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Height Assessment Using the Length of Humerus of Selected Group of Hausa Ethnic Students in Yusuf Maitama Sule University, Kano State

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Abstract

Height assessment from bones plays a vital role in detecting unidentified bodies and parts of bodies or skeletal remnants, the aim of this study was to estimate the height of individual using the length of humerus of selected group of Hausa ethnic Students in Yusuf Maitama Sule University, Kano State, Nigeria. Two hundred and two (202) subjects were selected from the various faculties of the University, using random sampling method. The age range of the participants was between 18-50 years. Ethical approval was required from the Ethical Committee of the College of Health Science of the institution before the beginning of the research, Informed consents were sought from the participants. Using a stadiometer, standing height of individual was measured to the nearest centimeter (cm) with subject standing barefoot in an anatomical position. The humeral length was measured in between two points:- Distal point-Midpoint of elbow joint and Proximal point- Acromian landmarks, line was measured and documented. Length of humerus obtained was put in regression equation for humerus estimation. From the result obtained indicated that height can be estimated from the humeral length with Coefficient of significance (R=0.628) Coefficient of determinant (R^2=0.395). The present study found significant differences between the sex in both humeral length and height of the study population and resolved that the maximum height can be estimated from the length of humerus with effective precision so that may help the archaeological, anthropometric and also forensic investigations.

Keywords: Assessment, Height, Humerus and Hausa

INTRODUCTION

Estimation of stature from bones plays a vital role in detecting unidentified bodies, parts of bodies or skeletal remnants. Anthropometric practices have been usually used to estimate stature and bone length from skeletal remains and unidentified body parts by medical scientists, anatomists and anthropologists, for over a hundred years (Ozaslan *et al*., 2003). In

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forensic practice and archaeology, long bones remains are frequently used as the main obtainable source to institute individuality. In a situation of absenteeism of greatest part of the skeleton, complete long bone with ends intact can be overcome by applying the derivative technique to the obtainable part of bone. This will help to resolve medico -legal problems providing due consideration to regional factors (Dan *et al*., 2009). Life reconstruction from human skeletal remnants has been a major challenge among forensic scientist including anatomist and anthropologist. Living stature estimate from length of the limb bone is one of the firstborn problem in the history of anthropology (Hoppa & Gruspier, 1996).

Height estimation from humeral length is conceivable; if any part of body is found from shoulder to fore arm which is acts as a guideline for forensic anthropologist (Steele & MCkern, 1969). Individual Height play a vital role to medico-legal investigations, consequently in forensic anthropology, prediction of the stature from bones plays a significant role in the identification of missing persons. (Ross & Konigsberg, 2002). Stature estimation can be done from the humeral length, in the absence of femur or tibia, which is more appropriated long bones for stature estimation.

The presentation of measurement of human and animal skeleton is of greatest significance in the field of forensic medicine. Medico legitimate examination for attaining the objective of assessing sex, race, ancestry, ethnicity, stature, age at the time of death, , body weight, body built, details of personalising features such as bone fractures, amputation, bone pathologies and deformities and to certain degree the course of death if revealed in the skeletal remnants. The main objective is to permit the law implementation agencies to accomplish the vital goal of personal identification (Shende and Parekh, 2009).

Previous studies on estimation of total human height by means of measuring long bones has been existing for hundreds of years (Dupertuis & Hadden,1951) but were limited in the developing world. For the anthropometric research Humerus is always been quite a studied bone. A significant role is played in reconstruction of individual stature, forensic sciences sex determination, etc. However, few research have been accomplished with modern human groups. There are few existing data concerning estimating of living height in actual human group (Mall *et al.,* 2001). The present study aim is to estimate height of some individuals using length of humerus among Hausa student in Yusuf Maitama Sule University, Kano State, in Nigeria.

MATERIALS AND METHODS

Study area

The present research was conducted among group of Hausa ethnic students in Yusuf Maitama Sule University which is one of the three main Universities in Kano State, Nigeria. The university have five faculties including faculty of basic medical science and twenty nine different departments of which anatomy department is one of them.

Study design

The present research was a prospective cross sectional approach.

Study Population

The study population was made up of Hausa undergraduate male and female students of Yusuf Maitama Sule University Kano, Nigeria. Two hundred and two (202) subjects were selected from various Faculties of the University, using random sampling methods. The age

range of the participants was between 18-50 years. Participants who reported any clear deformity or limb abnormality were not included in the study, non - Hausa ethnic groups and non- student of Yusuf Maitama Sule University Kano, Nigeria were not included from the study. Before the beginning of the research, Ethical approval was sought from the Ethical Committee of the College of Health Science of Yusuf Maitama Sule University Kano, Nigeria Kano before the beginning of the research, Informed consents were sought from the participants.

