central position both in anthropological research and in identification necessitated by medical jurisprudence. Stature as a measure of biological development of both an individual and a population and is commonly used in physical anthropology (Kodak 1996). Stature estimation from skeletal materials or from mutilated limbs has obvious significance in personal identification in the events of murders, accidents, war and natural disaster (Jibonkumar 2006). The development of stature as a very sensitive trait depends on a number of factors such as sex, age, race, body composition, social stratum and secular trend (Kodak, 1996). For this reason, the application of the best formulae to a particular population is very difficult therefore, it is necessary to establish formulae for estimating stature in different population. The aim of this study was to provide regression formulae for bones of lower limb with stature and find the most accurate predictor of stature among the bones of urhobos of southern Nigeria.

MATERIAL AND METHODS

This crosssectional study involves 634 healthy volunteer Urhobos comprising of 338 males and 296 females age range 18-30 years. The measurements were taken at fixed time 10am-1pm to eliminate discrepancies due to diurnal variation. By convention, left bones of the lower limbs were measured using measuring tape, following standard measuring landmarks as described by Allbrook; Bhavana and Surinder (Allbrook 1961; Bhavana et al 2007):

- Stature: it is the distance between the standing surface and the vertex using anthropometric rod.
- Femur length: the distance between the uppermost point on the greater tronchanter to the lowermost point palpable on the lateral femoral condyle.
- Tibia length: the distance from the medial condyle to the tip of the medial malleolus.
- Fibular: distance between the uppermost point palpable on the fibular head and the tip of the lateral malleolus

Statistical Analysis

Regression and correlation values were obtained using statistical package for social sciences.

RESULTS

TABLE 1: Mean Length of Male and Female Long Bones of Urhobos

	MALES			FEMALE		
BONES	N	MEANS (in/cm)	S.D	N	MEANS (in/cm)	S.D
FEMUR	338	16.87/44.12	1.14	296	16.32/40/80	1.31
FIBULAR	338	15.55/38.60	1.35	296	14.63/36.57	1.10
TIBIA	338	14.90/37.25	1.06	296	14.20/35.47	1.00
STATURE	338	68.99/172.45	3.93	296	64.69/162.45	3.03

TABLE 2: Correlation Values of long Long Bones with Stature in Urhobos Pearsons Correlation

BONE	MALE	FEMALE
FEMUR	0.298	0.493
FIBULAR	0.246	0.499
TIBIA	0.544	0.338

TABLE 3: Regression Equations of Stature with Long Bones of Urhobos

BONE	MALE	S.D	FEMALE	S.D
FEMUR	x = 51.71 + 1.02 (Y)	3.03	x = 46.11 + 1.16 (Y)	1.95
FIBULAR	x = 57.78 + 0.71 (Y)	2.38	x = 44.80 + 1.37 (Y)	2.03
TIBIA	x = 50.30 + 1.25 (Y)	2.84	x = 41.65 + 1.63 (Y)	2.09

Table 1 presents means and standard deviations of adult Urhobos parameters. In a sample of 338 males average stature was found to be 68.99in/172.45cm and average female height was found to be 64.69in/162.45cm. Femur length 16.87in/44.12cm in males and 16.32in/40.80cm in females, fibular length 15.44in/38.60cm in males and 14.63in/36.57cm in females, tibia length 14.90in/37.25cm in males and 14.20in/35.47cm in females.

Table 2 displays pearsons correlation coefficient (r) between stature and lower limb bones. All long bones studied showed significant correlation with stature ($p < 0.001$).

Table 3 showed regression equation for estimation of stature (in inches) from lower limb bones. From the formula X=stature while Y=length of bone in inches.

DISCUSSION

During identification general demographic characteristic are determined first. These include age, sex and race of the individual. For many years now, formulae of Trotter and Glessar have been used most frequently for stature estimation. However many researchers have cautioned that formulae used to estimate stature should be specifically derived for each population. It was with this in mind that this study was carried out among the Urhobos of Nigeria. The Urhobos of southern Nigeria

happens to be the tenth largest ethnic group in the country (Ekanem, 1972). The result indicates that one can successfully estimate stature from lower limb bones in situations where these bones are brought for forensic examinations. From table 1 the mean height of Urhobo males 172.45cm is significantly higher ($p>0.05$) than the mean female height 162.45cm. This agreed with other studies done in Nigeria (Ebite et al 2008).

