

## The Lip Length and Thickness in Relation to Smile Line

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**Abstract: Background:** The smile plays an important role in personal, professional, and romantic relationships among humans. The aesthetic of smile depends on the relationship between the teeth and lips and the way that lips and soft tissue frame the smile. **Method:** The study was conducted in the department of dentistry, of Al-Hadi University College in Baghdad. 240 subjects (120 males and 120 females) were examined in this study whose age ranged from 18 to 30 years. We used vernier caliper for the measurement of the upper lip length, upper lip thickness and smile line. **Results:** There were high statistically significant gender differences observed for lip length and lip thickness with males than females (There were significant differences in smile line scores with the mean score for males ( $M = -0.04$ ) was lower than females ( $M = +2.95$ )). **Conclusion:** There was significant positive correlation between (upper lip length at rest and upper lip thickness) and smile line among Iraqi students. There is also a significant difference between males and females in upper lip length, upper lip thickness and smile line among Iraqi students.

**Key points:** upper lip length, upper lip thickness, smile line.

### Introduction

The smile plays an important role in personal, professional, and romantic relationships among humans. A smile may be posed or spontaneous, based on the external stimulus, and is characterized by a combination of facial movements that form the “smiling face”<sup>1</sup>. Smiling tends to play a primary role in our daily social interactions, more so than other physical traits. In addition, smiling creates a social perception of happiness, youthfulness, and kindness.<sup>2</sup>

The aesthetic of smile depends on the relationship between the teeth and lips and the way that lips and soft tissue frame the smile. A pleasant smile also depends on the quality and beauty of the dental elements and their harmonious integration. Dental components of the smile include the size, shape, color, alignment, and crown angulation (tip) of the teeth; the midline; and arch symmetry.<sup>3</sup>

### Lip length:

Vertical lip thickness proved to be the most influential variable in smile esthetics. The significant relationship of incisor protrusion with the vertical thickness of the vermilion border of the upper lip must be considered when planning orthodontic treatment.<sup>4</sup>

Many studies investigated the soft tissue profile changes of subjects aged 5–45 years and demonstrated that most soft tissue profile changes in women were observed between 10 and 15 years of age, whereas they occurred between 15 and 25 years of age in men.

The authors stated that the upper and lower lips protruded the most in relation to the aesthetic plane between 15 and 25 years of age. Upper lip thickness increased in both sexes until 25 years of age but decreased between 26–74 years. However, this was not true for lower lip thickness.<sup>5</sup>

The measurement of vertical upper lip thickness is measured vertical distance from the most superior point of cupid’s bow to the most inferior portion of the tubercle of the upper lip<sup>6&7</sup>. The mean value of upper lip thickness in Iraqi male is 14.3 and for female 11.8.<sup>8</sup>

**normal smile:**<sup>9</sup>

1. The whole height of upper incisors should be visible on full smiling with only interproximal gingiva visible. This smile usually 1-2mm in female.
2. The upper incisor edges run parallel to the lower lip (smile arc).
3. The upper incisors should be close to but not touching the lower lip.
4. Gingival margin of the anterior teeth is important if they are visible in smile.
5. The margins of the central incisors and canines should be approximately level with the lateral incisors lying 1mm more incisally than canines and central incisors.

**Smile line classification**

according to Liebart classification: <sup>10</sup>

Class 1 (Very high smile line): More than 2 mm of marginal gingiva visible or more than 2 mm apical to the CEJ visible for the reduced but healthy periodontium. This could be the 'gummy smile'.

- a) Class 2 (High smile line): Between 0-2 mm of marginal gingiva visible or between 0-2 mm apical to the CEJ visible for the reduced but healthy periodontium
- b) Class 3 (Average smile line): Only gingival embrasures are visible.
- c) Class 4 (Low smile line): Gingival embrasures and CEJ are not visible.

**Materials and method****Sample**

The study was conducted in the dentistry department of Al-Hadi University College. Two hundred forty subjects (120 males and 120 females) were included in this study whose age ranged from 18 to 30 years and those who without significant medical problems were selected, no history of craniofacial trauma, surgery, or dental rehabilitation, no anterior teeth malocclusion, a healthy periodontium or a reduced but still healthy one and no congenital anomalies., while the exclusion criteria, missing teeth that could have been visible on smile, excessive dental attrition, history of lip surgery or asymmetry, craniofacial syndromes, dental prosthesis for the anterior teeth and active orthodontic treatment.

