Original Article

Study of Lip Anthropology in Young Adult Males and Females in Jazan, Saudi Arabia

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Abstract

Background: The lips serve crucial functions for the face, including facial expression, speech, eating, and esthetics. Surgeons who repair or reconstruct facial deformities often rely on the anatomy and dimensions of these structures. **Objective:** This study aimed to collect diverse data on lip morphology. **Design:** Cross-sectional study. **Settings:** College of Dentistry, Jazan. **Methods:** The current study included randomly selected Saudi adults with complete dentition with ages ranging from 18 to 30 years. The lips or their surrounding areas of patients with abnormalities, malformations, deformities, inflammation, trauma, or surgical scars (cleft lip operations) were omitted. **Main Outcome Measures:** Average lip size of male and female population in Jazan, KSA. **Sample Size:** 400 (200 males and 200 females). **Results:** The mean height of the upper vermilion was 14.38 mm in males and 13.78 mm in females. The height of the upper lip (Sn-Sto) was measured, with males having a mean value of 24.05 ± 4.02 mm (range, 15–32 mm) and females having a mean value of 20.66 ± 4.12 mm. The difference between the sexes was statistically significant. The medial vertical height of the cutaneous lower lip (Li-SI) of females had a mean value of 10.63 ± 1.59 mm, and that of males had a mean value of 11.55 ± 2.25 mm. The height of the lower lip of males was 20.28 ± 5.2 mm and that of females was 16.95 ± 3.03 mm, and the differences were statistically significant. **Conclusion:** Significant differences in lip measurements between males and females (indicating sexual dimorphism) were observed. Additionally, the upper vermilion tends to be thinner than the lower vermilion in both sexes, with this being the most prominent feature of the region. Furthermore, the height of the cutaneous upper lip was greater than that of the cutaneous lower lip, and the medial vertical height of the upper lip was greater than that of the lower lip in both sexes.

Keywords: *Anthropometry, lip index, lip morphology, orthodontic treatment, Saudi population*

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Introduction

The middle and lower facial areas are occupied by the lip–nose complex. The Cupid's bow particularly has distinctive characteristics that are difficult to replicate.[1] Consequently, any anomaly or imbalance in this area is easily recognized. Surgery is commonly performed to enhance the cosmetic appeal of the lip and nose profiles. This is also the focus of patients with cleft lip undergoing cheiloplasty and nasal repair.[2] The term "anthropometry," which is Greek for "human measurement," refers to the measurement of the human body, performed to comprehend the physical diversity of people. To retain the best interactions between the facial structures, the anatomy and proportions of the facial structures are considered helpful criteria for

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surgeons who perform facial deformity repair and reconstruction.[3,4] Correct diagnosis and treatment of people may be possible with thorough knowledge of the interactions between the face structures.[5] Several variables, including age, sex, ethnicity, socioeconomic level, environment, and area, have an impact on lip anthropometric characteristics.[6] Additionally, before beginning orthodontic treatment, clinical evaluation should always analyze the soft tissues (such as the lips), both at rest and when functioning, as the morphology of the soft tissues plays a significant role in determining the overall facial profile.[7] A person's lips and how they relate to the alignment of their anterior teeth have a significant impact on their smile and overall facial esthetics.[8] An individual's self-esteem, psychological health, and social acceptance are correlated with physical attractiveness. Facial appearance has a significant impact on self-esteem. Consequently, the lips are one of the main facial features. Nonetheless, various subjective considerations define an attractive and charming face, including age, culture, personality, and ethnic heritage.[9] Individual, sex, and cultural differences greatly influence the shape and size of the visible red lip surface.[10] These dimensions also change slightly with age. As people age, their lips become thinner, the moist line travels caudally, and the oral commissure begins to decline.[11] The present study was considered appropriate because, to the best of our knowledge, no systematic analysis of lip morphometric measurements has been performed in the Jazan province of the Kingdom of Saudi Arabia. This study is expected to be useful to oral surgeons, orthodontists, forensic odontologists, plastic surgeons, and forensic specialists. In other words, it can be valuable for both identification and esthetic repair.

