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Stature Estimation from Measurement of Scapula of Igbos of South-East Nigeria

[1]*M. Igwe, [2]F. C. Akpuaka

Department of Anatomy, Anambra State University, Uli. Anambra State, Nigeria.

* Author for Correspondence

Abstract

The study investigated the correlation between stature and different radiographic scapular measurements. An also estimated stature using linear regression formula derived for the population of Igbos of south-east Nigeria, 90 scapular radiographic films comprising 45 males and 45 females with ages ranging between 25 to 65 were used for the study, Six different radiographic scapular variables were measured with spreading calliper. Height of the subjects was measured with standard height measuring instrument with the subject standing erect, in anatomical position. The result obtained was analyzed and used to derive a formula between different radiographic scapular measurements and the total height of an individual.

KEYWORDS: Forensic anthropology, Scapula, Height, Regression formula, South-east population, Stature estimation.

INTRODUCTION

The science of forensic anthropology has a varied array of means and methods of reconstructing stature from bones. To assess the stature of an individual from measurement of different bones of the body has always been of immense interest to anthropologists. For a long time, stature has been one of the factors in the identification of an individual.

However, during disasters such as plane crashes, acts of terrorism and natural disaster can take the lives of hundreds of thousands of victims when such disasters occur, victims remains may be fragmented, scattered and mixed together, making it difficult to build complete biological profiles. When this occur stature estimation is used to determine whether or not recovered skeletal remains are human and if the remains belongs to one or more individuals. Forensic anthropologists; Trotter and Gieser (1952) under took one of the earliest most comprehensive studies on estimation of stature from long bones and regression formula for estimating stature.

Note that a regression formula is the result of regression analysis which allows researchers to predict the value of stature from random variables. Athawale (1963), Celbis and Agritmis (2006) study indicates a more significant linear relationship between forearm length and stature. Musgrave and Harneja (1978), Meadows and Jainz (1992) and Byers et al (1989) took measurements of the metatarsals in an attempt to estimate stature. Hauser et al (2005), De Mendonsa (2000), Genoves (1967) determined that the longest measurement of the femur was the most useful for correlating with living height. Patil and Mody (2005) determined that height could be estimated from the skull using separate regression formula for male and female. Didia et al (2009) measured the tibia length and derived the least squares method of estimating stature.

Today this type of research is still important to forensic sciences. With 206 bones in the human body there are still 80 many new ways that stature might be estimated and one of this is using the scapula to estimate stature. Shulin and Fangwu (1983) in china, campobasso et al (1998) in south Italy and Reachel Marie Burke (2005) in America used the scapula to derive the linear regression formula to estimate stature. But in the present study, attempt has been made to find out the correlation between scapular measurements and

the height of individuals in south-east Nigeria and also the derivation of linear regression formula.

MATERIALS AND METHODS

This research follows the methodology for estimating stature based on measurements of the scapula bones as outline by campobasso et al (1998). The current research was conducted using patients in the university of Nigeria teaching hospital (Ituku Ozala, Enugu State) that carne for routine chest x-ray exposure. 90 scapulae radiographic films comprising 45 males and 45 females with ages ranging between 25 to 65 were used for the study. Six different radiographic scapular variables were measured with spreading calliper. Height of the subjects was measured with standard height measuring instrument with the subjects standing erect, in anatomical position.

The six scapular measurements and the guidelines for taking them are provided as follows:

1. Maxim urn length of scapula (MLS): Maximum distance from the superior angle of the scapula to the inferior angle of the scapula.
2. Maximum breadth of scapula (MBS): Maximum distance between the middle of the lateral border of the glenoid fossa to the end of the spinal axis at the vertebral border.
3. Length of coracoid process (LCP): Maximum distance between the most lateroventral point of the coracoid process and the base of the most medial point of the coracoid process often just above the scapular notch.
4. Length of glenoid fossa (LGF): Maximum distance between the superior border and the inferior border of the glenoid fossa.
5. Breadth of glenoid fossa (BGF): Maximum distance between the ventral border and the dorsal border of the glenoid fossa.
6. Length of axial border (LAB): Distance between the most inferior point of the glenoid fossa and the bottom of the inferior angle.

