A Study on Orbital Linear Measurements among Bengalee Population

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Abstract- Human androgens like testosterone and oestrogen are responsible for sexually dimorphic features like more musculo-skeletal system in men. Testosterone affects a number of facial features. In pubertal males, a high testosterone/oestrogen ratio is thought to facilitate the lateral growth of cheek bones, mandible and chin and the forward growth of the bones of eyebrow ridges and lengthening of the lower face leading to more robust face shape. The data for the present study was collected from the 283 individuals of both sexes, which includes 144 mals and 139 female. Considering the present study in Bengalee Hindu caste population. In another hand it is easily highlited that orbital linear measurements (Burley et al, 2003; Debopriya, 2008) which clinically represents the measurement for assessing ocular Hypertelorism, are strongly correlated but in case of male 2D:4D ratio as a proxy measurement for prenatal androgen level is not correlated with Orbital region linear measurements which denotes that prenatal hormonal environment do not affect the orbital measurements. Though in females a negative correlations are found between Inter pupillary distance and outer canthal distances and canthal indices are positively correlated. canthal linear measures in case of males are not correlated with digit ratio which represents the prenatal hormonal level but in case of females Inter pupillary distance and Outer canthal distance are negatively correlated and inner canthal distance and Canthal indices are positively correlated. It also stated that orbital Hypertelorism signifies an increased distance between both medial sides and lateral sides of orbits which associated with curved hairline.

Index Terms- Obital linear measurmnts, Anthropometry, Bengali population.

I. INTRODUCTION

Human andrology like testosterone and estrogen are responsible for sexual dimorphism (McDonald et al, 2011). It is seen in mostly musculo-skeletal system in man. Testosterone affects a number of facial features. In pubertal males , a high testosterone / estrogen ratio is thought to facilitate the lateral growth of cheek bones, mandible and chin and the forward growth of the bones of eyebrow ridges and lengthening of the lower face leading to more robust face shape (fink et al, 2005). Studies show that finger length and the differentiation of the uro-genital tract are both controlled by the Home box gene – Hox a and d, and 2D:4D is thought to be a somatic marker of prenatal sex hormone exposure (Kulkarni et al, 1992). Many studies provide indirect evidence that testosterone stimulates prenatal growth of fourth finger and oestrogen affects the second finger (Manning, 2002). A low 2D:4D ratio (Neave et al, 2003; Nelson et al,2010) can be considered as a marker for uterine environment of hormonal balance between testosterone and estrogen (Lutchmaya et al, 2004); obtained radio immune assay of foetal testosterone FT and foetal estradoil FE from routine amnio-synthesis. In another study it was depicted that face shape is related to prenatal androgen level, which is estimated from 2D:4D ratio in geometrical morpho-metric method – GMM. (Fink et al, 2005). it is also noted that from the previous study early exposure to higher level of testosterone is likely to produce more male –like characteristics where as less exposure do the reverse. In another recent study has shown that using several points as landmarks on face like pupils outermost and innermost corners, left most and right most point of nose, mouth corners, cheek bones and jaws to estimate facial symmetry and relationship with 2D:4D ratio of androgens. The hormonal effect on facial structure may affect the linear measurements on various regions on face like canthal distance which is very much important to estimate ocular disorder like hypertelorism. Hypertelorism is an abnormally increased distance between two organs or parts, commonly referring to widely spaced eyes or ocular hypertelorism - (oxford concise medical dictionary, 2010). Hypertelorism is a manifestation of a complex deformity that affects several skeletal – specially orbital bones, and soft tissue structure and relies on the evaluation ofbcertainanthropometric facial measurements – Azeem et al, 2010. Hypertelorism and hypotelorism are indicated by increased distance of IPD, ICD and OCD with decrease of those. Hypertelorism is a famous symptom for various disorders and regarded as related with widows's peak or curved hairline. Hairline is the line determining the last line of hairs forming a pattern between forehead and scalp. This line is curved to form a small projection just above the mid point of two frontal tuberosities. Te curved hairline is also known as wodow's peak and it is regarded as dominant over the straight hairline (Feero et la, 2010; Malats and Calafell, 2003).

The present study focus on the relations between prenatal androgenic hormone exposure in uterine environment estimated by 2D:4D ratio (Spigel et al 2009; Van Honk et al, 2011), the hyperteloremic measurements – ICD, OCD, IPD which stands

for the distance between the orbital region of individual and association with presence of widow's peak.

II. Materials and Methods

The data for the present study was collected from the 283 individuals of both sexes, which includes 144 mals and 139 female. All participants are from Bengali speaking Hindu caste population of Howrah, west Bengal. Measurements were taken according to the standard technique (Manning et al, 2002) by using sliding caliper of Martin. The length of the second digits and foruth digits of the left and right hands from tip of the finger to ventral proximal creases are measured in centimeter scale.
Measurements of orbital region taken by standard technique - (Burriss et al, 2006), by using a sliding caliper of Martin. To estimate the inner canthal distance sliding caliper was use to measure from medial angle of palpebral fissure of the region between eyes. The outer canthal measurements were taken from outer edge of bony orbit of the meeting point of upper and lower eye lids. The inter papillary distance was also measured by putting a scale on the forehead and sliding the casket of caliper just beneath the pupil. Hairline estimation was done following the standard technique (Hugo et al 2007). For the accuracy of the measurements the subjects are asked to sit in a horinzontal plane and also asked to put the face in eye ear plane, they are also asked to remove all kind of head gear and ornaments from hand and finger. The subjects having the accidental marks in hand and in finger excluded from the study. The data has been checked and computed accordingly. Analysis has been done by using the office, 2007 (excel) and SPSS (Version 10.0).

