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Smile line relationship with lip length and lip thickness in Iraqi population

A research submitted to the department of prosthodontics, in the College of Dentistry, Babylon University as a partial requirement of degree of bachelors (B.D.S.)

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DEDICATION



We dedicate this research to our parents for their endless love, support And encouragement throughout or pursuit for education. We hope this achievement will fulfill the dream they envisioned for us. This research Is also dedicated to our teachers especially Dr. Hanan Ali and Dr. Haider Hameed And our friends and by the Grace of God Almighty, our journey of Becoming dentists has finally culminated .Thank you everyone who Have been a part of this journey and best of luck to everyone for Their future endeavors.

Abstract

Background: Smile plays an important role in social acceptance, interaction, and development of personality. Smile line is a major factor considered in esthetic treatment planning. The aim of our study is to provide scientific data as part of an evidence based assessment regarding the relationship between the upper lip length and smile line and the correspondence between smile line and lip thickness also to assess the most common smile line in the natural smile in relation to gender in the Iraqi population.

Material and method: The study was conducted in Department of Prosthodontics Babylon university College of dentistry, 150 subject who visited to our department for general dental check-up were included in this study with age ranged from 18 to 35 years and those who had no significant medical problems were selected. Subjects who have met the study criteria then have been measured lip length, lip thickness and smile line three times for them.

Result: Statistically significant relationship was apparent between smile line and lip length and smile line and lip thickness. Smile line is higher in male with significant difference than female also lip length is longer in male than female. Lip thickness shows greater value in male. Average smile line is more prevalence in both gender. Female show more gingival display than male.

Conclusions: Data from this study clearly indicate that lip length and lip thickness affect on the smile line. There is medium positively relationship between lip length and smile line and small positively relationship between lip thickness and smile line.

Key words: smile, lip length, lip thickness, smile line, gingival display

1. Introduction:

The main objective of restorative dentistry, especially prosthetic dentistry, is restoring occlusion, esthetics, phonetics, function, form and contour of stomatognathic system. The aims of esthetics dentistry are to create beauty, attractive face and satisfaction of the patient. Most patients go to the dentist to get an esthetic smile (1, 2). Facial esthetics refers to dynamic facial expressions, such as smiling and talking. The smile has an important role in the appearance and facial expression. Face and smiles related to each other. The facial shape, the condition of the teeth especially the anterior teeth and surrounding tissues greatly affect the esthetic smile and even the facial esthetic overall (3).

Anterior teeth play very important role in esthetics, phonetics and incision of the food. When restoring the anterior teeth, esthetics is primary focus by dentist as well as by the patients. When a patient is missing all the maxillary anterior teeth, the prosthodontist should attempt to position the artificial teeth in the position that the natural teeth were arranged in or in a fashion similar to the arrangement of ideal patient of similar age, gender, race and facial structure. As a general rule, the vertical position of central incisors is often placed about 2 mm below the vermillion border of the upper lip. But the position of the teeth can be influenced by age, sex and length of the upper lip (4).

Frush and Fisher stated that the smiling line helped to determine the vertical position of the maxillary teeth in complete denture. Who observed that the central incisors were longer than the other maxillary teeth, in addition to the curvature of the maxillary teeth follows the curvature of the upper border of the lower lip during smiling (5). Smiling is a facial expression that usually indicates pleasure, friendliness and gratitude (6). The" smile line" also termed as "smile arc" by Ackermann *et al.* which is defined as the relationship between the curvature of the maxillary anterior teeth and the curvature of the upper border of the lower lip (7). In the analysis of the smile, this parameter, also known as the smile line or tooth exposure when smiling is calculated as the difference between the height of the lip line and the tooth exposure (8, 9). In addition, lip movement is a controlling factor for smiling. (10) The smile line is commonly divided into three categories depending on the amount of tooth and gingiva exposed during smiling: high, average and low.

The smile is determined by four factors which affects the pleasantness or unpleasantness of the smile;

- 1. Incisogingival display: Amount of visibility of the incisor crown height and the gingival show.
- 2. Upper vertical lip thickness: The vertical distance from the most superior peak of the lip to the most inferior portion of the tubercle of the upper lip which considered the most important factor in the esthetics of the smile.
- 3. Lower vertical lip thickness: The vertical distance from the deepest midline point on the superior margin of the lower lip to the most inferior portion of the lower lip.
- 4. The curvature of the maxillary incisal edges and canines relative to the curvature of the lower lip on smile .(11-13)

The goal of this study is to provide scientific data as part of an evidence-based assessment regarding the relationship between the upper lip length and smile line as well as the correspondence between smile line and lip thickness also to assess the most common smile line in the natural smile in relation to gender in the Iraqi population.

