

STATURE ESTIMATION FROM INTER-ACRIMAL LENGTH IN WESTERN U.P. REGION



Original Research Article

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ABSTRACT

Background and Objectives: The field of Science known as an Anthropology deals with the study of humans from their earliest beginners on earth up to the present time. Inter-acromial length is the distance between two bony landmarks, i.e;- acromial process of scapula on each side. [1] In this study, an effort has been done to establish the relationship between statures of different persons in Western Uttar Pradesh region of India and their inter-acromial lengths and to develop regression equation formulae from these two variables by simple regression analysis and so many Ethical issues involved in the study are minimal and there is no anymore invasive methods are to be used.

Methods : This study been carried out over a period of one year from 2014 to march 2015. During this period , 400 subjects i;e- 200 males and 200 females ,born and brought up in Western U.P. region ,aged 20 years and above upto 25 years old persons, have been chosen for the reason that by this age, there is completion of skeletal growth by ossification of long bones. After statistical analysis of the results, three regression equation formulae were obtained from the relationship between statures and inter-acromial lengths of females, males and males & females combined. The study sample comprised of randomly selected four hundred (400) students of Teerthankar Mahaveer University. The participants are explained about the purpose and procedure of the study and informed consent was obtained. The data for the present study are stature and inter-acromial length.

Result: We have used computer based programs for our calculated a linear equation of the form equation;-

(“ $Y = a + b(X)$ ”). The linear regression equation derived from Inter-acromial distance for estimating height showed statically non-significant relationship [$P < 0.005$] in both genders. The formulae have been obtained by using the statistical equations in both males and females separately;- The Regression formulae is;- $\{Y = a + b(x)\}$

Where;- Y = Value of stature (cm), X =Variable mean (cm), a = Intercept, b = Regression coefficient.

Discussion and Conclusion: The level of marginal significance within a statistical hypothesis test, representing the probability of the occurrence of a given event. In this study the p- value is 0.178 in females and 1.408 in males, in case of females the p- value indicates that the result is statically significant approximately but not accurate. here 0.178 is nearly to the value of 0.05, which indicates nearly significant result in this study. In the case of males the p- value is more than 0.05, it is 1.408 in males, this indicates that the correlation is much more lesser than threshold value, so that it indicates that the result is statically insignificant in case of male's p-value. The estimation of height by organizing regression equations for males and females separately, with the help of obtained all the quantitative statistical data. There exists a significant correlation of height with the inter-acromial length of an individual in both the sexes, these significant correlations organized into the form of regression equations for both sexes separately and that stature can be estimated with the inter-acromial length when mutilated upper parts of the trunks are available or when bony parts of any individual is present. regression equation formulae “ $y = 95.93 + (-0.377)146$ ” or “ $y = 38.29$ ”, with standard error ± 3.50 in males and “ $y = 6.41 + (0.90)169$ ” or “ $y = 38.52$ ”, with standard error ± 22.08 in females can be useful in estimating stature of the population of Western U.P. region.

Keywords:

Forensic Anthropology,
Identity, Inter-Acromial Length,
Stature,
Regression Equation.

I. INTRODUCTION

The field science known as Anthropology which deals with the study of humans from their earliest beginnings on earth up to the present time. Acromian is the most lateral point on the lateral margin of the acromial process when the subject stands in normal position with his arms hanging by the sides.[2] Some authors have attempt to find suitable alternatives when human remains are discovered methods have also been developed for use in case of fragmentary remains with identifiable bony landmarks.[3] The Indian perspective of the problem of stature estimation has been studied by the **Athwale et al, Patel et al, Joshi et al, Lal and Lala et al**.[4] it is necessary to have different formulae for the determination of stature from the lengths of different body parts in different population groups as they vary from population to population.[5] In situations, where the corpse is severely mutilated, decomposed or represented by skeletal measurements. such estimation is based on relations between skeletal parts and stature. as a rule of thumb, larger the skeletal parts, taller the individuals.[6] Estimation of stature from inter-acromial distance is to find;- (a);- the most appropriate anthropometric parameter which correlates highly with inter-acromial distance, birth weight, weight of normal adults, children and elder individuals, (b);- To predict weight and height and in infants, children and elderly individuals by using equations. The branch of science in which we uses the data obtained from body parts and skeletons from the living or dead bodies people for forensic purposes are called “Forensic Anthropology”. [7] The estimation of stature is an important criteria in terms of detecting the identity.[8],[9] If impaired integrity of the body size exists, the most reliable parameters for prediction are the measurements of the upper and lower extremities.[10] In India, **Siddiqui & Shah, Singh & Soha and Mehta & Thomas**[11] have attempted to be determine the

