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RESEARCH ARTICLE

EVALUATION OF SMILE AESTHETICS IN CENTRAL INDIAN POPULATION - A CROSS SECTIONAL STUDY

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ABSTRACT

Aim: To evaluate the smile aesthetics in central Indian population.

Materials and Methods: Static photographs of posed smiles were taken in natural head position, with camera lens perpendicular to the occlusal plane. The following smile parameters were quantified using Adobe Photoshop ruler software:

- Maxillary incisor exposure (mm)
- Smile index (SI) (mm)
- Smile arc
- Most posterior maxillary tooth visible
- Anterior height of the smile (%)
- Posterior height of the smile (%)

Statistical Analysis: The data obtained through questionnaire was synchronized and analyzed statistically. The software used in the analysis was SPSS 17.0 version.

Conclusion: The dentist's knowledge of the smile aesthetics among a particular population is essential while restoring a patient's intraoral harmony so as to achieve functional and aesthetic balance.

Clinical significance: The knowledge of particular parameters are important for comprehensive diagnosis treatment planning and execution for the same in the given population.

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INTRODUCTION

Smile is defined as facial expression characterized by upward curving of the corners of the mouth.[i]Although dental experts are subjected to the same natural patterns and media viewpoints, instructive encounters may predispose a clinician's esthetic inclination far from those of the general public.[ii] Clinicians are committed to comprehend excellence, amicability, function, and extent as seen by public opinion when arranging treatment. [iii]Dentofacial appeal is especially vital to a person's psychosocial well-being.[iv] Smiling is a standout amongst the most critical facial expressions and known as a nonverbal parameter of correspondence, communicating joy.[v]

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Furthermore, an appealing smile is portrayed as a paramount apparatus to impact individuals. Overviews have checked that smiling individuals are trusted more than non smiling ones.[vi] Existing proof has additionally uncovered that facial allure, in which an alluring smile assumes a significant part, impacts voting and choices, work recruitments and other social interactions[(6–10)]. Smiles are classified as stages I and II.[vii] Stage I smile is a posed (social) smile, while stage II is an unposed (enjoyment) smile[viii]. the social smile, or the smile typically used as a greeting, is a voluntary, unstrained, static facial expression.[ix] The lips part due to moderate muscular contraction of the lip elevator muscles, and the teeth and sometimes the gingival scaffold are displayed. The enjoyment smile, elicited by laughter or great pleasure, is involuntary. It results from maximal contraction of the upper and lower lip elevator and depressor muscles, respectively. This causes full expansion of the lips, with maximum anterior tooth display and

gingival show[x]. The social smile is repeatable photographically in comparison with the other smile. Most studies refer to the posed smile as it is reproducible and can be used as a reference position[xi]. During clinical examination emphasis is placed on the display zone of smile, which is determined by lip thickness, intercommissural width, interlabial gap, smile index (SI), and gingival architecture. Inclusion of smiling photographs, with the usual frontal and lateral photographs makes it possible to observe patients in a much more natural attitude. Although various scientific studies examined smile esthetics using static photographs to determine relationships and proportion.[xii]Few studies have been reported in the Indian population.

MATERIALS AND METHODS

Static photographs with posed smile in natural position (NHP) were taken. All photographs were taken in a similar environment and lighting conditions using Cannon DSLR camera, which was mounted on a tripod stand at a fixed distance of 20 inches. Focal length of 38 mm was set. The lens was positioned parallel to the true perpendicular of the face in NHP, and the camera was raised to the level of patient's lower facial third. The patient was asked to say "cheese" and then smile. The photographs were then transferred to computer software (Adobe Photoshop 14.0.1) and were cropped with vertical (tip of the nose and soft-tissue pogonion and perpendicular drawn from the zygomatic prominence) limits. All images were then adjusted to a standardized image size. Measurement between two points (subnasale to submenton) was considered representative to check magnification error. This was then compared with clinical measurements and was found to have a statistically significant correlation. The Adobe Photoshop ruler software was used to obtain measurements for this study.

The following parameters were recorded:

- **Maxillary incisor exposure:** Vertical display of the maxillary central incisors was measured in mm. The Adobe Photoshop ruler software was used to measure MIE
- **Smile index:** Inter-commissural width on smiling with the ruler tool in Adobe Photoshop a horizontal line was drawn from the corner of the lips on one side to the same point on the contra lateral side. The distance between the two points was measured. Inter-labial gap on smiling — the distance in mm between the upper and lower lips at midline. The Adobe Photoshop ruler software was used to measure distance between the upper and lower lips.
- **Smile arc:** The smile arc was recorded as parallel(when the incisal edges of the maxillary anterior teeth followed the curvature of the lower lip),flat (when the incisal edges of the maxillary anterior teeth had no curvature relative the lower lip line), or reverse (when the incisal edges of the maxillary anterior teeth had a reverse curve relative the lower lip line
- **Most posterior maxillary tooth visible:** It was recorded as either as canine, first premolar, second premolar, or first molar. In the case of a discrepancy between the two sides, the most posterior tooth was entered
- **Anterior height of the smile:** It was recorded as either high smile (a contiguous band of gingiva above the maxillary central incisor), average smile (showing 75% to 100% of the maxillary central incisors), high smile (showing <75% of the maxillary central incisors)
- **Posterior height of the smile:** It was recorded as either high smile (a contiguous band of gingiva above the maxillary first premolar), average smile (showing 75% to 100% of the maxillary first premolar), high smile (showing <75% of the maxillary first premolar visible).

