

# THE EVALUATION OF SMILE DESIGN BY LAY PEOPLE AND DENTISTS IN THE UAE.

BY

Asmaa Ahmed Khaliefah Obaid AlShamsi

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#### ABSTRACT

## THE EVALUATION OF SMILE DESIGN BY LAY PEOPLE AND DENTISTS IN THE UAE.

**Aim:** This study aimed to evaluate what features of a smile are regarded attractive as viewed by lay people and dental professionals in the UAE.

**Material and Methods:** A questionnaire survey of standardized images of smiles was distributed to 190 dental professionals including 135 under-graduate students at Sharjah University and 190 lay people. A sample size calculation determined the sample as 384. The participants were not randomly selected and were not a representative sample of the UAE population but a convenience sample. The participants were all adults above the age of 17 years. The questionnaire had 7 separate aesthetic features with between 3 to 6 different standardized computer generated images for each feature. The different features included amount of tooth exposed, lip line height, buccal corridor and midline position.

**Results:** There were a total of 380 participants with a mean age of 28.6 years (SD 7.9) of which 228 (60%) were female. Significantly more females compared to males preferred a convex smile irrespective of whether or not the upper teeth contacted the lower lip (p<0.01). Females tended to prefer a low lip line compared to males but this was at the borderline of significance (p=0.067). Interestingly, more married respondents preferred the low lip line whereas unmarried respondents were evenly

distributed between those liking an average and low lip line (p<0.05). The coincidence of dental and facial midlines would be expected as the preferred choice for both dental professionals and lay people but significantly more lay people preferred the smile that deviated to the right whereas dentists preferred midlines to be coincident (p<0.001). Furthermore, residents of Abu Dhabi, Dubai and Sharjah preferred the coincidence of midlines whereas the lay people from Fujairah preferred the right deviation of the dental midline. Over half the unmarried respondents had a significantly greater preference for midline coincidence but married respondents were more evenly split regarding this aspect of smile design (p<0.05). There were no preference differences for most of the smile design features as judged by dentists and lay people.

**Conclusion:** There is general agreement between dentists and lay people regarding the most pleasing features of smile design. Females prefer a convex incisal curve that follows lip curvature and tend to prefer a low lip line. Coincidence of facial and dental midlines was expected to be preferred by both dentists and lay people but surprisingly this was not the case as lay people, married respondents and residents from Fujairah prefer a right deviation. Why should this preference for a smile with a deviated dental midline be regarded as attractive requires further research but may be influenced by tribal or other cultural factors.

## DEDICATION

This thesis is dedicated to my parents, Ahmed AlShamsi and Majeda AlFaris, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve. This work is also dedicated to my husband, Khalid AlFalahi, who has been a constant source of support and encouragement during the challenges of graduate school and life. I am truly thankful for having you in my life.

## DECLARATION

I declare that all the content of this thesis is my own work, there is no conflict of interest with any other entity or organization.

Name: Asma Ahmed AlShamsi

Signature :

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## TABLE OF CONTENTS

Abstract	ii
Dedication	iv
Declaration	V
Acknowledgment	vi
List of tables	viii
List of graphs	ix
1.Introduction	
2. Literature review	2
3. Aim	13
4. Materials and method	14
4.1 Study design	14
4.2 Sample and area	14
4.3 Inclusion criteria	15
4.4 Exclusion criteria	15
4.5 Questionnaire	15
4.6 The esthetic features of different smile	16
4.7 pilot study	17
4.8 Survey logistics	18
4.9 Sample size	19
4.10 Statistical analysis	
4.11 Ethical considerations	20
5. Results	21
6. Discussion	32
7. Conclusion and recommendation	37
8. Bibliography	38
9. Appendices and index	43

## LIST OF TABLES

- Table (1) : Demographic data of participants as raters
- Table (2)
   : Comparison of esthetic features by gender
- Table (3)
   : Comparison of esthetic features by occupation
- Table (4)
   : Comparison of esthetic features by city
- Table (5)
   : Comparison of esthetic features by marital status

## LIST OF GRAPHS

Graph (1) : Comparison of esthetic features by occupation (inter incisal line vs facial midline rated by lay people and dentists )

Graph (2) : Comparison of esthetic features by city

## **1. INTRODUCTION**

Dental appearance is considered an important feature in determining the attractiveness of a face, thus it influences human social interactions  $^{1,2}$ . A patient's smile expresses a feeling of success, affection, sensuality and courtesy and reveals self-confidence. The smile, in particular, plays a significant part in determining the first impression of an individual<sup>2</sup>. The smile is more than a method of communicating; it's a mean of socialization and attraction.

Different factors affect the overall esthetic and smile, including tooth shape, position, and quality of restoration, color and general arrangement of dentition<sup>3</sup>. The harmony of the smile is determined not only by the shape, the position, and the shade of the teeth but also by the gingival tissues. Gingival visibility depends on the position of the smile line, which is defined as the relationship between the upper lip and the visibility of gingival tissues and teeth<sup>4</sup>. Although any factor could be considered separately, they are considered esthetically as a unit, in terms of symmetry and harmony. A youthful smile is defined as full display of maxillary incisor crowns, with 1-2 mm of gingival margin. Usually, females tend to show 1-2 mm more of gingival tissue than males. <sup>5</sup>

## **2.LITRATURE REVIEW**

Smile is a person's ability to express a range of emotion with the structure and movement of the teeth and lips. Smile has been classified as high, average and low by Tjan et al. <sup>2</sup> High smile shows complete display of cervico-incisal length of maxillary incisors along with a contiguous band of gingiva whereas low smile has less than 75% of display. In an average smile there is 75 to 100 % display of maxillary incisors with the incisal curvature of the maxillary anterior teeth paralleling the inner curvature of lower lip and may be slightly or totally touching the lower lip.

Nowadays people are concerned more about smile, it is not just a facial expression, but it has a lot of benefits. Smile makes people more attractive. Studies show that we are more trustful of others when they smile.

According to Scharlemann et al, participants were more likely to trust another person if they were smiling. <sup>6</sup> This study found that a smile increased people's willingness to trust by about 10 %. Attractive smiles not only influence other people's perceptions but also affect the psychosocial well-being of the individual as well as their behavior.

