

**Evaluation of Smile arc attractiveness using Smile Curvature Guide with different angulation by Lay person , Dentist and Prosthodontists.**

<sup>1</sup>Dr. Mohammad Wasimuddin .M., <sup>2</sup>Dr. Ajay Mootha, <sup>3</sup>Dr. Surojit Dutta , <sup>4</sup>Dr.Anjusha Pillewar

**Corresponding Author:** Dr. Mohammad Wasimuddin .M., PG Student, YCMM & RDF's Dental College, Ahmednagar.

**Type of Publication:** Original Research Paper

**Conflicts of Interest:** Nil

**Abstract**

**Purpose:** Purpose of this study is to evaluate the Smile arc angulation attractiveness using Smile Curvature Guide with different angulation by Lay person , Dentist , and Prosthodontists .

**Materials & Methods:** Ideal sample was selected utilizing inclusion and exclusion criteria. Photographs were taken in upright position and occlusal plane parallel to the floor. Each photograph was edited with different smile curvatures as 0°, 5°, 10°,15°,20° . Photographs were divided into five categories and evaluation was done using visual analog scale to assess the smile attractiveness. Evaluators were asked to rate each image as 0 , 25 , 50, 75 and 100 , where 0 would represent 'hardly attractive' and 100 represent 'very attractive'. Results obtained were analyzed using two way ANOVA test. The final angulation obtained was then used to fabricate the Smile arc curvature guide.

**Results:** All 3 groups of evaluators 30 each (Prosthodontist, Dentists and Lay person) could distinguish variations of smile arc curvature. Statistically significant differences were seen among 3 groups of evaluators. 5° and 10° smile arc curvature was found to be more esthetically acceptable when compared to 0°, 15° and 20°

**Conclusion:** The smile arc angulation influences smile attractiveness. Within the limitations of the study, it was

concluded that smile arc angulation of 5° and 10° is the esthetic characteristic preferred by all groups of evaluators within the varying degrees of angulated smile arc.

**Keywords:** Esthetic smile, smile arc curvature guide.

**Introduction**

Beautiful confident smile has a positive impact on the psychosocial well-being of patients. Spacing present in the anterior region, missing teeth due to trauma, makes a patient feel unsatisfied with their smile. Over the years, a number of innovative techniques have been described in the field of esthetics. There are various proportion to design smile like Golden Proportion, Recurrent Esthetic Dental Proportion, Golden Percentage etc. However, these proportions have not considered the smile curvature angle which also plays a major role<sup>1</sup>.

**Materials and Methodology**

A front view photograph (Fig.1) of a participant with her consent is taken.



Fig.1:Frontal view of subject

The parent photograph in which smile arc was then modified to different angulation i.e 0°,5°,10°,15° and 20° with the help of Photoshop CS 8.0

Fig.2: Smile arc angulations given to images



Set of 5 different smile arch curvature with varying angulation of smile arch curvatures .

These set of images were all together printed on a photo paper as shown above.

A validated Questionnaire was designed to which this photo print was attached and distributed among 3 groups of evaluators. The questions asked for 5 photographs were the same as follows;

1. Can you note the difference between the images?
2. Which image do you like the most?
3. Which image do you like the least?
4. Rate each image individually as 0,25,50,75,100.

**Statistical Analysis**

A total of 90 evaluators (30 Prosthodontists, 30 Dentists and 30 Layperson) actively participated in this study and attempted the questionnaire.They had no difficulty in appreciating difference between the images and the facial types.

The data was then collected on the basis of scores given to each image and analysed using Chi square test.

**Results**

Comparison of frequencies of degrees within the evaluators

**Table 1: Prosthodontist**

Score	Degree					Total	Chi-square value	p value of chi square test
	0 Degree	5 Degree	10 Degree	15 Degree	20 Degree			
Prosthodontists 0	10	2	0	1	17	30	54.00	0.000**
25	3	7	7	10	3	30		
50	8	4	9	7	2	30		
75	4	9	6	8	3	30		
100	5	8	8	4	5	30		
Total	30	30	30	30	30	150		

Above results concluded that prosthodontists gave highest scores . 75 & 100 for 5° & 10° smile curvature while lowest scores 0 for 0° & 20° smile curvature.

