RESEARCH ARTICLE

Evaluating the Perceptions of Smile Aesthetics among Dental Students at King Abdul-Aziz University: A cross-Sectional Study

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Abstract:

Background: Individuals seek out cosmetic dentists not so much for improved dental function or overall health but rather to improve the appearance of their teeth and gain more social acceptance. This study aimed to evaluate how dental students at King Abdul-Aziz University (KAU) perceived smiles based on their gender.

Methods: The study included two hundred students with clinical experience from the College of Dentistry, KAU. The data were collected using a three-part validated questionnaire. The first part included socio-demographic items; the second part included two close-ended questions regarding aesthetic characteristics; and the third part consisted of perception to seventeen photos of digitally manipulated smiles to be assessed using a numeric rating scale (NRS), (1, best; 5, worst).

Results: The first facial feature to catch the attention of most students was a smile, which was followed by the eyes. Almost 98% of the participants considered the smile one of the most important features of facial aesthetics. According to Faradeni research, men valued their gingival smile characteristic (p=0.013) and teeth color (p=0.001) substantially higher than women.Conversely, females had higher crucial margin discrepancy (p=0.038) and convex occlusal plane (p>0.001) than males.

Conclusion: When it comes to the gingival smile, teeth color, and the initial facial feature that attracts the eye, women perceive smiles as more aesthetically pleasing than men. Gingival margin discrepancy and convex occlusal plane were more critical in males than females. Understanding smile aesthetics from the perspective of dental students enhances patient care, education, and overall treatment outcomes.

Keywords: Dental student, Aesthetic smile, Perception, Smile characteristics, Dental function, Facial aesthetics.

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1. INTRODUCTION

The term aesthetic refers to a collection of concepts that underpin the work of a specific artist or artistic movement or that are concerned with beauty or the perception of beauty. Aesthetic dentistry is a discipline that focuses on improving the appearance of a person's teeth, gums, and bites [1].

Cosmetic dentistry procedures such as tooth whitening, veneers, and smile makeovers are frequently highlighted on social media sites. This emphasis on cosmetic dentistry has the ability to affect dental students' perceptions and interests, potentially leading to a larger emphasis on aesthetic treatments and an increase in demand for cosmetic dentistry services [2]. Furthermore, the term "Hollywood smile" refers to the cosmetic progression of a person's dental appearance and has now become a dentistry trend. When it comes to improving a smile, no one can deny the importance of the Hollywood smile, which has now become a typical request from patients to their dental healthcare providers. The use of veneers in aesthetic dentistry inspired the creation of this phrase, which is currently used on a regular basis by both patients and dental professionals [3]. According to the meta-analysis Langlois *et al*. analyzed, because they are more likely to have self-confidence, attractive children and adults obtain more positive evaluations and academic performance ratings than their less attractive counterparts [4].

Social media platforms have become popular sites for showing attractive smiles. Dental students who use these platforms may be exposed to a variety of smile aesthetics and trends, which might raise their awareness of smile aesthetics and potentially shape their opinion of what constitutes an ideal smile [5]. Social media has an impact on smile perception that reaches beyond dental students. When seeking dental treatments, patients may be influenced by social media trends and expectations. Dental students should be prepared to communicate with patients in an open and honest manner to assist in managing their expectations and to educate them on realistic outcomes and treatment alternatives. Females are particularly drawn to dental aesthetics and their looks as a result of social media marketing, and their decision-making is heavily influenced by the repeated adverts exhibited on various social media websites. Aside from the gender effect, older adults were shown to be more influenced by celebrity smiles on social media, increasing their need for the "Hollywood smile" [6]. However, several studies have shown that during social engagement, the speaker's mouth and eyes are frequently the focus of attention, implying that the smile is a significant feature of facial appearance that can transmit a wide range of feelings and emotions through the structure and movement of the teeth and lips, and it can also determine how successfully an individual can perform in society [7].