Few publications exist regarding the relationship between gingival visibility and teeth during the smile. In a study of 425 students, Crispin and Watson<sup>7</sup> reported that the gingival margin was visible in 66% of the participants in a natural smile.

Tjan et al  $^2$  examined 454 young adults and classified them into 3 categories according to the position of the smile line. The study used the following classification: 1) the smile line is above the cement-enamel junction (gummy smile), 2) the smile line reveals interproximal gingiva and 3) the smile line reveals less than 75% of the anterior maxillary teeth. Class 1 accounted for 10.6%, class 2 accounted for 68.9% and class 3 accounted for 20.5%. <sup>2</sup> The conclusion of this study that when patients presented with a gummy smile esthetics was the prime requirement, patients with uncovered interproximal gingiva esthetics were still important and in patients with a smile line under 75% of anterior maxillary teeth, the impact of esthetics was less.

The perception of esthetics differs from person to person and is influenced by personal experiences and social environments. The most influential factors contributing to a harmonious anterior dentition are the size, shape, and arrangement of maxillary anterior teeth.

Lombardi<sup>8</sup> was the first to emphasize the importance of order in dental composition; he was the first to suggest the application of the golden proportion in dentistry. He said that the golden proportion was too strong for use in determining tooth size.

Levin <sup>9</sup> indicated that the most harmonious issue in tooth to tooth ratio was that of the golden proportion. However, in a recent study it was reported that the golden proportion did not exist between the widths of the maxillary anterior teeth in individuals who have an esthetic smile. <sup>10</sup>

Frush and Fisher <sup>11</sup> were the first to publish the concept of smile arc. While Hulsey <sup>12</sup> quantified the smile line as ratio to the lower lip, He found that the smile line is an important contributing factor in an attractive smile. Ackerman et al <sup>13</sup> retitled the "smile line " to "smile arc".

Frush and Fisher <sup>11</sup> identified the idea of the buccal corridor spaces, by definition, the buccal corridor spaces were the negative space created between the buccal surfaces of posterior teeth and the inner wall of the cheek. Too much buccal corridor resulted in large empty spaces, while too little looked artificial and was considered the essence of bad prosthetic denture esthetics.

Buccal corridor spaces did not contribute significantly to smile esthetics<sup>37</sup>. Kokich et al <sup>14</sup> used variations of smile esthetics with computer based approach and found that orthodontists , general dentists and lay people had varying levels at which they detected dental discrepancies.

The Occlusal plane represents an important craniofacial point of references, its established by the incisal surfaces of the anterior teeth and the Occlusal surfaces of the posterior teeth <sup>15</sup>. The incisal plane is the anterior portion of the Occlusal plane when viewed from the front, it should be parallel to the horizontal references lines such as inter pupillary line and commissural line to maintain natural facial harmony <sup>15,16.</sup>

Studies done by Yoon et al <sup>18</sup> to examine the attractiveness of the smile by investigating the esthetic criteria of the smile, the subjects were 240 university students (129 males, 111 female) with normal occlusion, no subjects were missing

teeth or had experience prosthodontic or orthodontic treatment. Photographs of full smile were taken and five elements of the smile were analyzed: (1) the upper lip position, (2) the upper lip curvature, (3) the parallelism of the anterior incisal curve with the lower lip, (4) the relation between the maxillary anterior teeth and the lower lip and (5) the number of teeth displayed in a smile. Five dentists and five fine arts professors estimated the esthetic quality of the subjects smiles (smile score) using a scoring system of five grades , when evaluating the smile the judge saw the lower 1/3 of the face only .

The upper lip position was divided into 3 categories; a high smile reveals the total cervico-incisal length of the maxillary anterior teeth and a contiguous band of gingiva. An average smile reveals 75% to 100% of the maxillary anterior teeth and the interproximal gingiva only while the low smile shows less than 75% of the maxillary anterior teeth.

According to Yoon et al studies <sup>18</sup>, The most common smile is the average smile (56%) followed by high smile (29%) and low smiles (15%).

The upper lip curvature was divided into 3 categories, upward, straight and downward. The upward means that that the corner of the mouth is higher than the center of the lower border of the upper lip, straight means that the corner of the mouth and the center of the lower border of the upper lip are on a straight line. While the downward means that the corner of the mouth is lower than the center of the lower border of the upper lip.<sup>17</sup>

The most common upper lip curvature were straight (45%) followed by downward (43%), while the upward smile was rare (12%) according to Yoon et al studies  $^{18}$ .

The parallelism of the maxillary anterior incisal curve with the lower lip was divided into 3 categories: parallel, straight and reverse.

The parallel means that the incisal edges of the maxillary anterior teeth are parallel to the upper border of the lower lip, straight means that the incisal edges of the maxillary anterior teeth are in a straight line, while reverse means that the incisal edges of the maxillary anterior teeth curved in reverse to the upper border of the lower lip.

According to study done by Yoon et al <sup>18</sup> to study the attractiveness of the smile by investigate the esthetic criteria of the smile, it shows that the most attractive smile in regard to parallelism of the maxillary anterior incisal curve with the lower lip was parallel smile was (60%) followed by straight smile (34%) then the reverse smile (5%).

The relationship between maxillary anterior teeth and lower lip was divided into3 categories: slightly covered, touching and not touching <sup>17</sup>. Slightly covered means that the incisal edge of the maxillary anterior teeth was slightly covered by the lower lip, touching means that the incisal edge of the maxillary anterior teeth is touching the lower lip, while not touching means that the incisal edge of maxillary anterior teeth did not touch the lower lip <sup>17</sup>.

According to study done by Yoon et al  $^{18}$  shows that the touching (36%) and not touching (54%) smiles were more esthetic than slightly covered (10%) smiles.

Teeth displayed in a smile considered as one of the criteria that affect the attractiveness of the smile, and what we mean by that is the number of teeth showing while smiling.

Study done by Yoon et al <sup>18</sup> shows that the mean esthetic rank of the subjects who displayed to the first molar was the highest and the mean esthetic rank of the subjects who displayed to canine was the lowest.