Material and Methods

The current study included 400 Saudi adults with complete dentition (200 men and 200 females) who were randomly selected and who ranged in age from 18 to 30 years. The sample size was calculated based on the 2020 report, and the total population of Jazan was 1.67 million persons. With a confidence level of 95% and a margin of error of 5%, the minimum sample size was 385, and 400 participants were included in the study. The lips or their surrounding areas of patients with abnormalities, malformations, deformities, inflammation, trauma, or surgical scars (cleft lip operations) were omitted. Institutional ethics approval was obtained after obtaining permission in the prescribed format with IRB no: CODJU.2205I. Reference No.: REC-44/06/443 and Date: 28 December 2022. The nature of the study and its implications were explained to participants in their vernacular language. Only patients who voluntarily agreed to participate in the study were included. All parameters were recorded using a flexible millimeter ruler since it will curve along the wet-dry border rather than traveling straight across. This study is based on Singh and Bhasin's methodology.[12]

The following somatometric landmarks were chosen for measurement.

- The (Sn) is the location where the bottom of the nasal septum meets the skin of the upper lip.
- The chelion (Ch) is the point at which the corners of the mouth meet, marking the ends of the upper and lower lips.
- The labial Superior (Ls) is at the midpoint of the upper edge of the upper lip in the sagittal plane.
- The labial Inferior (Li) is the midpoint of the lower edge of the lower lip in the sagittal plane.
- The stomion (Sto) is the point at which the closed lips meet the sagittal plane, creating a mouth opening.
- The sublabiale (Sl) is the center point of the horizontal ridge of the skin between the lower lip and chin. This ridge usually marks the boundary between the lower lip and chin.

If the chin contour is not pronounced, the sublabiale can be located by placing a spatula at the bottom of the vestibule and gently lifting the skin to identify the midpoint of the ridge. Once landmarks were identified, eight parameters related to lip morphometry were measured.

1. The medial vertical height of the cutaneous upper lip was defined as the distance between the subnasale and labiale superiors (Sn-Ls).
2. The height of the upper vermilion was defined as the distance between the labiale superior and the stomion (Ls-Sto).
3. The height of the upper lip was defined as the distance between the subnasale and stomion (Sn-Sto).
4. The medial vertical height of the cutaneous lower lip was defined as the distance between the labiale inferior and sublabiale (Li-Sl).
5. The height of the lower vermilion was defined as the distance between the stomion and labiale inferior (Sto-Li).
6. The height of the lower lip was defined as the distance between the stomion and the sublabiale (Sto-Sl).
7. The height of the integumental lip was defined as the distance between the labiale superior and labiale inferior (Ls-Li).
8. Mouth width was defined as the distance between the right and left chelions (Ch-Ch).

To conduct statistical analysis, we first collected data and organized them in an MS Excel spreadsheet. SPSS

version 22 (Chicago, IL, USA) was used to analyze the data. For quantitative variables, we report the mean and standard deviation, whereas for qualitative variables, we present proportions and percentages. Fisher's exact test was used to assess the differences between two proportions.

Results

The current study determined the baseline values for several lip characteristics in the native population of Jizan Province, Saudi Arabia. Table 1 presents the findings of this study. This shows the different sizes of the two lips in both sexes. All parameters measured between males and females were significantly different ($P < 0.05$), as shown in Table 1.

The medial vertical height of the cutaneous upper lip (SN-Ls) was measured in millimeters and defined as the distance between the subnasale (SN), which is the midpoint of the nasal base, and the most superior point on the vermilion border of the upper lip (Ls). A shorter SN-Ls measurement may indicate a more retruded or "flat" upper lip position, while a longer measurement may indicate a more prominent or "protrusive" upper lip position. The mean measurement in males was 14.38 mm and that in females was 13.78 [Figure 1].

The height of the upper vermilion was measured, and the overall values for females were found to be greater compared to that for males [Figure 2]. The minimal and maximal values for males were 5 mm and 12 mm, respectively, and the mean was 9.07 ± 3.01. Similarly, for females, the minimal and maximal values were 3 mm and 13 mm, respectively, and the mean was 8.2 ± 2.5 mm.