A cross-sectional study found that dental students judge smile aesthetics based on dentolabial, dentogingival, dental, and dental arch characteristics. The study discovered that hypodontia, a gingival smile, a reversed curvature of the occlusal plane, and dental crowding were the most distracting elements of a smile when judging its attractiveness [8]. According to another study, the majority of dentistry students consider the smile as the most essential face aesthetic characteristic. Patients also are becoming increasingly accepting of orthodontic treatments, teeth whitening, veneers, and other aesthetic

dental procedures as part of their personal self-improvement plans as aesthetic dentistry advances [9]. Several aspects have been proposed to help dental practitioners standardise smile assessment. These objective features are identified by the lips that encircle the teeth and the shape of the gums. The extent of gingiva exposure when smiling, the arc of the smile, the proportions of the teeth, the presence of a midline shift and changes in axial inclination, buccal corridors, gingival height and contours, the presence of a diastema, and the colour of the teeth all contribute to the harmony and symmetry of an aesthetic smile [8].

The General Assembly of the Association for Dental Education in Europe and the Dental Education Association in North America have identified core and supporting dental competencies that graduate dental students should possess, including the ability to identify a patient's aesthetic requirements and determine the extent to which those requirements or desires can be met [10]. This study evaluated the aesthetic perception of smiles perceived by King Abdulaziz University (KAU) dental students. This will help identify the weaknesses and strengths of the graduate's perception of the aesthetic smile through aesthetic assessment and management of the patient's aesthetic treatment needs, such as aesthetic analysis, decision-making, and clinical reasoning. These are the competencies that will be assessed at the end of the sixth year of the CCC course, including for males and females. The null hypothesis of our study was that there are no differences between KAU dental students in their perception of smile aesthetics.

2. METHODS

Two hundred local 6th-year undergraduate dental students and interns with clinical experience from the Faculty of Dentistry, KAU, were involved in this cross-sectional study. The study was carried out between September 2020 and June 2021. Using a systematic sampling method, the research sample was selected from the enrollment lists of admitted students for each academic year. They were exposed to smile aesthetics and their elements, resulting in them being knowledgeable and well-informed about aesthetic dentistry.

The study's sample size was determined by considering the need to achieve sufficient statistical power to detect the difference in smile perception. A total of 200 individuals, both male and female, were sought after. Taking into consideration the variance in people's perceptions, the sample size calculation secured a 5%margin of error and a 95% confidence level.

The research is based on surveys limited only to KAU students, which includesixth-year students and interns. A normal smile was photographed and modified using photoshop, and the student's evaluation was based on the original smile and the modified smiles.

The study was reviewed and approved by the ethical approval committee at KAU, Faculty of Dentistry, Jeddah, Saudi Arabia (Ethical approval number:4254862). The first

section of the questionnaire asked about socio-demographic data, gender, and the year of study; the second section featured two closed-ended questions about aesthetic traits, the first of which was what was the first face feature to strike your eye? And there was a drop-down box to select an answer. The second was a yes or no question, asking if they thought the smile was one of the most essential cosmetic aspects of the face. The final section elicits responses from the 17 photographs of smiles representing Fradeani's standards, which will be evaluated using a numeric rating scale (NRS) (1 wonderful aesthetic, 5 bad aesthetic) (Fig. **1**). For clarification, ten dental students were utilised to pretest the analysis. According to the pilot's findings, the cut-off value for a smile that was no longer aesthetically appropriate was set at an NRS score of ≥3.5

To generate smile pictures for the survey, a photo was taken of a random individual with smile characteristics similar to normal, and many photos were taken of the patient to capture a natural smile. Informed consent was acquired before photos were utilised and digitally manipulated for research purposes. A colored photograph smile picture was taken with a digital camera (Canon EOS 800D) in the frontal aspect of the anterior teeth, including the underlying gingival tissues, and lips of acceptable

quality were chosen for the questionnaire (Fig. **2**). The image was digitally edited to purposefully disrupt this ideal smile by utilising image processing software (Adobe Systems, San Jose, California, USA) to create a collection of 17 photographs that evaluate the 17 aesthetic smile elements (Fig. **3**). According to Fradeani diagnostic criteria, the image was cropped to reduce distraction and any confounding variables that could alter the perception of a smile, with only one dentolabial, dentogingival, dental, or dental arch smiling characteristic represented (Table **1**).