Regarding oral condition and smile, Ko et al <sup>19</sup>investigated the effect of prosthesis, missing teeth and mal-alignment, such as crowding and spacing on the smile.On his study he took photographs of a full smile and examined subjects oral condition, of 145 subjects, 42 had normal condition, 13 had missing teeth, 21 had prosthesis and 69 had mal-aligned teeth. In the subjects who had missing teeth, they all had 1 or 2 missing teeth in the posterior region. The investigators then estimated the esthetic score of the smile and analyzed the data statistically.

From the study of Ko et al<sup>19</sup> it shows that the normal group had the highest mean smile and the missing teeth group had the lowest. These results reveal that missing or mal-aligned teeth impair the smile.

Kim et al <sup>20</sup> investigated the correlation between personality factors and the smile, assuming that smile esthetic is closely related to an individual's psychological state and physical condition. The study of Kim et al<sup>20</sup> shows that women's personality is correlated to attractive smiles while men's personality is not.

Choi et al <sup>21</sup> investigated the changes in the smile caused by aging , he measured the exposure of the maxillary and mandibular central incisors in both resting and smiling positions, the results of the study shows that the amount of maxillary incisal exposure gradually decreased with age while the amount of mandibular incisal exposure gradually increased by age .

The fact that the Yoon et al <sup>18</sup> and Choi et al <sup>21</sup> findings were similar to those of other studies conducted in the west, shows that the Korean concept of an attractive smile dose not differ significantly from that of Westerners .

Shaw et al <sup>22</sup> reported that dentofacial appearance has a very strong influence on young adults and their preference for friends. In contrast study done by Eagly et al <sup>23</sup> shows no correlation between the physical attractiveness of a subject and the tendency of others to attribute positive virtues to the subject.

An attractive smile is important for facial esthetic, the esthetic of the smile are affected by upper lip curvature, upper lip position, the relationship between maxillary anterior teeth and the lower lip, the parallelism of the anterior incisal curve with the lower lip and the number of teeth displayed in a smile.

The American Academy of Cosmetic Dentistry has published guidelines <sup>24</sup> directing the artistic parameters of smile design, with the goal of esthetically replicating nature. Observation is fundamental to this concept as it's a true understanding of patient expectations.

Regarding teeth shape, several methods have been used to predict the shape of the missing anterior teeth to facilitate the restoration and maintenance of the anterior segment <sup>25</sup>. In 1914, Williams <sup>26</sup> established that to restore the upper central incisors they should be related to the facial contour. He classified both facial contours and teeth into three categories: square, tapered and ovoid.

Studies have proven the existence of a relationship between upper central incisors shape and facial contours <sup>27</sup>, while other studies have proven the contrary <sup>25,28,29</sup>. However the majority of these studies determined this relationship by using photographs of the facial contours and comparing them to the intraoral photographs of the upper central incisor.

Brisman<sup>27</sup> has demonstrated that judgments on dental esthetics differed when the teeth shape is assessed jointly with the facial contours, indicating an influence of the facial presentation on the esthetic perception.

Several studies have reported that the level and type of education can influence people's esthetic perception. Anderson et al <sup>30</sup> evaluated the esthetic perception of tooth shapes when smiling and found discrepancies between the preferences of dental professionals and lay people. Brisman<sup>27</sup> stated that the patients and dentist's opinions differ when evaluating images and photographs of upper central incisor variations in shape, symmetry and proportion.

Brisman<sup>27</sup> stated that female should present more round and delicate teeth (tapered or ovoid) while males should have more angulated teeth (square). He also reported that when patients and dentists observed an incisor individually, they preferred it to be longer, but when the judgment was made jointly with the facial contour, shorter teeth were preferred indicating an influence of the facial presentation on the esthetic perception.

Mahshid et al <sup>31</sup> evaluated dental proportions in a harmonious smile and noted that cultural and individual characteristics as well as esthetic perception of each person played an important role in this area.

Dentists have been searching for ways to standardize fixed characteristics to obtain the composition of each patient or group of patients. This has caused dentists to learn certain characteristics and concepts related to persons with respect to age, gender and personality <sup>32</sup>.

Study done by Parekh et al <sup>33</sup> to evaluate the esthetic acceptability range of computergenerated variations in smile arc and buccal corridor between laypeople and orthodontists, buccal corridor and smile arcs each presented for a female and male image, buccal corridor were presented as none, ideal and excessive, while the smile arcs were presented as flat, ideal and excessive. The nine male and female variations, as combinations of the above variables, were each presented twice to evaluate reliability.

The results of Parekh et al <sup>33</sup> study shows that both laypeople and orthodontists showed good reliability, there was a broad range of acceptability, but laypeople and orthodontists showed no significant differences on the two variables tested, while orthodontists and laypeople both found smiles with excessive buccal corridors to be

significantly less acceptable than those with ideal or absent buccal corridors. Regarding the smile arcs, flat smile arcs were only acceptable 50-60 % of the time, while smiles with ideal and excessive smile arcs were significantly more acceptable 84-95% of the time  $^{33}$ .

Roden-Johnson et al <sup>34</sup> found no differences among rater groups for buccal corridors space, which is also consistent with the findings of Ritter et al <sup>35</sup> and Gracco et al <sup>12</sup>. Moore et al <sup>36</sup>found differences between the narrow and broad smiles as determined by proportion of buccal corridor space. Gracco et al <sup>12</sup>found a preference for minimal buccal corridor space. Over all, excessive buccal corridors emerged as less acceptable. Understanding attractiveness of the smile arc and buccal corridor space in important, because it provides a hierarchy of esthetic preference.

Study done by Dunn et al <sup>38</sup> to identify factors distinctive to attractive smiles versus unattractive smiles, as perceived by patients. Photographs of eight males and eight female smiles framing only lips and teeth were viewed by 297 subjects, the smiles exhibited differences in symmetry, tooth shade, number of teeth displayed, and height of maxillary lip line and included both restored and unrestored teeth.

The results of Dunn et al <sup>38</sup> shows in all cases, tooth shade was the most important factor, followed in sequence by unrestored natural teeth and number of teeth displayed. No correlation was found to exist between specific demographic groups and smile variables.