As for the height of the upper lip (Sn-Sto) in males, the minimal and maximal values were 15 mm and 32 mm, respectively, and the mean was 24.05 ± 4.02 mm. In females, the height of the upper lip (Sn-Sto) ranged from a minimum of 12 mm to a maximum of 29 mm, the mean being 21.15 ± 3.7 [Figure 3]. The differences between males and females were analyzed, and the *P* values were found to be significant.

The medial vertical height of the cutaneous lower lip (Li-SI) was recorded. The range of values recorded for males was 5–18 mm, and the mean value was 11.55 ± 2.25 mm. In females, the values ranged from 5 mm to 17 mm, and the mean value was 10.63 ± 1.59 mm [Figure 4].

The height of the lower vermilion (Sto-Li) can vary depending on the individual and several other factors,

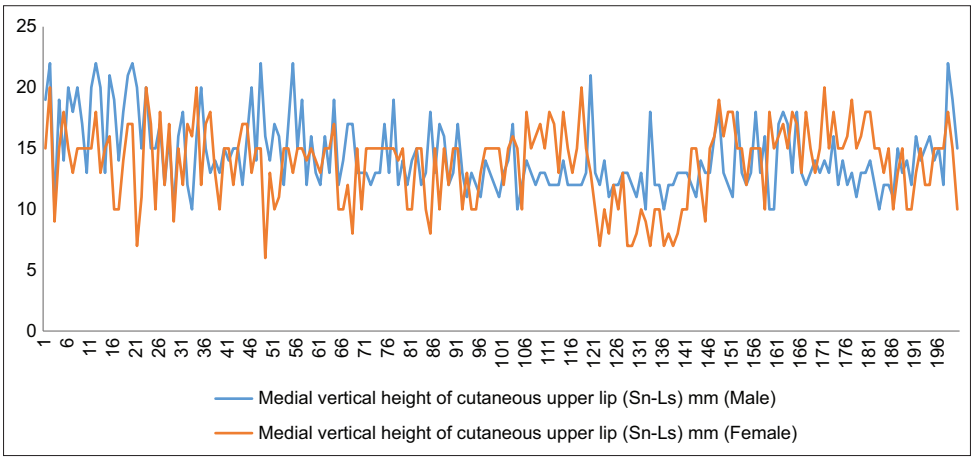

Figure 1: Comparison of the medial vertical height (mm) of the cutaneous upper lip (SN-Ls) by sex

Table 1: Parameters of lip morphometry in males and females of the study

Parameters	Male (*n*=200) Mean±SD	Females (*n*=200) Mean±SD	*P*
Medial vertical height of the cutaneous upper lip (Sn-LS)	14.38±3.74	13.78±2.5	0.02*
Height of the upper vermilion (Ls-Sto)	9.07±3.01	8.2±2.5	0.013*
Height of the upper lip (Sn-Sto)	24.05±4.02	21.15±3.7	<0.001*
Medial vertical height of the cutaneous lower lip (Li-Sl)	9.23±1.97	7.49±1.25	<0.001*
Height of the lower vermilion (Sto-Li)	11.55±2.25	10.63±1.59	<0.001*
Height of the lower lip (Sto-Sl)	20.28±5.2	16.95±3.8	<0.001*
Height of the integumental lip (Ls-Li)	18.08±2.74	17.66±2.8	0.033*
Mouth width (Ch-Ch)	66.79±6.36	56.23±4.68	<0.001*

