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RESEARCH ARTICLE

CRANIOFACIAL MORPHOLOGY OF 9 YEARS RURAL RESIDENTIAL SCHOOL CHILDREN OF SUTTUR.

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Abstract

Introduction: Most of the craniofacial growth studies are cross-sectional in nature and provided a large number of cephalometric standards for males and females at different ages and for various ethnic groups. Variations in craniofacial Morphology exist between different ethnic and racial groups. The cephalometric standards developed for one ethnic group need not apply to other ethnic groups - the racial groups must be dealt according to their own characteristics. Limited number of longitudinal or semi-longitudinal studies has been reported for Indian population. **Objective:** The present study was designed to describe craniofacial morphology of rural residential Free school children of Suttur at 9 years. **Material and Methods:** 10 Males & 10 Females of 9 years old children were selected and Lateral Cephalograms were taken. On each Lateral Cephalogram, 21 skeletal cephalometric landmarks were identified. From the cephalometric landmarks and reference lines, 31 angular & linear measurements were analyzed, which were grouped as JSS Craniofacial analysis. **Results & Discussion:** Mean Sagittal Measurements of 9 year old when compared between genders, there was no statistical significant difference. Females showed higher values than males for variables SNA, SNB, ANB, A-Npog, A:ss-n-pg. Mean vertical measurements when compared between genders for PFH, AFH & N:ANS were found to be statistically significant and males had higher values than the females. Mean Mandibular length measurements Go-Co and Co-Gn when compared between genders males had higher Mean values for both parameters were statistically significant. Mean Dental measurements when compared between genders for values of L1-APog, U1-NA, L1-NB, U1-NL, U1-Protrusion, U1-Inclination, L1-Inclination and U1-L1, there was no significant difference between genders for any variables. Males had higher Mean values than females for all caranial base measurements. The variables S:Ba& ACB showed statistically significant difference between genders. **Conclusion:** Craniofacial Morphological data obtained in this study is very useful, but needs to be done on a larger sample.

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Introduction:-

Craniofacial growth is a complex and beautiful phenomenon. Growth has been described in so many terms. Todd defines growth as “increase in size”. Meredith defines growth as the entire series of anatomic and physiologic changes taking place between the beginning of prenatal life and the close of senility. Growth is quantitative, i.e., it is measureable aspect of biologic life.¹⁻³ Variations in craniofacial Morphology exist between different ethnic and racial groups. There is a lack of studies on cephalometric standard values for Indian School children. Thus the present study was designed to describe the Craniofacial morphology of rural residential Free school children of Suttur at 9 years.

Materials and Methods:-

The subjects were from residential free school of Suttur who had clinically acceptable occlusion having normal growth and no history of orthodontic treatment. Ethical Clearance was obtained from Institutional Ethical committee. Informed consent of parents or guardians was obtained for children.

Estimation of sample size was based on mean and standard deviation of parameters under study. In order to detect a Clinically Relevant Difference (CRD) at 5% at 95% confidence and 90% power, required sample size was provisionally estimated to be 20. In order to study changes in Cephalometric measurements 10 Male & 10 Female of 9 years old children were selected and Lateral Cephalograms were taken using – Trophy Ortho Slice 1000 C in Department of Oral Medicine & Radiology of JSS Dental College and Hospital, with teeth in centric occlusion. Films were processed in Promax Automatic x-ray film processor. The Lateral Cephalograms were 492igitized using Epson V 700 dual bedded scanner at 720 dpi and tracing was done using Nemoceph studio software.

On each Lateral Cephalogram, 21 skeletal landmarks (Figure 1) were identified. From them 31 angular and linear measurements were derived, which were grouped as JSS Craniofacial analysis (JSS Growth analysis). These angular and linear measurements were taken from Steiner's⁴, Tweed's⁵, Down's⁶, Ricketts⁷, Rakosi Jarbak⁸, McNamara⁹ and Bjork¹⁰ analysis. For purpose of convenience and better understanding findings of the study were grouped under five headings – 1) Basal Sagittal Measurements 2) Basal Vertical Measurements 3) Mandibular length measurements 4) Dental Measurements & 5) Cranial Base Measurements.

