ORIGINAL RESEARCH PAPER

Anatomy

KEY WORDS: estimation, limb, anthropometry, height, parameters.

A STUDY OF LENGTH OF HUMAN EXTRIMITIES AND ITS RELATIONSHIP WITH HUMAN HEIGHT IN MALE AND FEMALE STUDENTS

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ABSTRACT

Stature estimation is traditionally an important consideration in physical anthropology and archaeology and is especially pertinent in the realm of forensic. Anthropometry has an important role in industrial management and ergonomic design. This information is needed to be collected regularly in every society.

METHOD: - This study was performed on 200 medical students (100 males and 100 females). Students were selected randomly excluding any physical deformities. Standing height (Stature) and upper arm, thigh length were taken of each subjects.

RESULT: - The data thus observed has been tabulated and subjected to statistical computation to drive regression equation.

CONCLUSION: - From the present study, it's found that with multiplication factors and R values. The stature can be estimated from length of limbs. It may be helpful for researchers who work in this area, especially in the various medical disciplines, anthropologists and security personnel.

INTRODUCTION: -

Assessing height of an individual from measurement of different parts of the body has always been of interest. Anthropometry is often viewed as a traditional & perhaps the basic tool of biological anthropology, but it has a long tradition of use in forensic sciences. The significance and importance of craniometry, somatometry, cephalometry and osteometry in the identification of human remains has been described and a new terminology "Forensic Anthropometry".

Stature has been one of the most important factor in the description of the individual characteristics for a long time. The estimation of height from various parameters has been performed in various studies. The study is important because of the increase in the number of catastrophic events causing mass death from natural and manmade errors. Such disasters like flooding, earthquakes, crashes(plane/train) requires identification of victims from fragmentary and dismembered human remains.

The living stature can be predicted by anatomical and mathematical techniques. Bones as the body segments were mostly used for stature estimation or vice versa. There have been already some attempts using thigh length and arm span etc. to estimate body height. Despite the need, there is a lack of systemic studies to identify fragmented and dismembered human remains.

MATERIAL AND METHOD: -

200 Subjects (100 males and 100 females) from 19-25 yrs. Old medical students of J.L.N. Medical College Ajmer (Raj.) were enrolled into the study. Metallic and plastic tape was used for anthropometric measurements. All the measurements were taken by a unique person.

Length of arm length:- The length of arm was measured in 90 degree bended elbow in person with standing position. The length of arm was defined as the distance between acromion end of clavicle and olecranon process.

Length of thigh measurements: - The length of thigh was measured in sitting position of the person from the anterior superior iliac spine felt and patellar apex.

Stature measurement: - During the stature evaluation, subjects were in standing barefoot position and were on the platform of the stadiometer with the upper back buttock and heels pressed against the upright position of the instrument. In addition, the subject's head was positioned in the Frankfort horizontal plane, the shoulders were relaxed, the back was straight, upper surface of the thighs was horizontal, the feet supported and the back of the knee joint was clear of the stool and then the head vertex was contacted to firm and the number was recorded.

Data analysis: Data were collected for each sex and analyzed by SPSS version 22.0. Mean ±Standard Deviation (SD) was used for descriptive analysis. T-test was used for evaluation of differences between groups. The correlation between height and arm length was evaluated, and the simple linear regression model was used for describing the formula of the population. Then standard error of estimate (SEE) and coefficient of determination (R2) were calculated for the relation.

RESULT: -

TABLE 1:- COMPARISION OF HEIGHT AND UPPER ARM LENGTH IN MALES AND FEMALES

	MALES				FEMALES			
	MEAN	S.D	MAX	MEAN	MEAN	S.D	MAX	MEAN
HEIGHT(cm)	172	7.25	179	159	159.09	5.46	164	152
UPPER ARM LENGTH(cm)	35.67	2.89	38.5	31	33.26	2.22	37	28.4

TABLE2 :- COMPARISION OF HEIGHT AND THIGH LENGTH IN MALES AND FEMALES

	MALES				FEMALES			
	MEAN	S.D	MAX	MEAN	MEAN	S.D	MAX	MEAN
HEIGHT(cm)	172	7.25	179	159	159.09	5.46	164	152
THIGH LENGTH(cm)	52.32	5.00	58.1	42	49.4	2.87	52.9	46.2

TABLE 3: STATISTICAL ANALYSIS

	UPPER ARM LENGTH					THIGH LENGTH				
	COVARIANCE	CORRELATION	STD. ERROR OF PREDICTION	INTERCEPT	SLOPE	COVARIANCE	CORRELATION	STD. ERROR OF PREDICTION	INTERCEPT	SLOPE
MALES	14.91	0.82	1.77	-21.15	0.33	26.65	0.85	2.83	-49.23	0.59
FEMALES	4.99	0.45	2.09	4.02	0.18	8.59	0.60	2.41	-0.89	0.31

REGRESSION EQUATION FOR UPPER ARM LENGTH (when height is known =X)

MALES Y= -21.15 + 0.33 x X

FEMALES Y= 4.02 + 0.18 x X

REGRESSION EQUATION FOR THIGH LENGTH (when height is known =X)

MALES Y= -49.23 + 0.59 x X
FEMALES Y= -0.89 + 0.31 x X

DISSCUSSION: -

Identification is the most important issue in forensic. The long bones and their relations with stature can be useful in forensic identification. In living population percutaneous length of bones can be used for prediction of stature in different population and different age group.

In a study by Nath, Rajni and Chhibber on 302 Punjabi females of Delhi, derived regression formulae for estimation of stature from upper arm length was, 82.68 + 2.29 (UAL) whereas in present study the regression equation for females was 4.02 + 0.18 x X(X=HEIGHT). Similarly, Nath and Krishan also formulated multiplication factors for reconstruction of stature from upper arm length in 276 Hindu (Baniya) females of Delhi, having age range from 15-22 years. The multiplication factor was found to be 4.95 whereas in this our study the multiplication factor in females was 4.02. Nath, Garg and Krishan also conducted a study on 160 male Rajputs of Tehsil Chakrata; district Dehradun, Uttar Pradesh in age range of 16-35 years. The multiplication factor was 5.12 whereas in comparison, the multiplication factor from upper arm length in male was 0.33.

Anand and Nath conducted a study on Rajput males and females of Pauri Garhwal and calculated multiplication factor for upper arm length to be 5.59 for males and 5.89 for females.. Another study done by Jain and Nath on 132 male Brahmins of Kumaon in age range of 17-19 years and the multiplication factor was calculated to be 5.44

Shah et al. (2015) introduced a model for height estimation from shoulder width, arm length and foot length in Muslim and Hindu of Gujarat, Indian populations. In this study, 160 subjects (128 male and 32 female, aged 20-50 years) were studied. Multiple regression analysis was performed for finding the relation between height and the evaluated factors. SEE was 6.65 for both sexes.

In this study, the linear regression equations were used for calculating the stature from UAL in medical students males is MALES Y= -21.15 + 0.33 x X and FEMALES Y= 4.02 + 0.18 x X (where X is height).

In this study, the linear regression equations were used for calculating the stature from thigh length in medical students males is MALES Y= MALESY= -49.23 + 0.59 x X FEMALES Y= -0.89 + 0.31 x X (where X is height).

CONCLUSION: -

From this study, it can be concluded that since the error between the observed and calculated lengths of arm and thigh can be estimated from the known height. The regression equation generated by using intercept and slope showed more or less similar observations between observed and calculated data. This method may be useful for identifications especially considering its cost effectiveness.

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