stature with the limited success. An approach is utilized in this study to establish the relationship between statures of western Indians population and their inter-acromial lengths; to develop regression equation formulae from these two variables by simple regression analysis. The formula thus obtained could be used for the determination of stature of individuals of this region. In view of this, the present study is undertaken on the subjects of the Western U.P. region, the students of Teerthankar Mahaveer University in Moradabad region population of aged 20 years and above, have been chosen for the reason that by this age, there is completion of skeletal growth by ossification of long bones. The present study is taken up to fill the above lacuna. In addition, inter-acromial length being a macro measurement, is easy to measure. And so many Ethical issues involved in the study were minimal and there is no anymore invasive methods were to be used.

II. MATERIAL AND METHOD

This prospective study been carried out over a period of one year from 2014 to march 2015. During this period, 400 subjects I;- 200 males and 200 females, born and brought up in Western U.P. region, aged 20 years and above upto 25 years old persons, have been chosen for the reason that by this age, there is completion of skeletal growth by ossification of long bones. These age group was chosen for the reason that by this age nearly all secondary centres fuse with the respective shafts. Those who were not born and brought up here were excluded. To minimize error, cases of dwarfism, gigantism and those having skeletal abnormality of spine and long bones were excluded from the study. After taking their written informed consent and recording their full particulars like name, age, sex and place to which they belong, the stature of each individual was measured in centimetres with the subject standing against a vertical background surface in normal erect position, the shoulders, buttocks and heels lightly touching the background wall. An anthropometric rod set was used for taking the above measurements. The measurement from the vertex of head to the ground was taken after bringing down the adjustable cross-bar to the head and the measurement was read from the vertical scale. The inter-acromial length was measured in centimetres with the person in the same erect position (**Momonchand A and Devi TM, 1999**). [12] Stature and inter-acromial distance Stature was measured to the nearest 0.1 centimetres (cm) in bare feet with the participants standing upright against a Stadiometer. Inter-acromial distance was measured with a calibrated steel tape. Participants stood bare-foot with feet together on a level concrete floor, with their upper backs, buttocks and heels touching the wall. The participant's head was held erect and the eyes looking forward. The lower margin of the eye socket (Orbitale) and the tragion (the notch superior of the tragus of the ear) were in the Frankfort plane. inter-acromial distance was measured with a flexible steel tape from the tip of the lateral ends of either sides of acromian process. Readings were taken to the nearest 0.1 cm. After statistical analysis of the results, three regression equation formulae were obtained from the relationship between statures and inter-acromial lengths of females, males and males & females combined. The study sample comprised of randomly selected four hundred (400) students of Teerthankar Mahaveer University. Male and Female ratio of the participants was equally, The participants were explained about the purpose and procedure of the study and informed consent was obtained. The data for the present study were stature and inter-acromial length. The measurements were taken with procedures and landmarks as by **Krogman**. [13] Following The data were subjected to statistical analysis for determining Means, Standard Error (SE), Standard Error Estimation (SEE), Pearson's 'R'-value, and Linear Regression Equation using SPSS 14 statistics software. The data were analyzed applying various subroutines of SPSS and regression formulas were developed for various combinations to reach the best estimate possible. Such a statistical approach is commonly used in research of these natures. [14]

III. STATISTICAL ANALYSIS

The statistical analysis for estimate to the regression equation two other variables like dependent and independent variable, which we see vide infra. After taking the measurements, statistical analysis was done using statistical equations as given below:- $\{Y = a + b X\}$.

Where :-

Y= Value of stature (cm) ,

X= Variable mean (cm) ,

a= Intercept,

b= Regression coefficient .

From the above equations, regression formulae, standard errors and co-efficient of correlations were developed to fulfill the aims and objectives of the study.

IV. RESULT

Mean and Standard deviation were calculated for each variable. Gender wise distribution of inter-acromial distance and height was studied. The coefficient of determination provides a quantitative measure of how well the regression line fits the scatter plot. The coefficient of determination measures the strength of relation that exists between two variables. The Pearson's correlation coefficient R, Multiple R, R-square are statistics which used in the context of statistical analysis. A summary of the anthropometric measurements, both genders is shown in tables.

