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Research article

ESTIMATION OF STATURE FROM CEPHALO-FACIAL ANTHROPOMETRY IN 800 HARYANVI ADULTS

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ABSTRACT: The study is aimed at modeling the stature on the basis of cephalo-facial dimensions. The study was conducted in Department of Anatomy, MM institute of medical sciences & research, Mullana (Ambala), on 800 Haryanvi adults comprising of 400 males and 400 females. Prior informed written consent was obtained from subjects. Inclusion and exclusion criteria for the study were predefined. The measurements were taken by using standard anthropometric instruments. The purpose of study was to access the head length, head breadth, horizontal circumference of head, facial length, bigonial diameter, stature and to find out the correlation of these parameters with stature. The results showed a statistically significant positive correlation between stature and all cephalo-facial measurements except for maximum head breadth which showed a insignificant correlation with stature in both sexes.

Keywords: Cephalo-facial, anthropometry, Haryanvi

INTRODUCTION

All human beings occupying this globe belong to the same species. i.e. Homo sapiens[1]. No two persons are ever alike in all their measurable characters, that the latter tends to undergo changes in varying degrees from birth to death, in healthy and in diseases, and since persons living under different conditions, and members of different ethnic groups and the offspring of unions between them, frequently present interesting differences in bodily form and proportions[2]. Personal identification means determination of individuality of a person .it may complete (absolute) or incomplete (partial). Complete identification means absolute fixation of individuality of a person. Partial identification implies ascertainment of only some facts about the identity of the person while others still remain unknown. Age,sex and stature are the primary characteristics of identification[3].

Anthropometric characteristics have direct relationship with sex, shape and form of an individual and these factors are intimately linked with each other and are manifestation of the internal structure and tissue components which in turn, are influenced by environmental and genetic factors. Anthropometric data are believed to be objective and they allow the forensic examiner to go beyond subjective assessments such as ´similar' or ´different'. With measurement data, the examiner is able to quantify the degree of difference or similarity and state how much confidence can be placed in this interpretation [1].

Estimation of stature is an important tool in forensic examination especially in unknown, highly decomposed, fragmentary and mutilated human remains. In such cases while conducting a medico-legal autopsy, forensic pathologist is often asked to opine about the identity of the deceased. Stature being one of the criteria of personal identification helps in narrowing down the investigation process and thus provides useful clues to the investigation agencies [4].

MATERIAL & METHODS

The present study was conducted on 800 adult Haryanvi Banias (400 of either sex). Prior informed consent both in English & Vernacular were obtained from subjects in writing. The subjects of age group 18 years and above were included in the study .The subjects were apparently healthy and without any craniofacial deformity.

A series of five somatometric landmarks and six anthropometric measurements were taken on 800 Haryanvi Banyas. The methodology for cepahlo-facial measurements was adopted from Krishan and Kumar.

SOMATOMETRIC MEASUREMENTS

Maximum head length:– It measures straight distance between glabella & opisthocranion.
Maximum head breadth:- It is the maximum biparietal diameter & is the distance between the most lateral points on the parietal bones.
Horizontal circumference of head:- It is the maximum circumference of the head measured from just above the glabella area to the area near the top of the occipital bone(opisthocranion).
Bigonial diameter:- It is the maximum breadth of the lower jaw between two gonion points on the angles of mandible.
Morphological facial length:- It is straight distance from the nasal root (nasion) to the lowest point on the lower border of the mandible in the mid sagittal plane (gnathion).
Stature:– It is the vertical distance between highest point on the head (vertex) and the floor.
The measurements were taken with the help of an anthropometric rod, sliding caliper,spreading caliper and measuring steel tape to the nearest 0.1.

RESULTS

Regression analysis was done to estimate stature from all five cephalofacial measurements. Pearson correlation coefficient was used to find the relation between the cephalofacial measurements and stature. All the cephalofacial measurements show significant correlation with stature in both sexes except maximum head breadth which show insignificant correlation with stature.

Table 1 observations and values

parameters	sex	Mean	S.D	S.E.M	Range	
					Min	Max.
Maximum head length	M	18.75	1.386	0.0538	16	22.2
	F	17.75	0.847	0.0424	13.6	20.2
Maximum head breadth	M	13.11	1.098	0.0525	10.6	16
	F	12.95	0.832	0.258	10	14.7
Horizontal head circumference	M	55.95	1.631	0.082	45.4	64
	F	54.61	1.605	0.080	44	62
Morphological facial length	M	11.07	0.698	0.035	8.5	13.1
	F	10.21	0.940	0.047	8.5	12.6
Bigonial diameter	M	11.45	1.104	0.055	9.3	14.2
	F	10.33	0.753	0.037	8.4	12.4

Table 2: Pearson Correlation Coefficients Between Stature and Cephalo-facial Measurements in Males

Measurements	Pearson correlation coefficient (r)	p- value
Maximum Head length	0.174	0.0004
Maximum Head breadth	0.321	>0.05*
Horizontal Head circumference	0.122	0.014
Morphological Facial length	0.177	0.0003
Bigonial diameter	0.164	0.0009

*Insignificant
Table 2 shows that all the cephalofacial measurements showed positive significant correlation with stature ($p<0.01$) except for maximum head breadth which was not significantly correlated with stature.