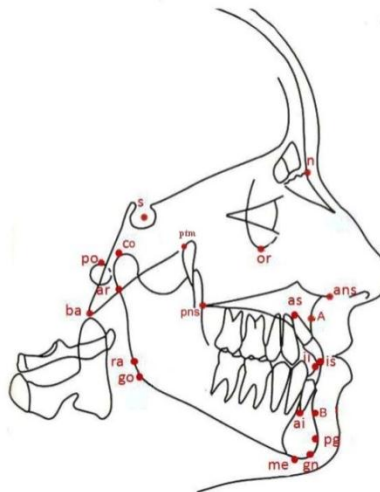


Fig 1:-Cephalometric landmarks

Linear and Angular Measurements:-

Basal Sagittal measurements:-

Angular: SNA, SNB, ANB, A:ss-n-Pg, S-N-Pg

Linear: A-NPog

Basal Vertical measurements:-

Angular: Jaw relationship, Maxillary Inclination, Jaw Angle, Mandibular Inclination, SN-PoOr.
 Linear: PFH, AFH, PFH/AFH, N:ans, Ans:Gn

Mandibular Length:-

Linear: Go-Co, Co-Gn

Dental measurements:-

Angular: U1-NL, U1- Inclination, L1-Inclination, U1-L1.
 Linear: L1-APog, U1-NA, L1-NB, U1-Protrusion.

Cranial Base Measurements:-

Angular: n-s-ar, n-s-ba,
 Linear: S:Ba, PCB, ACB.

Statistical Analysis:-

Descriptive and Inferential statistics were employed and level of statistical significance was predetermined at the 0.05 level of confidence. Descriptive statistics that included mean, S.D, Standard Error, 95% confidence interval for mean, Minimum, Maximum values were calculated for each parameter. Inferential Statistics – Independent sample t test between Males and females were compared by using Independent student t test. The Statistical analysis was done using SPS software version 20.

Results and Discussion:-

Craniofacial morphology and their variations amongst various ethnic groups has long been a subject of investigation. Establishing norms for different populations & racial groups is very helpful in prediction, diagnosis and treatment planning. Many studies have concluded that standard measurements of one racial group cannot be considered for other racial groups.^{11,12} In the Indian scenario, the amount of cephalometric studies to establish norms for Indian school children are very scanty and hence have been using western norms which would not be relevant to the Indian population.¹³⁻¹⁵ Thus the purpose of this study was to establish lateral cephalometric craniofacial Morphology at 9 years, and also to evaluate possible differences between genders.

Table 1:-Basal Sagittal Measurements – at 9 Years of age.

Basal Sagittal Measurement	N (20)	Mean	S D	Std. Error	95% Confidence Interval for Mean		Min	Max	Comparison b/w males and females		
					Lower Bound	Upper Bound			Mean Diff.	t value	p value
SNA	M	79.85	1.20	0.38	78.99	80.71	78.90	82.30	0.26	-0.566	0.578
	F	80.11	0.82	0.26	79.52	80.70	79.00	81.70			
SNB	M	77.77	1.99	0.63	76.35	79.19	75.00	82.20	0.5	0.538	0.597
	F	77.27	2.16	0.68	75.73	78.81	73.30	80.10			
ANB	M	2.09	1.37	0.43	1.11	3.07	0.10	4.20	0.76	-1.117	0.279
	F	2.85	1.66	0.53	1.66	4.04	0.70	5.70			
A-NPog	M	2.05	2.11	0.67	0.54	3.56	-1.90	4.70	0.85	-0.99	0.335
	F	2.90	1.71	0.54	1.67	4.13	0.30	5.90			
A:ss-n-pg	M	2.33	2.51	0.79	0.53	4.13	-2.60	5.30	1.29	-1.253	0.226
	F	3.62	2.07	0.66	2.14	5.10	0.40	6.90			
s-n-pg	M	77.53	3.17	1.00	75.26	79.80	73.90	85.00	1.06	0.81	0.428
	F	76.47	2.66	0.84	74.57	78.37	72.10	80.40			

* $p < 0.05$ and ** $p < 0.01$; Significant *** $p < 0.001$ Highly Significant; $p > 0.05$ not significant

Results of Table 1 inferred that Mean Sagittal Measurements of 9 year old, when compared between males and females, there was no statistical significant difference between genders. Females showed higher values than males

for variables SNA, SNB, ANB, A-Npog, A:ss-n-pg. But mean difference for variables was very small between genders.