A person's ability to recognize a beautiful smile is innate and ultimately, the perception of attractiveness is an individual preference. From Dunn et al study it has been assumed that the shade of one's teeth might be an important factor in dental attractiveness  $^{38}$ .

Professional assessment of dental appearance is important, but the patient's opinions regarding dental appearance should also be respected and included in assessments for treatment planning. Within the face, the mouth and teeth are major features in the evaluation of physical appearance. It has been suggested that maxillary, mandibular and dental structure have an indirect impact on the perception of facial beauty <sup>39</sup>.

The dentition is an important part of a person's overall facial appearance and is therefore related to self-esteem.

In dentistry, esthetics is characterized primarily by the smile, however, the smile comprises much more than the dental arch. Dental smile design preferences differ from one person to other based on different factors such as: social level, economic level, education level and ethnic origin. There is a lack of similar studies in the UAE.

This study aimed to determine which features of a smile are attractive as rated by lay people and dental professionals in the UAE.

## 3. AIM OF THE STUDY

The aim of this cross sectional study, was to determine which features of a smile are attractive as rated by lay people and dental professionals in the UAE.

## 4. MATERIALS AND METHOD

## 4.1 Study design:

This was a cross sectional study sampling 380 UAE subjects above 17 years of age.

## 4.2 Sample and area:

The sample was 190 lay people and 190 dental professionals. The dental professionals included 135 under-graduate dental students (1st year, 2nd year ,3rd year ,4th year and 5th year) from Sharjah and Ajman Universities, and 55 qualified dentists which included postgraduate residents for Mohamed Bin Rashid University of Medicine and Health Science.

The dental students and qualified dentists in this study were from Sharjah university (65 subjects), Ajman university of science and technology (70 subjects) and post graduate students from Mohamed Bin Rashid University of Medicine and Health Science (55 subjects).

The participating laypeople in this study were recruited from several places. Al Bahar primary female school in Fujairah city 39 teachers, employees from Dubai Municipality (41 Subjects), employees from Fujairah Court (53 subjects), employees from Hamdan Bin Mohamed College of Dental Medicine (6 Subjects) and students from different specialties in Ajman University of Science and Technology (51 subjects).

## 4.3 Inclusion criteria:

- UAE population (male and female)
- Age above 17 years old
- Dental professional and laypeople

## 4.4 Exclusion criteria:

- Age under 17 years old.
- Respondents who did not answer 70% of the questionnaire

## 4.5 Questionnaire:

The images used in this study were developed by Prof. Dr.Wael Att, (Director of Postgraduate Program at the Department of Prosthodontics, Dental School, University of Freiburg).

The questionnaire had 7 different smile designs with between 3 to 6 different images. There are a total of 24 images of computer generated smiles of lips and teeth. Participants were asked to choose their preferred smile from the 7 groups of images. None of the subjects had a problem with the questionnaire.

# 4.6 The esthetic features of the different smile images included the following:

- 1- Tooth exposure at rest with three images of the <u>amount of tooth exposed at</u> <u>rest</u> (more than half of maxillary teeth only, less than half of maxillary teeth only, mandibular teeth only).
- 2- <u>Incisal curve vs lower lip (convex, flat, reverse, contacting, not contacting, covering).</u>
- 3- <u>Smile line (average, low, high)</u>.
- <u>Smile width</u> (number of teeth visible) (6-8 teeth visible, 10 teeth visible, 12-14 teeth visible).
- 5- <u>Buccal corridor (normal, wide, absent)</u>.
- 6- <u>Upper interincisal line vs mid line</u> (coincident, deviated to RT, deviated to left).
- 7- Occlusal plane vs commissural line/horizon (parallel, slanted to right, slanted to left).

(The questionnaire is in appendix IV)

## 4.7 Pilot study:

A pilot study was planned using the questionnaire on 10 dentists and 10 lay people. Four questions were asked:

1- Did you understand all the questions?

2- Did you understand the aim of the questions?

3- Did you have any problem answering any of the questions?

4- Regarding question (3), if the answer yes, what problem did you have with the questionnaire?

These questions were added to the end of the main smile design questionnaire. All 20 respondents for the pilot questionnaire were recruited from Mohamed Bin Rashid University of Medicine and Health Science. (Appendix II).

The results of the pilot indicated that none of the respondents had problem answering any of the four questions. Two respondents did not understand the aim of the main questionnaire.

A covering explanation letter was distributed to the respondents for the main study.

## 4.8 Survey logistics

It was distributed among lay people, dental students and qualified dentists and they selected the preferred smile from their point of view. The time allowed to view the images was one day. The principal investigator (Asma.Alshamsi) distributed the questionnaire among the groups and collected the questionnaire from the participants. (The questionnaire is in appendix IV).

Each participant had only one questionnaire and they could select only one image in each question. After assessment of the questionnaire, the data were collected and analyzed using SPSS.

## 4.9 Sample size:

The sample size will be calculated based on the assumption that the probability of perceiving preferable smile is equal to 50% (survey) and using the formula of Cochran's sample size calculation for cross-sectional design:

$$N = p (1-p) (\frac{Z}{E})^2$$

Where

P is a proportion of perceive preferable smile.

*q* is (1-p)

 $z_{\alpha/2}$  is the quartile of 95%, and

*E* is the desired margin of error. Within 95% confidence interval we use E= 0.05 then the calculation will be

$$N = 0.5 (1 - 0.5) \left(\frac{1.96}{0.05}\right)^2 = 384$$

The power of the calculation if 384 will be used is given, generally and theoretically if 95% confidence interval used the power of the study will range from 80% to 90%.

## 4.10 Statistical Analysis:

Data were entered in computer using SPSS for windows version 20.0 (SPSS Inc., Chicago, IL). Descriptive statistics were used to describe categorical and continuous variables. A cross-tabulated was used to examine the independency between categorical variables and statistical analysis was performed using  $\chi^2$ -square and Exact Fischer's test when appropriate for test of association. Where two or more continuous independent variables were examined. P-value of less than 0.05 was considered significant in all statistical analysis.

#### 4.11 Ethical considerations:

This study was conducted in full conformance with principles of Good Clinical Practice (GCP), and within the laws and regulations of the UAE/DHCC.

