RESEARCH ARTICLE

A Study to Evaluate the Role of Macro-, Micro-, and Miniesthetics in an Attractive Smile

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Abstract

Aim: The aim of the study is to evaluate the influence of macro-, micro-, and miniesthetics in an attractive smile.

Materials and methods: The smile photographs of around 214 dental students were taken of age group 18–25 years with natural dentition with specific inclusion and exclusion criteria. Frontal photographs were taken with a Nikon DSLR 200 105 mm macro lens ratio 1:1 F/2.8 digital camera. The study was carried out in two stages: stage 1—the photographs were analyzed for beautiful smiles. Those photographs which had a mean score of 60 and above and small standard deviation (3.45) were selected. Out of 214 photographs, 33 photographs were selected for attractive smiles. Stage 2—in the second part of the study different parameters of macro-, micro-, and miniesthetics that influence attractive smile were evaluated. The data obtained were subjected to statistical analysis.

Results: Facial form contributes more in an attractive smile compared with the remaining factors for macroesthetics In factors influencing microesthetics ideally tooth shade plays major role compared with other factors. Crowding ideally plays significant role compared with the remaining factors for miniesthetics.

Conclusion: In restorative dentistry, all factors are to be included during the treatment to enhance the esthetic appearance of the patient thereby improving the smile.

Keywords: Attractive smile, Esthetics, Macroesthetics, Microesthetics, Miniesthetics.

International Journal of Prosthodontics and Restorative Dentistry (2019): 10.5005/jp-journals-10019-1251

Introduction

Smile is a curve that sets everything straight—Phyllis Diller. Facial attractiveness is defined more by the smile. Smile is a very important positive social behavior for human beings. An attractive smile clearly enhances the acceptance of the individual in our society by improving the initial impression and interpersonal relationship.[1] It has been found that the eyes and the mouth were the most important factors in a hierarchy of characteristics for determining facial beauty.[2] Studies have shown that infant's mood and responses to the environment can be influenced by parent's smiles. Also, recent research with functional magnetic resonance imaging technology suggests that adults actually respond neurologically to an attractive and happy face as if it were a reward stimulus. So no wonder, smile is attributed as the universal language.[3] Esthetics have become increasingly important in the practice of modern dentistry and synonymous with a natural harmonious appearance.[1]

Increasing number of patients are seeking dental treatment for the need of esthetics that is to look attractive.[4]

Esthetic smile requires a perfect integration of facial composition and dental composition. An individual's dentofacial appearance influences social attraction and relationships.[5–7] Facial composition includes the hard and soft tissues of the face. Dental composition is more specific to teeth and their relationship with gingival tissues.[8]

Attractive faces generally follow the facial third proportionality concept. They tend to have common proportion and relationship that generally differ from normative values. More attractive faces display optimal balance when they present in proportions.[7]

The principles involved in making "pretty smiles" have come to be known within the profession as the discipline of smile design. Smile design theory can be broken down into: facial esthetics, gingival esthetics, macroesthetics, microesthetics, and miniesthetics. Macroesthetics involve the elements that make teeth actually look like teeth. The anatomy of natural anterior teeth is specific for each tooth and that tooth's location in the dental arch. It represents the principles that apply when groupings of individual teeth are considered. The relationship between those teeth and the surrounding soft tissue and the patient's facial characteristics creates a dynamic and three-dimensional canvas.[9] Microesthetics includes fine structures of dental and gingival esthetics. Mini esthetics is the correlation of lips, teeth, and gums at rest and in smile position. It can be appreciated at a visual microesthetic distance of less than 2 feet or within normal make-up distance.[10]

Achieving a successful, healthy, and functional result requires an understanding of the interrelationship among all the supporting oral structures, including muscles, bones, joints, gingival tissues, and occlusion.[11]

The purpose of this study is to evaluate the role of macro-, micro-, and miniesthetics in an attractive smile.

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MATERIALS AND METHODS

A total of 214 frontal photographs of dental students were taken between the age group of 18–25 years with natural dentition.

Exclusion Criteria

Students who have

- Undergone orthodontic treatment
- Prosthetic rehabilitation
- Congenitally missing teeth
- Fractured teeth

Data Collection

The approval to use human subjects was obtained from the governing body of Rajiv Gandhi University of Health Sciences, Karnataka. Informed consent of individual subject was obtained. The subjects were induced to a spontaneous maximum open smile (smile displaying teeth). Frontal photograph of middle and lower third of the face was taken with a Nikon DSLR 200 105 mm macro lens ratio 1:1 F/2.8 digital camera. Lighting and staging were kept constant for all the photographs. Digital management of the photographs was undertaken using Adobe Photoshop CS (version 8.0, 2003 Adobe) along with visual examination. All photographs were scanned and saved in personal computer using image measurement program (Adobe Photoshop).