Mean values of SNA for males was 79.85 ± 1.20 and for females was 80.11 ± 0.82 , SNB for males was 77.77 ± 1.99 for females was 77.27 ± 2.16 . Mean value of ANB for males was 2.09 ± 1.37 and females were 2.85 ± 1.66 . These values suggested that though females had higher values for SNA and SNB the value of ANB should have decreased. But ANB also had higher value suggesting that females had retrognathic mandible than males. This was supported by mean value of s-n-pg which was 77.53 ± 3.17 for males and 76.47 ± 2.66 for females. Our study values were in agreement with studies of Savadi S C¹⁷, but our values were closely matching with Chandranee¹⁶ study. Savadi.S.C.¹⁷ recorded ANB to be 5.75 for 6-9 years age group and 4.35 for 10-13 years age group.

Table 2:-Basal Vertical Measurements – at 9 Years of age.

Basal vertical Measurement	N (20)	Mean	S D	Std. Error	95% Confidence Interval for Mean		Min	Max	Comparison b/w males and females		
					Lower Bound	Upper Bound			Mean Diff.	t value	p value
PFH	M	64.82	3.98	1.26	61.97	67.67	55.70	69.30	3.17	1.704	0.106
	F	61.65	4.33	1.37	58.55	64.75	53.10	68.90			
AFH	M	98.70	5.51	1.74	94.76	102.64	90.30	107.30	4.98	2.373	0.029*
	F	93.72	3.70	1.17	91.08	96.37	86.70	101.00			
PFH/AFH	M	65.71	4.10	1.30	62.78	68.64	58.30	71.80	0.03	-0.016	0.987
	F	65.74	4.13	1.31	62.78	68.70	61.20	73.40			
Jaw relation	M	24.72	4.69	1.48	21.37	28.07	18.90	32.50	0.53	-0.273	0.788
	F	25.25	3.95	1.25	22.42	28.08	18.70	29.00			
Max Inclina	M	9.24	2.84	0.90	7.21	11.27	5.40	13.40	0.7	0.629	0.537
	F	8.54	2.08	0.66	7.05	10.03	5.30	12.20			
Jaw angle	M	125.79	7.10	2.24	120.71	130.87	112.70	134.40	0.05	-0.018	0.986
	F	125.84	5.42	1.71	121.96	129.72	115.50	135.20			
Mand .incli	M	33.94	6.42	2.03	29.35	38.53	24.30	43.80	0.14	0.056	0.956
	F	33.80	4.74	1.50	30.41	37.19	24.00	38.30			
SN-POOR	M	8.15	1.01	0.32	7.43	8.87	6.90	10.00	0.22	-0.507	0.619
	F	8.37	0.93	0.29	7.71	9.03	7.00	9.40			
N:ANS	M	44.52	4.18	1.32	41.53	47.51	38.00	52.00	2.31	1.654	0.115
	F	42.21	1.42	0.45	41.20	43.22	40.10	44.60			
Ans: Gn	M	53.14	2.04	0.64	51.68	54.60	50.60	56.70	2.48	2.281	0.035*
	F	50.66	2.77	0.88	48.68	52.64	46.60	55.80			

* $p < 0.05$ and ** $p < 0.01$; Significant *** $p < 0.001$ Highly Significant; $p > 0.05$ not significant

The results of table 2 inferred that Mean vertical measurements of 9 years old when compared between genders for AFH & ANS:Gn were found to be statistically significant and males had higher values than the females. This Observation suggested that boys have relatively increased Anterior Facial Height and ANS:Gn.

