



## Comparative evaluation of facial parameters and symmetry - A hospitalbased study in Bhubaneswar

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### Abstract

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<b>Article History</b> Received: 08 Oct 2023 Revised: 29 Nov 2023 Accepted: 02 Dec 2023	<b>Aim:</b> The study focuses on measuring various facial parameters and their relationships in individuals seeking orthodontic care. <b>Materials and methods:</b> The researchers conducted a study in Bhubaneswar, India, involving 102 subjects (47 males and 55 females) aged 20 to 45 years. They used descriptive and statistical analyses to examine measurements such as distances between inner canthi of eyes, eye widths, interpupillary line width, and nasal width. <b>Result:</b> The study revealed sexual dimorphism
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<p>CCLicense CC-BY-NC-SA 4.0</p>	<p>in some measurements, indicating differences between males and females. The distance between inner canthus of eye (p-value - 0.0528 ) showed that males have larger width compared to females, width of left eye ( p-value - 0.0055 ) and width of right eye ( p-value - 0.0706 ) showed that males have wider eyes than females. Inter pupillary line width (p-value 0.0046 ) indicates that males have larger pupil gap compared to females. Nasal width (p-value 0.0766 ) indicates wider nose in males compared to females. The research is conducted on a sample of residents from Bhubaneswar, India, within a specific age range, and includes measurements related to eye width, nasal width, and interpupillary line width.</p> <p><b>Clinical significance:</b> The abstract also references previous studies and their findings in the field of orthodontics, including discussions about the impact of orthodontic tooth movement on the soft tissue profile and the need for further research to comprehensively understand facial form.</p> <p><b>Conclusion:</b> The abstract concludes by emphasizing the importance of facial esthetics in orthodontic treatment and the need for more studies to investigate angular and facial features.</p> <p><b>Keywords:</b> facial parameters, sexual dimorphism, facial esthetics</p>
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**Introduction:** Facial symmetry has been equated with facial aesthetic from earlier days and the idea continues today even though there is change in the standard of facial beauty. It is the common reason for patients seeking orthodontic treatment and in latest years both patients and orthodontist focus has been increased.(1)

During orthodontic diagnosis and orthodontic treatment design, the subjects facial soft tissue evaluation is essential. The form face of human is dependent on the soft tissue and solid tissue structures mainly underlying bone that is present under it. Overlying tissue layer should be examined for the perfect evaluation of a skeletal variation due to contrast in underlying tissue structure. The measurable estimation of

facial soft tissue is universally used in the field of medicine like orthodontics, plastic surgery, and maxillofacial surgery for detection of proper treatment design and postoperative care. (2)

Facial aesthetic depends on the well balanced soft tissue profile over the hard tissue. In a clinical case of patient with very mild anterior protrusion the choice of treatment will not be extraction, as it leads to dish in face and senile look. The correction of the overlying lip is used as a reference in such cases. Whatever is the hard tissue, the final treatment plan will always be focused on the soft tissue. Hence, it is essential to have a well balanced soft tissue profile for facial aesthetic.

The drape of soft tissue, composed of connective tissue and fatty adipose tissue which is not always distributed uniformly over the skeletal or underlying hard tissue. It is assumed that the face will be balanced if the underlying hard tissue and cephalometric structure are in harmony, but it does not ensure facial aesthetic. The facial esthetic is benefitted by harmony of skeletal and soft tissue relationships. (3-4)

The facial esthetic evaluation is instinctive for a layperson and consider parts like balance and harmony, symmetry and proportions of the constituent parts, color and hairstyles. With the introduction of various diagnosis method the approach of orthodontic treatment changed from the internal soft tissue factors of face to underlying hard tissue factor. In fact this should be considered and the treatment plan should be completely based on the both soft tissue and hard tissue facial factors. The patient's esthetic is directly in relation to place and spots of chin, lips and nose.