III. Results

The result represent the test of significance represents no association between sexual differentiation and occurrence of curved hairline. Table 1, 2 and 3 represent the significant relationship between hyperteloremic measurements in orbital regions of subjects. The ICD, OCD and IPD are positively correlated with each other. Table 4 and 5 represent the correlations between 2D:4D hormonal level and hyperteloremic measurements. In case of male subjects no correlation is found, but in case of females ICD and OCD are negatively correlated and IPD are positively correlated at significant level.

Table – 1 Distribution of orbital linear measurements in females

Female variables	ORBITAL LINEAR MEASUREMENTS		
	Mean ±SD	Mean ±SD	r
ICDXOCD	2.8±0.039	9.2±0.90	0.517*
IPDXICD	6.3±0.77	2.8±0.39	0.402*
IPDXOCD	6.3±0.77	9.2±0.90	0.783*

*p<0.05

Table – 2 Distribution of orbital linear measurements in males

MALE variables	ORBITAL LINEAR MEASUREMENTS		
	Mean ±SD	Mean ±SD	r
ICDXOCD	3.01±0.32	9.5±0.64	0.527*
IPDXICD	6.8±0.55	3.01±0.32	0.364*
IPDXOCD	6.8±0.55	9.5±0.64	0.735*

*p<0.05

Table – 3 Distribution of orbital linear measurements in both sexes

Both sexes data pooled variables	ORBITAL LINEAR MEASUREMENTS		
	Mean ±SD	Mean ±SD	r
ICDXOCD	2.9±0.36	9.4±0.79	0.527*
IPDXICD	6.5±0.71	2.9±0.36	0.364*
IPDXOCD	6.5±0.71	9.4±0.79	0.735*

*p<0.05

Table – 4 relationship of orbital linear measurements and 2D:4D ratio in males

Male variables	2D:4D RATIO	orbital liner measurements	
	Mean ±SD	Mean ±SD	r
2D:4D vs IPD	0.9697±0.0355	6.5±0.71	0.136
2D:4D vs ICD	0.9697±0.0355	2.9±0.36	0.122
2D:4D vs OCD	0.9697±0.0355	9.4±0.79	0.121
2D:4D vs CI	0.9697±0.0355	31.2±3.8	0.22

Table – 5 relationship of orbital linear measurements and 2D:4D ratio in females

Female variables	2D:4D RATIO	orbital liner measurements	
	Mean ±SD	Mean ±SD	r
2D:4D vs IPD	1.0102±0.0455	6.5±0.71	-0.283*
2D:4D vs ICD	1.0102±0.0455	2.9±0.36	0.135
2D:4D vs OCD	1.0102±0.0455	9.4±0.79	-0.228*
2D:4D vs CI	1.0102±0.0455	31.2±3.8	0.296*

*p<0.05

IV. Discussion

Considering the present study in Bengalee Hindu caste population, it is easily highlited that orbital linear measurements (Burley et al, 2003; Debopriya, 2008; Ordu et al, 2014) which clinically represents the measurement for assessing ocular Hypertelorism, are strongly correlated but in case of male 2D:4D ratio as a proxy measurement for prenatal androgen level is not correlated with Orbital region linear measurements which denotes that prenatal hormonal environment do not affect the orbital measurements. Though in females a negative correlations are found between Inter pupillary distance and outer canthal distances and canthal indices are positively correlated. So the female face shape with representation by linear measurements is related with 2D:4D ratio. In the study of Bernhard Fink and others found association between shape regressions of the facial landmark coordinates upon 2D:4D ratio for both male and female faces. It is found some characteristics which are typically related to masculine feature corresponding to low 2D:4D ratio of male. But in the others hand (Burries et al, 2006) it may be stated that all significant relationships between female 2D:4D and the facial metric measurements were the prediction that high values of 2D:4D were associated with feminine facial features such as a narrower nose, thicker lower lip, and shallower jaw angle with a

focus on nose width. Before this work another was done to support this correlation between female face and high digit ratios though it was negative correlation. Same like others (Azeem et al, 2010; Spigel et al, 2009) also tried to find the relation between masculine features and 2D:4D ratios but found none. A part of present study objective was to found any correlation or association between 2D:4D ratio and three facial metric measurements which also considered as ocular hyperteloremic measurements. From the results it can be established that canthal linear measures in case of males are not correlated with digit ratio which represents the prenatal hormonal level but in case of females Inter pupillary distance and Outer canthal distance are negatively correlated and inner canthal distance and Canthal indices are positively correlated. So that is possible that high 2D:4D ratio affects linear orbital region measurents like higher the digit ratio lesser the IPD and OCD but in ICD and CI it is reversed. To do this the linear measurements are categorized in to two groups and it is found that no association exist between IPD and OCD though ICD is associated. So we can say that presence of curved hairline in the individuals (who are not having Ocular Hypertelorism and normal) may affect the Inner canthal distance. Present study is a first attempt and preliminary work done in this population with a small sample size further study and works may produce more accurate result on this association of 2D:4D ratio, ocular Hypertelorism and curved hairline.

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