Facial Anthropometry: A Reliable Tool for Stature Estimation in Haryanvi Population

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Abstract

Background: Facial anthropometry is a part of cephalometry that involves the measurements of face. It is very helpful in reconstructive surgery, forensic medicine, orthodontics and to find ethnic differences by defining various shapes of face. Facial features of every individual are different even in siblings. These features vary according to gender, racial and biological group, ecological and geographical region. Anthropometry can also be used for estimation of stature, where it cannot be measured directly such as spinal or lower limb deformity or any other neuromuscular disorder.So, the present study attempted to find that is the facial parameters are reliable in estimation of stature in Haryanvi jaat population and also aims formulate regression equation for estimation of stature in the same.

Methods: A sample of total 300 adult Haryanvi jaatsof age group 20 to 60 years was taken for the present study. Out of them 150 were females and 150 weremales. Anthropometric measurements of face and stature were taken on each subject.

Conclusion: All the studied facial parameters showed positive significant correlation with stature (p<0.01) both in males and females So, it can be concluded that facial anthropometry is a reliable tool for stature estimation in Haryanvi population.

Key words: Anthropometry, Facial, Haryanvi, Identification, Stature.

Introduction

Identification of every human being is unique. This identification can be done by various methods like physical examination, fingerprinting, DNA printing and anthropometry etc. Facial anthropometry is a part of cephalometry that involves the measurements of face. It is very helpful in reconstructive surgery, forensic medicine, orthodontics and to find ethnic differences by defining various shapes of face[1]. Males comprises

large stature, more prominent cranial and facial features, greater muscularity and strength as compared with females. These differences are not visible in infants, children and sub adults but are noticeable in adult stage due to the effect of hormonal changes occurring at puberty. These features vary according to gender, racial and biological group, ecological and geographical region[2].Anthropometry can also be used for estimation of stature, where it cannot be measured directly such as spinal or lower limb deformity or any other neuromuscular disorder[3]. Itis the most applied, non-invasive and inexpensive method of measurement to assess the size, proportions of the human body.[4] Stature can also provide circumstantial and presumptive identification of individual. It is a good indicator of growth and development and may be used in clinical settings for health and nutrition research.In the past,

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estimation of stature from various body parts like bones, fingerprints, skulls, upper and lower limbs, hand and foot has been achieved by many researchers with varying degree of accuracy. Many studies showed that there presentsa definite biological relationship between stature and facial parameters[5]. So, the present study attempted to find the reliability of facial parameters in estimation of stature in Haryanvi jaat population and also aims toformulate regression equation for estimation of stature in the same.

Material and Method

A sample of total 300 adult Haryanvi jaats of age group 20 to 60 years was taken for the present study. Out of them 150 were females and 150 were males. Written consent was taken from every subject. Measurements of stature, Bigonial diameter, morphological facial length and physiognomic facial length were taken on each subjectaccording to the landmarks and procedure recommended by Nath S[6] and Krishan & Kumar[7].

Type of Study: Community based Anthropometric study

Sampling Method: Purposive sampling method

Instruments Used: Anthropometric rod, Spreadingcaliper and Sliding caliper.

The taken anthropometric measurements are described as: -

1. **Stature (S):** It is the vertical distance between the horizontal surface (where the subject stands straight uprightand barefooted) and the highest point on the vertex on the head. The subject's head was kept in Frankfurt Horizontal Plane.

2. **Bigonial diameter (BD):** It is the maximum breadth of the lower jaw between two gonion points on the angle of mandible.

3. **Morphological facial length (MFL):** It is the straight distance between nasion and gnathion.

4. **Physiognomic facial length (PFL):** It measures the straight distance between trichion and gnathion.

Statistics Done: Mean, standard deviation, Karl Pearson's correlation coefficient and derivation of regression equation using Statistical Package for Social Sciences (SPSS).

Results and Discussion

Table 1 showing the descriptive statistics i.e mean, standard deviations, minimum and maximum values for bigonial diameter, morphological facial length, physiognomic facial length and stature measurements in adult Haryanvi males and females respectively. The values of all parameters are higher in males than females.

