ORIGINAL RESEARCH PAPER

Orthodontics

EVALUATION OF ATTRACTIVE FACIAL PROFILE IN DIFFERENT DENTOFACIAL IRREGULARITIES (ANGLE'S) IN BENGALI POPULATION USING PHOTOGRAPHIC MEASUREMENTS

KEY WORDS: Bengali population, Facial profile, Malocclusion, Orthodontics

Dr. Pintso Tshering Lepcha	Assistant Professor, Department of orthodontics & Dentofacial Orthopaedics North Bengal Dental College & Hospital, Darjeeling, West Bengal
Prof. Dr. Uttam Deb	Former Professor & HOD, Department of Dentistry, Bankura Sammilani Medical College & Hospital, Bankura, West Bengal
Dr. Ali Asger Nakib	Assistant Professor, Department of Dentistry, Bankura Sammilani Medical College & Hospital, Bankura, West Bengal
Dr. Mukesh Kumar	Reader, Department of orthodontics & Dentofacial Orthopaedics, Sarjug Dental College & Hospital, Darbhanga, Bihar
Dr. Manish Jha	Reader, Department of orthodontics & Dentofacial Orthopaedics, Gurunanak Instutute of Dental Sciences & Research Panihati, Kolkata
Dr. Tathagata Bhattacharjee	Assistant Professor, Department of Oral Pathology & Microbiology, North Bengal Dental College & Hospital, Darjeeling, West Bengal

ABSTRACT

Introduction: Attractive facial profile is significant to each individual. Nowadays, however, establishing ideal facial esthetics is also a major factor in Orthodontic treatment. Achieving the class I occlusion is not the only benchmark for success, but also the resultant soft tissue contours are often equally important in defining a well- treated case. The study was done to determine the type of malocclusions that is more coherent to facial attractiveness as well as to establish soft tissue profile norms for Bengali population using linear and angular photogrammetric analysis. **Materials and Methods:** 80 samples of age group ranging from 12 to 25 years were selected from the patient reported in Dr R Ahmed Dental College and Hospital, Department of Orthodontics and Dentofacial Orthopaedics west Bengal. Standard frontal and lateral profile photographs were taken and on each photograph, all the linear and angular measurements were statistically analyzed. Seven linear and six angular soft tissue parameters were calculated. Correlation coefficient was carried out between linear, angular measurements and VAS score of different malocclusion. The following inferences were obtained from the study regarding the linear, angular parameters and VAS score of Bengali population. **Results:** ANOVA showed that there was significant difference between mean VAS of the four different type of malocclusion. As per post hoc Tukey's test mean VAS of Class-I and Class-II Div2 were significantly higher than other two classes. **Conclusion:** The finding of the present study showed that during Orthodontic treatment planning for Bengali subjects; it may be useful to use a modified set of norms.

INTRODUCTION:

Attractive facial profile is significant to each individual. The face is a focus of much attention when it comes to physical attractiveness, because that represents the person's identity which is most exposed to public view. Therefore attractive facial profile is related with the term beauty and aesthetics.[1]

In the past, orthodontists were mainly concerned with the correction of skeletal and dental relationships. Nowadays, however, establishing ideal facial esthetics is also a major factor in Orthodontic treatment as patients expect better facial esthetics and smile.

The literature has numerous studies involving soft tissue facial profile of Caucasian and Negroid subject. Concepts of facial aesthetics have begun to change worldwide as technology has facilitated global communication. There are large numbers of population from different ethnic background found in this socially and ethnically diverse country.[1,2]

In West Bengal there are large numbers of Bengali come to demand for Orthodontic treatment to improve their aesthetic. The Bengali people are the principal ethnic group native to the region of Bengal. Bengali populations are under the Caucasian categories but Bengali's features are slightly different from Caucasian. So there is a need to establish data of facial patterns for the Bengali population which will eliminate the use of Caucasian based norms on subjects of Bengali descent during diagnosis and treatment planning. It would be useful to the clinician to have soft tissue facial profile norms for subjects of Bengal descent to modify diagnosis and treatment planning.

Malocclusion is not only caused by local factors influencing the dental arches or the dental parts of the jaws. More generally active factors determining the formation of facial skeleton and skull as a whole causing malocclusion to a unpleasing extent.