2.1. Statistical Analysis

The statistical analysis was performed using the IBM SPSS Statistics version 20 programme (IBM Corp., Armonk, NY, USA). Descriptive statistics were used: mean and standard deviation (SD) for frequency and percentage for variables for each group in each test. The Mann-Whitney test was used to compare two groups in non-related samples, such as sociodemographic data (*e.g.*, gender and years of study) and dependent outcome variables (NRS score for pictures). The data were examined for normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Data showed a non-parametric (not-normal) distribution. P-values less than 0.05 were considered significant.

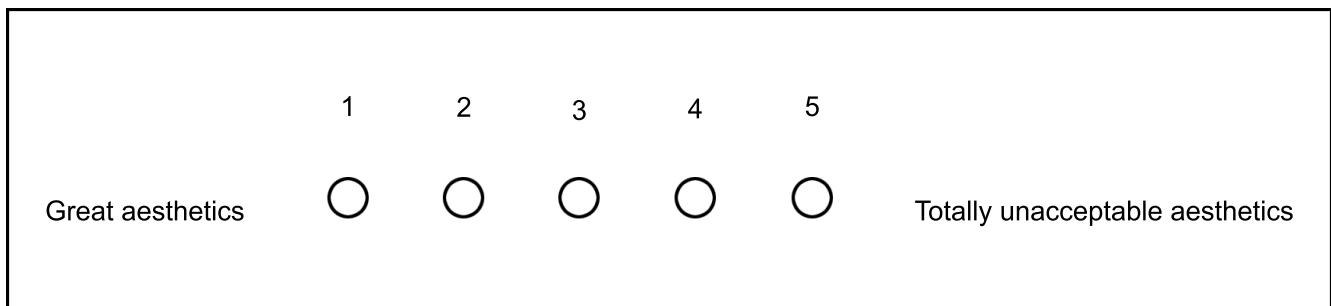**Fig. (1).** Numeric rating scale (NRS) used for smile scoring (1 wonderful aesthetic, 5 bad aesthetic). Available online under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/) [8].

Fig. (2). Example of the picture representing the feature of in the frontal aspect of the anterior teeth, including the underlying gingival tissues, and lips of acceptable quality.

Fig. (3). Collection of photographs that evaluate the 17 aesthetic smile elements based on Fradeani diagnostic criteria.

Table 1. Fradeani diagnostic criteria with 17 aesthetic smile elements [11].

Gingival Smile	The amount of gingival tissue that is displayed above the maxillary central incisors while smiling.
Maxillary midline discrepancy	The position of the maxillary dental midline, in relation to the midline of the face, is defined by the center of the philtrum.
Buccal corridor fill	The amount of dark space displayed between the buccal surfaces of the posterior teeth and the corners of the mouth.
Gingival margin discrepancy	The variation in the vertical height of the gingival zenith of the central incisor to the lateral incisor.
Hygiene	Bad oral hygiene (plaque). Plaque is a yellow sticky layer that can be seen at the gingival margins of teeth.
Gum recession	Root exposure of the teeth is caused by a loss of the margin of the gum tissue that surrounds the teeth.
Diastema	Space is created between the upper incisors.
Dental crowding	The dental arch space is less than the space needed to occupy the teeth. Crowding can be classified into three categories: mild (2 - 3 mm), moderate (4 - 6 mm), severe (7- 10 mm) and extreme (>10 mm).
Protrusion of anterior teeth	Increased horizontal overlap anteroposteriorly (overjet). The normal horizontal overlap of the incisors is 2-3 mm.
Incisor midline discrepancy	The relationship between the maxillary and mandibular central embrasures.
Hypodontia	A congenital condition that has fewer teeth than the normal number.
Anterior teeth color	The teeth have abnormal color, hue or translucency, external discoloration, or Internal discoloration.
Golden proportion	A ratio of the frontal side of teeth crown width and height. According to the golden proportion, the relationship between the upper central, lateral incisors and the canine should be as follows:1,62:1:0,62.
Occlusal cant	The difference of the occlusal plane from the horizontal axis, as seen while smiling. By definition, the idealistic is considered to be 0° for this variable.
Convex occlusal plane	Relationship between the curvature of the upper anterior teeth of the incisal edges and the curvature of the upper border of the lower lip. As a rule, the incisal plane, while observed from the frontal side, has a convex curve that follows the natural concavity of the lower lip while smiling.
Flat occlusal plane	The relationship between the curvature of the incisal edges of the upper anterior teeth and the curvature of the upper border of the lower lip is not equivalent to flat maxillary incisal curvature to the upper border of the lower lip.
Reversed curvature of the occlusal plane	The relationship between the curvature of the incisal edges of the upper anterior teeth and the curvature of the upper border of the lower lip is not equivalent to reverse maxillary incisal curvature to the upper border of the lower lip.