Table 2 presents the descriptive statistics of lower limb bones, as might be expected the mean long bone lengths of males are significantly higher ($p>0.05$) than the mean values for the females in all the bones measured. These tend to be the normal trend as this result agreed with several other studies (Bhavana et al 2007, Iwao et al 2009, Manisha et al 2008, Kodak 1996). These differences were attributed to sex chromosome differences, XY in males as opposed to XX in females. Women ordinarily reach their greatest height at a younger age than men do. The femur, tibia and fibula have been used to estimate stature and statistical analysis done to know correlation between these bones and stature and six regression equations have been derived as shown in table 2. The usefulness of regression equation is generally assessed on the basis of their standard error of estimates. A comparism of the standard error of estimate for different bones used in stature estimation indicates that long bones provide more accurate estimate. In this study, the standard error of estimate ranged from 1.95 to 3.03 for the long bones. In both gender, tibia provides the best estimate with stature, next was femur for males and fibular had the least correlation. However, in females fibular provided a better correlation than femur. This finding corresponds with findings of Bhavana et al (2007) where they found all three long bones correlated with stature with tibia having best correlation, fibular second and femur the least.[7] Munoz et al (2000) estimated stature in a Spanish population and found femur to be the most accurate predictor of stature in males and tibia in females. Surindaer and Prabba reconstructed stature from all six long bones and found femur had highest correlation, next tibia and lastly fibular (Surinder 2002).From this research and work by other authors, there seem to be slight differences in the results obtained from different populations thus, buttressing the statement of trotter in 1970 who emphasized that estimate of stature are derived from a sample of the population with same gender, race, geographical area and time period.[16] It has been established by earlier studies that means of stature reconstruction are both population and gender specific. The findings have confirmed largely the usefulness of the methods of stature reconstruction recommended by pearson concerning the groups of different social and economic level.

REFERENCES

Dayal MR, Steyn M, Kuykeendall KL (2008). Stature estimation from bones of South African whites. South-African Journal of Science 104, 124-128.

Scheuer L (2002). Application of osteology to forensic medicine. Clinical Anatomy. 15, 297-312.

Thomas G (1986). Estimation of australopithecine stature from long bones. Folia primatol 47; 119-127.

Jibonkumar and Lilinchandra (2006). Estimation of Stature using different facial measurements among the Kabui Naga of Imphal Valley, Manipur. Anthropologist, 8 (1):1-3.

Kodak J (1996). Stature recostructionfrom long bones. The estimation of the usefulness of some selected methodsfor skeletal populations from Poland. Variability and evolution, Vol 5:83-94.

Allbrook D (1961). The estimation of stature in British and East African males based on tibia and ulna bone lengths. J. For. Med. 8: 15-18.

Bhavana, Nath S (2007). Estimation of stature on the basis of measurement of the lower limb. Anthropologist special volume. No 3:219-222.

Ekanem II (1972). The 1963 Nigeria Census. A critical Appraisal. Ethiope publishing corporation Benin, Nigeria 2nd ed 196-199.

Ebite L, Ozoko T, Eweka A, Otuaga P, Oni A, Ominiabohs F (2008). Height: Ulna Ratio: A Methods of Stature Estimation In A Rural Community in Edo State, Nigeria. The Internet Journal of Forensic Science. Volume 3 number 1.

Iwao H, Kazuhiro U, Tatsushige F, Ryousuke K, Motoki O (2009). Stature estimation formulae from radiologically determined limb bone length in a modern Japanese population.

Manisha RD, Maryna S, Kelvin LK (2008). Stature estimation from bones of South African whites.

Monoz JI, Suarez-penaranda JM, Conchecheiro L, Rodriguez-calvo MS, Mayor M, Miguens, X. 2000. Stature estimation from radiologically determinedlong bone length in a Spanish population.

Surinder N and Prabba B (2002). Reconstruction of stature from long bone length. Anthropologists special issue No.1. 109-114.

Gleser GC (1952). Estimation of stature from long bones of American White and Negroes. American journal of physical anthropology. Vol.