UPPER FACIAL INDEX: AN ANTHROPOMETRIC STUDY

Research

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Abstract

Background: Facial contour is highly attentive and interesting topic for artists, anthropologist, anatomist, forensic science expert, plastic surgeons and maxillofacial surgeons. Many factors affect the shape of face like race, sex, climate, genetic, socio economic and nutritional factors. Less studies available on upper facial index from skull worldwide and not all suggestive of significant sexual dimorphism. The purpose of this study to verify significance of sexual dimorphism by upper facial index and to determine dominant facial type in Western Indian population. **Materials and Methods:** The study was conducted on 80 crania of known sex. Upper facial height and bizygomatic breadth were measured and upper facial index was calculated. **Result:** In the present study the mean upper facial index is found to be 50.5 + 3.6mm. Mean upper facial index is observed as 49.9mm in males and 51.3mm in females. The difference in upper facial index of male and female crania is statistically insignificant for sexual dimorphism. Dominant facial type is mesene (round face) category for both male and female crania. **Conclusion:** Present study verified and confirmed that upper facial height and bizygomatic breadth show statistically significant difference for sex determination of adult crania while upper facial index is statistically insignificant indicating less sexual dimorphism suggestive to use other methods for sex determination of adult crania. Mesene type is the dominant facial type (56%) found in western Indian population. This study will serve as a future framework for estimating other cranial variables in same population.

INTRODUCTION

When dealing with skeleton or its remains; race, sex and age are the three most vital determinations to be made out.[1] They are best determined from skull both morphometrically and morphologically.[2,3,4,5,6] Craniometric indices are commonly used as reliable sexual dimorphic traits. These indices give fairly accurate and simplest way for judging similarities or disparities when comparing different races.[7] They are expressed as percentages or ratios which is important for classification of cranial type and also for studying living population.[8] Some studies done comparing South and north Indian population craniometric indices but Western Indian population is yet neglected having few data available on these.[9,10] As this method is highly population specific, should be customized in reference to population.[11]
Facial contouris highly attentive and interesting topic for artists, anthropologist, anatomist, forensic science expert, plastic surgeons and maxillofacial surgeons.Since ancient time human face measurements are in practice to determine various shapes. Measurements of facial skeleton play crucial role for identifying skeletal variations and determining population history.[12] Many factors affect the shape of face like race, sex, climate, genetic, socio economic and nutritional factors.[13] Facial analysis is also necessary for growth study and diagnosis of genetic and other anomalies and for facial approximation of disputed identity.[14,15] Proper knowledge of facial anatomy and anthropometry is vital for high success rate of facial reconstructive surgeries. Recently upper facial index is proposed as novel sexual dimorphic measure.[16] Less studies available on upper facial index from skull and not all suggestive of significant sexual dimorphism.[8,17,18,19,20] Putting all these things in base, present study aimed to verify significance of sexual dimorphism by upper facial index and to

determine dominant facial type in Western Indian population which will add into literature data.

MATERIALS AND METHODS

The study was conducted on 80 (40 males and 40 females) dry, well preserved and intact adult crania obtained from anatomy departments of medical colleges across Gujarat. All crania were assumed to be from West Indian origin. Two parameters were measured based on methods as per international standards.[21,22,23] Points are marked by marker pen, distance is measured thrice in millimeters and average is counted for each measurement on every skull for reducing intra observer error.

- Upper facial height: Distance measured from nasion to prosthion by vernier caliper
- Bizygomatic breadth: Distance measured between two zygia (most laterally placed points on zygomatic bone) by spreading caliper.

The measurements were tabulated in excel program. Mean and standard deviation for each parameter were calculated. Z test is applied as the sample size is more than 30 and statistical significance is checked by p value.

The upper facial index was calculated as follow

$$\text{Upper Facial Index} = \frac{\text{Upper facial height} \times 100}{\text{Bizygomatic breath}}$$

Classification of facial types based on upper facial index (Martin and Sellar).[23]

a) Hypereuryene (very broad face) ≤ 44.9
b) Euryene (broad face) 45– 49.9
c) Mesene (round face) 50–54.9
d) Leptene (long face) 55– 59.9
e) Hyperleptene (very long face) ≥ 60

RESULTS

The results of cranial parameters used for this study are shown in [Table 1]. The mean of upper facial height and bizygomatic breadth are 62.2mm and 123.4mm respectively for total sample. Both these parameters are statistically significant. The mean upper facial index for male and female crania are 49.9 mm and 51.3 mm respectively. The mean upper facial index for total sample is 50.5mm. Mean of female crania show higher value than mean of male crania for upper facial index. Differences of male and female upper facial index is statistically insignificant for sexual dimorphism (p>0.05). Table 2 shows facial types identified based on upper facial index in the present study. According to classification, 04 (05%) crania were grouped as Hypereuryene (very broad face), 25 (31%) as euryene (broad face), 45 (56%) as mesene (round face) and 06 (08%) as leptene (long face) from total sample.