The Mean values of males were higher than the females for PFH, AFH, Maxillary Inclination, Jaw Angle, N:ANS & ANS:Gn also whereas the females showed Higher values for Jaw relation and SN-PoOr. Mean Mandibular Inclination in a study by Chandranee¹⁶ on age group of 4-5 years was found to be 32.03 ± 3.64 and by Savadi.S.C¹⁷ on age group of 6-9 years was found to be 34.75 and 29.9 at 10-13 years and in our study it was found to be 33.94 ± 6.42 for males and 33.80 ± 4.74 for females at 9 years.

Table 3:-Mandibular length Measurements – at 9 Years of age.

Mandibular length Measurement	N (20)	Mean	S D	Std. Error	95% Confidence Interval for Mean	Min	Max	Comparison b/w males and females
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					Lower Bound	Upper Bound			Mean Diff.	t value	p value
Go-Co	M	46.14	2.86	0.91	44.09	48.19	39.80	49.20	1.89	1.463	0.161
	F	44.25	2.91	0.92	42.17	46.33	38.90	48.80			
Co-Gn	M	93.23	4.77	1.51	89.81	96.65	85.10	100.20	4.45	2.559	0.02*
	F	88.78	2.73	0.86	86.83	90.73	83.10	92.50			

* $p < 0.05$ and ** $p < 0.01$; Significant *** $p < 0.001$ Highly Significant; $p > 0.05$ not significant

The results of Table 3 Inferred that mean Mandibular length measurements Go-Co and Co-Gn of 9 year old when compared between males and females, the males had higher Mean values than females for both parameters and was statistically significant when compared between genders. The above changes in 9 years of variables Go-Co and Co-Gn suggest that Males had increased growth in ramus height and length of Mandible, when compared with females. This suggests that males had a prominent mandible than females at 9 years.

Table 4:-Dental Measurements – at 9 Years of age.

Dental Measurement	N (20)	Mean	S D	Std. Error	95% Confidence Interval for Mean		Min	Max	Comparison b/w males and females		
					Lower Bound	Upper Bound			Mean Diff.	t value	p value
L1-APog	M	4.02	2.60	0.82	2.16	5.88	-0.90	6.80	0.15	0.146	0.885
	F	3.87	1.94	0.61	2.49	5.25	0.80	7.40			
U1-NA	M	5.44	2.07	0.66	3.96	6.92	1.80	8.50	0.77	0.811	0.428
	F	4.67	2.17	0.69	3.12	6.22	1.20	7.60			
L1-NB	M	4.91	2.14	0.68	3.38	6.44	1.00	7.90	0.14	0.182	0.858
	F	4.77	1.16	0.37	3.94	5.60	3.10	6.50			
U1-NL	M	116.37	6.63	2.10	111.63	121.11	102.20	122.20	2.26	0.863	0.4
	F	114.11	4.97	1.57	110.55	117.67	106.30	120.50			
U1-Protrusion	M	7.07	2.22	0.70	5.48	8.66	2.60	9.20	0.02	0.023	0.982
	F	7.05	1.55	0.49	5.94	8.16	4.40	10.00			
U1-Inclination	M	107.13	6.43	2.03	102.53	111.73	95.50	114.40	0.55	0.189	0.852
	F	106.58	6.59	2.08	101.87	111.29	95.20	115.40			
L1-Inclination	M	101.07	6.74	2.13	96.25	105.89	88.00	112.70	3.27	-1.143	0.268
	F	104.34	6.03	1.91	100.02	108.66	93.50	112.60			
U1-L1	M	119.01	11.45	3.62	110.82	127.20	105.30	139.00	0.5	0.105	0.918
	F	118.51	9.79	3.10	111.51	125.51	103.50	136.70			

* $p < 0.05$ and ** $p < 0.01$; Significant *** $p < 0.001$ Highly Significant; $p > 0.05$ not significant

The results of Table 4 Inferred that Mean Dental measurements of 9 year old when compared between Males and females for values of L1-APog, U1-NA, L1-NB, U1-NL, U1-Protrusion, U1-Inclination, L1-Inclination and U1-L1, there was differences in the mean values but it was not a statistically significant difference between genders for any variables. The Mean values of L1-APog, U1-NA, L1-NB, U1-NL, U1-Protrusion, U1-Inclination & U1-L1 showed higher values for males than females, whereas females had higher mean values than males for L1-Inclination.