The study was carried out in the following two stages:

Stage 1—the photographs were analyzed for beautiful smiles. Those photographs which had a mean score of 60 and above and small standard deviation (3.45) were selected. Out of the 214 photographs, 33 photographs were selected for attractive smiles.

Stage 2—in the second part of the study different parameters of macro- (Table 1), micro- (Table 2), and miniesthetics (Table 3) that influence attractive smile were evaluated (Figs 1 to 10).

Table 1: Macroesthetics

Parameters	Grade I	Grade II	Grade III
Facial form[12,13] a simple way of describing the face	Mesoprosopic—average or normal	Leptoprosopic—long and narrow	Euryprosopic—broad and short
Facial proportions[11]	All are equal	Two proportions are equal	All are not equal
• Vertical proportion—ideal face is divided sagittally into five equal parts			
• Horizontal proportion—a well-proportioned face is divided into three equal thirds using horizontal planes	Width of five eyes	Two to four proportions are equal	All are unequal
Facial and dental midline[9] between the maxillary centrals should be coincidental with the facial midline	Coinciding	Shifted to right or left	Deviation more than 10 mm
Lip fullness[14] thickness of the lips	Mild—some red lip shows with no lower lip pout	Moderate—moderate red lip shows with slight lower lip pout	Marked—significant red lip shows with lower and upper lip pouts

Table 2: Microesthetics

Parameters	Grade I	Grade II	Grade III
Gingival height of contour[3]	Ideal—gingival margins of maxillary centrals and canines are at the same level with lateral 1.5 mm incisal	All are at the same level	Cannot be assessed
Tooth shade[3] color of the tooth	Central incisors are brightest	Lateral incisors are brightest	Canines are brightest
Embrassure[15] triangular spaces incisal and gingival to the contact area	Normal—interdental papilla is between contact point (CP) and interproximal CEJ (IC)	Class 1—interdental papilla is above CP	Class 2—interdental papilla is blunt and above IC

Table 3: Miniesthetics

| Parameters	Grade I	Grade II	Grade III
Incisal display[3] of maxillary incisors during smile	Average[16] 75–100%	Low <75%	High 100% with a band of gingiva
Smile arc[3] relationship of curvature of incisal edges of maxillary anterior with curvature of lower lip	Parallel—consonant	Straight—flat	Reverse
Smile symmetry[11] regularity of arrangement of forms or objects	Radiation symmetry—from midline to either side like mirror image	Horizontal symmetry—from left to right side of smile	–
Buccal corridor[12] distance between the maxillary posterior teeth and inside of the cheek	Ideal[17] (16%)	Minimum (8%)	Maximum (22%)
Crowding[12] discrepancy between tooth and jaw size	No crowding	Mild	Moderate
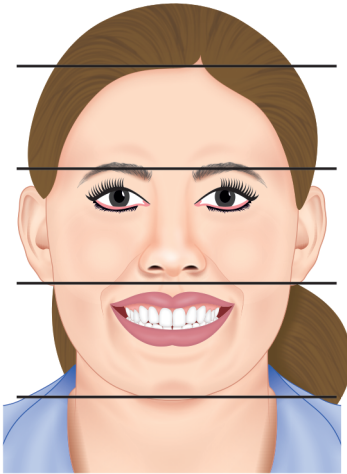
Fig. 1: Vertical facial proportion
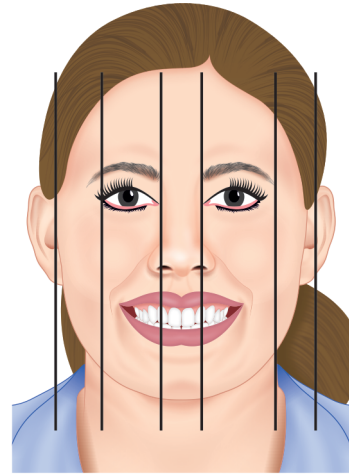

Fig. 2: Horizontal facial proportion

Fig. 3: Mild lip fullness

Fig. 4: Moderate lip fullness
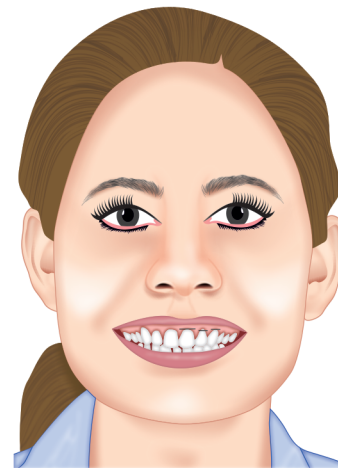

Fig. 5: Marked lip fullness

Fig. 6: Ideal gingival height of contour

Certain scoring criteria were followed to analyze attractive smile as follows:

Grade I—ideal/normal, grade II—average, and grade III—below average.

