ESTIMATION OF GENDER FROM FACIAL LENGTH AND MAXIMUM FACIAL BREADTH IN MALWA REGION OF CENTRAL INDIA

Anatomy

Dr. Aprajita Awasthi	Demonstrator, Department Of Anatomy, Government Medical College, Datia, MP, India
Dr. Rajendra Singh Marko*	Assistant Professor , Department Of Anatomy, M.G.M. Medical College, Indore, MP, India (*Corresponding author)
Dr. Massarat Jehan	Assistant Professor, Department Of Anatomy, M.G.M. Medical College, Indore, MP, India
Dr. Annapurna Bose	Professor (TS), Department Of Anatomy, M.G.M. Medical College, Indore, MP, India

ABSTRACT

Present study was conducted in 200 medical students of Malwa region in which gender determination was done using Face length (FL) and Maximum Facial Breadth (FB). Among all 200 students included in our study, the mean age for males was 19.9±0.114 years (Mean±SEM) and for females it was 20.2±0.096 years. The mean Face length for males was 12.1±0.079 cm and for females it was 10.9±0.04 cm. The mean Maximum Facial Breadth was 12.9±0.065 cm for males while it was 12.4±0.06 cm in females. It is concluded that there was a significant (p<0.0001) statistical difference between males and females for the facial parameters used in this study which shows that these parameters can significantly be used for estimation of gender using the part of skull with intact norma frontalis which allows to measure these parameters during forensic investigations. The FL was a better parameter than FB.

KEYWORDS

Face length, Facial Breadth, Sex estimation, Gender determination.

INTRODUCTION

Sexual dimorphism is the existence of physical differences between the sexes other than differences in sex organ.[1] Study of human skeleton for sex determination has been a topic of interest among researchers, as bones of the body are last to perish after death, next to enamel of teeth. Almost all bones of the human skeleton show some degree of sexual dimorphism.

Sex of an individual can be identified accurately in 80% of cases using skull alone and in 98% cases using pelvis and skull together. But the forensic experts were not getting the intact skeleton or bone every time therefore they are facing difficulty in estimation of sex in that conditions. Even a part of a bone may show some dimensional difference in different gender as most bones that are used for gender determination are often recovered either in a fragmented or incomplete state, and some authors used the bony dimensions of thickened parts of bones like bizygomatic distance[2] and maxilla (maxillary sinus dimensions)[3] of norma frontalis reporting it to be intact even in incinerated skull and therefore they used their dimensions for identification of gender using CT scan.[2-3] But every time the CT scan of a part or study of its interior dimensions are not possible and therefore the general superficial (outer) measurements of bone or a part of bone for specific (different) populations is a need and topic of research.

Facial dimension is the measurement of length, width and height relating to the face.[4] For evaluation of variations in craniofacial morphology, standards of anthropometric measurements should be established for a particular population.[5]

Growth and development of a human being depend not only on hereditary factors (genetic determinants) but also on environmental factors. Environmental factors may influence hormonal and metabolic activities during harmonious growth.[6-8] Men usually have less fat tissue; they have stronger and wider bones, more muscular mass, etc. in comparison to women.[9]

Anthropometric characteristics have direct relationship with sex, shape and form of an individual and these factors are intimately linked with each other. Therefore the aim of the present study is to predict the sexual dimorphism from the dimensions (facial length and maximum facial breadth) among people of Malwa region of Central India.

MATERIAL AND METHODS

Medical students between 18 to 22 years of age group were selected from our institution, MGM Medical College, Indore, MP, India, for the study which included 100 males and females each (total = 200). Students with facial deformity were excluded from study.

Facial length and maximum Facial breadth were measured using spreading caliper. The anthropometric measurements which were measured were defined as:

Facial length (FL): It is the maximum vertical distance of the face measuring between nasion (intersection of naso frontal suture with the mid sagittal plane) to gnathion (most anterior and lowest median point on lower jaw) passing in front of the nose anteriorly as shown in Figure 1.