Therefore, it is usually considered that treatment planning should begin with a overall judgement of face, with proper observation to the visual necessity and also consider the functional and cephalometric measurements. (5) Currently, the mid facial asymmetry data in healthy individuals is scarce. Since majorly in clinical settings facial asymmetry is often mentioned, it should be acceptable to quantify various aspects related to nose development or nasal axis or any other facial measurements(1). The facial measurements of the face is of eyes , nose , and inter pupillary line width . It is also know that facial normal values have greater edge in long term retention.

To know any such deviations which is present in the facial soft tissue structures, it is very important to know the ideal values or normal values. Hence, the objective of

the present research is to examine the soft tissue facial forms of an group of orthodontic patients reporting to a hospital based in Bhubaneswar city, Odisha.

**Materials and methods:** A descriptive research was conducted at the Dept. of Orthodontics and Dentofacial Orthopaedics, KIDS (Kalinga Institute of Dental Sciences), KIIT Deemed to be University, BBSR, Odisha, India. The study was conducted from May 2023 to August 2023. The subjects were the residents of the Bhubaneswar city, Odisha, India. The study subjects was selected by random sampling, with a age range of 20-45 years. From all the subjects, verbal consent was taken in language English, Hindi, Odia. A total of 102 subjects, ( 47 male subjects , 55 female subjects ) with the profile which were esthetically pleasing were considered, all of them were residents of Bhubaneswar and had Odia as native language .

**Inclusion criteria:** The male and female samples which considered were between, age group of 20 to 45 years old, were inhabitant of Bhubaneswar. They had bilateral Angle's molar relation Class I, Class II and Class III, with normal overbite and normal overjet. The samples had no history of wound, scar or burnt tissues in head region, neither any systemic illness.

**Exclusion criteria:** Subjects with skeletal discrepancies and cleft lip were not selected. Any presence of systemic illness or subjects whose upright head posture could not be decided were cut off from the study.

**Soft Tissue Landmark Points:**

**Study reference line:** The following facial measurements were taken in consideration.

**Width between inner canthus of eye** - it is the distance from the inner canthus of left eye and right eye.

**Width of Left eye** - it is the distance between the outer canthus and inner canthus of left eye.

**Width of right eye** - it is the distance between the outer canthus and inner canthus of right eye.

**Interpupillary line width** - it is the distance when an horizontal imaginary line is drawn from the centre of pupil of left eye to the centre of pupil of right eye.

**Nasal width** - it is the distance between the left and right ala of nose.



**Procedure of study :** The samples were considered clinically sound and age , sex, angles molar relation were recorded along with the measurements of above mentioned references of soft tissues. Total 102 subjects were studied.

A digital Vernier Caliper was used to measure the landmark. The patients were instructed to sit in an adjustable dental stool with upright head position. They were asked to look straight towards the wall and the measurements were taken by keeping the Vernier Caliper against the face.



**Figure:** A Vernier Calliper, 30cm Metal scale, probe and mouth mirror used during recording the data.

**Statistical analysis:** All the measurements were collected and updated in an excel sheet. A elaborate statistical study of all the parameters collected were analyzed by software SPSS

version 23 (SPSS Inc. Chicago, Illinois). Mean, maximum value, minimum value, standard deviation and p-value was calculated. A statistical significant value of  $p < 0.05$  was considered significant. To generate graphs and table software like Microsoft Word and WPS office was used. A elaborate statistical study of all the measurements were carried out.

Results: The sample size composed of 102 subjects, 47 male and 55 female, between 20 to 45 yrs of age (mean value age of male is 30.5 and mean age of female is 28.6). The facial measurements have been tabulated. [ Table 1 ] Table contains statistical information for the analysed data.