COLLECTION OF DATA

Measurement of the Height

The participants were asked to take away their shoes and hair ornaments and then asked to stand on the stadiometer (RGZ, 160) back of the subject against the measuring rod. The head stop was then sliding down until it touched the top of the head and the head was maintained in Frankfort plane. The participants were requested to take a deep breath so as to straighten the spine to give a consistent measurement. The measurement was read from the display to the nearest 0.1 cm. for consistency, each measurement was taken two times and then the mean was calculated.

Elbow Joint Line Surface Marking

Lateral & Medial epicondyles were identified. Two points were identified; point one was marked 1cm vertically below lateral epicondyle while point two was marked 2cm vertically below the medial epicondyle. Both the points were joined using an imaginary horizontal line; central of this line was taken as reference point.
The humerus length was measured in living participants in between two points:-
Upper point- Acromian landmarks
Lower point-Midpoint of elbow joint line was measured and documented.
Length of humerus obtained was put in regression equation to estimate the height of individuals.

DATA ANALYSIS

- The data were expressed as mean ± SD. T-test was used for evaluation of sexual dimorphism between groups. Pearson correlation was used to quantify the relationships between the height and humerus length, and the simple linear regression model was used for the estimation. The factor of determination (R^2) & standard error of estimate (SEE) were calculated for the relation. The analyses was carried out using SPSS version 20.
  $P < 0.05$ was considered as level of significance.

RESULTS

Table 1: shows descriptive statistics of humerus length and height of the study population. The mean value of humerus length was 34.75 ± 2.26cm and that for the height was 164.3 ± 7.60cm.

Table 1: Descriptive statistics of humerus length and height of the study population.

S/N	Variable	N	Minimum(cm)	Maximum(cm)	Mean ± SD
1	Humeral length	202	28.00	41.00	34.75 ± 2.26
2	Height	202	149.0	184.0	164.3 ± 7.60

N= Sample size

Table 2: shows sexual dimorphism of humerus length and height of the study population. The present study shows that there were significant differences in both the humerus length and height in the study population.

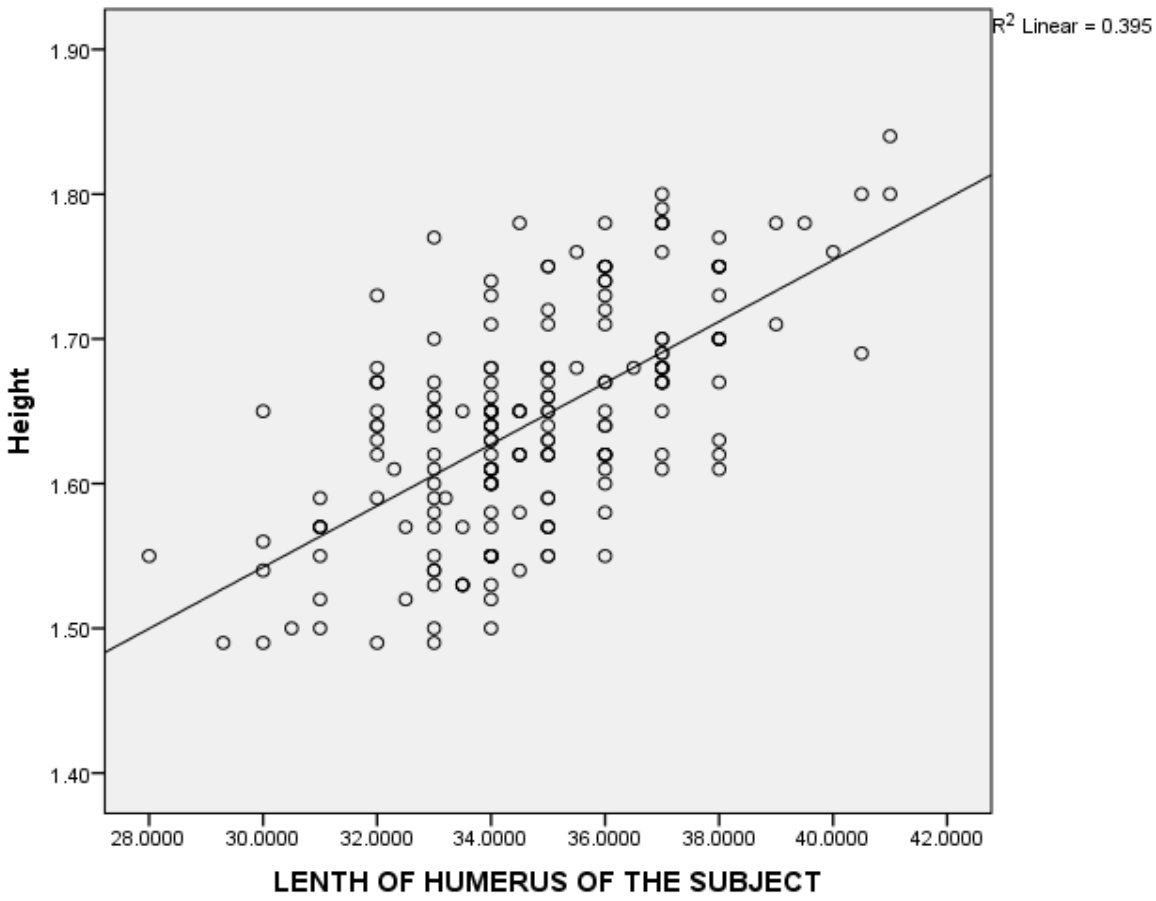
Table 2: Sexual dimorphism of humerus length and height of the study population.