2. Materials and Methods:

2.1 Search strategy

The study was conducted in department of prosthodontics, college of dentistry university of Babylon. One hundred fifty subjects who visited to our department for general dental check-up were included in this study whose age ranged from 18 to 35 years and those who without significant medical problems were selected. All subjects had no history of smoking, alcohol abuse or use of specific drugs. We used vernier caliper, cotton/tissue and alcohol. Subjects who have met the study criteria were given a description of study procedures and then asked to sign an informed consent. Then lip length, lip thickness and smile line were measured in the sample of study subject as much as three times repetition.

2.2 Measurements

2.2.1 Measurements on rest frame

- 1. Upper lip length- from subnasale to stomion superius (Figure 1.A).
- 2. 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 (Figure 1.B).



Figure 1: A- lip length, B- Measurement of lip thickness.

2.2.2 Measurements on smile frame (Figure 2)

Smile line- subnasale to stomion superius during smile.





2.3 Smile line classification

According to Liebart the smile line is classified as following (13):

• 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'. (Figure 3.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. (Figure 3.B)

- Class 3 (Average smile line): Only gingival embrasures are visible. (Figure 3.C)
- Class 4 (Low smile line): Gingival embrasures and CEJ are not visible. (Figure 3.D)



Figure 3: A- very high smile line, B- High smile line C- Average smile line, D- Low smile line.

2.4 The inclusion criteria

- 1. Voluntary involvement in the study.
- 2. Age between 18 to 35 years.
- 3. Iraqi citizen.
- 4. No history of craniofacial trauma, surgery or dental rehabilitation.
- 5. No anterior teeth malocclusion.
- 6. A healthy periodontium or a reduced but still healthy one.
- 7. No congenital anomalies.

8. At least 6 contiguous anterior and superior teeth quality equally distributed between left and right.

2.5 The exclusion criteria

- 1. Gross asymmetries.
- 2. Missing teeth that could have been visible on smile.
- 3. Excessive dental attrition .
- 4. History of lip surgery or enhancement.
- 5. Lip asymmetry.
- 6. Craniofacial syndromes.
- 7. Dental prosthesis for the aforementioned teeth in the inclusion criteria active.
- 8. Active orthodontic treatment.

2.6 Statistical analysis

The data collected was analyzed with Pearson test for correlation and association. A value of P < 0.05 was considered statistically significant.

3.Result:

Study comprised of 150 participants including an equal numbers of females (n=75) and males (n=75) with the age range of (18-35) years and a mean age of (23.046) years. The result is shown in figure 4. Statistically significant gender differences observed for lip length (p value < 0.001) with males having higher lip length (mean=19.182) than females (mean= 17.939).

Also, lip thickness in males (mean= 8.3) is slightly higher than females (mean= 7.992) with no significant differences between both genders (p value =0.311). For smile line, statistically significant difference between males and females was observed (p value = 0.008) indicating that a smile line is higher in males (mean= 13.853) than Females (mean= 12.74).



Figure 4: Gender differences of smile line, lip thickness and lip length of total sample.

According to the study results, the most prevalent class in male is class 4 which accounts about (33.3%) of total sample of males followed by class 3 which accounts about (30.6%) of total male's sample. Class 2 accounts (24%) of total male's sample while class 1 came at least with about (12%) of total male's sample as shown in (Figure 5. A and table 1).

In female, class 3 possessed higher value of about (40%) of total female sample. In the second place class 1 account about (29.3%) and class 2 (24%). Class 4 came at least with about (6.6%) of total female sample as shown in (Figure 5. B and Table 1).



Α

Figure 5: Gender differences in smile line classification: A- Male, B- Female.

B

Table 1: Gender differences	in	smile	line	classi	ficatio	on
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Male		Female		
Classes	Number	Classes	Number	
Cl 1	9	Cl 1	22	
Cl 2	18	Cl 2	18	
Cl 3	23	Cl 3	30	
Cl 4	25	Cl 4	5	

The Pearson correlation analysis [Table 3] clearly indicated that lip length and lip thickness affect on the smile line. There is medium positively relationship between lip length and smile line r = 0.520 and P = 0.000 and small positively relationship between lip thickness and smile line r = 0.268 and P = 0.001 [Figure 6 A and B] shown the linear relationship between these variables.

	Mean	Std. Deviation
Lip length	18.56	2.11
Lip thickness	8.13	1.72
Smile line	13.3	2.6

Table 2: Mean and standard deviation of lip length, lip thickness and smile line.

Table 3: Pearson correlation between lip length and smile line, lip thickness and smile line.

		Smile line
Lip length	Pearson Correlation (R)	0.520
	Pearson Correlation (R ²)	0.271
	Sig.	0.000
	N. 150	150

Lip thickness	Pearson Correlation (R)	0.268
	Pearson Correlation (R ²)	0.072
	Sig.	0.001
	Ν	150



Figure 6: The linear relationship between A- lip length and smile line. B- lip thickness and smile line.