S.no	Parameter	Gender	Mean value (in cms)	Maximum value (in cms)	Minimum value (in cms)	Standard deviation	p-value (two tailed value)
1	Distance between inner canthus of eye	Male	3.0680	4.6	2.1	0.3873	0.0528
		Female	2.9210	3.8	1.4	0.3692	
2	Width of Lefteye	Male	3.1978	4	2	0.3431	0.0055
		Female	2.9890	3.6	1.4	0.3730	
3	Width of Righteye	Male	3.1042	3.7	2.4	0.3368	0.0706
		Female	2.9763	3.7	1.4	0.3651	
4	Interpupillary line width	Male	5.1382	6.5	3.8	0.5256	0.0046
		Female	4.8327	6.3	2.3	0.5350	
5	Nasal width	Male	4.1553	5	2.8	0.4849	0.0766
		Female	3.7490	5	2	0.5047	

**Table:** Descriptive statistics for facial measurements; males are 47 and females are 55.

Distance between inner canthus of eye conveyed a noticeable variation in between males and female with a greater mean in males (3.0680) than in females

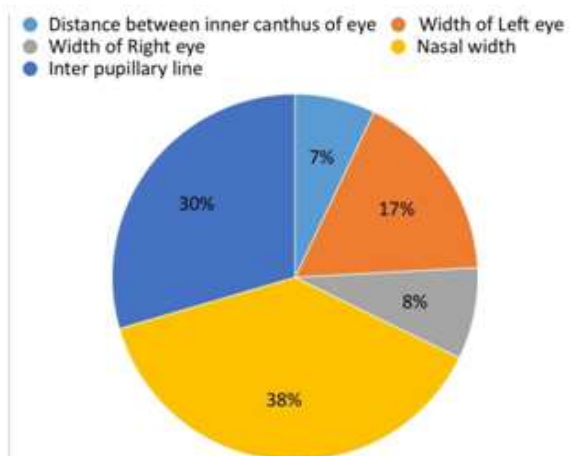


(2.9210). The maximum value for males (4.6) and females (3.8) with sexual dimorphism. A wider face was seen in males than in females (P-value 0.0528).

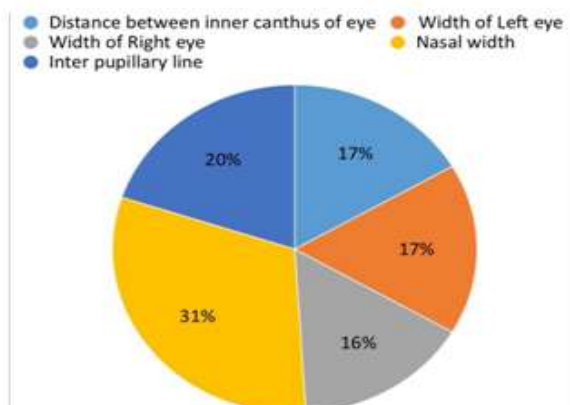
Width of the Left Eye showed sexual dimorphism with males having greater eye width than in females (p value 0.0055). The measurements of left eye showed that males have wider left eye (3.1978) than in females (2.9890).

Width of Right Eye (p value 0.0706) showed sexual dimorphism with males (mean 3.1042) having greater eye width than in females (mean 2.9763).

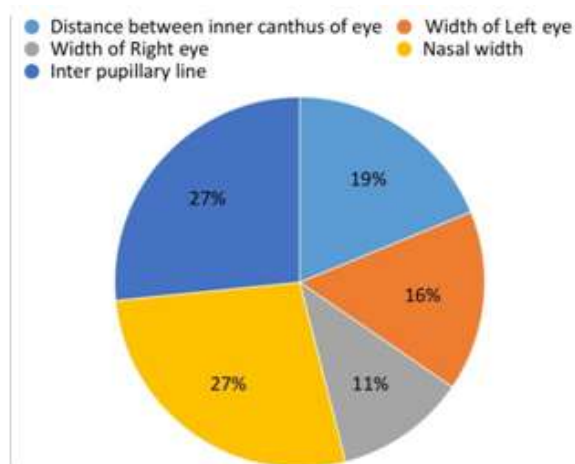
Interpupillary line (p value 0.0046) measurements showed that males having wider pupil line compared to females with maximum value for males (6.5) and for females (6.3). Nasal width (p value 0.0766) showed males having wider nose with mean (4.1553) compared to females (3.7490)



**Pie Chart 1** - Descriptive comparison of the Class I Angle's malocclusion among the total population based on facial measurements.