Figure 1: Method of measuring the Facial length

Maximum Facial Breadth (FB): It is maximum transverse distance of the face which is measured from right tragion (the point in the notch just above the tragus of the ear) to left tragion with the help of measuring spreading caliper passing in front of the nose anteriorly (Figure 2).

Figure 2: Method of measuring the maximum Facial Breadth

The measurements were taken with the help of a spreading caliper to the nearest 0.1 cm. The subjects were apparently healthy and those with any craniofacial deformity were excluded from the study. All the measurements were taken at fixed time between 02:00-04:30 PM to eliminate discrepancies due to diurnal variation.

The Age, Facial length (FL) and Maximum Facial Breadth (FB) were calculated as range, mean, standard deviation and standard error of mean. A student t-test was performed for Age, FL and FB and were statistically analyzed and compared between male and female participants with the help of Graph prism statistical software and Microsoft excel sheet.

OBSERVATION AND RESULTS

A descriptive statistics were calculated among 200 students enrolled as shown in Table-1 for male and Table-2 for females which shows that the mean age for males was 19.9±0.114 years (Mean±SEM) and for females it was 20.2±0.096 years. The mean Face length for males was 12.1±0.079 cm and for females it was 10.9±0.04 cm. The mean Maximum Facial Breadth was 12.9±0.065 cm for males while it was 12.4±0.06 cm in females. FL and FB measured gives results greater for males than females which represents its sexual dimorphism.

TABLE – 1
DESCRIPTIVE STATISTICS OF AGE, FACIAL LENGTH (FL) AND MAXIMUM FACIAL BREADTH (FB) OF MALE

Statistics	Age	FL	FB
Minimum	18	10.5	11.5
Median	20	12.5	13
Maximum	22	14.5	14
Mean	19.9	12.1	12.9
Std. Deviation	1.14	0.794	0.654
Std. Error (SEM)	0.114	0.0794	0.0654
Lower 95% CI of mean	19.7	12	12.8
Upper 95% CI of mean	20.1	12.3	13.1
Coefficient of variation (CV)	5.71%	6.55%	5.05%

TABLE – 2
DESCRIPTIVE STATISTICS OF AGE, FACIAL LENGTH (FL) AND MAXIMUM FACIAL BREADTH (FB) OF FEMALE

Statistics	Age	FL	FB
Minimum	19	10	11.2
Median	20	11	12.5
Maximum	22	11.5	13.5
Mean	20.2	10.9	12.4
Std. Deviation	0.961	0.397	0.604
Std. Error (SEM)	0.0961	0.0397	0.0604
Lower 95% CI of mean	20	10.8	12.2
Upper 95% CI of mean	20.4	11	12.5
Coefficient of variation (CV)	4.77%	3.65%	4.89%

TABLE – 3
STUDENT t- TEST BETWEEN MALE AND FEMALE AGE, FACIAL LENGTH (FL) AND MAXIMUM FACIAL BREADTH (FB)

Student t- test	Age	FL	FB
t – value	t=1.814	t=14.07	t=6.38
p – value	0.0711	<0.0001	<0.0001
P value summary	Ns	****	****
Difference between means	0.27 ± 0.1488	-1.249 ± 0.08876	-0.568 ± 0.08903
Are means signif. different? (P < 0.05)	No	Yes	Yes
95% confidence interval	-0.02346 to 0.5635	-1.424 to -1.074	-0.7436 to -0.3924
R squared	0.01635	0.5	0.1705
Upper 95% CI of mean	20.1	12.3	13.1
Coefficient of variation (CV)	5.71%	6.55%	5.05%

*** Significant; ns- non significant

According to Table-3, the statistical difference of the results of student t- test between males and females for Age was not significant with p<0.07 which means that the age group of the participant students were same. p value is significant (p<0.0001) for Face length and Maximum Facial Breadth and indicates that the gender can be predicted significantly using the above parameters and t- value of 14.04 for FL indicates it to be a better parameter to assess gender than FB (t=6.38).

DISCUSSION

Present study was conducted in 200 medical students of Malwa region in which gender determination was done using Face length and maximum Facial breadth.

