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ORIGINAL ARTICLE

Angular Photogrammetric Analysis of Nasiolabial and Mentolabial Angle in Pakistani Adults

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ABSTRACT

Objective: The objective of the study was to determine the range of nasiolabial and mentolabial angles in normal Pakistani adult and to establish any sexual dimorphism if present.

Method: Five hundred objects 500 were selected from the indoor of the de'Mont morency College of dentistry, Lahore. Written consent was obtained from all the participants and were guaranteed that secrecy of all the data was kept up. They were selected using following criteria 1)subjects aged between 18-30 years both males and females 2)skeletal class 1,2 and 3 using ANB of Stenier's analysis with no or minor crowding, good facial asymmetry and full dentition irrespective of third molar. Gender wise difference was found using independent sample t test.

Results: The results of Independent sample t test revealed that there was a significant gender wise difference with regards to nasiolabial (t= 3.827, P<.001) and mentolabial angle (t= -2.733, P<.007).

Conclusion: The results showed wider nasiolabial angle in males while no significant difference in terms of skeletal classes. However, mentolabial angle was less in males than females and highest in class 3 than class 1 which was greater than class 2.The impact of sex was significant in both angles

Keywords: Nasiolabial angel, Mentolabial angle, Sexual Dimorphism, Angular photogrammetric analysis

INTRODUCTION

The result of an orthodontic treatment is assessed by the final outcome and improvement in the facial esthetics by the patient. The association between orthodontic treatment and facial esthetics has made facial outline as important guideline for treatment planning. Self-esteem, confidence, social acceptance and psychological wellbeing of a person are related to his physical appearance. Self-conceit is strongly dependent on the facial appearance .One of the major reasons for patient to seek orthodontic treatment is to make their facial appearance more esthetic and congenial.[1]

One of the primary objectives of orthodontic treatment is esthetic balance. So, it is not possible to quantify a trait such as beauty, rather focus should be on quantifying different linear and angular measurements in determining the proportions of a balanced face. Contemporary orthodontics has changed from hard tissue paradigm to soft tissue paradigm .For the orthodontic diagnosis and treatment planning, soft tissue analysis is the key component. Furthermore, the assessment of soft tissue profile is of great importance and value especially in facial esthetic and cosmetic dentistry and orthognathic surgeries.[2,3]

Numerous pretreatment methods are used to determine facial soft tissue measurements and analyses in orthodontics. These include photography, lateral cephalometry and three dimensional radiography.[4,5] Photographic evaluation of an orthodontic patient has gained importance as an important method in the treatment planning as it shows a very close representation of the patient.

The nasiolabial angle is one of the most frequently used parameter in the diagnosis of orthodontic patients and pretreatment evaluation. To line showing the upper lip's inclination from the line drawn from the lower margin of nose is called Nasiolabial angle. But difference was reported in drawing nasiolabial angle by different researchers which is also affected due to the positioning of nose and upper lip, so relying only on nasolabial angle is not accurate.

Another parameter used in evaluation of soft tissue profile into account of lower face is mentolabial/labiomental angle.[6,7] It is an anterior angle formed by the intersection of a tangent to the lower lip and a tangent to the upper part of the soft tissue chin pad. The mentolabial region and angle is also affected by various factors, like mandibular inciors proclination. Moreover, class 2 skeletal profile individuals exhibit an acute mentolabial angle while people having class 3 skeletal profile have an obtuse one.[8,9]

Changes in the nasiolabial angle and mentolabial sulcus and angle occur according to race and ethicinity of the people. According to Scavone, specific ethnic groups have particular dentofacial characteristics. Different ethnic groups have specific skeletal base patterns and facial features that reflect on the variations in the soft tissue profile of the face.[10] The nasiolabial and mentolabial angles had not measured on the photographs in the Pakistani population till date. The aim of the study was to determine the range of nasiolabial and mentolabial angles in normal Pakistani adult and to establish any sexual dimorphism if present.

MATERIALS AND METHODS

Five hundred objects 500 were selected from the indoor of the de'Mont morency College of dentistry, Lahore. Written consent was obtained from all the participants and were guaranteed that secrecy of all the data was kept up. They were selected using following criteria 1)subjects aged between 18-30 years both males and females 2)skeletal class 1,2 and 3 using ANB of Stenier's analysis with no or minor crowding, good facial asymmetry and full dentition

irrespective of third molar. EXCLUSION CRITERIA included no facial trauma, DNS or asymmetry, previous orthodontic treatment, previous orthognathic or esthetic surgery, facial nerve palsy, cleft lip and palate, syndromic deformity.

