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Comparative Study of Facial Morphology Among Two Ethnic Groups of Bangladeshi Students

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Abstract

Background: *Physical variation between the people of different ethnic groups can be recorded by anthropometry. This study was carried out to establish the anthropometric difference by measuring the facial parameters among Bengali and Chakma school going children. The data of facial parameters provide important information in plastic surgery, aesthetics, nationality study and medical jurisprudence.*

Methods: *It was an observational and cross sectional study, convenient sampling was done to select the 50 Bengali and 50 Chakma school going children, age ranging from 5-16 years old. Data were collected by using standard anthropometric methods with a sliding caliper. Values were expressed as mean ±standard deviation (SD). Student's T test was used to compare the results.*

Result: *Morphological face height(p=0.001) and upper face height(p=0.003) in female between Bengali & Chakma present highly significant difference but when comparison were done between male of two ethnic groups significant difference was found only in morphological face height(p=0.045).To find out the sexual difference the subject were arranged at three different age groups where the both ethnic population showed statistical significant sexual difference at the age group of 13-16 years but the lower age group had failed to show any significant difference.*

Conclusion: *Different results of facial parameters between the two ethnic groups revealed a clear ethnic difference by face but in case of gender difference, sex had no considerable effect on facial morphology in children.*

Introduction

Face is the identity of an individual. It is an important phenomenon in one's life. Minor alterations in the size, shape, position and proportion of our face results in major perceptible differences and subtle differences between two people are instantly recognizable.[1-3] The human face is used for expression, appearance and identity among others. It is a well known fact that facial features differ amongst different races and ethnic groups.[4-6] Anthropometric Study plays an important role in distinguishing a pure race/ethnicity from the local mingling of races. Each race has different gene pools and even genetically different subgroups that exhibit different behaviors and characteristics.[5-7]

Human beings can distinguish between a male and a female face without much difficulty. The science of recognizing and differentiating different faces by human are not completely understood and is still under research. Sexual dimorphism is common in humans and in other species of animals as well as. Generally it refers to difference between males and females of the species in terms of size, appearance and behavior. Hence the face plays a significant role to determine if a person is male or female.[4,8,9] Measurements of craniofacial variables are considered as important for studying the

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changes of facial skeleton at different ages, race and sex. Its normative value helps in determine the facial abnormalities and thus in early making of treatment planning.

Anthropometry is to be useful in medical science and its use has been increased especially in the discipline of forensic medicine. It is also useful in orthodontic research and in reconstructive surgery to treat any congenital or post-traumatic facial disfigurements in members of different ethnic groups successfully.[6] While correcting malocclusions, the knowledge of the anthropometry of the human face helps the reconstructive or orthodontic surgeons to decide "normal or abnormal," "improved or not improved" craniofacial form.[10]

The present study was conducted on school going children because early observations demonstrated a concern with finding or establishing a relationship between mouth and facial features and also gives thorough concepts about the normal growth pattern of child's face.[1]

In our country there are different religions and ethnic groups live and these different groups have different physical characteristics. Through this study the basic differences of facial morphometry as well as sexual dimorphism among these two ethnic groups have been established. Therefore, the present study is designed to establish the baseline quantitative data of the craniofacial anthropometric parameters of the Bengali and Chakma school going children that may be necessary for future reference.

As craniofacial anthropometry is a new field in Bangladesh though some studies had been done on different tribal groups, but this type of comparative study has not been done yet, so the present study may provide some important information to a forensic scientist to find out the age, sex, and ethnicity of a unknown highly decomposed, fragmented body parts. As Farkas et al.[2,6] refer 0-18yrs group as a formative age so the orthodontic surgeon and facial reconstructive surgeon can get a clear information about the facial growth pattern and make a early treatment planning.

Methods and Materials:

The study was descriptive and cross-sectional in nature with some analytical components. Convenient sampling was done to select 50 Bengali and 50 Chakma school going children, age ranging from 5 to16 years. All participants were Bangladeshi by nationality, Bengali or Chakma by ethnicity, Muslim and Buddhist by religion, Middle class by economic status. After taking history and physical examinations, some expected participants were screened out from the study due to presence of some exclusion criteria such as mixed origin, history of any congenital craniofacial anomaly, having common genetic, endocrine or neurological disorders that might affect the measurements such as, Down's syndrome, acromegaly, myxedema, hyperthyroidism, facial palsy. Data were collected in standard anthropometric methods with a sliding caliper. According to Kolar and Salter[10], for taking facial measurements six anthropometric landmarks and four facial variables were used in this study namely Nasion (n)- the sagittal midline point of the nasal root at the nasofrontal suture, Gnathion (gn)- the lowest median landmark on the inferior aspect of the mandible, Sub-nasale (sn)- it is the junction between the lower border of the nasal septum(the partition which divides the nostrils) and the cutaneous portion of the upper lip in the midline, Stomion (sto)- it is the mid point of the labial fissure when the lips are closed naturally, Tragion (t)- it is located at the notch above the tragus of the ear where the upper edge of the cartilage disappears into the skin of the face, Exo canthion (ex)- it is the outer corner of the eye fissure where the eye lids meet. The facial variables were-

1. Morphological height of face (n-gn)- it is the linear distance between the 'nasion' and 'gnathion'.
2. Upper face height (n-sto)- it is the distance between the 'nasion' to the 'stomion'.
3. Lower face height (Sn-gn)- it is situated between the subnasale to the gnathion.
4. Upper cheek depth (Ex-t)- it is the distance from exocanthion to tragion.