**Material**

Digital caliper:

The Digital Caliper is a precision instrument that can be used to measure internal and external distances extremely accurately, readings are close to 0.01 (500-184-30 DC, Mitutoyo, Japan)

**Method**

1. Measurement of upper lip length:

Upper lip length- from subnasale to stomion superius. <sup>11</sup>



**Figure -1-Lip Length measurement on the participant. <sup>12</sup>**

2. Measurement of upper lip thickness:

Upper lip thickness- vertical distance from the most superior point of cupid's bow to the most inferior portion of the tubercle of the upper lip.<sup>7</sup>

Measure of upper lip thickness.<sup>13</sup>

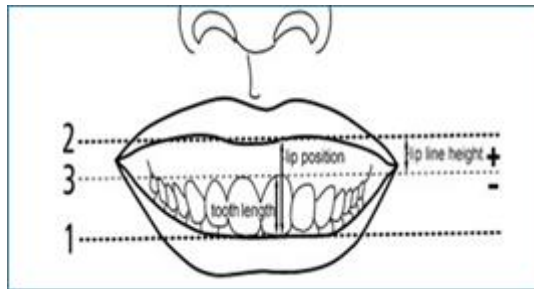
Smile line measurements:

Following Peck & Peck in 1995<sup>14</sup>, lip-line height was expressed relative to the gingival margin (line 3) and is thus a measure of both tooth and gingival visibility. Lip-line height was calculated as the difference between lip position and tooth length



**Figure- 2 measuring lip thickness**

When the gingival margin was displayed, positive values were given in both the maxilla and mandible. When the teeth remained partly covered, negative values were given. Sometimes the upper and lower lips covered both the gingival margin and incisal point, in which case lip-line height was denoted as not measurable. If a tooth was not visible, lip-line height was coded as missing.



**Figure -3-Measurement of the lip-line height<sup>15</sup>.**

Line 1: marking the most incisal point of the central incisor.

Line 2: marking of the lip edge on the central incisor.

Line 3: cervical gingival margin of the central incisor.

Lip-line height is lip position minus tooth length. When the gingival margin is displayed, lip-line height has positive values. When the teeth are partly covered, lip-line height has negative values.

## Results

### the analysis of differences between males and females:

Study comprised of 240 participants including an equal number of females (n=120) and males (n=120) with the age range of (18-35) years.

The results are shown in table1. An independent sample t-test was conducted to compare the resting upper lip length in males and females. There were significant differences ( $t(238) = 8.12, p < 0.001$ ) in scores with the mean score for males ( $M = 10.63, SD = 2.89$ ) was higher than females ( $M = 7.48, SD = 3.11$ ). The magnitude of difference in the means (mean difference = 3.14, 95% CI: 2.38 to 3.91). Hence H1 was supported.

**Table 1: Independent t test for testing the differences lip length among males and females.**

variables	gender	mean	Sd	sig.	t	D.f	p	mean difference	C.I lower	C.I upper
Resting upper lip length	male	16.7	2.89	0.02	8.73	238	<.001	3.30	2.56	4.05
	Female	13.4	3.11							

An independent sample t-test was performed to compare the upper lip thickness in males and females. There were significant differences ( $t(238) = 12.166, p < 0.001$ ) in scores with the mean score for males ( $M = 6.62, SD = 2.29$ ) was higher than females ( $M = 3.32, SD = 1.88$ ). The magnitude of difference in the means (mean difference = 3.29, 95% CI: 2.76 to 3.83). Hence H2 was supported. As shown in table 2.