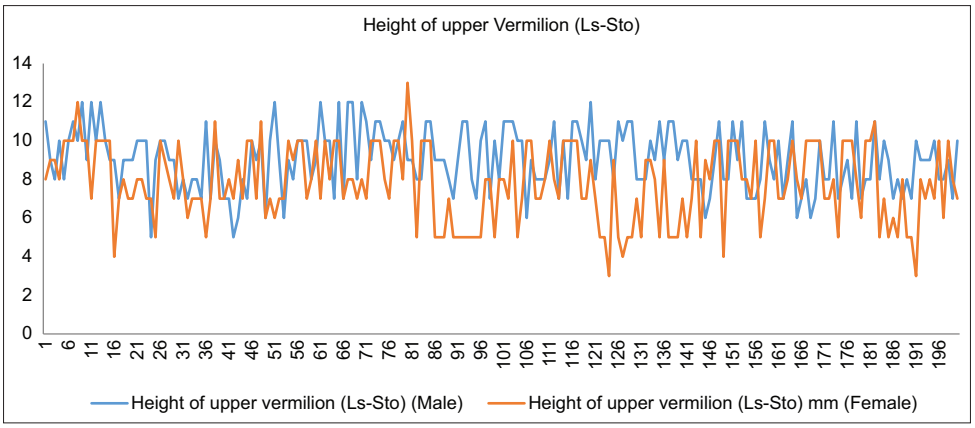

Figure 2: Comparison of the height (mm) of the upper vermilion by sex

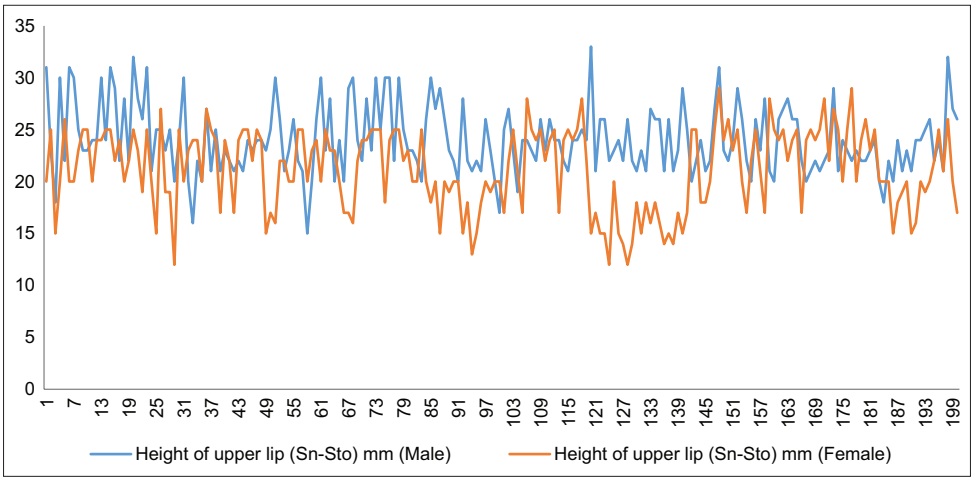

Figure 3: Comparison of the height (mm) of the upper lip (Sn-Sto) by sex

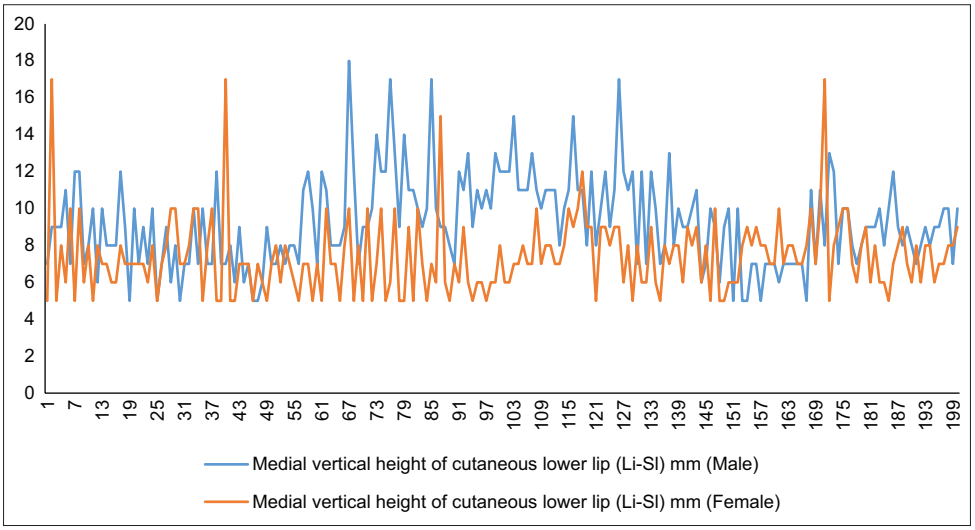

Figure 4: Comparison of the medial vertical height (mm) of the cutaneous lower lip (Li-SI) by sex

