

Evaluation of cephalometric lip morphology in a Saudi sub population: A cross sectional study

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Abstract

This cross-sectional study was done to evaluate linear and angular measurement of lip morphology in Saudi adults and their comparison with the norms. After taking their history and physical examination, the patients were referred for a lateral Cephalograph using Dolphin Imaging Software. Linear and angular measurements related to lip morphology were recorded. Significant differences were found in the lower lip to E line, upper and lower lip protrusion, upper and lower lip to S line and upper and lower lip thickness, nasolabial angle, Z angle, with Saudi males having more prominent, thicker lips than the Saudi females. Comparison with the norms revealed that both lips are prominent among Saudi males, while in females there is an increased prominence of the lower lip. Value of the lower lip to H line is increased in both genders, males have prominent and thicker upper lips compared to the females and the lower lip in both genders is more prominent compared to the norms.

Keywords: Lip, Morphology, Cephalometry, population.
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Introduction

Three main aims of orthodontic management as described by Jackson and Jackson's triad¹ are structural balance, functional efficiency and esthetic harmony. Soft tissue evaluation is of key importance in diagnosing and planning orthodontic management. E H Angle described the significance of the relationship between soft tissues and facial esthetics.² Holdaway R A focused on implementation of soft tissue relations.³ Both researchers highlighted the significance of including soft tissue analysis in the diagnostic process.

The nasolabial angle is formed by two lines, one from the nose, the other from the upper lip, and both are independent of each other. Inadequate information is

gleaned by measuring the angle alone, as it is difficult to identify which component is responsible for the variability. It could be the nose, the lip or both. Therefore, analysis of each component of this angle is necessary to understand the differential diagnosis from the normal and its variations. After an in depth search for relevant data, we concluded there is a dearth of studies on the evaluation of lip morphology and nasolabial angle in Saudi males and females. Therefore, this study evaluated the linear and angular measurement of lip morphology in Saudi adults and their comparison with norms as per Ricketts E-line⁴ and Steiner's S line.⁵

Methods

This cross-sectional study involves evaluation of lateral cephalometric radiographs done at the Department of Paedodontic and Orthodontics, King Khalid University from April 2017 to September 2017. Approval was taken from the ethical committee and an informed verbal consent from the patients. A total of 100 Saudi male and female adults, 50 in each group were recruited through convenience sampling. The study was of six months duration.

The inclusion criteria were patients between the ages of 17 to 22 years, having normal occlusions, and whose both parents and grandparents were Saudis. The study excluded patients who did not give consent for the study. After taking patients' history and clinical examination, lateral cephalometric radiographs were taken. These scanned images were then transferred to the Dolphin Imaging Software Version 11 and soft tissue cephalometric landmarks were identified and recorded and all linear and angular measurements were entered on a predesigned proforma. SPSS 20.0 was used to verify and analyse the data with confidence level of 5% ($P < 0.05$) to assess the significance among both the sexes. Using mean and standard deviation, descriptive analysis was attained. Independent t-test was applied to evaluate sexual dimorphism between Saudi adults of both genders and compared with the standards stated by Ricketts and Steiner's.⁵

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Table-1: Showing Comparison of linear and angular measurement of lip morphology in Saudi adults between male and female.

Variables	Gender	Mean±SD	p-value
UL to E Line*	Male	-2.658 ± 1.758	0.202
	Female	-3.180 ± 2.270	0.202
LL to E Line*	Male	0.880 ± 1.350	0.000*
	Female	-1.450 ± 1.824	0.001*
UL Protrusion*	Male	3.962 ± 0.668	0.001*
	Female	2.400 ± 0.647	0.001*
LL Protrusion*	Male	4.470 ± 1.388	0.001*
	Female	3.614 ± 1.519	0.005*
UL to S Line*	Male	-0.494 ± 0.294	0.001*
	Female	-1.802 ± 1.513'	0.001*
LL to S Line*	Male	1.142 ± 1.377	0.004*
	Female	0.356 ± 1.286	0.004*
UL Thickness*	Male	11.987 ± 0.555	0.001*
	Female	9.769 ± 0.454	0.001*
LL Thickness*	Male	13.53 ± 0.696	0.001*
	Female	10.84 ± 0.675	0.001*
LL to H Line*	Male	1.852 ± 0.238	0.405
	Female	1.638 ± 1.79	0.407
Z Angle*	Male	74.56 ± 0.491	0.001*
	Female	74.055 ± 0.571	0.001*
NL Angle*	Male	98.142 ± 3.479	0.001*
	Female	103.060 ± 3.969	0.001*

*Statistically significant at 5% level of significance(p<0.05)

Table-2: Showing comparison of values of lip morphology of Saudi Males and females with norms.