Achieving the class I occlusion is not the only benchmark for success, but also the resultant soft tissue contours are often equally important in defining a well- treated case. Harmonious facial aesthetics and functional occlusion have long been recognized as two important goals of orthodontic treatment. Soft tissue profile is one of the most critical areas of interest in the development and selection of a potential orthodontic treatment. The soft tissue profile has been studied extensively in orthodontics, primarily from lateral cephalometric radiographs, under the assumption that the form of soft tissue outline largely determines the aesthetics of the face.[2,3]

There are many ways of evaluation of mal-relation of the jaws and malocclusion of the teeth. Besides clinical examination, study model analysis, radiographic evaluation, including new 3D digital imaging technique like M.R.I, C.T scan, CBCT etc, as well as the photographic evaluation. The photographic evaluation is the most inexpensive, easily available and it also provides the basic idea of diagnosis and treatment plan without radiograph.

In this study an attempt was made to establish a norm for soft tissue face-form in Bengali population by taking facial photograph, which will provide guideline for correction of dental irregularities and recontouring of soft tissue form.

In this study specifically we have tried
A. To evaluate the facial attractiveness in angles' classification of frontal and lateral profile photograph on the basis of visual analogue scale(VAS) by general people.

B. To determine the type of malocclusions that is more coherent to facial attractiveness.

C. To establish the linear ratio and angular photogrammetric norms from Standardize photographs of adult Bengali population, age range from 12- 25 years irrespective of sex.

MATERIALS AND METHODS:
We have taken eighty Bengali patients age ranges from 12-25yrs irrespective of sexual variation, who came to the Department of Orthodontics in Dr. R. Ahmed Dental College & Hospital 114, A. J. C. Bose Road, Kolkata-700014;for our study. The study period was for one and half years.

Patients with history of trauma or previous Orthodontic treatment, facial asymmetry, subject with missing teeth, subject having fixed or removable partial denture and subject with congenital defect example cleft lip and cleft palate were excluded from the study.

Patients with molars relations of Bilateral Angles class I, Bilateral Angle's class II division 1,Bilateral Angle's class II division 2 and Bilateral Angle's class III were included in the study.

At first each subject was asked about their name,age,ethnic group,history of their parents origin. To each subject, the purpose and method of the research was explained and thereafter at their voluntary acceptance of participation, each was asked to sign a release permitting the use of their facial photographs in the study. Further it was verified that they had no objections to the display of their photographs in the course of the study. It was also made clear that the results of the research may be published.

This study was based on the measurement of certain angular and linear parameters relating a series of standard soft tissue lateral and frontal facial profile photographs. Hence a series of standard lateral and frontal facial profile photographs of these patients were taken.

The technique of Photography:
The photographic set-up consists of a tripod supporting digital camera (Nikon D 80, SB 22s, 105 lenses shatter speed of 1/160). Off white matte poster to form the background. Adjustment of the tripod height will allow the optical axis of the lens to be maintained in a horizontal position during the recording, to be adapted to each subject body height. The records were taken in Natural Head Position (NHP) in a standing position, each subject was asked to relax, and the lips were also relaxed, adopting their normal position with both the arms hanging freely beside the trunk. The patient's forehead, neck, and ears were clearly visible during the recording, the subject is positioned on a line marked on the floor, and behind the subject, there is a vertical measurement scale divided into millimeters that allows measurements. A plumb line, suspending a 0.5 kg weight hung from the scale, held by a thick thread will be used to define the vertical plane on the photographs. 120 centimeters in front of the subject, on the opposite wall, there is a mirror. The subjects have to look towards in the mirror with lips relaxed so that the right-side profiles and frontal profile are taken in natural head position (NHP).

The photographs were standardized as one-half of the subject`s original dimension.

Each photograph was transferred into hard copies and was traced in tracing paper, de's mart (0.003 inch acetate matte) for photographic analysis. After analysis photographs were placed randomly in album and each photograph has been shown to panel of general public to score on visual analogue scale according to facial attractiveness. Each photograph has been shown to them for 15 second and asked them to give the rating according to attractiveness. From the scores of all panel members, the final facial esthetic score for a subject has been determined as the mean of all VAS scores given for him or her. At the same time mean of linear ratio and angular measurements has been calculated.