such as age, sex, ethnicity, and facial anatomy. We recorded the average height of the lower vermilion range in males from 8 to 24 mm (11.55 ± 2.25), and in females, the values recorded ranged from 5 to 19 mm (10.63 ± 1.59 mm); the mean height was greater in females than in males [Figure 5].

The height of the lower lip (Sto-Sl) can also differ from person to person and is based on several variables,

including age, sex, ethnicity, and facial morphology. The typical height of the lower lip is between 20 and 25 mm. The height of the lower lip ranged from 15 mm to 31 mm in males and from 9 mm to 25 mm in females [Figure 6]. The mean value for males was 20.28 ± 5.2 mm, and it was 16.95 ± 3.03 mm in females. The differences between values for males and females were not statistically significant [Table 1].

The height of the integumental lips (Ls-Li) for males varied from a minimum of 6 mm to a maximum of 27 mm, and the mean value was 18.08 ± 2.74 mm. In female patients, the minimum value was 5 mm and the

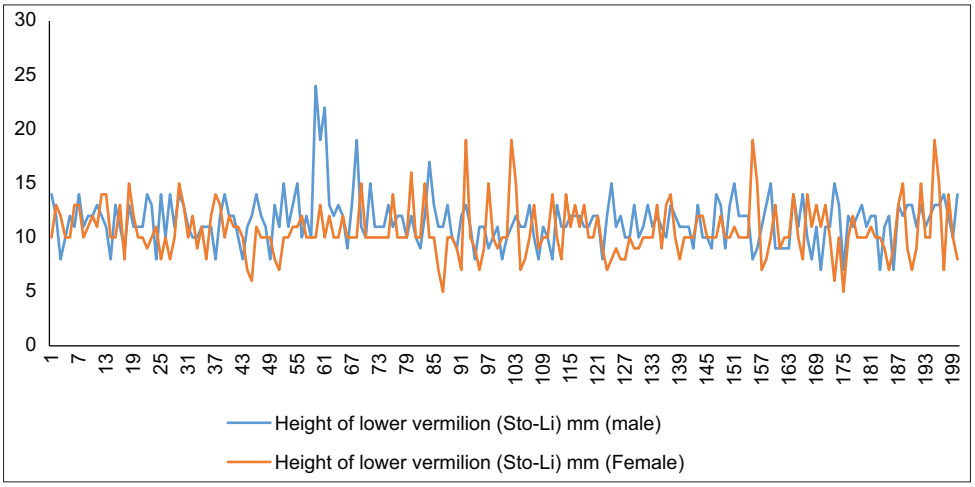

Figure 5: Comparison of the height (mm) of the lower vermilion (Sto-Li) by sex

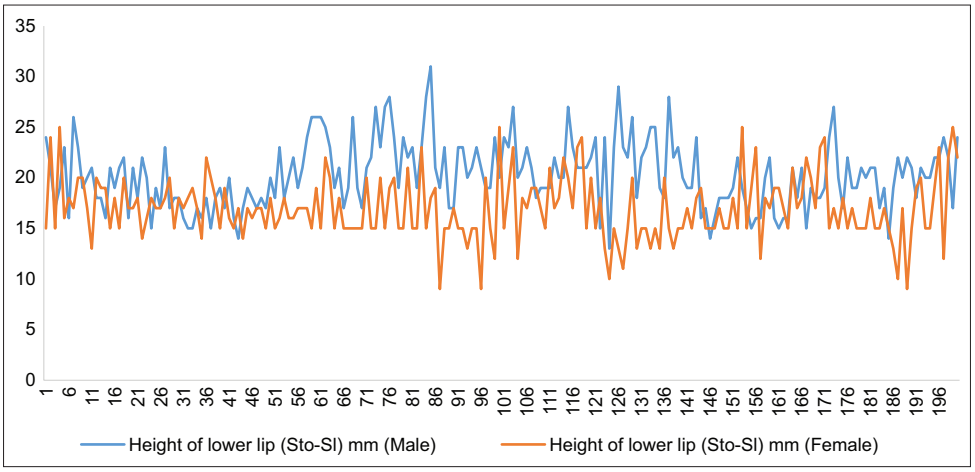

Figure 6: Comparison of the height (mm) of the lower lip (Sto-Sl) by sex

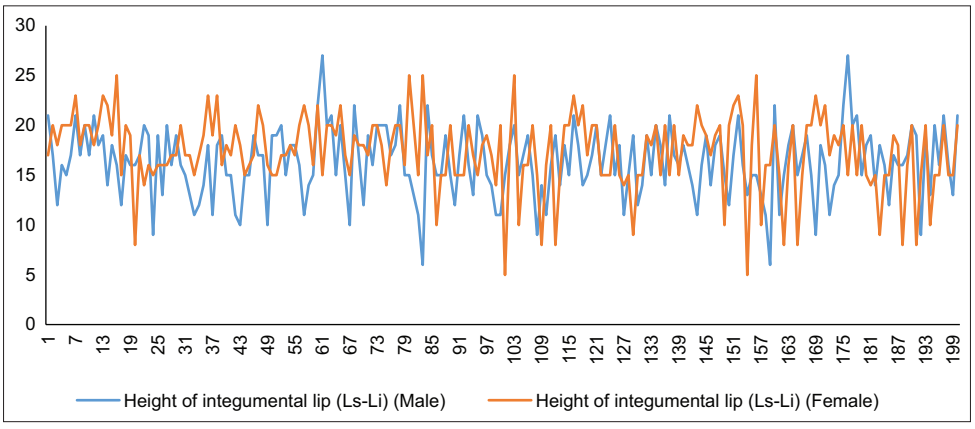

Figure 7: Comparison of the height (mm) of the integumental lip (Ls-Li) by sex

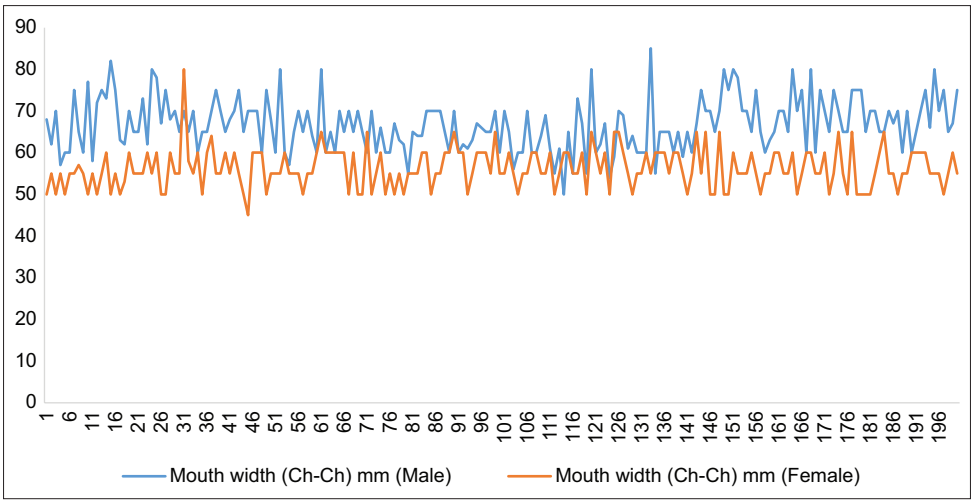

Figure 8: Comparison of the mouth width (Ch-Ch) by sex

Table 2: Comparison of lip measurements in males in different studies

Authors	Region of study	Mean±SD (Males)							
		Cut UL	Ver UL	UL	Cut LL	Ver LL	LL	Int L	Mouth Width
Present study	Jizan, KSA (*n*=200)	14.38±3.74	9.07±3.01	24.05±4.02	9.23±1.97	11.55±2.25	20.28±5.2	18.08±2.74	66.79±6.36