For gender difference the subjects of the study were categorized into 3 age groups (5-8years, 9-12years and 13-16 years).

Result

Results Regarding Ethnicity:

Table - I

Statistics of various facial dimensions within ethnic groups among the males (with independent samples t – test significance)

Cranio-facial Dimensions	N	Mean	± SD	Sign.	
Morphological Face Height	Bengali	25	105.78	9.98	t = 2.057
	Chakma	25	99.75	10.71	P = 0.045
	Total	50	102.76	10.69	Significant
Upper Face Height	Bengali	25	66.03	9.12	t = 1.621
	Chakma	25	61.59	10.20	P = 0.112
	Total	50	63.81	9.84	Not Significant
Lower Face Height	Bengali	25	54.32	8.15	t = 1.788
	Chakma	25	58.21	7.22	P = 0.080
	Total	50	56.27	7.87	Not Significant
Upper Cheek Depth	Bengali	25	64.48	9.05	t = 0.871
	Chakma	25	66.47	6.98	P = 0.388
	Total	50	65.48	8.06	Not Significant

Table-II

Statistics of various facial dimensions within ethnic groups among the females (with independent samples t – test significance)

Cranio-facial Dimensions	N	Mean	± SD	Sign.	
Morphological Face Height	Bengali	25	103.55	5.45	t = 3.739
	Chakma	25	95.51	9.27	P = 0.001
	Total	50	99.53	8.55	Highly Significant
Upper Face Height	Bengali	25	66.23	4.77	t = 3.149
	Chakma	25	60.29	8.13	P = 0.003
	Total	50	63.26	7.24	Highly Significant
Lower Face Height	Bengali	25	53.32	4.58	t = 0.015
	Chakma	25	53.34	6.16	P = 0.988
	Total	50	53.33	5.37	Not Significant
Upper Cheek Depth	Bengali	25	64.26	4.47	t = 0.733
	Chakma	25	62.95	7.75	P = 0.467
	Total	50	63.60	6.29	Not Significant

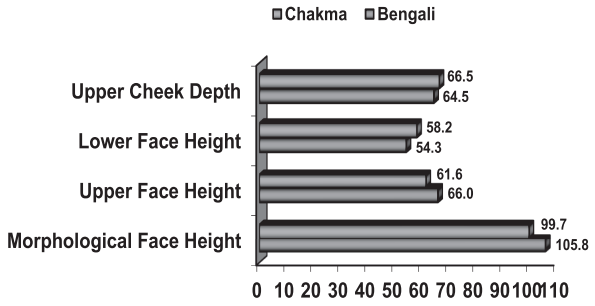

Fig-1 : *Mean facial dimensions within ethnic groups among the males*

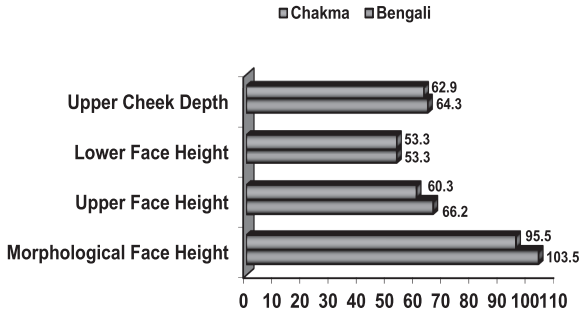

Fig- 2 : *Mean **facial** dimensions within ethnic groups among the females*

Table I, II showed the mean value, SD and comparison of different parameters of facial variables between Bengali and Chakma of same sex.

Table I and II showed that except lower face height in both sex and upper cheek depth in Chakma male, the male and female from Bengali ethnic group had larger morphological face height, longer upper face height and larger upper cheek depth in female while Chakma ethnic group had longer lower face height in both sex and larger upper cheek depth in male compared to that of Bengali.

Further comparison from table I, II showed highly significant difference in morphological face height and upper face height in female between Bengali & Chakma but when comparison were done between the males of two ethnic groups significant difference was found only in morphological face height.