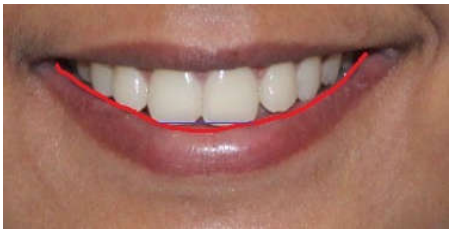
Patient Inclusion Criteria

- Patients aged about 18-25 with pleasing smile.
- Angle's class I molar relationship with complete permanent dentition up to the second molars.

Patient Exclusion Criteria: History of orthodontic treatment, maxillofacial surgery, restoration/ prosthetic crowns in the anterior teeth, or periodontal treatment (except for routine scaling and polishing).

Method of photograph

Maxillary incisor exposure



Smile arc

Smile index

Most posterior teeth visible

Anterior height of smile

Posterior height of smile

Statistical analysis

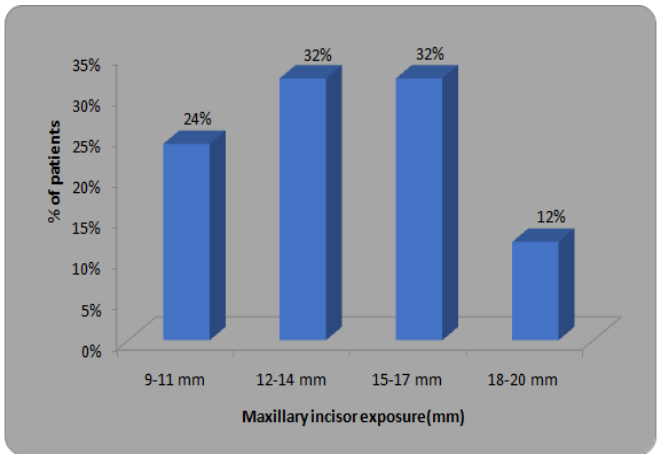
Statistical analysis was done by using descriptive and inferential statistics using chi-square test and software used in the analysis was Graph Pad Prism 6.0 version and $p<0.05$ is considered as level of significance.

Observations and Results

Table 1. Distribution of patients according to maxillary incisor exposure(mm)

Maxillary incisor exposure(mm)	No of patients	Percentage (%)
9-11 mm	12	24
12-14 mm	16	32
15-17 mm	16	32
18-20 mm	6	12
Total	50	100
Mean±SD	14.10 ± 3.00(9-20 mm)	
χ2-value	14.29,p-value=0.0025,S	

Mean maxillary incisor exposure was 9-11 in 24% of the patients, 12-14 mm and 15-17 mm in each 32% of the patients and 18-20 mm in 12% of the patients and the distribution is found to be statistically significant (χ2-value=14.29,p-value=0.0025,S). Mean maxillary incisor exposure was 14.10 ± 3.00(9-20 mm).

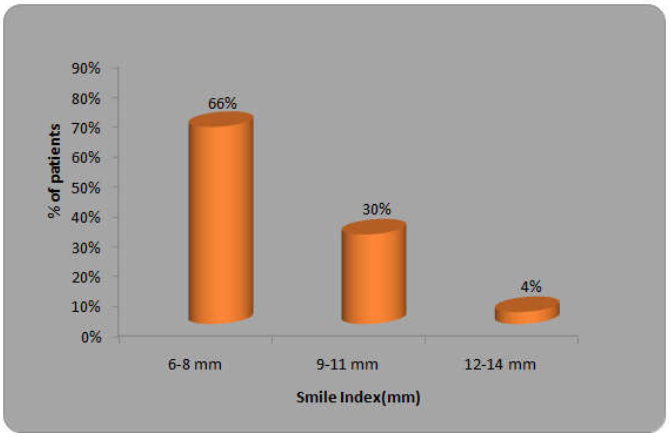


Graph 1. Distribution of patients according to maxillary incisor exposure (mm)

Table 2. Distribution of patients according to smile index (mm)

Smile Index (mm)	No of patients	Percentage (%)
6-8 mm	33	66
9-11 mm	15	30
12-14 mm	2	4
Total	50	100
Mean± SD	8.06 ± 1.66(6.20-13.70 mm)	
χ2-value	34.90,p-value=0.0001,S	

Mean smile index of patients was 6-8 mm in 66% of patients, 9-11 mm in 30% of patients and 12-14 mm in 4% of patients and the distribution is found to be statistically significant (χ2-value=34.9, p-value=0.0001,S). Mean smile index of the patients was 8.06± 1.66(6.20-13.70 mm).