The data obtained was subjected to statistical analysis and linear regression equation was derived using SPSS, a statistical computer software.

RESULTS

Table 1: Range, mean, standard deviation and standard error of Height of females and males of Igbos of south-east Nigeria.

	HEIGHT IN CM			
	Range	Mean	S.D	S.E
Female	150.00-179.00	162.00	7.56	1.13
Male	157.00-182.00	171.00	6.49	0.97

Table 2: Range, mean, standard deviation and standard error of six different radiological Scapular measurements of females and males of Igbos of south-east Nigeria.

	Range		Mean		S.D		S.E	
(CM)	female	male	female	male	female	male	female	male
MLS	1200-15.50	12.10-16.80	13.50	14.00	0.85	1.14	0.13	0.17
MBS	4.30-6.80	5.00-7.50	5.00	6.00	0.54	0.70	0.08	0.10
LCP	3.10-3.40	3.20-3.50	3.20	3.40	0.12	0.11	0.02	0.02
LGF	3.30-3.60	3.30-3.70	3.50	3.50	0.11	0.13	0.02	0.02
BGF	2.10-2.20	2.10-2.30	2.10	2.20	0.05	0.07	0.01	0.01
LAB	5.90-8.90	7.10-10.90	7.70	8.60	0.78	1.02	0.12	0.15

MLS represents maximum length of scapula.
MBS represents maximum breadth of scapula.
LCP represents length of coracoid process.
LGF represents length of glenoid fossa.
BGF represents breadth of glenoid fossa.
LAB represents length of axial border.

Table 3: Pearson's correlation between each radiological scapular measurements and the stature of females and males Igbos of south-east Nigeria.

Radiological scapula Measurements	Pearson's correlation values	
	Female	Male
Maximum length of scapula	0.225	-0.005
Maximum breadth of scapula	-0.051	0.382
Length of coracoid process	0.304	-0.215
Length of glenoid fossa	-0.209	-0.176
Breadth of glenoid fossa	0.289	0.203
Length of axial border	0.119	0.348

The highest correlation of stature is found to be with length of coracoid process with pearson's correlation value of (0.304) followed by breadth of glenoid fossa (0.289) for females. And the highest correlation of stature is found to be with maximum scapular breadth with pearson's correlation value of (0.382) followed by length of axial border (0.348) for males.

Table 4: Linear regression equations for estimation of stature of female Igbos of south-east Nigeria (FH).

Stature (FH)	Liner regression equation	Variables
s=	131.232 + 2.264x	Where x=MLS
S=	165.401- 0.716x	Where x=MBS
S=	97.322 + 19.894x	Where x=LGP
S=	213.833 - 15.000x	Where x=LGF
S=	67.935 + 43.785x	Where x=BGF
S=	152945 + 1.145x	Where x=LAB

Table 5: Linear regression equation for estimation of stature of male Igbos of south-east Nigeria (MH).

Stature (FH)	Linear regression equation	Variables
S=	171.046 - 0.029x	Where x=MLS
S=	149.162 +·3.543x	Where x=MBS
S=	214.212 -12.982x	Where x=LCP
S=	202.481 - 9.062x	Where x=LGF
S=	128.583 +19.167x	Where x=BGF
S=	151.486 +2.225x	Where x=LAB

DISCUSSION:

The present research after statistical analysis and data interpretation has clearly revealed that the hightest correlation of stature is found to be with the maximum length of coracoid process and the maximum breadth of glenoid fossa and where the most useful for predicting the stature of females while the maximum scapular breadth and length of axial border were the best for the linear regression formula for males.

There is no other or known research on the use of scapula for determining an individual height in the south-east Nigeria Igbos but the current research has been carried out by Campobasso et al (1998) in the south Italian population while Recheal Marie Burke (2005) also conducted the mentioned above research on modern American population. All came to a conclusion that the study is significant because it shows how fragments and incomplete bones can be used to estimate height in forensic investigations.

The current research provided linear regression formulae for estimating stature based on radiological scapular measurements, nevertheless due to increase in mass disasters which often leave bone fragments and commingled remains, need for the development of different regression formulae for scapula estimation for other populations is important because this will help forensic experts in the estimation of stature of affected individuals.

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