Table 2. Comparison of the most important aesthetic features between males and females.

Measurement	Gender		N	%	p-value
First facial feature to catch your eyes' attention	Male	Eyes	24	28.2%	0.772
		Teeth/Smile	56	65.9%	
		Eyebrows	3	3.5%	
		Nose	2	2.4%	
	Female	Eyes	34	28.3%	
		Teeth/Smile	82	68.3%	
		Eyebrows	3	2.5%	
		Nose	1	0.8%	
Most important facial aesthetic features	Male	Yes	81	95.3%	0.170
		No	4	4.7%	
	Female	Yes	120	100%	
		No	0	0%	

Table 3. Comparison of fradeani diagnostic criteria between males and females.

Measurement	-	Mean	S.D	p-value
Gingival smile	Female	3.93	0.82	0.013*
	Male	4.18	0.97	
Maxillary midline shift	Female	2.93	0.96	0.651
	Male	2.87	1.27	
Buccal corridor	Female	3.03	0.98	0.986
	Male	3.04	1.05	
Gingival margin discrepancy	Female	4.38	0.76	0.038*
	Male	4.14	0.86	
Hygiene	Female	4.84	0.39	0.300
	Male	4.72	0.68	
Gum recession	Female	4.74	0.51	0.665
	Male	4.61	0.86	
Diastema	Female	3.97	0.95	0.329
	Male	3.82	0.98	
Dental crowding	Female	4.58	0.69	0.116
	Male	4.39	0.86	
Protrusion of anterior teeth	Female	4.23	0.91	0.242
	Male	4.07	0.97	
Incisor midline shift	Female	3.08	1.11	0.653
	Male	3.19	1.34	
Hypodontia	Female	4.88	0.39	0.050
	Male	4.73	0.71	
Teeth color	Female	3.69	0.99	0.001*
	Male	4.11	1.06	
Golden proportion	Female	3.44	0.98	0.364
	Male	3.31	1.2	
Occlusal cant	Female	3.55	1.06	0.646
	Male	3.48	1.15	
Convex occlusal plane	Female	2.82	1.12	<0.001**
	Male	2.08	1.14	
Flat occlusal plane	Female	4.06	0.85	0.841
	Male	4.05	0.99	
Reverse occlusal plane	Female	4.53	0.61	0.299
	Male	4.31	0.95	

3. RESULTS

A total of two hundred out of three hundred dental students agreed to participate in the study by filling out the survey, with eighty-five men (42.1%), one hundred and twenty women (59.4%), eighty-one sixth-year dental students (40.1%), and one hundred and twenty-one intern dental students (59.9%). The majority of respondents considered the smile to be the most essential facial aesthetic feature, followed by the eyes, brows, and nose, with no statistically significant variation in response based on gender. Although it wasn't significant, eighty-two of the females concentrated on a person's teeth while communicating more than males (p= 0.772) (Table 2). In relation between males and females in assessing the seventeen photographs, the average NRS scores ranged from 2.08 (SD 1.14) to 4.88 (SD 0.39); the worst smile feature ranked by female was hypodontia n=4.88 (SD 0.39), and the male reported 4.73 (SD 0.7), which is ranked as the worst and followed by the hygiene and gum recession respectively (Table 3). The gingival smile feature was ranked significantly higher (p=0.013) by males, n=4.18 (SD 0.82), compared to females, n=3.93 (SD 0.97). Teeth color was also ranked more significantly by males compared to females (p= 0.001). On the other hand, margin discrepancy with p=0.038 and convex occlusal plane with p>0.001 were more critical in females than males (Table 3).