The landmarks used in this soft tissue analysis were as follows:
Soft Tissue Landmarks For Frontal Photograph
- Trichion (Tr): the sagittal midpoint of the forehead that borders the hairline.
- Soft tissue nasion (N): the most concave point in the tissue overlying the area of the fronto-nasal suture.
- Subnasale (Sn), the point at which the nasal septum merges with the upper cutaneous lip in the mid-saggital plane.
- Soft tissue Menton (Me), the most inferior point on the soft tissue chin.
- Stomion (ST), the median point of the oral embrasure when the lips are closed.
- ExR: Exocanthion on the right side.
- EnR: Endocanthion on the right side.
- ExL: Exocanthion on the left side.
- EnL: Endocanthion on the left side.
- PR: Middle of the pupil on the right side.
- PL: Middle of the pupil on the left side.
- XR-XL: Facial width at bipupil line (constructed point)

Fig. 1
Fig. 1 showing soft tissue land mark for frontal profile: trichion (Tr), nasion (N), subnasale (Sn), stomion (St), mention (Me), facewidth at bipupil line (XR and XL), exocanthion left and right (ExL&ExR), endocanthion left and right (EnL & EnR), middle of the pupil on left and right (PL & PR)

Soft Tissue Landmarks For Lateral Photograph
- Skin glabella (G): the most anterior point of the middle line of the forehead.
- Soft tissue nasion (N): the most concave point in the tissue overlying the area of the fronto-nasal suture.
- Pronasale (Prn), the most prominent point of the tip of the nose.
- Columella Point (Cm), the most anterior point in the columella of the nose(nasal septum).
- Subnasale (Sn), the point at which the nasal septum merges with the upper cutaneous lip in the mid-saggital plane.
- Mn: Mid nasal
- Labrale Superius (Ls), a point indicating the mucocutaneous border of the upper lip.
- Labrale Inferius (Li), a point indicating the mucocutaneous border of the

lower lip.

- Sm: Supramental;
- Pogonion (Pog), the most anterior point on the soft tissue chin.
- Cervical point (C), the inner point between the submental area and the neck located at the intersection of lines drawn tangent to the neck.
- Soft tissue Menton (Me), the most inferior point on the soft tissue chin.

Fig.2

Fig.2: The soft tissue landmarks for lateral profile view: glabella(G),nasion(N), midnasale (Mn), pronasal (Prn), columella(Cm), subnasal(Sn), labial superior(Ls), labial inferior(Li), supramental(Sm), pogonion (Pg).

Specific parameters used for the study

Soft tissue parameters for frontal photographs:

1. **Ratio 1 :** ratio of linear measurement between trichion to nasion and nasion to stomion.

2. **Ratio 2:** ratio of linear measurement between nasion to stomion and subnasale to menton.

3. **Ratio 3:** ratio of linear measurement between exocanthion right to endocanthion left and endocanthion right to left.

4. **Ratio 4:** ratio of linear measurement between endocanthion left to exocanthion left and endocanthion right to left.

5. **Ratio 5:** ratio of linear measurement between middle of pupil on the left to right and exocanthion right to left.

6. **Ratio 6:** ratio of linear measurement between nasion to menton and facial width at bipupil line.

7. **Ratio 7:** ratio of linear measurement between nasion to stomion and facial width at bipupil line.

FIG-3

Fig. 3 : linear measurement: Trichion to nasion (Tr-N), nasion to stomion (Nst), subnasale to menton (Sn-Me), nasion to menton (N-Me).

FIG-4

Fig. 4: Linear measurement: Exocanthion right to endocanthion right (ExREnR), Endocanthion right to left (EnR-EnL), Endocanthion left to exocanthion left (EnL-ExL), middle of pupil on left and right (PL-PR), face width at bipupil line (XR-XL).

Soft tissue parameters for lateral photographs:

1. G-N-Prn(naso frontal angle) angle formed by the glabella, nasion and pronasale.

2. Cm-Sn/N-prn(nasal angle) angle formed by line joining the columella to subnasale and nasion to pronasale.

3. N-Mn-Prn(angle of nasal dorsum) angle formed by nasion, mid nasal and pronasale.

4. Cm-Sn-Ls(nasolabial angle) angle formed by columella, subnasale and labial superior.

5. Li-Sm-Pg(mentolabial angle) angle formed by labial inferior ,supramental and pogonion

6.C-Me/G-Pg(cervicomental angle) angle formed by line joining the cervical to menton and glabella to pogonion

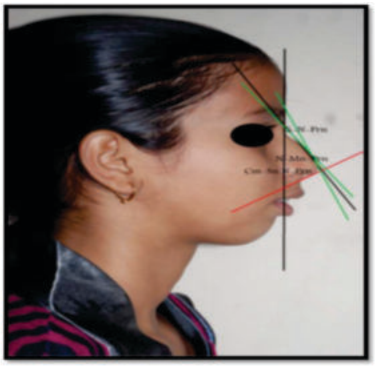

FIG-5

Fig. 5: Angular measurement: Nasofrontal angle (G-N-Prn), angle of nasaldorsum (N-Mn-Prn), nasal angle (Cm-Sn/N-Prn).