Ethical approval was gained for the research.

(Ethical approval letter in Appendix I)

## 5. RESULTS

## Table 1: Demographic data of participants as raters

Items	No.(%)
Gender	
Male	152 (40)
Female	228 (60)
Age: mean (SD)	28.57(7.92)
Occupation	
Qualified dentists and students	190(50)
Lay people	190(50)
City	
AD (Abu Dhabi)	18(4.7)
DXB (Dubai)	88(23.2)
SHJ (Sharjah)	90(23.7)
Others	184 (48.4)
Marital status	
Not Married	245(64.5)
Officially married	135(35.5)

A total of 380 participated in this study of perception of esthetics. From this total number of participants, 190 were lay people, 55 were qualified dentists including postgraduate residents and 135 were undergraduate students.

This study included participants from different UAE cities, Abu Dhabi 18 participants (4.7%), Dubai 88 participants (23.2%), Sharjah 90 participants (23.7%) and other cities includes (Ajman, Ras AlKhaima, Um Al Qeween and Fujairah) 184 participants (48.4%).

This study included 152 (40%) male participants and 228 (60%) female participants, There were more single participants (64%) than officially married participants (35.5%).

The mean age was 29 years (SD 7.9).

Table 2 shows the comparison between aesthetic criteria by gender.

The analysis revealed that there was no significant difference between male and female in evaluating the aesthetic smile criteria (P>.005).

Item	Male	Female	P-value	
1-Tooth exposure at rest				
a-More than half shown	82 (39%)	128 (61%)	-	
b-Less than half shown	65 (39.9%)	98 (60.1%)	.227	
c-Lowers visible	5 (71.4%)	2 (28.6%)		
2-Incisal curve vs lower				
lip				
a-Convex	52 (34.9%)	97 (65.1%)		
b-Flat	49 (55.1%)	40 (44.9%)	.009*	
c- Reverse	6 (60%)	4 (40%)		
d-Contacting	15(41.7%)	21 (58.3%)		
e-Not contacting	27 (32.5%)	56 (67.5%)		
f- Covering	3 (23.1%)	10 (76.9%)		
3- Lip line height				
a- Average	66 (45.2%)	80 (54.8 %)		
b-Low	77 (35.3%)	141 (64.7%)	.067	
c-High	9 (56.2%)	7 (43.8%)		
4-Smile width				
a-6-8 teeth visible	29 (34.9%)	54 (65.1%)		
b-10 visible	82 (43.9%)	105 (56.1%)	304	
c- 12-14 visible	41 (37.3%)	69 (62.7%)		
5- Labial corridor				
a- Normal	43 (47.8%)	47 (52.2%)	.224	
b-Wide	69 (37.3%)	116 (62.7%)		
c-Absent	40 (38.1%)	65 (61.9%)	-	
6- Upper inter incisal line				
vsfacial midline				
a- Coincident	83 (43%)	110 (57%)		
b- Deviated to right	46(36.2%)	81 (63.8%)	.460	
c-Deviated to left	23(38.3%)	37(61.7%)		
7-Occlusal plane vs Commissural line				
a-Parallel	54 (36%)	96 (64%)	.352	
b-Slanted to right	76 (41.5%)	107 (58.5%)		
c-Slanted to left	22 (46.8%)	25 (53.2%)		

## Table 2: Comparison of esthetic features by Gender

Item	Dentist &	Lay people	P-value	
	student			
1-Tooth exposure at rest				
a-More than half shown	113 (53.8%)	97 (46.2%)	0.209	
b-Less than half shown	73 (44.8%)	90 (55.2%)		
c-Lowers visible	4 (57.1%)	3 (42.9%)		
2-Incisal curve vs lower				
lip			.680	
a-Convex	74 (49.7%)	75 (50.3%)		
b-Flat	42 (47.2%)	47 (52.8%)		
c-Reverse	3 (30%)	7 (70%)		
d-Contacting	20 (55.6%)	16 (44.4%)		
e-Not contacting	43 (51.8%)	40 (48.2%)		
f- Covering	8 (61.5%)	5 (38.5%)		
3- Lip line height				
a- Average	92 (63%)	54 (37%)	.000*	
b- Low	87 (39.9%)	131(60.1%)		
c- High	11 (68.8%)	5 (31.2%)		
4- Smile width				
a- 6-8 teeth visible	33 (39.8%)	50 (60.2%)	.050*	
b-10 visible	104 (55.6%)	83 (44.4%)		
c-12-14 visible	53 (48.2%)	57 (51.8%)		
5- Labial corridor				
a- Normal	49 (54.4%)	41 (45.6%)	.475	
b- Wide	93 (50.3%)	92 (49.7%)		
c- Absent	48 (45.7%)	57 (54.3%)		
6- Upper inter incisal line				
vs facial midline				
a- Coincident	122 (63.2%)	71 (36.8%)	.000*	
b- Deviated to right	44 (34.6%)	83 (65.4%)		
c-Deviated to left	24 (40%)	36 (60 %)		
7-Occlusal plane vs				
Commissural line				
a-Parallel	84 (56 %)	66 (44%)		
b-Slanted to right	85 (46.4%)	98 (53.6%)	.164	
c-Slanted to left	21 (44.7 %)	26 (55.3 %)		

## Table 3: Comparison of esthetic features by occupation

The results of question 1 regarding " preference for tooth exposure at rest " are shown in table 3. Of 190 lay people 97(46.2%) preferred more than half of the crowns of teeth to show at rest, out of 190 dental students and qualified dentists 113 (53.8%) preferred more than half of the crowns of teeth to show at rest. The majority of the two groups preferred more than half of the crowns of teeth to show at rest and there was no significant difference between the two groups (p > 0.05).

The analysis of responses to Q2 regarding "preference of incisal curve vs lower lip (Table 3) shows that there was no significant difference between the two groups (p > 0.05).

Of 190 dental students and qualified dentists 74 (49.7%) preferred image a, the convex incisal curve in relation to lower lip, and out of 190 lay people 75 (50.3%) preferred the convex incisal curve related to lower lip. Surprisingly the populations liking b and e were similar despites the images having very different appearance.