RESULTS

Out of the 214 frontal photographs, 33 were selected for attractive smile.

Ideal factors influencing macroesthetics are presented in Figure 11: 69.6% had ideal facial form, 54.5% had ideal facial and dental midline, 39.3% had ideal vertical proportion, 27.2% had ideal lip fullness, and 24.2% had ideal horizontal proportion.

Average factors influencing macroesthetics are presented in Figure 12: 75.7% had average horizontal proportion, 51.5% had

Fig. 7: Average incisal display

Fig. 8: Low incisal display

Fig. 9: High incisal display

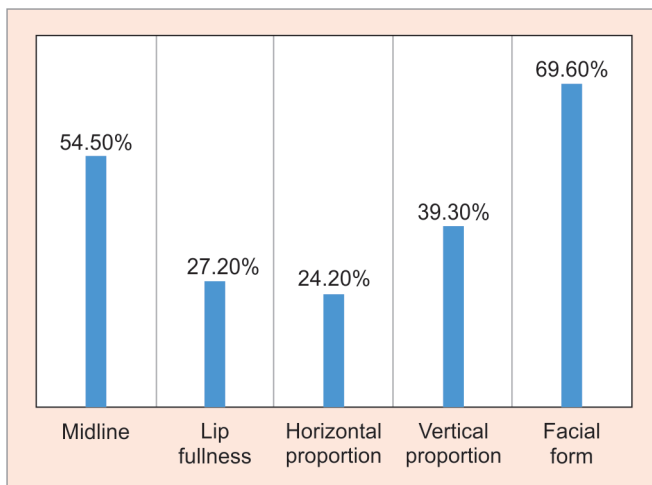**Fig. 10:** Parallel smile arc/smile curve

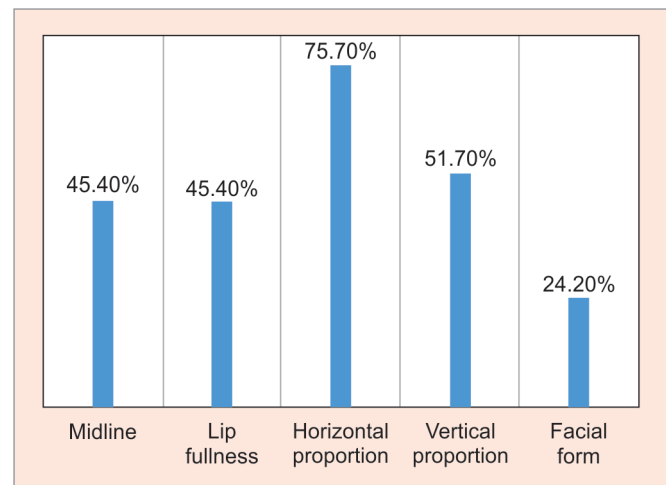**Fig. 11:** Ideal factors influencing macroesthetics

Fig. 12: Average factors influencing macroesthetics

average vertical proportion, 45.4% had average facial and dental midline, 45.4% had average lip fullness, and 24.2% had average facial form.

Below average factors influencing macroesthetics are presented in Figure 13: 27.2% had below average lip fullness, 9% had below average vertical proportion, 6% had below average facial form, 0% had below average horizontal proportion, and 0% had below average facial and dental midline.

Ideal factors influencing microesthetics are presented in Figure 14: 93.9% had ideal tooth shade, 42.4% had ideal gingival height of contour, and 3% had ideal embrasures.

Average factors influencing microesthetics are presented in Figure 15: 96% had average embrasures, 6% had average tooth shade, and 0% had average gingival height of contour.