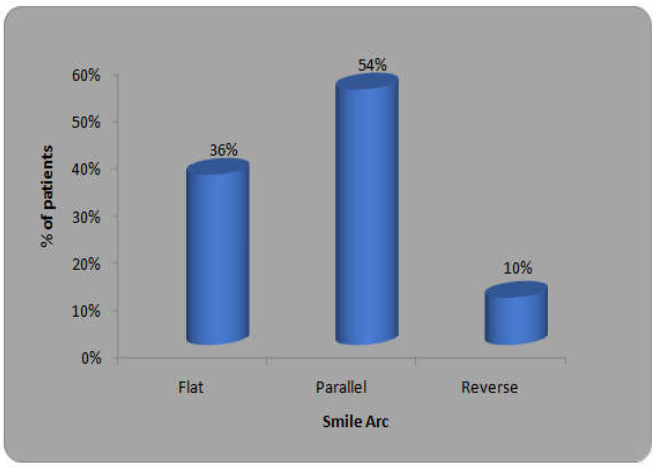


Graph 2. Distribution of patients according to smile index (mm)

Table 3. Distribution of patients according to smile arc

Smile Arc	No of patients	Percentage (%)
Flat	18	36
Parallel	27	54
Reverse	5	10
Total	50	100
χ2-value	44.04,p-value=0.0001,S	

Mean smile arc of the patients was flat in 36%, parallel in 54%, reverse in 10% and the distribution was found to be statistically significant (χ2-value=44.04,p-value=0.0001,S)

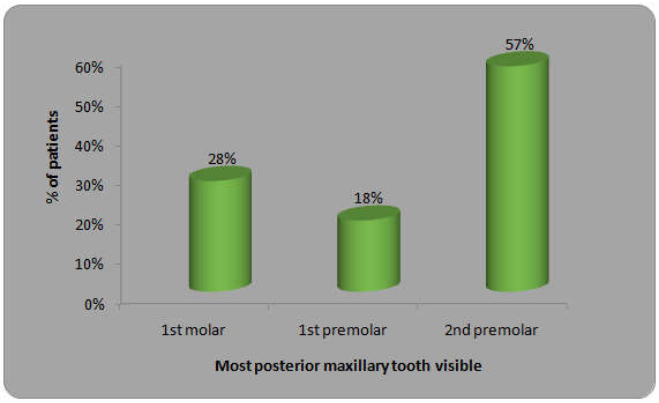


Graph 3. Distribution of patients according to smile arc

Most posterior maxillary tooth visible for 28% of patients was 1st molar, for 18% of patients was 1st premolar, and for rest 57% of patients was 2nd premolar and the distribution was found statistically significant (χ2-value=39.04,p-value=0.0001,S).

Table 4. Distribution of patients according to Most posterior maxillary tooth visible

Most posterior maxillary tooth visible	No of patients	Percentage (%)
1st molar	14	28
1st premolar	9	18
2nd premolar	27	57
Total	50	100
χ2-value	39.04,p-value=0.0001,S	

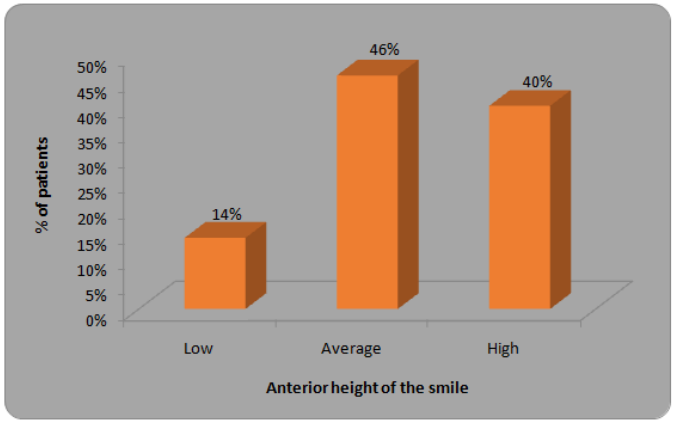


Graph 4. Distribution of patients according to Most posterior maxillary tooth visible

Table 5. Distribution of patients according to height of the smile in anterior region

Anterior height of the smile	No of patients	Percentage (%)
Low	7	14
Average	23	46
High	20	40
Total	50	100
χ2-value	26.04,p-value=0.0001,S	

Mean anterior height of smile was low for 14% of patients, average for 46% of patients, and high for 40% of patients and the distribution was found statistically significant (χ2-value=26.04, p-value=0.0001,S).