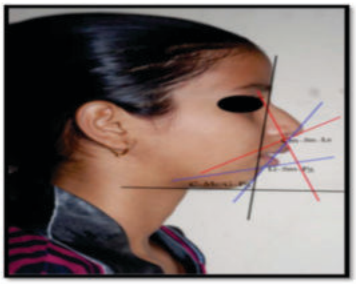

FIG-6

Fig. 6: Angular measurements: Nasolabial angle (Cm-Sn-Ls), mentolabial angle (Li-Sm-Pg), cervicomental angle (C-Me/G-Pg).

RESULTS:

Data was kept in microsoft excel and statistical analysis was done using Epi Info (TM) 3.5.3. Descriptive statistical analysis was performed. t-test was used to compare the means. Test of proportion was used to compare the proportions. $P \leq 0.05$ was considered as statistically significant.

Comparison of value of different linear measurement and angular measurement in different malocclusion is described in Table 1 to Table 8.

Table 1: Shows Comparison of value of linear measurement (in mm) of Class I

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
TR-N/N-ST	1.00±0.09	0.92±0.06	3.30	<0.01**
N-ST/SN-ME	1.00±0.06	1.08±0.12	2.67	<0.05*
EXR-ENR/ENR-ENL	1.00±0.04	0.98±0.06	1.24	>0.05
ENL-EXL/ENR-ENL	1.00±0.05	0.99±0.02	0.83	>0.05
PR-PL/EXR-EXL	0.70±0.02	0.71±0.02	0.21	>0.05
N-ME/XR-XL	0.86±0.03	0.91±0.05	3.83	<0.01**
N-ST/XR-XL	0.53±0.02	0.63±0.03	12.40	<0.01**

>0.05 – Not Significant *- Significant at 5% level of significance **- Significant at 1% level of significance

Table 2: Shows Comparison of value of angular measurement (in degree) of Class-I

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
G-N-PRN	138.00±3.17	150.20±4.34	10.15	<0.01**
CM-SN/N-PRN	72.00±7.24	85.80±8.13	6.49	<0.01**
N-MN-PRN	174.00±2.84	177.85±3.69	3.69	<0.01**
CM-SN-LS	105.00±7.41	105.85±8.86	0.33	>0.05
LI-SM-PG	130.00±9.08	127.80±10.83	0.69	>0.05
C-ME/G-PG	84.00±5.78	96.80±5.14	7.40	<0.01**

>0.05 – Not Significant. **- Significant at 1% level of significance

Table 3: Shows comparison of value of linear measurement (in mm) of Class- II Div-1

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
TR-N/N-ST	1.00±0.09	0.75±0.11	7.86	<0.01**
N-ST/SN-ME	1.00±0.06	1.35±0.12	11.66	<0.01**
EXR-ENR/ENR-ENL	1.00±0.04	0.87±0.04	10.27	<0.01**
ENL-EXL/ENR-ENL	1.00±0.05	0.89±0.05	6.95	<0.01**
PR-PL/EXR-EXL	0.70±0.02	0.76±0.04	6.00	<0.01**
N-ME/XR-XL	0.86±0.03	0.93±0.03	7.37	<0.01**
N-ST/XR-XL	0.53±0.02	0.68±0.06	10.61	<0.01**

****- Significant at 1% level of significance**

Table 4: Comparison of value of angular measurement (in degree) of Class-II Div-1

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
G-N-PRN	138.00±3.17	150.00±5.71	8.21	<0.01**
CM-SN/N-PRN	72.00±7.24	90.15±7.82	7.61	<0.01**
N-MN-PRN	174.00±2.84	175.35±3.49	1.34	>0.05
CM-SN-LS	105.00±7.41	90.25±6.74	6.58	<0.01**
LI-SM-PG	130.00±9.08	101.35±8.49	10.30	<0.01**
C-ME/G-PG	84.00±5.78	103.35±4.76	11.55	<0.01**