Setup for Photography: Canon camera with tripod stand was included in photographic set up. Single operator handled photographic system using manual settings. The participants were asked to stand on the marked line 100 cm apart from the camera on the floor. The photographs were taken in relaxed face condition. Participants' photographs were taken from one side. The format for photographs was Jpeg for further digitalizing and analyzing them in software named provixwin (Fig.1). SPSS version 20. Was used to analyzed data .

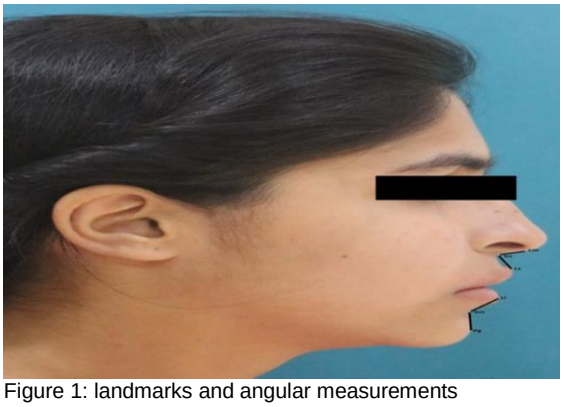

Figure 1: landmarks and angular measurements

- The most anterior and inferior spot of nose is called Columella (cm)
- In mid sagittal plane where nasal septum and upper lip meets is called Subnasale (sn)
- The upper lip's most anterior part is called Labial superior denoted by ls
- Lower lip's most anterior part is called Labial inferior and is denoted as li
- In the concavity, the most cordial point lies between pogonion and lower lip is called supramental, denoted by sm
- The chin's most anterior part is called Pogonion, denoted as pg
- Nasolabial angles included Cm-Sn-Ls
- Mentolabial angles included Li-Sm-Pg

Data was entered and analyzed using SPSS version 25.0. Gender wise difference was found using independent sample t test.

RESULTS

The results of Independent sample t test revealed that there was a significant gender wise difference with regards to nasiolabial (t= 3.827, P<.001) and mentolabial angel (t= -2.733, P<.007). The mean value of nasiolabial angel among males was 100.85±10.68 which is higher than females 96.52±12.47. Moreover, the mean value of mentolabial angel among males was 110.53±16.47 which is less than females 114.80±16.43.

Table 1: Gender wise difference with regards to Nasiolabial and Mentolabial angle

	Gender	Mean	Std. Deviation	t	Sig.	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Nasiolabial Angel	Male	100.85	10.68	3.827	.000	4.32	2.10	6.54
	Female	96.52	12.47					
Mentolabial Angel	Male	110.53	16.47	-2.733	.007	-4.26	-7.33	-1.19
	Female	114.80	16.43					

Furthermore, to explore the difference of nasiolabial and mentolabial angel among skeletal class I, class II, and class III, One-way ANOVA was used. Skeletal class wise significant difference was found in terms of mentolabial angel (F=11.596, P<.001). The mean value of mentolabial angel in skeletal class I was 114.55±15.19 which is higher than mean value of mentolabial angel in skeletal class II, 110.90±17.40 and less than mean value of mentolabial angel in skeletal class III, 121.72±12.87. Moreover, insignificant difference was found between the skeletal Classes in terms of nasiolabial angel.

Table 2: Difference of Nasiolabial and Mentolabial angle among Skeletal class I, class II, and class III

		Mean	Std. Deviation	F	Sig.	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Nasiolabial Angel	CLASS I (N=164)	98.87	11.74	2.601	0.07	97.06	100.68
	CLASS II (N=277)	98.12	11.78			96.73	99.51
	CLASS III (N=60)	94.77	13.86			91.19	98.35
Mentolabial Angel	CLASS I (N=164)	114.55	15.19	11.596	0.00	112.21	116.89
	CLASS II (N=277)	110.90	17.40			108.84	112.96
	CLASS III (N=60)	121.72	12.87			118.39	125.04

Post Hoc test, Hochberg's GT2, was performed to further investigate the skeletal class wise difference in term of mentolabial angel. There was no significant difference found between skeletal class I and skeletal class II (MD= 3.64, P=.067). Significant but negative difference was found between skeletal class II and skeletal class III (MD= -10.81, P<.001) which means that skeletal class II has higher mentolabial angel as compared to skeletal class III. Significant positive difference was found between skeletal class III and skeletal class II (MD=7.16, P=.01) which means that Skeletal class III has higher mentolabial angel as compared to skeletal class I.