Farkas *et al*.[15]	North white American (*n*=50)	16.70±2.2	7.4±1.7	22.7±2.3	11.9±2.2	8.8±2.0	18.8±2.5	------	54.1±3.8
Ngeow *et al*.[16]	Malay (*n*=50)	13.1±1.7	9.8±1.1	22.7±2.0	-----	12.0±1.6	------	------	48.8±3.5
Negow *et al*.[17]	Malaysian Indian (*n*=50)	12.9±2.5	9.2±1.3	21.6±2.0	-----	11.5±1.6	------	------	47.3±3.3
Khanderkar *et al*.[18]	Western Indian	16.2±0.6	-----	------	-----	------	------	------	53.5±1.0
Milosevic *et al*.[19]	Caucasian (*n*=52)	-------	8.3±1.3	23.55±2.64	-----	8.67±1.6	18.92±2.29	------	--------
Ferrario *et al*.[20]	North Italians (*n*=95)	-------	-----	-------	-----	------	------	17.91±0.31	--------

Table 3: Comparison of lip measurements in females in different studies

Authors	Region of study	Mean±SD (Females)							
		Cut UL	Ver UL	UL	Cut LL	Ver LL	LL	Int L	Mouth Width
Present study	Jizan, KSA (*n*=400)	13.78±2.5	8.2±2.5	21.15±3.7	7.49±1.25	10.63±1.59	16.95±3.8	17.66±2.8	56.23±4.68
Farkas *et al*.[15]	North White American (*n*=50)	13.30±2.1	7.7±1.1	19.6±2.1	9.9±2.4	9.0±1.5	16.7±2.0	------	50.6±3.1
Ngeow *et al*.[16]	Malay (*n*=50)	12.2±1.8	9.1±1.0	18.2±2.9	------	11.0±1.2	------	------	47.1±3.5
Negow *et al*.[17]	Malaysian Indian (*n*=50)	11.1±1.6	8.6±0.9	19.4±1.7	------	10.9±1.0	------	------	45.9±3.0
Khanderkar *et al*.[18]	Western Indian	14.2±0.7	------	------	------	------	------	------	47.0±0.7
Milosevic *et al*.[19]	Caucasian (*n*=52)	-------	8.52±1.35	------	------	8.60±1.35	17.67±1.73	------	--------
Ferrario *et al*.[20]	North Italians (*n*=95)	-------	------	-------	------	------	------	16.75±0.27	----

maximum value was 25 mm [Figure 7]. The mean value was 17.66 ± 2.8 mm, and the differences between the two were significant (P value < 0.0001).