Results regarding gender differences:

Table-III

Sex differences of various Cranio-facial dimensions within age groups among the Bengali ethnicity (with independent samples t-test significance)

Cranio-facial	5 – 8 Years		9 – 12 Years		13 – 16 Years	
Measurements	Male	Female	Male	Female	Male	Female
[Mean]	(n = 8)	(n = 6)	(n = 10)	(n = 11)	(n = 7)	(n = 8)
Morphological Face Height	97.62	99.47	108.46	103.75	111.26	106.33
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		$p > 0.05^{ns}$	
Upper Face Height	59.33	61.22	66.25	67.25	73.37	68.56
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		$^{**}p < 0.01$	
Lower Face Height	50.28	54.12	56.85	53.19	55.32	52.90
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		$p > 0.05^{ns}$	
Upper Cheek Depth	58.43	59.59	65.71	65.13	69.64	66.56
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		$p > 0.05^{ns}$	

ns = Not Significant; ** = Highly Significant

Table-IV

Sex differences of various Cranio-facial dimensions within age groups among the Chakma ethnicity (with independent samples t-test significance)

Cranio-facial Measurements [Mean]	5 – 8 Years		9 – 12 Years		13 – 16 Years	
	Male (n = 8)	Female (n = 6)	Male (n = 10)	Female (n = 11)	Male (n = 7)	Female (n = 8)
Morphological Face Height	90.35	87.31	92.80	99.26	110.38	101.83
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		** $p < 0.01$	
Upper Face Height	50.37	54.02	60.04	59.65	70.60	66.88
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		p > 0.05ns	
Lower Face Height	51.66	48.12	57.62	56.26	63.31	57.11
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		** $p < 0.01$	
Upper Cheek Depth	60.28	59.55	62.81	63.65	72.97	65.99
P value	$p > 0.05^{ns}$		$p > 0.05^{ns}$		* $p < 0.05$	

ns = Not Significant; * = Significant; ** = Highly Significant

Table III and IV respectively showed the mean values, standard deviations and significant sexual differences between male and female at various age groups in both ethnic populations.

Both table also depicted that in maximum variables, minimum measurements were always contributed by the female.

Among Bengali for age group 13-16 years only one measurement upper face height showed statistical significant sexual difference. But for age group 5-8 years and 9-12 years failed to show any significant result in morphological face height, upper face height, lower face height and upper cheek depth.

On contrary, Chakma exhibited same trend as Bengali. For age group 13-16 years, three measurements of facial variables such as morphological face height, lower face height and upper cheek depth showed statistically significant sexual differences but for other age groups 5-8 years & 9-12 years showed no significant sexual difference.

Discussion

The aim of this study was to compare the facial morphology by ethnicity and gender in two ethnic groups of Bangladesh. In the present study the values of facial morphology of male were higher than the female in case of both ethnicities. Significant difference appear in male for morphological face height (p=0.045). But in case of female, morphological face height and upper face height were found highly significant between both ethnic groups where p=0.001 and p=0.003 respectively. For the ethnic differences findings of the present study was compared with other population groups of different study. More recently, Farkas[6] had published an international anthropometric study of the facial morphology of 26 ethnic groups/races throughout the world. He found the racial differences in mean values of morphological face height and lower face height in Indian 112.5mm, 52.7mm, Singaporean Chinese 123.6mm, 72.8mm and in Thai 123.5mm, 72.4mm, Caucasian Azerbaijan 121.3mm, 69.0mm and Negroid Angolan 112.1mm, 67.3mm respectively. These observations showed that different ethnic

population had different facial values which was also similar to the present study.

For Upper face height, one comparison with Malay children was done by Ngeow and Aljunid [3] and was found 76.7 mm which also showed ethnic difference with the above and also with the present study. In case of female, the above study also had the same result and that showed the considerable ethnic differences like the present study.

As the present study did not show any significant sexual difference in lower age group, it needed to compare the result with several review articles that supported the findings. Priyanka Singh and Purkait[11] did cephalometric study among sub caste groups like Dangi and Ahirwar of Madhya Pradesh. In Dangis, the mean value of morphological face height at 3-11years, in case of male was 8.3cm, in female was 8.6cm, at 12-20 years, male was 10.7cm and female was 10.3cm, above 20 years male was 11.4cm and female was 10.1cm. This demonstrated that there were no significant sexual difference in lower age group but when age increased above 20 years significant sexual difference became established. There was same result observed in Ahirwar population. Nijam Abdullah[1] also studied on facial morphology where subjects were divided into several age groups. They also did not get any significant sexual difference from 5 years to 11.5 years but when comparison was done at age 14.4-15.5 years then significant sexual difference was found.

Other research conducted by Safikhani[3] on children under 6 years in Ahwaz depicted no significant sexual difference in facial height. They calculate the facial index and found the different types of face. In anatomical types of face, no significant differences observed between male and female ($p>0.05$). All this above articles supported the present study, here the subject was divided into several age groups where significant difference had got only in the upper age group regarding both ethnicity.

The other observers[5,8] conducted their study on the proportions of upper face height and lower face height which also failed to show any significant sexual difference at lower age group.

Conclusion

The result of this study revealed a clear ethnic difference by facial parameters but in case of gender difference, sex had no considerable effect on face in early age. The two groups though that are belong to same race (mongoloid) had showed significant variation due to different etiological factors i,e environment, genetic factors, geographical variation, nutritional factors and other related factors.

Therefore, it needs for further studies to establish the scientific reasons for variation in measurements among this ethnic study population of Bangladesh.

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