Table 3 shows the responses for Q 3 on smile line height.

The analysis revealed that there was a significant difference between lay people , qualified dentists and students in terms of preferred height of smile line (P<0.001).

The majority of lay people 60.1% (131subjects out of 190) preferred the low smile line (image 3 b), while the majority of qualified dentists and students 63% (92 subjects out of 190) preferred the average smile line (image 3 a) as shown in table 3.

The analysis of response to Q4 shown in table 3 revealed that there was no significant difference between lay people, qualified dentists and dental students (p > 0.05), the majority of the two groups preferred the smile width with 10 visible teeth (image 4 c).

Of 190 lay people 83 preferred the smile with 10 visible teeth (44.4%). Out of 190 dental students and qualified dentists, 104 preferred the smile with 10 visible teeth (55.6%) in terms of smile line width.

The responses to Q5 regarding " preference for labial corridor" show that there is no significant difference between the two groups in terms of labial corridor (p> 0.05). Most of the subjects from the two groups preferred the wide labial corridor rather than normal or absent .

Regarding the students and qualified dentists, 93 out of 190 (50.3%) preferred the wide labial corridor, likewise the lay people sampled , 92 out of 190 (49.7%) preferred the wide labial corridor rather than normal or absent .

The responses to Q6 regarding " upper inter incisal midline vs facial midline ", show that there was significant difference between the two groups (p < 0.05).

The majority of lay people, 83 out of 190, (65.4%) preferred the upper midline with right deviation in relation to inter incisal line, while the majority of qualified dentists and students 122 out of 190 (63.2%) preferred the upper midline that coincided with inter incisal line as shown in table 3.

Results in table 3 as a response to Q7 regarding " Occlusal plane vs commissural line ", show that there was no significant difference between the two groups (p > 0.05). Most of the subjects from the two groups preferred the parallel occlusal plane in relation to commissural line rather than slanted to right of left.



**Graph (1)** : Comparison of esthetic features by occupation (inter incisal line vs facial midline rated by lay people and dentists )

Item	AD	DXB	SHJ	OTHERS	P-value
1-Tooth exposure at rest					
a-More than half shown	9 (4.3%)	52 (24.8%)	52 (24.8%)	97 (46.2%)	.508
b-Less than half shown	9 (5.5%)	36 (22.1 %)	37 (22.75)	81(49.7%)	
c-Lowers visible	0 (0.0%)	0 (0.0%)	1(14.35)	6 (85.7%)	
Total	18	88	90	184	380
2-Incisal curve vs lower lip					
a-Convex	11 (7.4%)	40 (26.8%)	31 (20.8%)	67 (45%)	
b-Flat	1 (1.1%)	19 (21.3%)	19 (21.3%)	50 (56.2%)	523
c-Reverse	0 (0.0%)	2(20 %)	1 (10%)	7 (70%)	.323
d- Contacting	1 (2.8 %)	6 (16.7%)	11 (30.6%)	18 (50 %)	
e- Not contacting	4 (4.8%)	18 (21.7%)	25 (30.15)	36 (43.4%)	
f- Covering	1 (7.7%)	3 (23.1%)	3(23.15)	6 (46.2%)	
3-Lip line height					
a-Average	8(5.5%)	38 (26%)	43 (29.5%)	57(39%)	11.5
b- Low	10 (4.6%)	45 (20.6%)	44 (20.2%)	119 (54.6%)	.116
c-High	0 (0.05)	5 (31.2%)	3 (18.8%)	8 (50 %)	
4- Smile width					
a- 6-8 teeth visible	3 (3.6%)	17 (20.5%)	21 (25.3%)	42 (50.6%)	100
b-10 visible	5 (2.7%)	47 (25.1%)	50 (26.7%)	85 (45.5%)	.109
c-12-14 visible	10 (9.1%)	24 (21.8%)	19 (17.3%)	57 (51.8%)	
5- Labial corridor					
a- Normal	3 (3.3%)	16 (17.8%)	25(27.8%)	46 (51.1%)	267
b-Wide	11 (5.9 %)	39 (21.1%)	45 (24.3%)	90 (48.6%)	.207
c-Absent	4 (3.8%)	33 (31.4%)	20 (19%)	48 (45.7%)	
6-Upper inter incisal line vs facial midline					
a-Coincident	14 (7.3%)	47 (24.4%)	56 (29%)	76 (39.4%)	+
b-Deviated to right	2 (1.6%)	23 (18.1%)	23 (18.1%)	79 (62.2%)	.002*
c-Deviated to left	2 (3.3%)	18 (30%)	11 (18.3%)	29 (48.3%)	
7-Occlusal plane vs Commissural line					
a-Parallel	9 (6 %)	39 (26%)	38 (25.3%)	64 (42.7%)	
b-Slanted to right	7 (3.8 %)	38 (20.8%)	42 (23%)	96 (52.5%)	.695
c-Slanted to left	2 (4.3%)	11 (23.4%)	10(21.3%)	24 (51.1%)	1

## Table 4: Comparison of esthetic features by city

Table 4 shows the comparison between aesthetic criteria by different UAE cities, which is Abu Dhabi, Dubai, Sharjah and Northern Emirates.

The analysis revealed that there was a significant difference between the four groups, in terms of upper inter incisal line vs midline (P<0.001).

The majority of respondents from Abu Dhabi (7.3%), Dubai (24.4%) and Sharjah (29%) preferred the upper inter incisal line that coincided with the midline, while the majority from other Emirates preferred the inter incisal line that deviated to the right of the facial midline (62.2%).