The mouth width, also known as the intercommissural distance (Ch-Ch), refers to the distance between the corners of the mouth when the lips are relaxed and closed. The mouth width recorded in males ranged from 50 to 85 mm, and the mean was 66.79 ± 6.36 mm. In females, the mouth width ranged from 45 to 80 mm and the mean was 56.23 ± 4.68 mm [Figure 8]. The differences between the two groups calculated by Chi-squared test were found to be significant (P < 0.0005).

Discussion

Because the lips and chin play significant roles in determining a woman's attractiveness, the distances and divisions in the bottom third of the face are among the most significant when evaluating facial beauty.[13,14] Data from the current study and previous investigations revealed both differences and similarities in lip measurements. In

the current study, after analyzing the vertical heights of the upper and lower lips, it was observed that the upper lip exhibited greater height in both males and females. Similarly, the cutaneous height of the upper lip was greater than that of the lower lip. These results provide evidence for the existence of sexual dimorphism and indicate a statistically significant difference in morphological measurements between males and females.[15] These findings suggest that such measurements can serve as useful tools for differentiating between sexes. The findings were compared with existing data on North White Americans, Caucasians, Northern Italians, Malays, Malaysian Indians, and Western Indians, as shown in Tables 2 and 3. Table 2 compares the males in the present study with those in prior research, whereas Table 3 compares the females in the present study with those in prior research.