**Pie Chart 2** - Descriptive comparison of the Class II Angle's malocclusion among the total population based on facial measurements



**Pie Chart 3** - Descriptive comparison of the Class III Angle's malocclusion among the total population based on facial measurements.

Discussion: The limitations to orthodontic treatment is largely determined by soft tissues, from the perspective of proper stability and function, along with esthetics. Therefore orthodontist plan their treatment within patient's limit of adaptation and contour of soft tissue. There is a great need for objective and accurate estimation of soft tissue for harmony, orientation and proportion. Research results showed that the position of nose and eye is generally responsible for the orthodontic treatment, rather than chin and lips which are more critical in orthognathic surgery. This idea has direct effect on extraction and non extraction cases in treatment planning. (6) This predominantly effect the surgical or non surgical approach of the treatment. Proper facial attractiveness is our treatment motive. Hence all the factors which influence including soft tissue thickness and both skeletal and dental pattern has to be taken into consideration. As rectification of malocclusions is the main goal of orthodontic treatment, soft tissue profile plays a important part in it (7)

The ultimate objective of the present analysis was to get mean parameters of soft tissue facial profile of adults of Bhubaneswar and examine the data based on sexual dimorphism and for mean measurements. This is the first time the linear measurement are taken into consideration. In the present research, standardised facial measurements were conducted in upright head posture prescribed by various other studies.(8) The selected sample was 20 - 45 yrs old. Based on the sexual dimorphism the distance between inner canthus of eye ( p-value - 0.0528 ) showed that males have larger width compared to females, width of left eye ( p-value - 0.0055 ) and width of right eye ( p-value - 0.0706 ) showed that males have wider eyes than females. Inter pupillary line width ( p-value 0.0046 ) indicates that males have larger pupil gap compared females. Nasal width ( p-value 0.0766 ) indicates wider nose in males compared to females.



Various other studies have been done nationally and internationally based on the angular deviation in soft tissue. Linear measurements have been taken into consideration for the first time. As literature reviews suggest no study has been done till date which measures the linear measurement of the soft tissue. Previously various studies has been conducted which has recorded the angular parameters nationally and internationally. Both linear and angular measurements are to be considered during treatment planning by an orthodontist. Angular measurements deals with possible three dimensions whereas linear measurements are mainly between two points. This gives linear measurements an upper hand in term of mean values and estimation of the calculations.

Munish Reddy C et al.(9) in the year 2011 , in the observation showed that nasal , facial thirds, and lips length showed significant differences. The study was conducted among the population of north india with a sample size of 150, 78 males and 72 females, age considerably was 18-25 years.

In the present study, we have considered the age group of 20-45 years which included 47 males and 55 females with a sample size of 102. The present study also takes Angle's Class of malocclusion into consideration which was excluded from the previous study. The observations of the present study suggested that nasal width, interpupillary width and facial third length were in wider variations in males as compared to females. In the present study the width of left eye showed almost similar result in the sample including the Class I, II, III malocclusion. The gender variation was also significantly visible.

Panoian KS et el.(10) in the year 2018 , studied the facial convexity , lip contour which included both angular and linear measurements, among the population of south india with a sample size of 90 equal proportion of males and females. Age group considered was 18-25. The present study gives an age variation of wider range of people which also takes the molar relationship into consideration.

The present study was able to conclude that sexual dimorphism was seen in the standard given population where males showed wider facial profile as compared to females. However further studies, prospective in nature can be carried out with alarger group of individuals.

**Conclusion:** Facial esthetic is one of the main reason for patients to seek orthodontic treatment. Soft tissue analysis and its differentiation with typical soft tissue facial profile measurements are important for the orthodontist to change facial traits. The result of current study showed a sexual dimorphism in five linear

measurements. The distance between inner canthus of eyes, width of right eye and nasal width showed a statistical significant value. Nasal width and interpupillary line should be considered carefully while assessing these subjects. Even though a large number of studies have been conducted on facial profile, the orthodontic tooth movement has a significant effect on soft tissue profile. More studies with linear and angular estimation will give comprehensive plan of facial form, in future we need more research on angular and facial features of face.

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