Mean U1-NA at 9 years for males was 5.44 ± 2.07 and for females was 4.67 ± 2.17 in our study, where as in the studies of Chandranee¹⁶ It was found to be 0.14 ± 1.71 for 4-5 years of age group for Chandigarh population. Savadi.S.C.¹⁷ found U1-NA to be 2.15 ± 5.3 for age group of 6-9 years of Karnataka population. The study of Savadi agreed with our study whereas the study of Chandranee was not in agreement because the age of the subjects was very less i.e. 4-5 years. The Mean L1-NB at 9 years for males was 4.91 ± 2.14 and for females was 4.77 ± 1.16 where as in studies of Savadi S.C.¹⁷ L1-NB was found to be 4.85 ± 6.0 for he age group of 6-9 years of Karnataka population, and study by Chandranee¹⁶ found L1-NB to be 2.80 ± 1.31 for age group of 4-5 years on Chandigarh population. L1 inclination in our study at 9 years for males was 101.07 ± 6.74 for females was 104.34 ± 6.03 , whereas in study by Savadi S.C.¹⁷ on 6-9 years found to be 93.65 and at 10-13years to be 100.00 for Karnataka population, this suggested that L1-Inclination was influenced by age and was in agreement with Savadi S C study. U1-L1 in our

study, at 9 years was found to be 119.01 ± 11.45 for males and for females was 118.51 ± 9.79 Savadi S.C.¹⁷ in their study for age group of 6-9 years of Karnataka population found U1-L1 to be 131.9 was not matching with our study. D.N.Kapoor in a study on Lucknow Population of 6 years was 138.5 ± 9.85 and at 9 years was 125.33 ± 7.49 .

Table 5:-Cranial base Measurements – at 9 Years of age.

Cranial base Measurement	N (20)	Mean	S D	Std. Error	95% Confidence Interval for Mean		Min	Max	Comparison b/w males and females		
					Lower Bound	Upper Bound			Mean Diff.	t value	p value
S:Ba	M	39.66	2.09	0.66	38.17	41.15	36.20	42.80	2.74	3.356	0.004**
	F	36.92	1.52	0.48	35.83	38.01	34.40	39.20			
n-s-ar	M	121.89	3.75	1.19	119.21	124.57	116.90	127.40	1.71	-1.001	0.33
	F	123.60	3.89	1.23	120.82	126.38	115.60	127.70			
n-s-ba	M	129.80	3.50	1.11	127.30	132.30	123.90	134.80	0.76	-0.414	0.684
	F	130.56	4.63	1.46	127.25	133.87	122.20	136.50			
PCB	M	28.57	1.87	0.59	27.23	29.91	26.00	31.30	0.89	0.999	0.331
	F	27.68	2.11	0.67	26.17	29.19	24.20	30.00			
ACB	M	63.36	3.13	0.99	61.12	65.60	58.90	68.80	2.25	1.789	0.09*
	F	61.11	2.45	0.77	59.36	62.86	58.40	65.90			

* $p < 0.05$ and ** $p < 0.01$; Significant *** $p < 0.001$ Highly Significant; $p > 0.05$ not significant

Mean cranial base measurements of 9 year old when compared between Males and females, the males had higher Mean values than the females for all caranial base measurements. The variable S:Ba& ACB showed statistically significant difference between the genders. The mean S:Ba at 9 years for Males was 39.66 ± 2.09 and for females was 36.92 ± 1.52 the mean difference was 2.74 which was statistically significant. The mean ACB at 9 years for Males was 63.36 ± 3.13 and for females was 61.11 ± 2.45 the mean difference was 2.25 which were statistically significant. O.P.Kharabanda¹⁸&Ashima Valiathan¹⁹ in their study suggested that gender did not have any influence on the variable n-s-ar and this was matching with our study.

Conclusion:-

Craniofacial dimensions obtained in this study is very useful data of Craniofacial changes of Rural Residential School children of Suttur, but needs to be done on a larger sample.

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