>0.05 – Not Significant **- Significant at 1% level of significance

Table 5: Comparison of value of linear measurement (in mm) of Class-II Div-2

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
TR-N/N-ST	1.00±0.09	0.67±0.07	12.94	<0.01**
N-ST/SN-ME	1.00±0.06	1.38±0.05	21.75	<0.01**
EXR-ENR/ENR-ENL	1.00±0.04	0.93±0.21	1.46	>0.05
ENL-EXL/ENR-ENL	1.00±0.05	0.95±0.04	3.49	<0.01**
PR-PL/EXR-EXL	0.70±0.02	0.73±0.04	3.00	<0.01**
N-ME/XR-XL	0.86±0.03	0.89±0.06	2.12	<0.05*
N-ST/XR-XL	0.53±0.02	0.67±0.04	14.01	<0.01**

>0.05 – Not Significant *- Significant at 5% level of significance **- Significant at 1% level of significance

Table 6: comparison of value of angular measurement (in degree) of Class-II Div-2

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
G-N-PRN	138.00±3.17	155.95±4.06	15.58	<0.01**
CM-SN/N-PRN	72.00±7.24	90.85±5.89	9.03	<0.01**
N-MN-PRN	174.00±2.84	177.90±2.07	4.96	<0.01**
CM-SN-LS	105.00±7.41	101.70±5.57	1.59	>0.05
LI-SM-PG	130.00±9.08	110.95±13.57	5.21	>0.05
C-ME/G-PG	84.00±5.78	94.95±6.31	5.72	<0.01**

>0.05 – Not Significant **- Significant at 1% level of significance

Table 7: Comparison of value of linear measurement (in mm) of Class-III

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
TR-N/N-ST	1.00±0.09	0.66±0.03	16.02	<0.01**
N-ST/SN-ME	1.00±0.06	1.32±0.09	13.23	<0.01**
EXR-ENR/ENR-ENL	1.00±0.04	0.87±0.05	9.07	<0.01**
ENL-EXL/ENR-ENL	1.00±0.05	0.90±0.05	6.32	<0.01**
PR-PL/EXR-EXL	0.70±0.02	0.70±0.03	0	>0.05
N-ME/XR-XL	0.86±0.03	0.98±0.03	12.64	<0.01**
N-ST/XR-XL	0.53±0.02	0.69±0.03	11.34	<0.01**

>0.05 – Not Significant **- Significant at 1% level of significance

Table 8: Comparison of value of angular measurement (in degree) of Class-III

Parameters	Normal (n=20) (Mean±s.d.)	Observed (n=20) (Mean±s.d.)	t-value (t38)	p-value
G-N-PRN	138.00±3.17	151.70±5.52	9.62	<0.01**
CM-SN/N-PRN	72.00±7.24	85.35±8.33	5.41	<0.01**
N-MN-PRN	174.00±2.84	175.50±8.73	0.73	>0.05
CM-SN-LS	105.00±7.41	112.25±15.87	1.85	>0.05
LI-SM-PG	130.00±9.08	136.90±6.05	2.82	>0.05
C-ME/G-PG	84.00±5.78	92.75±6.49	4.50	<0.01**

>0.05 – Not Significant **- Significant at 1% level of significance

ANOVA showed that there was significant difference between mean VAS of the four classes. As per post hoc Tukey's test mean VAS of Class-I and Class-II Div2 were significantly higher than other two classes($p<0.01$). Mean VAS of Class-III was significantly lower than others ($p<0.01$). Comparisons of VAS of all the four classes of malocclusions are described in Table-9.

Table 9: Comparison of VAS of the four classes

Class	VAS (Mean±s.d.)	F-value	p-value
Class-I	72.80 ± 5.71	F3,75= 8.99	<0.01**
Class-II Div-1	49.21 ± 2.91		
Class-II Div2	70.70 ± 5.57		
Class-III	44.03 ± 3.19		