Table 3: Pearson Correlation Coefficient Between Stature and Cephalo-facial Measurements in Females

Measurements	Pearson correlation coefficient (r)	p- value
Head length	0.190	0.0001
Head breadth	0.008	>0.05*
Head circumference	0.181	0.0002
Facial length	0.150	0.002
Bigonial diameter	0.119	0.016

*Insignificant

Table 3 shows that all the cephalofacial measurements showed positive significant correlation with stature ($p<0.01$) except for maximum head breadth which was not significantly correlated with stature.

Table 4: Regression Equations for Estimation of Stature (cms) from Cephalofacial Measurements in Males

REGRESSION EQUATION	SEE
HEIGHT = 152.06 + 0.888(MHL)	**5.39**
HEIGHT= 146.72+ 1.677(MHB)	**5.18**
HEIGHT= 145.74+0.410(HHC)	**5.43**
HEIGHT= 153.31+ 1.390(MFL)	**5.38**
HEIGHT= 159.42+ 0.811(BGD)	**5.4**

Table- Show regression equations to calculate stature from cephalo-facial measurements (Maximum Head length(MHL), Maximum Head breadth(MHB), Horizontal Head circumference(HHC), morphological facial length(MFL), Bigonial diameter(BGD) by substituting the values of cephalofacial measurements in males. A hypothetical regression equation is depicted as follows:

Stature = a + bx where 'a' is the regression coefficient of dependent variable i.e. stature and 'b' is the regression coefficient of independent variable (any of the cephalofacial measurement), 'x' is any cephalofacial measurement. The standard error of estimate (SEE) is least for maximum head breadth.

Table 5: Regression Equations for Estimation of Stature (cms) from Cephalofacial Measurements in Females

REGRESSION EQUATION	SEE
HEIGHT = 136.77+ 1.037(MHL)	**4.54**
HEIGHT= 155.28+ 0.0077(MHB)	**4.63**
HEIGHT= 126.57+0.523(HHC)	**4.55**
HEIGHT= 147.62+ 0.740(MFL)	**4.33**
HEIGHT=147.61+0.733(BGD)	**4.60**

***Insignificant**

Table-5.11. Show regression equations to calculate stature from cephalo-facial measurements (Maximum Head length(MHL), Maximum Head breadth(MHB), Head circumference(HHC), Morphological facial length(MFL), Bigonial diameter(BGD) by substituting the values of cephalofacial measurements in females.

DISCUSSION

The results showed that the stature can be estimated from these cephalofacial diameters except maximum head breadth where cephalofacial remains are brought for forensic analysis.

Table 6 showed the comparison of work done by various workers

Sno			MHL	MHB	HHC	MFL	BGD
2	Jadav& shah	M	+0.53	--	---	---	---
		F	--	---	----	---	----
3	Patil&Mody	M	0.40	----	----	0.925	----
		F	---	--------	-----	-----	----
4	Ryan& Bidmos	M	0.40-0.54	----	--------	--	---
		F	0.45-0.54		----	-----	-----
5	Kalia et al	M	0.13	-----	0.14	-----	----
			0.00	----	0.00	----	----
6	Krishan & Kumar	M	0.732	0.625	0.773	0.345	0.449
		F	---	----	-----	-----	-----
7	Krishan	M	0.775	0.682	0.781	0.455	0.462
		F	---	----	----	------	---
8	IIaypperuna	M	0.715	0.312	-------	---	----
		F	0.470	0.454	-----	-----	-----
9	Present study	M	0.174	0.321*	0.122	0.177	0.164
		F	0.190	0.008*	0.181	0.150	0.119

- **insignificant**

CONCLUSION

From present study it was concluded that the cephalo-facial measurements can also be used for estimation of stature when cephalofacial remains are brought for forensic examination. The most reliable cephalofacial measurements to estimate stature using regression analysis among males is morphological facial length and among female is maximum head length. Since regression equations are known to be population and sex specific, there is a need for similar equations to be derived for other endogamous groups. Estimation of stature from cephalofacial measurements is a supplementary approach when useful samples like extremities and other body parts are not available for examination.

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