S/N	Variable	Gender	N	Mean ± SD	P-value
1		Male	102	35.44 ± 2.201	<0.0001
	Humeral length	Female	100	34.04 ± 2.103	
2		Male	102	168.7 ± 6.00	<0.0001
	Height	Female	100	159.9 ± 6.4	

Table3 shows estimation height from length of humerus of the study population. The result indicated that height can be estimated from the humeral length the result shows Coefficient of significance (R=0.628) Coefficient of determinant (R^2=0.395)

Table 3: Estimated height from humerus length of the study population.

Model (y=mx + c)	R	R^2	SEE	P value
H = 0.0212LH+ 0.905	0.628	0.395	0.059	<0.0001



The graph above shows the relationship between height and total length of humerus.

DISCUSSION

Assessment of stature from bones shows a vital role in detecting unidentified body part of skeletal remnants. Anthropometric practices are used to evaluate stature, length of bone from skeletal remnants & unidentified body parts by medical scientists, anatomists and anthropologists, for long period of times (Ozaslan *et al*., 2003). Individual height plays a vital role to medico-legal investigations, consequently in forensic sciences, prediction of the stature from skeletons part plays an important role in the identification of missing individuals. (Ross & Konigsberg, 2002). Stature estimation can be done from the humerus length, in the absence of femur or tibia, which is more appropriated long bones for stature estimation. The presentation of measurement of human and animal skeleton has an ultimate importance in forensic sciences. Medico-legal examination for attaining the objective of assessing sex, race, ancestry, ethnicity, stature, age at the time of death, body weight, body built, details of personalising features such as bone fractures, amputation, bone pathology and deformities and to certain degree the course of death if revealed in remnants of the skeleton (Shende and Parekh, 2009). The major application of the present research permit the law implementation organisations toward accomplish a vital goal of individual proof of identity

In the present research average value of humerus length was 35.44±2.201cm in males & 35.04±2.103cm in females respectively. For the previous research conducted by Hassanzadeh *et al*., (2014) discovered the mean humerus length for male was 33.72±2.30cm and 30.12±2.29cm for females and Studied conducted by Borkar, (2014) discovered the mean humeral length was 30.95±2.43cm right and 30.92±2.44cm left for males, and 28.27±1.92cm right and 28.12±1.93cm left for females and Studied by Bozkir *et al*., (2005) shown the mean value of total humerus length to be 304.8±1.8mm and 307.10±2.1mm on the left and right side respectively, comparing to previous study with present research, shown that Hausa ethnic group have the highest value of the length of the humerus, reasons for these variations may be due to race, culture, and environmental stimulus disturbing bone development like physical growth, nutrition & genetic influences. The present study found that the height of individual can be estimated with length of humerus with R value=0.628 and research conducted by Gautam *et al.,* (2013) R = 0.8451 this shown that height of individual can be estimated from the length of humerus and the strength of the relationship is higher than in the present study. Other studies done by Borkar, (2014) reveals the correlation coefficient between height and length of humeru were 0.849 in males and 0.793 in females respectively and by Hassanzadeh *et al*., (2014) also reveals the correlation coefficient between height and upper arm length was 0.716. All correlation coefficient of the previous research shown that strength of the relationship is higher than in the present study and reasons for these variations may be due to the sample size of the present study race, and environmental stimulus.

CONCLUSION

The present study shows significant differences between sex in both humerus length and height of the study population $P< 0.0001$. However, the maximum height can be estimated from the length of humerus with effective precision and that may help the archaeological, anthropometric and forensic research in proof of identity of remnants unidentified bodies by means of regression equations. It could be successful when comprehensive tissue parts with the muscle complete on bone is found instead of dry skeletal remain. It would safe time for anthropologist, forensic and archaeological investigations.

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