Table-10 describes relationship of Pearson Correlation Co-efficient (r) with VAS

Table 10: Pearson Correlation Co-efficient (r) with VAS

Parameters	Class-I		Class-II Div-1		Class-II Div2		Class-III	
	r	p-value	R	p-value	r	p-value	r	p-value
TR-N/N-ST	0.145	0.543	-0.311	.181	0.400	0.080	0.278	0.236
N-ST/SN-ME	-0.163	0.493	-0.053	0.824	-0.215	0.632	0.167	0.482
EXR-ENR/ENR-ENL	-0.076	0.750	-0.024	0.919	-0.009	0.969	0.109	0.648
ENL-EXL/ENR-ENL	0.087	0.714	-0.156	0.511	0.119	0.617	0.346	0.135
PR-PL/EXR-EXL	-0.244	0.443	-0.423	0.063	-0.409	0.074	-0.089	0.709
N-ME/XR-XL	0.186	0.301	-0.213	0.367	0.626	0.003*	-0.600	0.005*
N-ST/XR-XL	-0.352	0.128	-0.160	0.501	0.278	0.236	0.518	0.019
G-N-PRN	-0.122	0.610	-0.086	0.718	0.167	0.482	-0.014	0.955
CM-SN/N-PRN	-0.132	0.580	0.428	0.060	0.109	0.648	0.133	0.526
N-MN-PRN	-0.138	0.563	0.041	0.862	0.346	0.135	0.028	0.908
CM-SN-LS	0.043	0.856	0.458	0.042	-0.089	0.709	0.224	0.343
LI-SM-PG	0.035	0.882	0.304	0.193	-0.600	0.005*	0.320	0.168
C-ME/G-PG	0.123	0.605	-0.141	0.552	0.518	0.019*	0.093	0.697

*** - Significant at 1% level**

Significant correlations were found between VAS and N-ME/XR-XL in Class-II Div2 ($r=0.626; p<0.01$) and Class-III ($r=0.600; p<0.01$).

Significant correlations were found between VAS and LI SM-PG ($r=-0.600; p<0.01$) and C-ME/G-PG ($r=0.518; p<0.01$) in Class-II Div2.

DISCUSSION:

Although the cephalometric radiographs provide valuable information for the treatment planning as well as highlight the effects of growth on treatment, but radiobiologist believe that there is no threshold below which X-ray are harmless.[4] Every X –ray therefore causes finite damage to the patient and radiographic examination should be minimum. Wall and Kendall (1983) have estimated the risk of fetal malignancy from dental radiology in Britain.[5] By extrapolating the effects of high doses of radiation and taking into account the varying radio sensitivities of various organs, as well as age and sex difference. They predicted that the massive dental radiograph resulted in three extra cases of fetal cancer per annum.[6] A radiograph has several characteristics that lead to potential loss of accuracy of an image, particularly with respect to different radio densities of hard and soft tissue. Sharpness of the soft tissue outline is likely to be lost on a radiograph where as photographic image has an advantage over the radiograph, as they register reflected light which is more satisfactory to records soft tissue outline and thereby no chance of radiation exposure.

It has been shown previously that the soft tissues vary in thickness over different parts of facial skeleton. Correlation of hard tissues to normal values need not always reflect the improvement in the facial esthetics. The soft tissue appearance is only partially dependent on underlying skeletal structure. Consequently, the outline of facial profile should also include an evaluation of soft tissue morphology. A lateral cephalometric radiograph is one the most valuable tool to fulfill the above mentioned purpose.In the present study, soft tissue assessment gets priority over hard tissue assessment. Because a photograph accurately speaks how a face actually looks and it is superior to cephalogram which gives only facial outline. Thus it was felt necessary to do photogrammetric analysis. This photogrammetric analysis offers some advantages in terms of human profile analysis. With photogrammetric analysis, linear and angular measurements are not affected severely by photographic enlargement as that occurs in cephalometric radiographs.[7] Thus the technique can be used clinically for both pre-treatment planning and evaluation of a patient's post-treatment results. This study has determined the angular and linear soft tissue measurements of a sample of young Bengali population and correlate with the VAS score given by different observers. Seven linear measurements and six angular measurements that describe various aspects of the soft tissue profile were evaluated and compared to other existing values. Orthodontists should consider these variables during treatment planning. The data gathered in this study indicates differences in measured parameters when compared to similar studies done on Caucasians[8], and Negroids[9].

In this investigation, standardized photogrammetric records taken in natural head position (NHP) were analyzed using linear and angular measurements. The records were obtained from a sample of 80 (males and females) Bengali population age range from 12-25yrs irrespective of sexual variation. All the subjects were screened as per guidelines mention in material and methods.