**Table 2: Dentists**

Score	Degree					Total	Chi-square value	p value of chi square test
	0 Degree	5 Degree	10 Degree	15 Degree	20 Degree			
DENTIST 0	7	2	1	2	18	30	68.333	0.000**
25	10	4	5	8	3	30		
50	8	10	4	7	1	30		
75	2	10	7	9	2	30		
100	3	4	13	4	6	30		
Total	30	30	30	30	30	150		

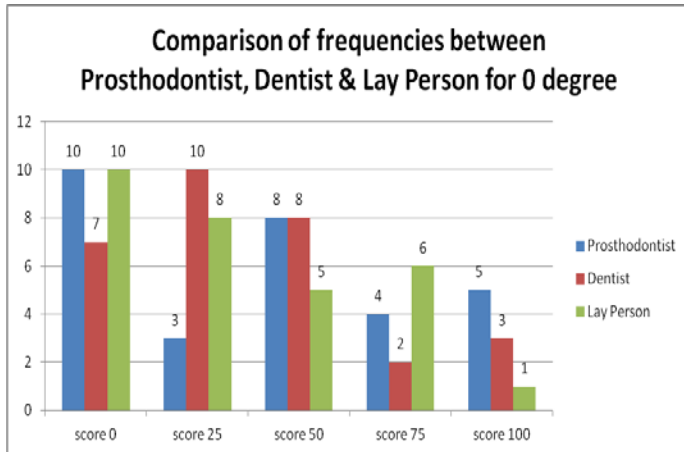
Above results concluded that Dentists gave highest scores i.e.; 100 for 10° while lowest scores i.e.; 0 for 20 degree.

**Lay Person \* degree**

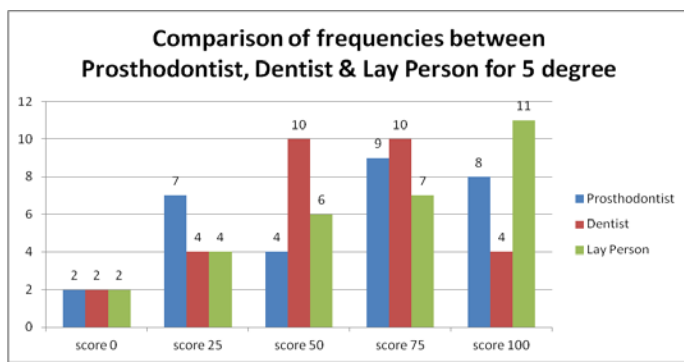
score	Degree					Total	Chi-square value	p value of chi square test
	0 Degree	5 Degree	10 Degree	15 Degree	20 Degree			
LAYPERSON 0	10	2	1	5	18	31	38.513	0.001**
25	8	4	5	9	3	29		
50	5	6	6	9	4	30		
75	6	7	8	4	5	30		
100	1	11	10	3	5	30		
Total	30	30	30	30	30	150		

Above results concluded that layperson gave highest scores i.e.; 100 for 5° & 10° while lowest score i.e.; 0 for 0° & 20°