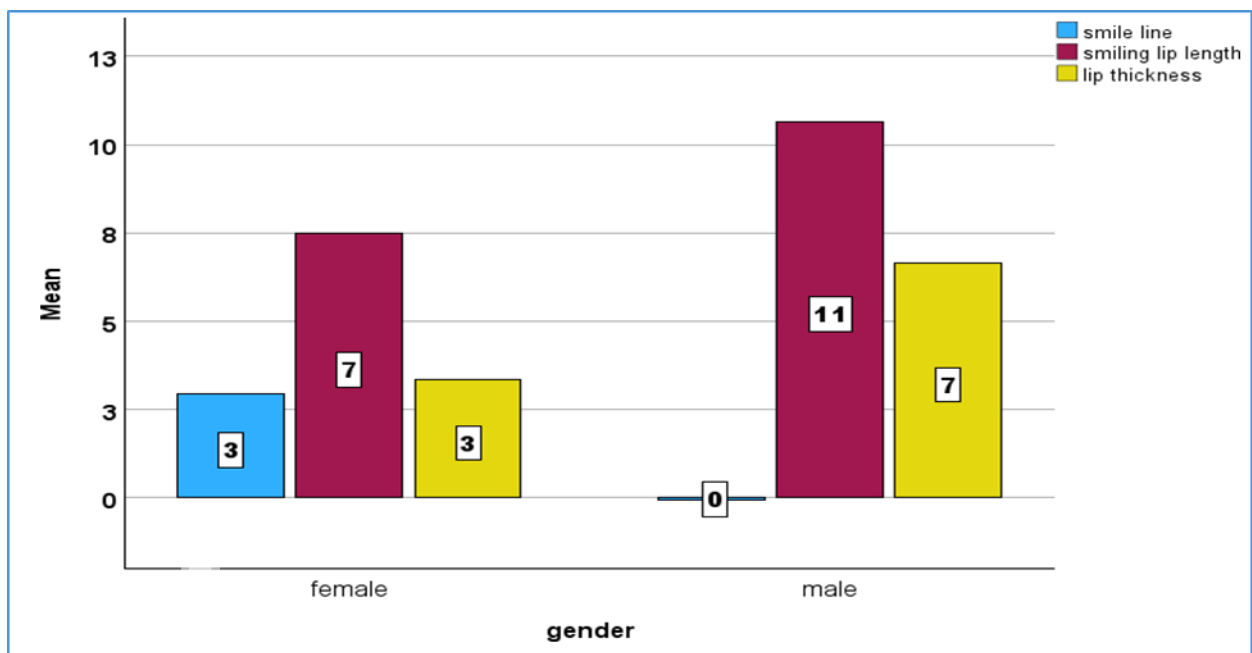
**Table 2: Independent t test for testing the differences upper lip thickness among males and females.**

variables	gender	mean	Sd	sig.	t	D.f	p	mean difference	C.I lower	C.I upper
Upper lip thickness	male	6.62	2.29	0.14	12.16	238	<.001	0.27	2.76	3.83
	female	3.32	1.88							

also, an independent sample t-test was conducted to compare the smile line in males and females. There were significant differences ( $t(238) = -16.7, p < 0.001$ ) in scores with the mean score for males ( $M = 10.60, SD = 2.88$ ) was higher than females ( $M = -0.04, SD = 1.28$ ). The magnitude of difference in the means (mean difference = -2.99, 95% CI: -3.34 to -2.64). Hence H3 was supported. As shown in table 3.

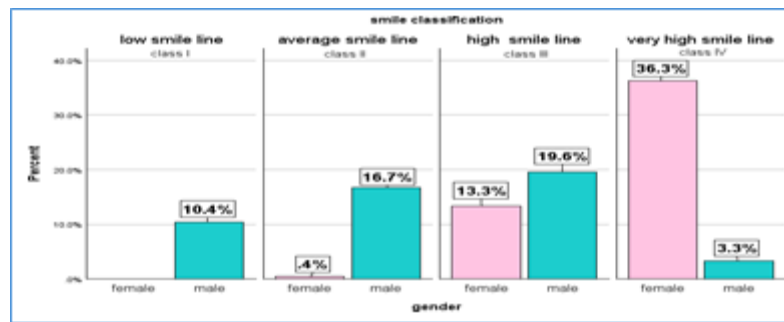
**Table 3: Independent t test for testing the differences in smile line among males and females.**

variables	gender	mean	Sd	sig.	t	D.f	p	mean difference	C.I lower	C.I upper
smile line	male	- 0.04	1.28	0.06	-16.7	238	<.001	-2.99	-3.34	-2.64
	female	2.95	1.48							



**Figure. 4 Gender differences of smile line, lip thickness and lip length in mm. of total sample smile classification analysis**

Our findings show that females tend to have very high smile line (class I) more than males (36.3% and 3.3% respectively), and men tend to have average (class III) and low smile line (class IV) more than females (16.7% and 10.4% respectively).