Many authors also used NHP in their studies.[10,11,12,13] In relation to the photogrammetric technique, the focal lens used was 105 mm to avoid facial distortion.The ratios and the angles in this study were calculated directly between the landmarks. No reference axis, projections, perpendiculars, or tangent lines were used. These restrictions were followed to prevent projection errors and to make the measurement technique simpler and more applicable in clinical practice.

Ideal ratio of linear measurements and angular measurements describe by different authors use them as reference for this study.

Lines et al. (1978)[14] in their study,found a mean range of 60-80 degrees for the nasal angle (Cm-Sn/N-Prn), Burstone (1967)[15] observed a nasolabial angle of 74 ± 8 degrees (range 60-90 degrees) in his Caucasian adolescent sample with a normal facial appearance. Yuen and Hiranaka (1989)[11] who,done their study in a Asian adolescents on standardized photographic records reported an angle of 102.7± 11 degrees for males and 101.6 ± 11 degrees for females. McNamara et al. (1992)[16] reported more or less similar results in their study on lateral cephalograms of adult Caucasians with pleasing facial aesthetics (males = 102.2 ± 8 degrees, females= 102.4 ± 8 degrees).

In our present study it was found that observed means of ratio of linear measurements (TR-N/N-ST - 0.92±0.06 p-value <0.01, EXR-ENR/ENR-ENL – 0.98±0.06 p-value >0.05 and ENL-EXL/ENR-ENL – 0.99±0.02 p-value >0.05) were lower than that of normal. For TR-N/N-ST it was statistically significant (p<0.01) but for EXR-ENR/ENR-ENL and ENL-EXL/ENR-ENL it was not significant (p>0.05). The observed means of ratio of linear measurements (N-ST/SN-ME – 1.08±0.12 p- value <0.05, PR-PL/EXR-EXL – 0.07±0.02 p-value >0.05, N-ME/XR-XL-0.91±0.05 p-value <0.01 and N-ST/XR-XL – 0.63±0.03 p-value <0.01) were higher than that of normal. For N-ME/XR-XL and N-ST/XR-XL it was statistically significant (p<0.01) but for PR-PL/EXR-EXL it was not significant (p>0.05) and all the angular parameters except LI-SM-PG the mean observed value was higher than that of normal. It was significantly higher than normal for G-N-PRN, CM- SN/N-PRN, N-MN-PRN and C-ME/G-PG (p<0.01). But it was not significant for CM-SN-LS and LI-SM-PG (p>0.05). The mean observed value of LI-SM-PG was lower than that of normal but it was not significant (p>0.05) in angle's class I.

The observed means of linear ratio of TR-N/N-ST, EXR-ENR/ENR-ENL and ENL-EXL/ENR-ENL were significantly lower than that of normal (p<0.01).The observed means of N-ST/SN-ME, PR-PL/EXR-EXL, N-ME/XR-XL and N- ST/XR-XL were significantly higher than that of normal (p<0.01) and all the angular parameters except CM-SN-LS and LI-SM-PG the mean observed value was higher than that of normal. It was significantly higher than normal for G-N- PRN, CM-SN/N-PRN and C-ME/G-PG (p<0.01). The mean observed value of CM-SN-LS and LI-SM-PG were significantly lower than that of normal (p<0.01). The mean observed value of N-MN-PRN was higher than that of normal but it was not statistically significant (p>0.05) in angle's class II div 1.

The observed means of linear ratio TR-N/N-ST and ENL-EXL/ENR-ENL were significantly lower than that of normal (p<0.01). The observed mean of EXR- ENR/ENR-ENL was lower but it was not significant (p>0.05). The observed means of N-ST/SN-ME, PR-PL/EXR-EXL, N-ME/XR-XL and N-ST/XR-XL were significantly higher than that of normal (p<0.01) and all the angular parameters except CM-SN-LS and LI-SM-PG the mean of observed value was higher than that of normal. It was significantly higher than normal for G-N-PRN, CM-SN/N-PRN and C-ME/G-PG (p<0.01). But it was not significant for CM-SN-LS and LI-SM- PG (p>0.05). The mean observed value of CM-SN-LS and LI-SM-PG were significantly lower than that of normal (p>0.05). The mean observed value of N-MN-PRN was higher than that of normal but it was statistically significant (p<0.01) in class II div 2.