4.Discussion:

A full examination of the smile characteristics is an essential part of treatment plan restorative dentistry especially when anterior dentition is involved and the patient has high aesthetic demands. Gingival and tooth exposure during smiling are challenging issues to many physicians, especially those who deal with smile esthetics. Consideration of smile line has a clinical application in treatment of the patients; great care should be taken to avoid excessive display of gingiva during restoration of anterior teeth in patients with high smile lines. (14-16)

4.1 Lip length and lip thickness

This study clearly demonstrate that the lip length is higher in male than female and this result can be attributed to that the female face appears to have a shorter distance between the base of the nose and the border of the upper lip, whereas the male face has a longer upper lip (17). These differences are reflections of simple biologic scaling: male subjects are uniformly larger than equivalent female subjects. In this study, in women the upper lip at rest was 1.25 mm shorter than men (P=0.000).

This finding is consistent with Al–T'aani (18) who stated that the upper lip length shows significant difference between two sexes. The vertical changes in upper lip length and thickness were significantly higher in males as compared with females. Which is also in agreement with those reported by previous studies (19-21).

In this study, the measurements demonstrated that the lip thickness values of men were higher than those of women. About the upper lip thickness Michelow & Guyuron state that in male all tissue thicknesses were significantly higher in men as compared to women (22). Furthermore, this result is in agreement with studies done by Al–T'aani (18), Bozdag, Zekiye Karaca, *et al.* (23) and by Kadhom, and Al-Janabi (24).

4.2 Smile line

In the study samples, a high smile line (lip length during smiling) was more common among females than in males, while a low smile line was more prevalent among males this being consistent with the outcome found in the previous studies which confirmed that a high smile lines appeared to be a female lineament, and low smile lines appeared to be a male lineament (25, 26, 19). Also, the differences between smile line in men and women were significant statistically as achieved by Tijan *et al.* (27).

In addition, this finding was similar to other studies in which the result shows that females have significantly more periodontal visibility when compared to males during forced smile (28, 29). Another study by Sereen *et al.* (30) revealed that females exhibited higher smile line and very high smile line (51.7% and 37.8% respectively).

While this finding disagree with Damayanti, R. and Ridal (31) who found there was no significant difference between men and women. Statistically significant difference existed regarding smile arc between the two genders, this was also testified by Khan *et al.* (32) and Desai *et al.* (33)

According to individuals gender, females more often presented a high smile line as compared with males. In contrast, males showed a higher frequency of low smile lines. In this study the findings suggest that a high smile pattern and average smile line can be considered a female norm, since more than half of the women in the study exposed their gums while smiling, and a low smile pattern and average smile line can be considered a male norm. Similar results and female/male ratios were observed by Miron *et al.* (21).

This study is clearly demonstrating that class 4 and class 3 (low to average smile lines) are more prevalent in males while class 3 and class 1 is (average to high) smile lines are more common in female's subjects. Peck *et al.* (9) analyzed smile lines in 42 male and 46 female subjects. The occurrence of high smile lines in female is doubled that as in males. In contrast, low smile lines appeared proportionally twice as often in males than in females. Also, this results come in agreement with study done by Khan. Mehwish *et al.*(32) which state that average smile line was frequently observed among the subjects. Also, the smile line was studied by Alqarni *et al.* within Asser region. These authors found that the average smile line was more commonly seen compared to a high or low smile line patterns (34). In addition, studies by Tijan *et al.* (35), Maulik and Nanda (36) were concluded that a low smile lines are more prevalent in males while high smile lines are more common in females subjects. Nold *et al.*(26) also investigated the smile line was a common feature seen in females, as an average smile line was mostly seen in males.

This study is concluded checking whether there was a correlation between resting upper lip length (external upper lip length) and lip shortage (smiling external upper lip length), a positive significant correlation was noticed. The higher the smile pattern, the shorter the upper lip length. In keeping with the reduction of upper lip length, maxillary incisor display at rest was higher among subjects with higher smile patterns. However, this study is clearly revealed that there is a relationship between smile line (lip length during smiling) and upper lip length at rest. Similarly, a study by Miron *et al.* stated that the shorter the lip length the higher the smile line, which is in accordance to this study findings (21).

A correlation between smile line (lip length during smiling) and upper lip thickness at rest was observed in the present study. This study is similar to other study applied by McNamara *et al.* (37) who stated that the upper vertical lip thickness was correlated positively with smile line.

5. Conclusions:

1. A positive significant correlation was apparent between smile line and lip length and smile line and lip thickness.

2. Smile line has a statically significant difference between male and female with male have higher smile line than female.

3. Lip length is higher in male than female with significant difference between both genders.

4. Lip thickness shows greater value in male.

5. Finally, average to low smile line is more prevalence in male while a high smile pattern and average smile line can be considered a female norm.

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Subjects who have met the study criteria were give a description of study procedures and then asked to sign an informed consent.