Table 4: comparison of Mean differences of Mentolabial angle among skeletal class I, class II, and class III

Mentolabial Angel	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
Class I-Class II	3.64986	1.59777	.067	-.1776	7.4774
Class II-Class III	-10.81775	2.30918	.000	-16.3494	-5.2861
Class III-Class I	7.16789	2.44672	.011	1.3067	13.0291

DISCUSSION

The main purpose of current study was norm development for nasiolabial and mentolabial angled in normal Pakistani adults. It is evident that before 18years of age, most of the changes in facial morphology occur, however growth and reforming continues all the course of life.[9] For that reason, the objects those were included in the study were aged 18-30. Another reason to choose this age group was that they are more bothered about their facial appearance as well as aesthetics. This is also believed by Soh et al.[11] in which they showed how orthodontic treatment as well as orthognathic surgery are becoming more popular among adults. One of the inclusion criteria was having complete dentition as labial support cannot be obtained if anterior teeth are absent/missing. Prominence of upper lip is less in extraction cases [12], which changes the soft tissue profile of face. Consequently, nasiolabial angle increases in extraction cases. [13] Similarly, Cummins pointed out that both upper and lower lip become more retrusive after extraction. Furthermore, in female extraction group, nasiolabial angle was significantly larger. [12].People who had previous orthodontic treatment and maxillofacial surgery done were not included in this study as they can notably change the cranial hard tissue structures which leads to musculature adaptions.[14,15] Also, Eggensperger et al stated that soft tissue changes in form and position during the surgeries to correct skeletal deformities.[16]

With the advent of technology and science, many analyses and landmarks have been introduced for facial analyses.[9,17,18,19,20,21,22]but majority of these methods with the exception of photography based need costly and complex techniques and give information that is hard to assess numeriacally.[23] So mostly orthodontists and plastic surgeons who work on facial aesthetics gauging use photographs or real patients rather using roentgenograms for the treatment planning.[17]

Photrographic analysis has benefits in terms of facial profile assessment. While angular values change with amplification in cepalometric analysis, it does not happen in photommertic analysis. [24] So, this can be used both for pretreatment planning and for the assessment of post treatment results. The most important parameters of facial profile include association between the nasal bone [columella] and upper lip, analyzed by nasio labial angle[cm-sn-ls], thus should be calculated carefully. In the present sample, nasiolabial angle showed mean value of 100.85+_10.68 which is higher than females 96.52+_12.47.

Burnstone [25] in the study in Caucasian adolescent with normal facial appearance reported a nasiolabial angle of 74± 8 [range 60-70]. Similarly, it was explored after conducting research on Caucasian adults' cephalograms with relaxed facial features, that a nasiolabial angle of males was 102.2±8 and for females was 102.4±8 .[29] In another study by Yuen and Hiranakaon [26] on Asian adolescents on standardized photographs, reported nasiolabial angle for males was 102.7±11 whereas for females, it was 101.6±11. Slight difference between measurements of nasiolabial angle among males (97±11) and females (98±10) reported by Fariably et al.[28] Similar findings were reported by another study that nasiolabial angle of males and females are slightly different.[27]

Nasiolabial angle is normally greater in females.[9,27,28] In this study,it is found higher in males than females. According to report, gender difference was insignificant.[9,28] However, in a study in Croatia, significant sexual dimorphism was found.[30] Howerever, in term of skeletal classes, no significant difference was found in nasiolabial angle in class 1,2 and 3.[sk 1=98.87+_11.74,sk 2=98.12+_11.78,sk 3=94.77+_13.86].

The mentolabial angle [li-sm-pg] among males was 110.53+_53 which is less than females 114.80+_16.43. Wider angle means mandibular incisors were upright over basal bone in Pakistani females as compared to males. Similarly, mean of mentolabial angle reported by Fernande; Riverio et al [9] was [males=130.75+_9.64, females=131.45+_11.01]. However, McNamara[29] found angle wider in males 133-134+_10. In various studies, gender wise dimorphism was significant in mentolabial angle.and so in our case, mentolabial angle is greater in females.[27,28,30]

In term of skeletal classes, mentolabial angle showed significant difference in our study. The mean value of mentolabial angle in skeletal class 1 was 114.55+_15.19 which is higher than mean value of mentolabial angle on skeletal class 2,110.90+_17.40 and less than mean value of mentolabial angle in skeletal class 3,121.72+_12.87.

Soft tissue analysis has become essential before orthodontic and orthognathic treatment and nasiolabial and mentolabial angles are two of the most important angles in analyzing and evaluating patients. McCollum and Evans [31] focused on soft tissue results more than dental and skeletal relationships. Therefore, getting the normal values of these variables is the one of the objectives of treatment for the patient. So results of the orthodontic and orthognathic treatments can be more predictable and acceptable if norms of angles are known in the population

CONCLUSION

Soft tissue profile has great importance in treatment planning and photographs are an important method to evaluate it. The results showed wider nasiolabial angle in males while no significant difference in terms of skeletal classes. However, mentolabial angle was less in males than females and highest in class 3 than class 1 which was greater than class 2.The impact of sex was significant in both angles.

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