**Figure. 5 smile classification analysis.**

analysis of the relation between lip length, lip thickness and smile line:

With the Pearson correlation test a statistically significant correlation was found between lip length, lip thickness and smile line as shown in table (2). there was a statistically significant ( $p > 0.01$ ) negative week correlation between smiling lip length and smile line ( $r = - 0.25$ ).

Also, there was a statistically significant ( $p > 0.01$ ) positive moderate correlation between smiling lip length and lip thickness ( $r = + 0.66$ ) and there was a statistically significant ( $p > 0.01$ ) negative moderate correlation between lip thickness and smile line ( $r = - 0.40$ ). Hence H4 was supported.

**Table 4. the correlation between lip length, lip thickness and smile line**

Variables		lip length	smile line	lip thickness
resting upper lip length	Pearson Correlation ®	1	- 0.31	+ 0.66
smile line	Pearson Correlation ®		1	- 0.40
lip thickness	Pearson Correlation ®			1

**Discussion**

There were high statistically significant gender differences observed for resting external upper lip length ( $p$  value  $< 0.01$ ) with males having higher lip length (mean=16.7) than females (mean= 13.4). From the reviewed literature, our study supports a study by Miron et al in 2012<sup>16</sup> stated that external upper lip length was shorter in the women than in the men, which is in accordance with our findings. Also, our finding is consistent with Al-T’aani in 1996<sup>17</sup> who stated that the upper lip length shows significant difference between two sexes.

Our findings show significant differences between both genders’ males and females in lip thickness with mean score for males (mean= 6.62) was higher than females (mean = 3.32). this result agrees with studies done Al-T’aani <sup>17</sup>; Kadhom and Al- Janabi in 2011<sup>18</sup>; (Bozdag et al., 2017 <sup>5</sup>

The study results showed that there were significant differences between both genders’ males and females in smile line with mean score for males (mean= -0.04) was lower than females (mean = 2.95). which is agreed with Al-Khawaja,2013<sup>19</sup> Sapkota et al 2017 <sup>20</sup> (Pham and Nguyen ,2021<sup>21</sup> . This sexual dimorphism in the height of upper lip during smile is also agreed with Peck et al., 1992 <sup>22</sup>

And may be due to factors such as age, gender, a short upper lip, short maxillary incisors, an upwardly-tilted palate, a high man- dibular plane angle, excessive maxillary height, , anterior maxillary excess, excessive overjet and overbite

### the correlation between lip length, thickness, and smile line

There was a statistically significant ( $P < 0.01$ ) positive moderate correlation between resting upper lip length and lip thickness ( $r = + 0.66$ ). which means that if the resting upper lip length increases by 1mm, the lip thickness will be increased by 66 %.

This may be due to racial and genetic factor which is agreed with Rhine and Cambell in 1980<sup>23</sup>. The incisors reposition after orthodontic treatment had no effects on muscle thickness<sup>24</sup>

Our results show a negative weak correlation between resting upper lip length and smile line ( $r = - 0.31$ , which is agreed with a study of (Miron, et al 2012<sup>12</sup> stated that the shorter the lip length the higher the smile line, which is in accordance with this study findings.

Our study reports negative moderate correlation between upper lip thickness and smile line ( $r = - 0.40$ ) which means that if the upper lip thickness decreases 1mm, the smile line will be increased by 40 %. . This is agreed with MicAlister et al in 1998<sup>25</sup> which examined the thickness of the muscles of lips by ultrasound and related to smile line. His finding showed not all the muscle of the lips had the same thickness

**Conclusion:** There was significant positive correlation between (upper lip length at rest and upper lip thickness) and smile line among Iraqi students. There is also a significant difference between males and females in upper lip length, upper lip thickness and smile line among Iraqi students.

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