Graph (2) : Comparison of esthetic features by city

Item	Not married	Officially	P-value	
	married			
1-Tooth exposure at rest				
a-More than half shown	138 (65.7%)	72 (34.3%)	.810	
b-Less than half shown	103 (63.2%)	60 (36.8%)		
c-Lowers visible	4 (57.1%)	3 (42.9%)		
2-Incisal curve vs lower				
lip				
a-Convex	89 (59.7%)	60 (40.3%)	.427	
b-Flat	61 (68.5%)	28 (31.5%)		
c- Reverse	5 (50%)	5 (50%)		
d-Contacting	22 (61.1%)	14 (38.9%)		
e-Not contacting	59 (71.1%)	24 (28.9%)		
f-Covering	9 (69.2%)	4 (30.8%)		
3-Lip line height				
a-Average	102 (69.9%)	44 (30.1%)	.049*	
b-Low	130 (59.6%)	88 (40.4%)		
c- High	13 (81.2%)	3 (18.8%)		
4-Smile width				
a-6-8 teeth visible	51 (61.4%)	32 (38.6%)		
b-10 visible	129 (69%)	58 (31%)	.184	
c-12-14 visible	65 (59.1%)	45 (40.9%)		
5-Labial corridor				
a-Normal	59 (65.6%)	31 (34.4%)		
b-Wide	123 (66.5%)	62(33.5%)	.524	
c-Absent	63 (60%)	42 (40%)		
6- Upper inter incisal line				
vs facial midline				
a-Coincident	134 (69.4%)	59 (30.6%)	.023*	
b-Deviated to right	81 (63.8%)	46 (36.2%)		
c- Deviated to left	30 (50%)	30 (50%)		
7-Occlusal plane vs				
a-Parallel	94 (62.7%)	56 (37,3%)		
b-Slanted to right	124 (67 8%)	59 (32.2%)	.352	
c-Slanted to left	27 (57 4%)	20 (42 6%)		
	27 (37.770)	20 (72.070)		

## Table 5: Comparison of esthetic features by Marital Status

Table 5 shows the comparison between aesthetic criteria by marital status.

The analysis revealed that there was no significant difference between single and officially married in evaluating the aesthetic smile criteria.

Both groups single and officially married preferred a low smile line as shown in table

5.

## 6. DISCUSSION

Several criteria for aesthetic smile and aesthetic treatment planning have been proposed in the literature. These criteria are crucial for facilitating the work of the dentist and dental laboratory technician.

Considerations of lay people and dentals professionals regarding aesthetic and beauty can be a valuable tool in improving the aesthetic value of restorations, increasing patient satisfaction, and reducing complaints.

This cross – sectional study was designed to evaluate the aesthetic smile preferences between lay people and dental professionals in the UAE.

The use of the questionnaire of images with different aesthetic criteria was done because it is a cost and time effective method. However, there were some complications. As expected, the images needed to be explained especially for the lay people and most of the lay people had difficulty in differentiation between the three categories of question 7 (occlusal plane vs commissural line).

The pilot study did not identify this problem as the respondents were recruited from the dental college and had dental knowledge and the lay people were probably better informed. Pilot studies should recruit from the target population. Regarding the age and gender, in this study age was significantly different between the two groups. As the mean age of lay people was 33years, qualified dentists was 30 years and dental students was 23 years. However, age didn't differ by gender.

According to Hulsey<sup>37</sup> the smile line is an important contributing factor in the attractive smile, while Tjan et al <sup>2</sup> has classified the smile line into average, high and low smile line.

According to Yoon et al  $^{18}$ , studies among dentists and laypeople to examine the attractiveness of the smile by investigating the aesthetic criteria of the smile, shows that the most common attractive smile in regards to smile line was the average (56%), followed by high smile (29%) and low smile line (15%).

The current study supported these findings as dental students and qualified dentists preferred the average smile line, except lay people where the majority preferred the low smile line.

According to study done by Yoon et al <sup>18</sup>, among the dentists and lay people to examine the attractiveness of the smile by investigating the aesthetic criteria of the smile, it was found that the most attractive smile in regards to parallelism of the maxillary anterior incisal curve with the lower lip was parallel smile (60%), followed by straight smile (34%) then the reverse smile (5%).

The current study supported these findings, that the majority of qualified dentists, students and lay people preferred the parallel smile.

According to study done by Parekh et al <sup>33</sup> to evaluate the aesthetic acceptability range of computer-generated variations in smile arc and buccal corridor between lay people and orthodontists , the buccal corridor were presented as none, ideal and excessive.

The study showed no significant differences between laypeople and orthodontists on the two variables tested , while orthodontists and lay people both found smiles with excessive buccal corridor to be significantly less acceptable than those with ideal or absent buccal corridor.

Contrary to our expectations, this study shows no significant differences between lay people and dental professionals in terms of buccal corridor, as the two groups preferred the smile with wide buccal corridor rather than normal or absent.

Our study shows significant differences between dental professionals and lay people in terms of upper inter incisal line vs facial midline. The majority of dental students and qualified dentists preferred the upper inter incisal line that coincides with facial midline as expected, while the majority of lay people preferred the upper inter incisal line that deviated to the right of the mid line. This result was not expected but it might be explained by the findings of Kokich et  $al^{14}$ , who found that the lay people were not able to detect deviations up to 4 mm.

The result of our study shows that the Occlusal plane which is parallel to the commissural line is most preferred by both dental professionals and lay people. This was proposed by Goldstein<sup>15</sup> and Dawson<sup>16</sup> is that the occlusal plane should be parallel to the commissural line to maintain natural facial harmony.

In contrast with the findings of Anderson et al <sup>30</sup> and Brisman<sup>27</sup>who found some discrepancies between the preferences of dental professionals and laypeople, our study shows that the majority of aesthetic criteria (occlusal tooth exposure at rest, incisal curve vs the lower lip, smile width, labial corridor and occlusal plane vs the commissural line) have no significant differences between dental professionals and lay people. The smile line and inter incisal line vs the facial midline were the only exceptions to this.

Dental professionals and lay people seem to have similar preferences when evaluating the attractiveness of smiles, this supports the theory that the level of dental- related education has little influence on the perception and judgment of dental aesthetics <sup>40</sup>.

This study shows that there is no cultural –related differences between different UAE cities in all esthetic criteria except the inter incisal line vs facial midline which shows that the people from Abu Dhabi, Dubai and Sharjah preferred the inter incisal line that coincides with the facial midline while people from other cities preferred the inter incisal line that deviated to the right of the midline. Marital status does not affect the esthetic preferences in this study.

A person's ability to recognize a beautiful smile is innate and the perception of attractiveness is an individual preference. This research identified certain variables that people consider in their assessment of the attractive smile.