Table 1: Descriptive Statistics for bigonial diameter, morphological facial length, physiognomic facial length and Stature in Adult Haryanvi Jaats (N = 300)

Measurements in (cm)	Gender	Mean	S.D	Minimum	Maximum
Bigonial Diameter	Male	10.68	0.559	9.20	12.00
	Female	9.92	0.559	8.26	11.46
Morphological Facial Length	Male	11.16	0.676	9.76	13.53
	Female	10.41	0.646	8.03	13.66
Physiognomic Facial Length	Male	17.93	1.046	15.76	20.30
	Female	16.75	0.959	13.43	19.16
Stature	Male	172.14	6.547	151.40	192.00
	Female	156.07	6.061	141.46	177.00

Table 2: Pearson Correlation Coefficients between stature and facial measurements

Measurements	Gender	Pearson Correlation Coefficient (r)	p-value
Bigonial Diameter	Male	0.278	0.001
	Female	0.324	0.000
Morphological Facial Length	Male	0.354	0.000
	Female	0.228	0.005
Physiognomic Facial Length	Male	0.304	0.000
	Female	0.210	0.010

Table 2 showing significant correlation of bigonial diameter, morphological facial length, physiognomic facial length with stature (p<0.01) in both sexes.

Table 3: Regression equations for estimation of stature from facial measurements

Regression Equation		Standard Error of Estimate (SEE)	
Males	**Females**	**Males**	**Females**
Height= 137.36+3.255(BD)	Height= 121.27+3.506(BD)	6.31	5.75
Height= 138.87+3.426(MFL)	Height= 133.77+2.142(MFL)	6.14	5.92
Height= 137.99+1.904(PFL)	Height= 133.85+1.326(PFL)	6.25	5.95

Table 3 showing the regression equations to calculate stature from facial measurements i.e. from bigonial diameter (BD), morphological facial length (MFL) and physiognomic facial length (PFL) by substituting the values of facial measurements in their respective equations.

Table 4. Studies showing comparison of mean values of facial parameters of present study with the mean of previous studies.

Sr. No.	Authors	Study Population	Mean Bigonial Diameter		Mean Morphological Facial Length		Mean Physiognomic Facial Length	
			Males	**Females**	**Males**	**Females**	**Males**	**Females**
1.	Present Study	Haryanvi Jaat Population	10.68	9.92	11.16	10.41	17.93	16.75
2.	Krishna and Babu8	South Indian Population	-	-	11.26	11.00	17.43	17.45
3.	Shah et al9	Gujarati Population	10.38	8.79	9.85	8.54	16.4	14.76
4.	Maalman et al10	Ghana Population	-	-	13.22	12.45	20.46	18.90
5.	Yadav AB et al11	Indian Population	9.91	9.04	11.33	10.61	17.18	16.11
6.	Agnihotri AK et al12	Indo-Mauritius Population	10.55	9.90	11.58	11.00	17.85	16.46
7.	Sahni et al13	Northwest Indian Population	10.64	10.26	11.25	10.80	-	-
8.	Kumar M and Gopichand14	Haryanvi Bania Population	11.45	10.33	11.07	10.21	-	-

Table 4 showing the comparison of results of present study with similar available studies on different populations which states that mean values of facial parameters i.e.bigonial diameter, morphological facial length and physiognomic facial length are higher in males as compared to females. The value of all facial parameters is different in all studies that reveals that these parameters vary in different populations.

Table 5. Studies showing p- values of facial parameters of present study and previous studies.

Sr. No.	Authors	Study Population	p-value		
			Bigonial Diameter	Morphological Facial Length	Physiognomic Facial Length
1.	Present Study	Haryanvi Jaat Population	p<0.00	p<0.00	p<0.01
2.	Shah et al9	Gujarati Population	p<0.05	p>0.05*	p<0.05
3.	Yadav et al11	Indian Population	p<0.05	p<0.05	p<0.05
4.	Agnihotri et al12	Indo-Mauritius Population	p<0.01	p<0.01	p<0.01
5.	Kumar& Gopichand14	Haryanvi Bania Population	p<0.01	p<0.01	-

*Insignificant

Table 5 showing p- values of facial parameters of present study and previous studies. It is evident that the facial parameters i.e.bigonial diameter, morphological facial length and physiognomic facial length showed positive significant correlation with stature in present study and in previous studies. Exceptthe morphological facial length of Gujarati population studied by Shah et al[9] which is insignificant. So, these parameters can be used for estimation of stature in Haryanvi jaat population effectively.

Conclusion

All the studied facial parameters showed positive significant correlation with stature (p<0.01) both in males and females So, it can be concluded that facial anthropometry is a reliable tool for stature estimation in Haryanvi population.

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