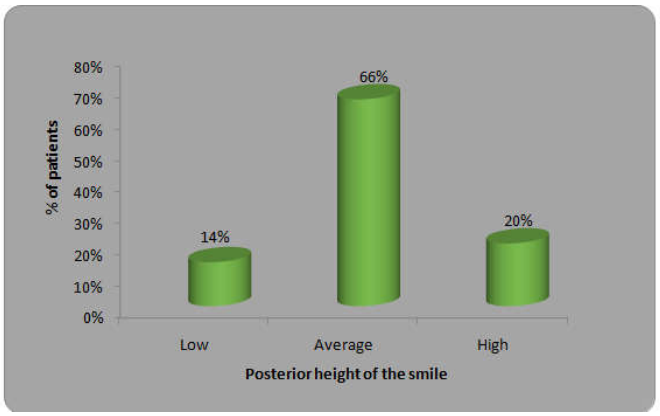


Graph 5. Distribution of patients according to height of the smile in the posterior region

Table 6. Distribution of patients according to height of the smile in posterior region

Posterior height of the smile	No of patients	Percentage(%)
Low	7	14
Average	33	66
High	10	20
Total	50	100
χ2-value	72.84,p-value=0.0001,S	

Mean posterior height of smile was low for 14% of patients, average for 66% of patients, and high for 20% of patients and the distribution was found statistically significant (χ2-value=72.84,p-value=0.0001,S).



Graph 6. Distribution of patients according to height of the smile in posterior region

RESULTS

- Average maxillary incisor exposure was 14.29 mm. (Table 1)
- Average smile index was 8.06 mm (Table 2).
- Smile arc: 36% of the cases had flat smile arc, 54% of the cases had parallel smile arc, 10% of the cases reverse smile arc (GRAPH 3).
- Most posterior maxillary tooth visible: For 28% of the cases, it was the 1st molarcases, 18% it was the 1st premolar, and for the remaining57% it was the 2nd premolar (Graph 4).
- Anterior height of smile: For 14% of the cases, it was low. For 46% of the cases, it was average and forremaining40% of the cases it was high (Graph 5).
- Posterior height of smile: For 14% of the cases, it was low, for 66% of the cases, it was average. And for the remaining 20% of the cases, it was high (Graph 6).

DISCUSSION

Maxillary incisor exposure (mm): According to Balani R *etal*, it was 7.97 mm, which is close to the study.[xiii]

Smile index (SI) (mm): According to Balani R et al it was 8.08 mm, which is close to the study.[xiv]

Smile arc: According to Balani R et al the smile arc was parallel for 45% of the cases, it was flat for 46%, and reverse for 9% of the cases[xv]. The results are similar to the study. According to Tjan AH, parallel smile arc was the most common. Ideally, the incisal crest, when observed from the front, has a convex curve that follows the natural concavity of the lower lip during smiling.[xvi]The study revealed that the most common smile arc is the Convex Smile. 42.8% of the population was found to have convex smile arc. The least common being concave with only 25% of the population showing a concave smile arc. 32.2% of the population had straight smile[xvii].

Most posterior maxillary tooth visible: According to Balani R *et al*, it was second premolar for 58% of the cases and first premolar for 42% of the cases[xviii]. Second premolar was also

seen in 51% of the cases in a study by Maulik C (2007)[xix] and in 57% of the cases in a study by Dong JK (Dong, 1999). In this study, first premolar was more commonly seen than the first molar.

Anterior height of the smile (%): *According to Balani et al*, it was average for 64% of the cases (close to our study), low for 30% of the cases and high for 6%[xx]. According to Tjan survey, 10.57% of the cases were classified as having a high smile, 68.94% as having an average smile and 20.48% as having a low smile. This observation is close to our study which is 14% for low, 46% for average, and 40% for low.

Posterior height of the smile (%): *According to balani et al*, it was average for 47% of the cases, low for44% of thecases and high for 9% of the cases. study, high posterior height of smile was most common[xxi], which is similar to a study done by Maulik C cases that had high posterior height of smile. Dong et al reported that an attractive smile had the overall cervico-incisal length of the maxillary anterior teeth shown between the upper and lower lips, an upward curved or straight smile with a parallel smile arc to the lower lip,and displayed up to the first molar.[xxii] There is scientific evidence that a certain smile line/tooth arrangement is the most common parameter among a given population which can be applied for treatment planning underline the importance of the smile line when restoring a patient's intraoral harmony. The above mentioned parameters can be apllied to any individual of a given population by any clinician. Therefore clinician should aim for parameters for an esthetic and functional balance.

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