The importance of potential patient's perception about aesthetic treatment cannot be overemphasized because it is the patients who receive treatment and need to gain satisfaction from improved aesthetics and function.

## 7. CONCLUSION AND RECOMMENDATIONS

Beauty must be studied and evaluated to improve the quality of treatment provided to dental patients.

The opinions and perceptions of lay people and dental professionals regarding beauty and attractiveness of the smile were similar, except two variables, which were smile line and the relation of inter incisal line to the facial mid line.

The majority of lay people and dental professionals preferred more than half the tooth to be shown at rest, an incisal curve which is convex to the lower lip, smile width with ten visible teeth, a wide labial corridor and an Occlusal plane that is parallel to the commissural line. This can be considered as the preferred esthetic smile among the UAE community.

The significant differences between lay people and dental professionals in this study was in smile line height, where the lay people preferred a low smile line and dental professionals preferred an average smile line.

Other significant differences between lay people and dental professionals in this study was regarding the inter incisal line related to the facial midline, which shows that dental professionals preferred inter incisal line to coincide with the midline while lay people preferred the inter incisal line that deviated to the right of the facial midline.

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## 9. APPENDICES AND INDEX

## Appendix list:

I- Ethical approval letter II- Pilot questionnaire

III- Explanatory letter

IV- Final questionnaire

## **I-Ethical approval letter**

Hamdan Bin Mohammed College of Dental Medicine Mohammed Bin Rashid UMHS



كـلـيــة حـمـــدان بــن محـــمــد لـــــطـــــب الـأبيتــــــان جامعة محمد بن راشد للطب والعلوم الصحية

Athanasios E. Athanasiou, D.D.S., M.S.D., Dr. Dent. Acting Dean Professor & Program Director in Orthodontics Hamdan Bin Mohammed College of Dental Medicine

Ref: HBMCDM/EC/2017 Date: June 25, 2015

Dr. Asma Ahmed Al-Shamsi Resident, Prosthodontics Department Hamdan Bin Mohammed College of Dental Medicine PO Box 505097 Dubai Healthcare City Dubai

Title of project: Esthetic Smile Preferences between Laypeople and Dental Professionals in UAE Reference: EC0615-002

Dear Dr. Asma,

Thank you for submission of your proposal for approval to the Ethics Committee.

On behalf of the Committee, I am pleased to confirm a favorable ethical opinion, effective  $7^{th}$  of October 2015, on the basis described in the application form.

The proposal has to be significantly improved in terms of English language.

Yours sincerely,

Professor Athanasios E. Athanasiou Chairman, Research & Ethics Committee

> مانها (1) العدرية الماحدة +91/15 ٤٢٤ ماكس، 3/491/15 حينة، 4/491/15 محيلة حين الطبية، حين الإمارات العدرية الماحدة Phone +971 4 ، 424 8777 | Fax +971 4 ، 424 8686 | P.O. Box 505097, Dubal Healthcare City, Dubal, United Arab Emirates | www.HBMCDM.ac.ae

## **II-Pilot questionnaire**



## (Pilot Study Questionnaire)

Researcher: DR. Asma AlShamsi (Prosthodontic Resident) Supervisor: DR.Moosa Abuzayda (Associate Professor of Prosthodontic Programme)

AGE :( العمر) GENDER (الجنس): -M (نكر) - F (نكر)

PROFESSION :(المهنة) -(DENTAL STUDENT ) (طالب طب اسنان ) year 1 - year 2 - year 3 - year 4 year 5) -DENTAL PROFESSIONAL(طبيب اسنان) - OTHERS (اخرى)

City : (الإمارة) Marital status (الحالة الاجتماعية):

Please choose the preferable smile from your point of view: الرجاء اختيار الابتسامة المفضلة من وجهة نظرك:









1- Did you understand all the questions?

- Yes - No

2- Did you understand the aim of the questions?

- Yes - No

3- Did you have any problem answering any of the questions?

-Yes -No

4- Regarding question (3), if the answer yes, what problem did you have with the questionnaire?

## **III- Explanatory letter**



#### Study Title:

The evaluation of smile design by lay people and dentists in the UAE.

#### The purpose of this study:

-To test the factors that effecting the attractiveness of smile between lay people and dental professionals in UAE which can help in increasing the patient satisfaction.

-To investigate what is the favorable smile pattern among UAE population .

#### **Study investigator:**

DR. Asma Ahmed AlShamsi

Prosthodontic Resident – 3rd year residency in Hamdan Bin Mohamed College of Dental Medicine.

Email: asma.alshamsi@Mbru.ac.ae

Phone : 0507555212

#### **Principle Supervisor:**

**Dr.Moosa Abuzayda:** Associate professor of prosthodontic programme. BDS,Dr.Med Dent, Diplomat, German board of prosthodontic.

Email: moosa.abuzayda@Mbru.ac.ae.

#### Hamdan Bin Mohamed College of Dental Medicine:

A postgraduate school offers residents the three year Master of Science

degree in six specialization (Endodontics, Oral surgery, Orthodontics,

Pediatric dentistry, Periodontology and Prosthodontics)

College website : www.hbmcdm.ac.ae

College location : Dubai Health Care City, District 5, Building 34.

Ground Floor.PO Box: 505097

Email : school@hbmcdm.ac.ae (for academic matters)

info@hbmcdm.ac.ae ( for inquiries about the clinic)

Phone NO: academic office : 009714 4248612

The clinic : (800-336825), (009714 4248777)

## **IV- Final questionnaire**



(Final Research Questionnaire) Researcher: DR. Asma AlShamsi (Prosthodontic Resident) Supervisor: DR.Moosa Abuzayda (Associate Professor of Prosthodontic Programme)

AGE :(العمر) GENDER (الجنس): -M (نكر) - F (نكر)

PROFESSION :(المهنة) -(DENTAL STUDENT ) (طالب طب اسنان ) year 1 - year 2 - year 3 - year 4 year 5) -DENTAL PROFESSIONAL(طبيب اسنان) - OTHERS (اخرى)

City : (الإمارة) Marital status (الحالة الإجتماعية):

Please choose the preferable smile from your point of view: الرجاء اختيار الابتسامة المفضلة من وجهة نظرك:

1 (a) (b) (c)