Below average factors influencing microesthetics are presented in Figure 16: 57.7% had below average gingival height of contour,
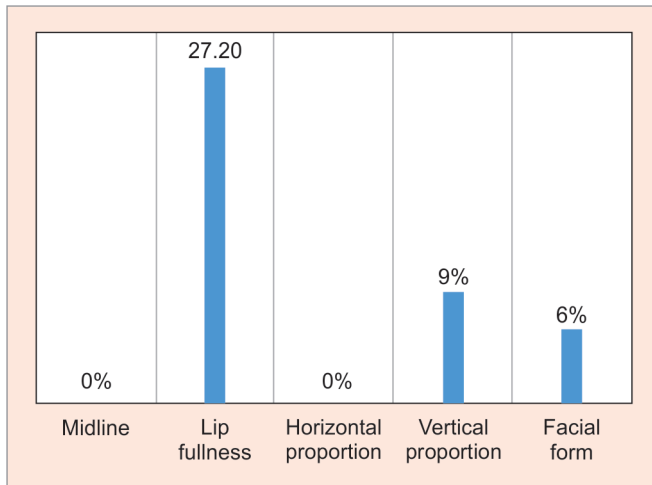
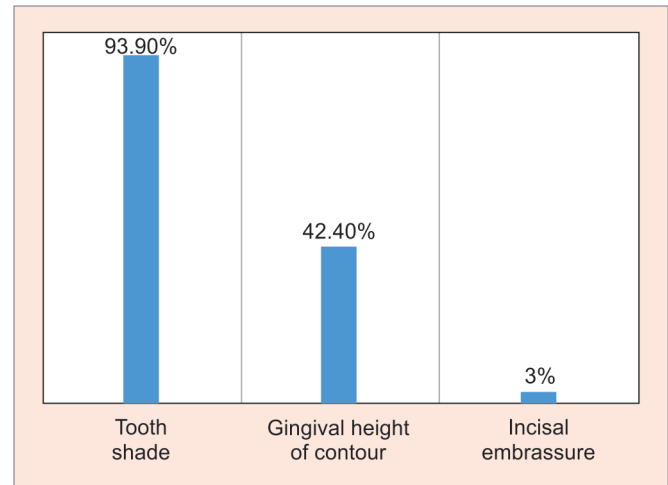**Fig. 13:** Below average factors influencing macroesthetics

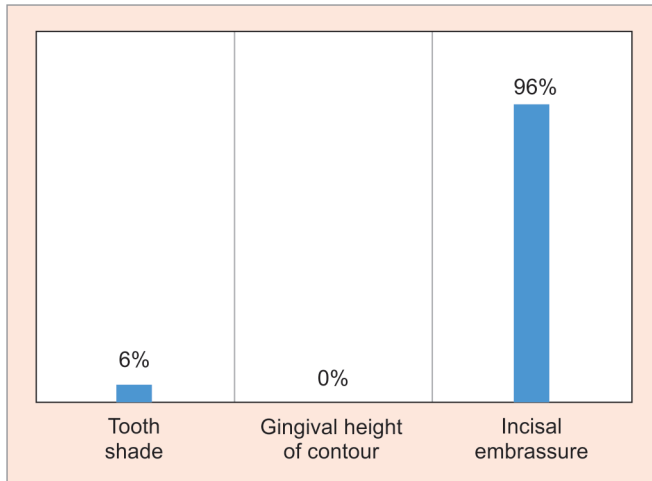**Fig. 14:** Ideal factors influencing microesthetics

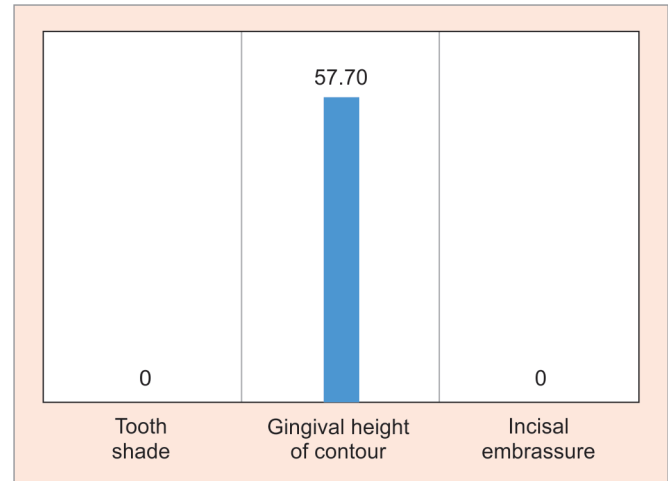**Fig. 15:** Average factors influencing microesthetics