The values of the different parameters obtained in the current study were compared with those recorded by different authors and regions worldwide [Table 2]. The cutaneous upper li*P* values were intermediate between those obtained by other authors given in Table 2. The values for the vermilion upper lip were higher than those seen in the study by Ngeow *et al*.[16,17] in the Malay and Malaysian Indian populations; however, the values were found to be lesser than those observed by Faras *et al*.[15] in the North White American population and Khanderkar *et al*.[18] obtaining a mean value of 16.2 mm in the Western Indian population. Milosevic *et al*. noted a mean value of 8.3 mm in the Caucasian population. Farkas *et al*.[15] observed a value of 7.4 mm in the North White American population. Goel *et al*.[21] reported that the vermilion height of the upper lips in males was 8.55 mm. The mean height of the upper lip in this study was found to be 24.05 mm, which was higher than the 23.55 mm reported by Milosevic *et al*.[19] in a Caucasian population. The mean value for the cutaneous lower lip was 9.23 mm, which was lesser than the 11.9 mm reported by Farkas *et al*.[15] in the North American white population. The mean value of the vermilion lower lip was 11.55 mm in agreement with 11.5 mm that was observed by Negow *et al*.[17] in Malaysian Indians. The height of the lower lip was 20.28 mm in our study, which was higher than that observed by Milosevic *et al*.[19] and Farkas *et al*.,[15] and the mean mouth width was 66.57 ± 6.36 mm, which is comparatively the highest among all the reported in Table 2.

The mean value measured in females in the current study was compared with those of other similar studies [Table 3]. The mean value of the cutaneous upper lip in females in this study was comparable to that reported by Farkas *et al*.[15] in the females of the North White American population. Khanderkar *et al*.[18] found the highest mean value of 14.2 ± 0.7 mm in the western Indian population. The values for the vermilion upper lip in the current study were comparable with those noted by Negow *et al*.[17] in the female Malaysian Indian population, 8.6 ± 0.9 mm, and Milosevic *et al*.[19] observed a value of 8.52 mm in Caucasians. Farkas *et al*.[15] reported a lower mean value of 7.7 ± 1.1 mm in the females of North America. The height of the upper lip in females was 21.15 ± 3.7, which is comparatively higher as compared to that in all the other studies reported in Table 3. The mean value of the cutaneous lower lip was lower than that reported by Farkas *et al*.,[15] and the mean value for the vermilion lower lip was similar to that reported by Negow *et al*.[17] in Malaysian Indian females. Milosevic *et al*.[19] reported the lowest mean value of 8.60 ± 1.35 mm. In a study on North Indians, Goel *et al*.[21] found that the height of the vermilion of the upper lip was 8.06 mm in females. Measurement of the height of the lower lip in the current study was consistent with that reported by Farkas *et al*.[15] The mean mouth width in the current study, 56.23 ± 4.68, was the highest among those observed in other similar studies (the maximum was 50.6 ± 3.1 mm reported by Farkas *et al*.)[15] [Table 3].

The available literature and data reveal that the soft tissue relationship among young adults in the Jazan province of the KSA is distinct from that of white or other standards and cannot be applied interchangeably. These findings highlight the importance of using appropriate population data for cosmetic surgery because different populations require different standards. Mean values of lip morphometry parameters reported in the literature vary across different populations, likely because of several factors, such as age, number, sex, and geographical conditions, in addition to the method adopted.

Conclusion

The present study found significant differences in lip measurements between males and females, indicating sexual dimorphism. Additionally, research has shown that the upper vermilion tends to be thinner than the lower vermilion in both sexes, with this being the most prominent feature of the region. Furthermore, the height of the cutaneous upper lip was greater than that of the cutaneous lower lip and the medial vertical height of the upper lip was greater than that of the lower lip in both sexes. Notably, there were significant differences in certain parameters between Arab males and females and other ethnic groups, including Caucasians, Malays, North White Americans, Western Indians, and Northern

Italians. This study provides a comprehensive database for the quantitative analysis of lip morphology in Saudi populations. This database can be utilized for surgical and orthodontic treatments as well as forensic identification.

Ethical permission

IRB no: CODJU.2205I.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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