Table 1: Mean and standard deviation values of parameters: (All measurements are in mm.)

Parameter	Male (n= 46)		Female (n= 34)		Total (n= 80)		Z test	P value
	Mean	SD	Mean	SD	Mean	SD		
Upper facial height	63.4	4.8	60.6	4.3	62.2	4.8	2.7	< 0.05
Bizygomatic breadth	127.1	5.0	118.3	6.6	123.4	7.1	6.4	< 0.01
Upper facial index	49.9	3.1	51.3	4.0	50.5	3.6	1.7	> 0.05

Table 2: Classification of Facial types based on upper facial index.

Facial type	Range of upper facial index	Male crania (46)		Female crania (34)		Total sample (80)	
		N	%	N	%	N	%
Hypereuryene (very broad face)	≤ 44.9	02	04%	02	06%	04	05%
Euryene (broad face)	45 – 49.9	16	35%	09	26%	25	31%
Mesene (round face)	50 – 54.9	27	59%	18	53%	45	56%
Leptene (long face)	55– 59.9	01	02%	05	15%	06	08%
Hyperleptene (very long face)	≥ 60	00	00%	00	00%	00	00%

DISCUSSION

Present study confirms sexual dimorphism in upper facial index is statistically insignificant (p>0.05) and classification of index suggest mesene type as dominant facial type in western Indian population followed by euryene in both sex.

If we compare our study with similar studies in India, Raghavan P et al,[9] measured over 1300 crania across India and calculated 17 indices. In every series except Urdu, upper facial index ranges from hypereuryene to leptene type which involves wide range of classification. Dattatray DA and Ankushrao DS,[16] concluded this index as statistically significant and reveled that out of 100

Indian skulls studied, most of skulls fall in euryene (broad face) group with few male skulls in mesene group and few female skulls in hypereuryene group while Chaturvedi RP and Herneja NK,[24] observed that mean of upper facial index is 52.99 which falls in mesene group in their study of for 150 skulls. North Indian population have mesene type face as per study by Saini V et al,[11] on total 483 skulls; Vaidya YP et al,[25] observed that Central Indian population fall in mesene type of group in their study on 30 crania which show mean of this index is 52.28. Padala SR and Khan N,[8] found 44% mesene type followed by 24% as hyperleptene type face however the difference was not statistically significant indicating less sexual dimorphism for 50 skulls of South Indian origin. Another Study by

Vidya CS et al,[20] on 80 skulls of South Indian origin also reported upper facial height, bizygomatic breadth and upper facial index as statistically insignificant sex predictors.

In Turkish study on 30 crania by Senol RGT et al,[26] mean of upper facial index is 52.61 classified in mesene type face. H de Villiers,[17] concluded that sexual dimorphism is more pronounced in face than calvaria but upper facial index shows insignificant result when he analyzed 745 crania of South African Bantu speaking Negroes. Liebenberg L et al,[18] studied 207 South African crania using five standard cranial indices resulted that only 17% of South African Whites and 10% of Khoesan are correctly classified by using upper facial index in contrast to that 85% South African black are correctly classified. They concluded that indices cannot compete with multivariate techniques and should be excluded from forensic anthropological analyses. Zaki ME et al,[19] also found this index as statistically insignificant when applied this index on skulls of Bahriyah oasis belonging to Greco- Roman period.

Many studies available on facial index in living population while few also carried out upper facial index on living subjects.[1,10,13,27,28,29,30,31,32]

Ansari MS et al,[32] found 81% female and 85% male of Jansari tribe have leptene type face with significant sexual differences. Comparision of North and South Indian population by Prasanna LC et al,[10] confirmed significance of upper facial index for sexual dimorphism; North and South Indian males have leptene to hyperleptene (very long) type face and most of North Indian females have very long face while South Indian females falls in round face type. Novita M,[1] used upper facial index in study on students of Jember University and found difference for index as Batak population classified as hypeuryene while Klaten and Flores population classified as euryene.

A study by Mehta M et al,[33] using CT scan for craniofacial indices reported leptene type of upper facial index in Gujarati population. Howale D et al,[34] show mesene type of index in Maharashtrian population.

CONCLUSION

Present study verified and confirmed that upper facial height and bizygomatic breadth show statistically significant difference for sex determination of adult crania while upper facial index is statistically insignificant indicating less sexual dimorphism suggestive to use other methods for sex determination of adult crania. Mesene type is the dominant facial type (56%) found in western Indian population followed by euryene type of face (31%) in both sex. The result of this study will be useful in anthropology, forensic medicine and surgery. This study will serve as a future framework

for estimating other cranial variables in same population.

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