The observed means of TR-N/N-ST, EXR-ENR/ENR-ENL and ENL-EXL/ENR- ENL were significantly lower than that of normal (p<0.01). There was no significant difference between mean of observed values and mean of normal values for PR-PL/EXR-EXL (p>0.05). The observed means of N-ST/SN-ME, N-ME/XR- XL and N-ST/XR-XL were significantly higher than that of normal (p<0.01) and all the angular parameters the mean observed value was higher than that of normal. But it was not significant for N-MN-PRN and CM-SN-LS and LI-SM-PG (p>0.05) for others it was significant (p<0.01) in angle's class III.

ANOVA showed that there was significant difference between mean VAS of the four classes. As per post hoc Tukey's test mean VAS of Class-I and Class-II Div2 were significantly higher than other two classes(p<0.01). Mean VAS of Class-III was significantly lower than others (p<0.01).

Significant correlations were found between VAS and N-ME/XR-XL in Class-II Div2 (r=0.626;p<0.01) and Class-III (r=0.600;p<0.01). Significant correlations were found between VAS and LI-SM-PG (r= -0.600;p<0.01) and C-ME/G-PG (r=0.518;p<0.01) in Class-II Div2.

CONCLUSION:

Our study indicates that the facial profile values established for Caucasians cannot be applicable to Bengali population. The finding of the present study showed that during Orthodontic treatment planning for Bengali subjects; it may be useful to use a modified set of norms.

Data obtained from this study may not be sufficient for establishing accurate norms for proper diagnosis and treatment planning because of small number of sample; so further studies is required with bigger number of samples with more delicate screening system to formulate the comprehensive data base.

REFERENCES:

1. Riveiro PF. et al. Angular photogrammetric analysis of the soft tissue facial profile. Eur J Orthod. 2003;25:393-399.
2. Willam R Proffitt: Contemporary Orthodontics: Fifth edition, ISBN: 9780323096270, Imprint: Mosby Elsevier.
3. Holdaway RA. A soft tissue cephalometric analysis and its use in Orthodontic treatment planning. 1983; Part I. Am J Orthod, 84: 1-28.
4. Smith N J D 1987 Risk assessment: The philosophy underlying radiation protection. International Dental Journal 37: 43-51.
5. Wall B F, Kendall G M 1983 Collective doses and risks from dental radiology in Great Britain. British Journal of Radiology 56: 511-516.
6. Benson PE and Richmond S. A critical appraisal of measurement of the soft tissue outline using photographs and video. Eur J Orthod1997;19: 397-409.
7. Malkoc S, Sari Z, Usumez S, Koyuturk AE. The effect of head rotation in cephalometric radiographs. Eur J Orthod 2005 Jun;27(3):315-21.
8. Legan HL, Burstone CJ. Soft tissue cephalometric analysis for orthognathic surgery. J Oral Surg. 1980 Oct;38(10):744-51. PMID: 6932485.
9. Sushner NI. A photographic study of the soft tissue profile of the Negro population. Am J Orthod Dentofacial Orthop 1977 Oct;72(4):373-85
10. Riveiro P F, Chamosa E S, Quintanilla D S, Cunqueiro M S 2003 Angularphotogrammetric analysis of the soft tissue facial profile. EuropeanJournal of Orthodontics 25: 393–399 (20)
11. Yuen S W H, Hiranaka D K 1989 A photographic study of the facial profiles of southern Chinese adolescents. Quintessence International 20: 665–676
12. Arnett G W, Bergman R T 1993a Facial keys to orthodontic diagnosis and treatment planning. Part I. American Journal of Orthodontics and Dentofacial Orthopedics 103: 299–312.
13. Arnett G W, Bergman R T 1993b Facial keys to orthodontic diagnosis and treatment planning. Part II. American Journal of Orthodontics and Dentofacial Orthopedics 103: 395–411.
14. Lines P A, Lines R R, Lines C A 1978 Profilemetrics and facial esthetics. American Journal of Orthodontics 73: 648–657
15. Burstone C J 1967 Lip posture and its significance in treatment planning. American Journal of Orthodontics 53: 262–284
16. McNamara J A, Brust E W, Riolo M L 1992 Soft tissue evaluation of individuals with an ideal occlusion and well-balanced face. In: McNamara J A, Carlson D S, Ferrara A (eds) Aesthetics and the treatment of facial form. Monograph No 28, Craniofacial Growth Series, Center for Human Growth and Development, University of Michigan, Ann Arbor, pp. 115–146