4. DISCUSSION

Dental aesthetics are thought to have an impact on a person's work, marriage, and personal characteristics, such as athleticism, popularity, and leadership abilities. A number of things can impact a smile's beauty, and it evokes a sense of enjoyment. These social expectations begin in childhood and last throughout one's lifetime [11]. Poor oral aesthetics have been linked to low self-esteem and are thought to have negative social, scholastic, and vocational consequences [12]. Younger generations lay a higher focus on all aspects of their appearance, and the worth of a beautiful smile is unavoidable. The current study aimed to assess dental student's perception of aesthetic judgment of the smile in KAU.

Based on the results of this study, there was no statistically significant variation between genders when evaluating the first facial feature to catch your eyes' attention and the most important aesthetic features. Several studies confirmed that women are more concerned about their appearance than men. Moreover, female patients were more critical when judging smile aesthetics than male patients [8, 13, 14]. In our study, 68.3% of the females agreed that the smile is always the first feature that catches their eyes' attention. Armalaite et al. reported that 98.3% of respondents thought that the smile is one of the most appealing features of the face [8]. According to Abidia et al., the majority of female students (89.4%) believe that their teeth determine their face beauty; almost one-third (30.8%) reported attempting to conceal their smile; and nearly half (51%) were dissatisfied with the color of their teeth. Furthermore,

almost two-thirds (61.5%) reported that their dental appearance had a negative impact on their quality of life [15].

In light of the literature, it is claimed that the variation in dentofacial esthetic perception between genders is highly dependent on culture. Despite this, females were likely to score numerically higher toward the attractive aesthetic smile than males towards gingival margin discrepancy and convex occlusal plane. In contrast, gingival smiles and tooth color were more essential in males than in females. Previous studies have shown that tooth color is an important component in smile attractiveness. There were no statistically significant differences between males and females [15-17].

In agreement with the results of this study, Omar et al., which evaluated the aesthetic perception of dental and pharmacy students, reported that darker teeth shades were least accepted by both dental and pharmacy students [17]. In contrast, Grosofsky et al. reported that altered shade of teeth did not influence smile attractiveness [18].

The gingival smile was found to be a significant element rated as unattractive among our participants, with males being more critical than females. In agreement with our findings, a study conducted by Mokhtar et al. also revealed that there was a statistically significant difference between males and females, where males were more critical than females. On the other hand, the gingival smile was accepted by a large number of people with no dental background, which suggested that treatment planning for obtaining a harmonious smile does not dictate correcting all variations from the aesthetic norms [19]. Furthermore, results of studies conducted by Ousehal et al. and Penzan-Vercelino et al. agreed that dental professionals were more critical than people of non-dental background when evaluating gummy smiles [20, 21].

Moreover, a study conducted in Iran revealed that gummy smiles, alterations in the "golden proportion", and crowding of teeth were perceived as unaesthetic, in agreement with the study in hand. However, the same study found that the reverse occlusal plane curvature was not clearly detectable among people with a non-dental background [21].

CONCLUSION

Female perception was higher than male regarding the first facial feature that catch the eyes' attention that was followed by eyes. Regarding faradani criteria, gingival smiles and teeth color were more critical in females than males. Gingival margin discrepancy and convex occlusal plane were more vital in males than females. Accordingly, gender may influence the choice of the final aesthetic treatment. When it comes to aesthetics, it is preferable to take many consultations and different opinions before making the final decision. These insights can guide practitioners in creating more aesthetically pleasing outcomes for their patients.

AUTHORS' CONTRIBUTIONS

It is hereby acknowledged that all authors have

accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

LIST OF ABBREVIATIONS

NRS	=	Numeric Rating Scale
SD	=	Standard Deviation

ETHICS APPROVAL AND CONSENT TO PARTI-CIPATE

The study was reviewed and approved by the ethical approval committee at KAU, Faculty of Dentistry, Jeddah, Saudi Arabia (Ethical approval number:4254862).

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from the participants.

STANDARDS OF REPORTING

STROBE and SAGER guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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