In our study, the mean Facial length for males was 12.1±0.079 cm and for females it was 10.9±0.04 cm. On applying the t-test the difference between the means of two groups was found statistically significant which indicates that the gender can be predicted significantly using the facial length. In a study, conducted by Neeta Chhabra and B.K. Mishra

in Delhi in 2015, the mean facial height for males was 112.84±6.23 mm and for females it was 108.84±5.21 mm. Sexual dimorphism was found statistically significant in their study also(p<0.001).[10]

In a similar type of study conducted by Vijeta Choudhary and A.K. Kapoor in Delhi in 2018, the mean face breadth was 124.7 mm in males and 121.51 mm in females. Sexual dimorphism was found to be statistically significant (p<0.001) indicating males having broader faces than females.[11]

In our study, the mean of maximum Facial breadth for males was 12.9±.065 cm and it was 12.4±.6 cm for females. Similar results were found in a study conducted by Vijeta Choudhary and A.K. Kapoor in Delhi in 2018, the biauricular breadth among males was 13.25±.25 cm and for females it was 12.41±1.11 cm.[11]

The male hormone testosterone could also be a possible reason for the observed sexual dimorphism as it brings about direct increase in the size and mass of muscles and bones and thus, changes in the shape of the face between the sexes.[12]

In this study significant differences were found in the facial measurements of males and females with values being higher in males. Our study agrees with other authors on sexual dimorphism of facial features. These findings should be kept in mind when planning facial reconstructive surgeries in men or women of Malwa region or in forensic investigations on skull with intact facial region.

CONCLUSIONS

It is concluded that there was significant statistical difference between males and females for the facial parameters used in this study ie. Face length and maximum Facial breadth. The Facial length was a better parameter with t- value of 14.04 than Maximum Facial Breadth (t=6.38) to assess gender accurately. This shows that these parameters can significantly be used for estimation of gender using the part of skull with intact norma frontalis which allows to measure these parameters during forensic investigations or during facial reconstructive surgeries in men or women of Malwa region.

REFERENCES:

1. Gluksman, A. Sexual Dimorphism in Human and Mammalian Biology and Pathology. Academic Press, 1981: 66-75.
2. Jehan M, Bhadkaria V, Trivedi A, Sharma SK. Sexual Dimorphism of Bizygomatic distance & Maxillary sinus using CT scan. IOSR-JDMS, 2014; 13(3) Ver.2: 91-95.
3. Sharma SK, Jehan M, Kumar A. Measurements of Maxillary Sinus Volume and Dimensions by Computed Tomography Scan for Gender Determination. Journal of Anatomical Society of India, 2014; 63(1):36-42.
4. Stedman. Medical Dictionary Lippincolt. 27th Edn., Williams and Wilkins. 2006: 405.
5. Basciftel, F.A., T. Uysal and A. Buyukerkman,. Craniofacial structures of Anatolian Turkish adults with normal occlusion and well balanced faces. AMJ Orthod and Dentofacial Orthodpedics. 2004:125(3): 366-372.
6. Moore KL. Before we are born. Philadelphia: WB Saunders Company, 1989.
7. Moyers RE. Handbook of Orthodontics. Chicago: Year Book Medical Publishers, 1988.
8. Moss ML. G. Genetics, Apigenetics and Causation. Am J Orthodont 1981; 80: 366-375.
9. Bjork A, Helm S. Prediction of the age of maximum pubertal growth in body weight. Angle Orthod 1967; 33: 134-143.
10. Chhabra N, Mishra BK. Sexual dimorphism and ethnic variations in facial index; a study done on north Indian adults. Int J Health Sci Res. 2015; 5(4):109-115.
11. Choudhary V , Kaoor A.K. Sexual dimorphism from the facial dimensions: an identification. International Journal of Research in Humanities, Arts and Literature. Vol. 6, Issue 2, Feb 2018, 367-378.
12. E.A. Osunwoke, F.S. Amah-Tariah, O. Obia, I.M. Ekere, O. Ede. Sexual Dimorphism in Facial Dimensions of the Bini's of South-Southern Nigeria. Asian Journal of Medical Sciences 3(2): 71-73, 2011.