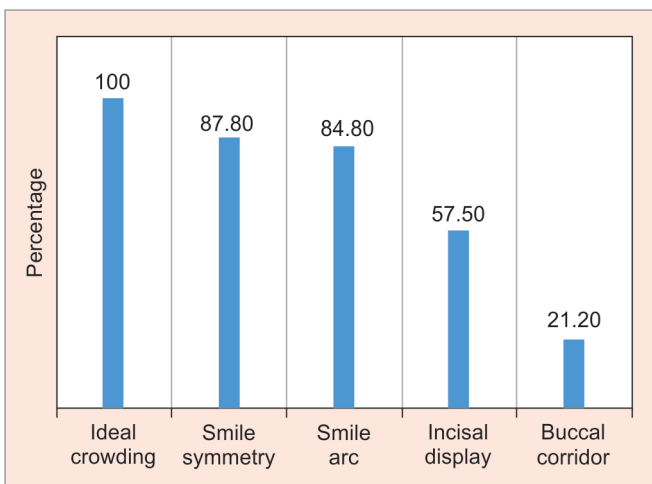**Fig. 16:** Below average factors influencing microesthetics

Fig. 17: Ideal factors influencing miniesthetics
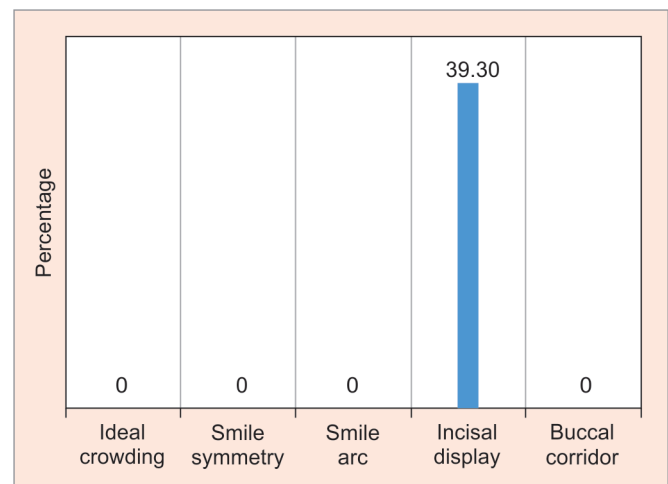
Fig. 18: Average factors influencing miniesthetics

0% had below average tooth shade, and 0% had below average embrasures.

Ideal factors influencing miniesthetics are presented in Figure 17: 100% had ideal crowding, 87.8% had ideal smile symmetry, 84.8% had ideal smile arc, 57.5% had ideal incisal display, and 21.2% had ideal buccal corridors.

Average factors influencing miniesthetics are presented in Figure 18: 78.7% had average buccal corridors, 15.1% had average

Fig. 19: Below average influencing miniesthetics

smile arc, 12.1% had average smile symmetry, 3% had average incisal display, and 0% had average crowding.
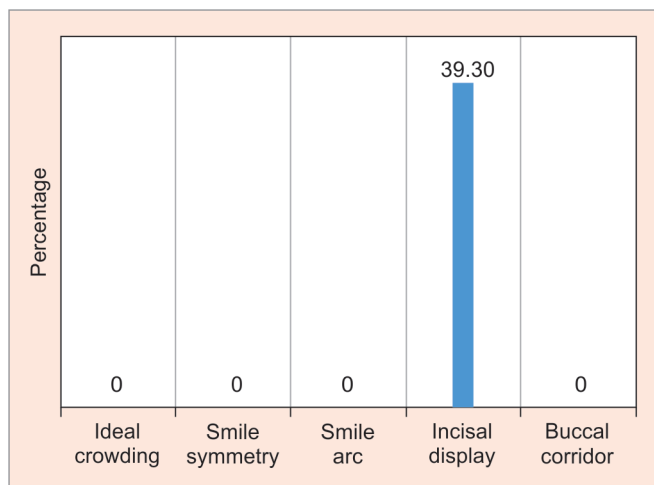
Below average influencing miniesthetics are presented in Figure 19: 39.3% had below average incisal average, 0% had below average smile arc, 0% had below average smile symmetry, 0% had below average buccal corridors, and 0% had below average crowding.