Variables	Norms	Saudi males	Saudi females	P-value
UL to E Line*	-4 ± 2mm	-2.658 ± 1.758	-3.180 ± 2.270	0.001
LL to E Line*	-3 ± 2mm	0.880 ± 1.350	-1.450 ± 1.824	0.001
NL Angle*	90-120°	98.142 ± 3.479	103.06 ± 3.969	0.001
UL Protrusion*	2±1mm	3.962 ± 0.668	2.400 ± 0.647	0.001
LL Protrusion*	3±1mm	4.470 ± 1.388	3.614 ± 1.519	0.001
UL to S Line*	0 ± 2mm	-0.494 ± 0.294	-1.802 ± 1.513'	0.015
LL to S Line*	0 ± 0.5	0.356 ± 1.286	0.356 ± 1.286	0.016
UL Thickness*	10-14mm	11.987 ± 0.555	9.769 ± 0.454	0.950
LL Thickness*	11-15mm	13.53 ± 0.696	10.843 ± 0.675	0.013
LL to H Line*	0 to 5mm	1.852 ± 0.238	1.638 ± 1.796	0.001
Z angle*	70-80 degree	74.56 ± 0.491	74.055 ± 0.571	0.382

* Upper lip(UL) to E line: It is the distance of upper Lip to E line. *Lower lip(LL) to E line: it is the distance of lower Lip to E line, *Upper lip protrusion: it is the linear distance of upper Lip to Sn-Pog line. *Lower lip protrusion: it is the linear distance of lower Lip to Sn-Pog line, *Steiner's S line: Line drawn from Midpoint between subnasale (Sn) and pronasale (Pog) to soft tissue pogonion. *Hold away line: Tangent drawn from the tip of chin to the upper lip, LLH: lower lip to the H-Line, *Upper lip Thickness (ULT): Line between the Labiale superius and the labial surface of the upper incisor. *Lower Lip Thickness (LLT): Line between the Labiale inferius and the labial surface of the lower incisor, *Z Angle: Inner inferior angle formed by the intersection of the Frankfurt horizontal plane and profile line, *Nasolabial angle: it is formed by intersection of Ci-Sn and Sn-Ls Line.

Results

A statistically significant difference was found in the lower lip (LL) E line, upper and lower lip protrusion, upper lip (UL) and lower lip S line and upper and lower lip thickness, nasolabial (NL) angle, Z angle with Saudi males having more prominent and thicker lips than Saudi females (Table-I).

On comparing with the norms stated by Ricketts and Steiner, Saudi males have prominent upper and lower lips while Saudi females have more prominent lower lips. The results evaluated found that the lower lip to H line is increased in both genders, signifying that lower lip is more protrusive in both males and females (Table-II).

Discussion

The results of the study have shown that Saudi males have more prominent thicker lips than Saudi females. The relationship of lips according to Ricketts E-line emphasises soft tissue equilibrium between lips and profile. According to Ricketts,⁴ upper lip should be 3-4 mm and lower lip should be 1-2 mm behind the E line.⁴ In this study, relationship of the upper and lower lips in Saudi males and females to the E-line is almost similar to that described by Ricketts for North Americans, whereas lower lip to E line showed significant difference between genders, with it being more prominent in Saudi males, This is also supported by a previous study on Saudi population by Mona A Abbassy in 2015.⁶

Ghorbany Javadvpour F, Khanemasjedi⁷ reported the relationship between the upper and lower lips to the E-plane in the Iranian population as more retrusive than in European population, which is contradictory to this study. This study is also contradictory to the results reported by Khan F et al⁶ who found protrusive upper lip and retrusive lower lip in relation to Ricketts E-line in Pakistani population. The relationship between Steiner's S line and the upper and lower lip plays a significant role in soft tissue examination and orthodontic treatment. Orthodontic movement of teeth leads to change in the relationship between Steiner's S line and both lips, hence the esthetics.⁵ In our study, the upper lip to S line is -0.4 and lower lip to S line is 1.14 in males, which is almost similar to norms suggested by Steiner. Whereas in females the upper lip is -1.8 and lower lip is 0.356 which is within the range established by Steiner.

Khan F et al⁸ showed great variability in lip positions among Pakistani population which is 4.55 mm in males

and 4.50 mm in females with lower lip protrusion of 3.51 mm in females and 3.43 mm in males. In a similar study of Bangladeshi adults, Alam et al⁹ found that the upper lip protrusion was 5.31 mm in females and 5.53 in males and lower lip protrusion was 3.51 mm in females and 3.43 mm in males, which suggests that Pakistani subjects have a somewhat retruded upper and lower lip than Bangladeshi adults. This study revealed that Saudi population has a similar lip prominence to Pakistani population.

The evaluation of the results showed that the lower lip to H line increased in both males and females, which signifies that the lower lip is more protrusive in both males and females. This is consistent with another study conducted of Pakistani population.¹⁰

Nasolabial angle quantifies the columella inclination related to the upper lip. Normal range of the angle is 90-120 degrees. This study showed great variability in the nasolabial angle between the genders i.e in males ($98.142^{\circ} \pm 3.479^{\circ}$) and in females ($103.060^{\circ} \pm 3.969^{\circ}$), and found a similarity when compared to the Pakistani population whose nasolabial angle was 102 degrees for both males and females.⁸

Similarly, this study found the nasolabial angle of 103° more obtuse when compared with the norms established for North Americans possibly due to their long nose.⁶ Alam et al in his study on lip morphology reported significant difference in angle between males and female similar to this study.⁹

The small sample size and cross-sectional design are limitations of this study. Further longitudinal studies are recommended in the future with a large sample size so that the results are more representative of the Saudi

population. More studies would be beneficial as the results would highlight racial eccentricities and soft tissue cephalometric standards for Saudi adults for orthodontic and orthognathic surgeries.

Conclusion

From this study, we conclude that Saudi males have more prominent lips compared to Saudi females, and their lower lips are more prominent when compared to the upper lips in both genders.

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