V. DISCUSSION

Anthropometry has an important role in many human growth and identification studies by measuring to the human body and its parts for many years. In cases of unimpaired integrity of bodies, there are not so much problems in identification but identification is much more difficult in impaired integrity of corpses by different reasons such as an earthquake, a war or a brutal murder. Some limitations have always existed in conducting such studies in terms of availability of adequate quantities and choice of bone and trained personnel.[15] The current study the height and the inter-acromial distance were the significant predictors of adult peoples. Inter-acromial distance were the significant predictors of height in the elderly time. Equations are based on inter-acromial distance, also these equations based for to estimate the maximum height obtained at around (20 to 25 years of age groups nearly) and involved a study sample of only 400 individuals. The maximum stature in males in this study, it is 183 centimeters and in a females is 184 centimeters, The minimum stature in males and females in this study is 152 centimeters and 143.5 centimeters, the average stature in this study in males and females is 168.13centimeters and 156.007 centimeters respectively. the inter-acromial lengths of this study maximum inter-acromial length in this study in males and females is 47 centimeters and 34.5 centimeters and The minimum inter-acromial lengths in the study are 28 centimeters and 29 centimeters for males and females respectively. In this study the p- value is 0.178 in females and 1.408 in males, in case of females the p- value indicates that the result is statically significant approximately but not accurate. here 0.178 is nearly to the value of 0.05, which indicates nearly significant result in this study. In the case of males the p- value is more than 0.05, it is 1.408 in males , this indicates that the correlation is much more lesser than threshold value ,so that it indicates that the result is statically insignificant in case of male's p-value. standard errors were ± 3.503 centimeters (males) and ± 22.085 centimeters (females) in this study. In this the standard error is more in females as compared to the males, it shows because of the males have more prominent bony projections anatomically, so as we can measured them perfectly to the inter-acromial distances in muscular males in comparison than that of females. In this study regression equation has come out to be $"y = 95.93 + (-0.377)146"$

In males and in females $"y = 6.41 + (0.19 \times 169)"$, there was a significant error in stature calculated . This implies that these formulae can be used for estimating the stature in the given population from which stature in the given population from which they have been developed . this also arises the need to have similar studies on different populations so that similar equations can be evolved for different population groups and the different can be studied further. Similar studies should be done on dead bodies in mortuary, where it is easier to mark bony projections accurately on account of absence of clothes. May be in these studies the standard of error can be minimized and these regression equations can be made more useful. Through various researchers with variable degree of success have attempted estimation of stature from various long bones, they have their own limitations. More studies need to be conducted to estimate the stature from inter-acromial length among other racial groups and of different geographical areas, as it can be extremely useful to estimate the stature when mutilated upper part of trunks are available.

VI. CONCLUSION

Inter-acromial Distance is helpful in envisaging (form of mental image of something that is not present or that is not case) age related loss in stature & identifying individuals with uneven growth oddity and skeletal dysplasia. Outcome of the present study provides baseline information, concerning some variables of a particular residents (defined for the present study as subjects of western u.p. population through the sample size was medium and the convenience sampling has to be applied due to time constraints. The study was approved by the Ethical committee of TMMC & RC, TMU. Stature forms an important aspect of individual's anthropometric measurement and can be used as a tool for partial identification of an individual. In this study, inter-acromial distance is a good parameter for the estimation of height by organizing regression equations for males and females separately, with the help of obtained all the quantitative statistical data. There exists a significant correlation of height with the inter-acromial length of an individual in both the sexes, these significant correlations organized into the form of regression equations for both sexes separately and that stature can be estimated with the inter-acromial length when mutilated upper parts of the trunks are available or when bony parts of any individual is present. A correlation matrix , usually means; a matrix of Pearson type correlations. Unfortunately, these correlations are unduly influenced by Outliers (An outlier is an observation that lies outside the overall pattern of a distribution), unequal variances, non-normality, and nonlinearities. The correlation matrix of the present study shows that the use of a single regression equation to predict stature from the equation to predict stature from the measurements of inter-acromial distance does not make a great difference from individual measurement equations based on sex. In the present study, the regression equation development for stature estimation from the inter-acromial length by regression equation formulae $"y = 95.93 + (-0.377)146"$ or $"y = 38.29"$ in males and $"y = 6.41 + (0.90)169"$ or $"y = 38.52"$ in females can be useful in estimating stature of the population of Western U.P. region. Whether these equations are useful with other population needs to be researched.

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