DISCUSSION

Esthetic dentistry can only be achieved if dentists understand the form, texture, and color of natural teeth and how the teeth relate to other facial structure. Basic knowledge of the esthetic aspects of natural dentition may contribute in a simple, yet efficient manner toward reducing difficulties in dentist vs patient relationship with regard to the patient's smile and esthetic appearance and psychosocial integration.[4]

In 1996, Mack stated that the lower 1/3rd of face significantly influences facial appearance. In this study, it was found that 51.5% of the students had got average score of vertical proportion, i.e., two of the proportions are equal which was more influencing and it contradicts with Mack's statement.[18] According to Server's study done in 1993, the face is divided sagittally into five equal parts from helix of one ear to the other ear. Width of face is equal to width of five eyes. We found that 75.7% of the students had got an average score of horizontal proportion, i.e., any 2–4 proportions are equal which does not show correlation with Server's study.[19] In this study, we observed that 54.5% of the students had got an ideal score for facial and dental midline, which corresponds with the study conducted by Frush and Fisher in 1958, who found that to attain optimal esthetics, facial and dental midline must coincide with maxillary and mandibular central incisor midline.[20] In 2015, Werschler et al. followed the Allergen lip fullness scale and stated that thin lips are not ideal for a smile. In this study, 45.4% of the students had moderate lip fullness which relates to Werschler et al.'s study.[14] Seixas et al. in 2012 stated that gingival contours must coincide with cementoenamel junction (CEJ), i.e., central incisors and canines are at the same level but apical to margins of lateral incisors. In this study, 57.5% of student's gingival height of contour could not be assessed.[21] In 2006, Naini et al. stated that tooth shade changes from midline posteriorly, i.e., central incisors and premolars are the brightest than lateral incisors with canines being the least bright. We found that 93.9% of the students had

got ideal score for tooth shade which is in accordance with Naini et al.'s study.[22] Gingival embrasures are triangular spaces which are incisal and gingival to the contact area which are also called as black triangles. In 2005, Sabri stated that short interdental papillae leave an open gingival embrasure above the contact point which gives unesthetic appearance. This study shows that 96.6% of the students had gingival embrasures above interdental contact point which contradicts Sabri's study. However, in adults they arise due to the loss of gingival tissue but when crowded and rotated maxillary incisors are corrected orthodontically, contact area moves incisally and black triangles may appear.[23] Zachrisson in 1998 found that average smile, i.e., 75–100% of upper incisor display gives a more youthful look which matches with this study showing 57.5% of the students having an ideal score of incisal display.[24] In 1997, Goldstein's study found that relationship of curvature of incisal edges of maxillary anteriors with curvature of lower lip should be parallel. In this study, 84.8% of sample size had parallel or consonant smile arc which is in accordance with Goldstein's study.[25] Symmetry is the harmonious arrangement of several elements with respect to each other. Symmetrical length and width are more crucial for the centrals. It becomes less absolute as we move further away from the midline. Balance is observed as the eyes move distally from the midline, so that both the right and left sides of the smile are well balanced. About 87.8% of the students had got ideal score of smile symmetry, i.e., radiation symmetry (like a mirror image) which is in agreement with the article by Bhuvaneswaran in 2010.[11] In 1970, Husley[26] demonstrated that there is no relationship between buccal corridor and esthetics. But we observed that buccal corridor influences esthetics which does not link with Husley's study. Morgolis (1997),[27] Dong et al., and Morley stated that smile with more posterior teeth visibility is more pleasant than less posterior teeth and more buccal corridor visibility. In this study, 78.7% of the students had got average score for buccal corridor which synchronizes with Morgolis, Dong et al., and Morley's study.[9,28,29] In 2016, Heravi et al. concluded that dental attractiveness can be predicted by upper anterior crowding. In this study, 100% of the students had got ideal score, i.e., no crowding is highly esthetic which concurs with Heravi's study.[30]

Factors influencing macro-, micro-, and miniesthetics in a large sample can be evaluated in both attractive and nonattractive smiles. The cumulative visual impact of the smile cannot be associated exclusively with the beauty of individual teeth. Therefore, the smile analysis must be assessed in association with the face to define esthetic rehabilitation of the smile.[1]

An attractive smile usually shows symmetry and proportion among teeth, gingiva, and lips. Amendment of dental esthetic inconsistencies desires cautious evaluation, planning, and multidisciplinary approach.[31] Thus, parameters of macroesthetics of natural dentition combined with micro- and miniesthetics influence attractive smile.[9]

CONCLUSION

Within the limitations of the study it was concluded that:

- In factors influencing macroesthetics, ideally facial form contributes more in an attractive smile compared with the remaining factors.
- In factors influencing microesthetics ideally tooth shade plays major role compared with other factors.
- In factors influencing miniesthetics ideally crowding plays significant role compared with the remaining factors.

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