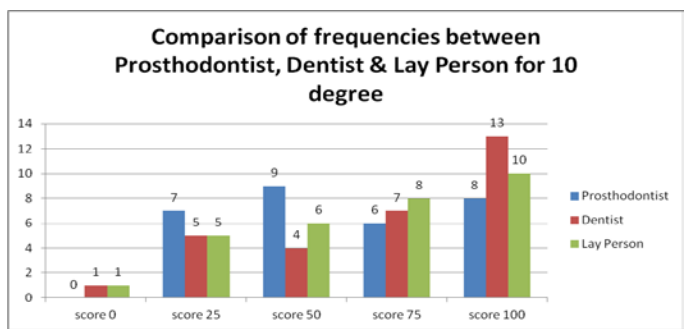
Graph 1



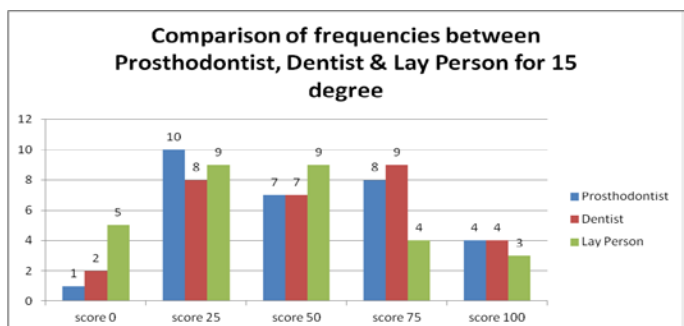
Graph 2



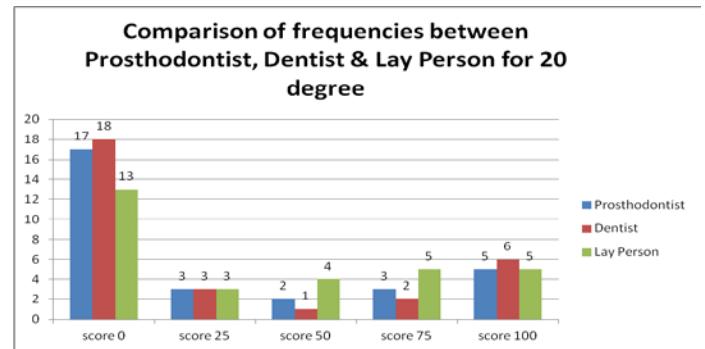
Graph 3



Graph 4



Graph 5



### 0 Degree curvature

10 Prosthodontists, 7 Dentists and 10 Layperson gave the lowest score i.e 0 for 0 degree of smile arc curvature.

### 5 Degree curvature

9 Prosthodontists, 10 dentists and 7 Layperson gave the second highest score i.e ; 75 to 5°.

8 prosthodontists, 4 dentists and 11 layperson gave the highest score i.e; 100 to 5°.

### 10 Degree curvature

8 Prosthodontists, 13 Dentists and 10 Layperson gave highest score i.e; 100 to 10°.

6 prosthodontists, 7 dentists and 8 lay person gave the second highest score i.e ; 75 to 10°.

### 15 Degree curvature

10 Prosthodontists, 8 Dentists and 9 Layperson found 15° least attractive and gave a score of 25.

7 prosthodontists, 7 dentists and 9 layperson gave a score of 50.

### 20 Degree curvature

17 Prosthodontists, 18 Dentists and 13 Layperson gave the lowest score i.e 0 to this degree .

### Discussion

The “art of the smile” lies in the clinician’s ability to recognize the positive elements of beauty in each patient and then create a strategy to enhance the attributes that fall outside the parameters of the prevailing esthetic concept. There are various parameters to analyze the smile like

Golden proportion , Recurrent Esthetic Dental proportion , Golden percentage<sup>1</sup>.

There are eight component of smile i) Lip line ii) Smile Arc iii) Upper lip curvature iv) lateral negative space v) Smile symmetry vi) Frontal occlusion plane vii) Dental component viii) Gingival component . Golden proportion , RED proportion , Golden percentage are based on visibility , height and width of crown ,but there is less information regarding the smile arc and its values which can help us to design the smile more precisely<sup>2</sup> .

The term smile arc has a number of definitions depending on whether one is reading literature from prosthodontics, orthodontics, or cosmetic dentistry. In his cosmetic dentistry text, Goldstein describes the “older smile,” in which the incisal edges appear straight across the smile, and contrasts it with the “youthful smile” in which the front teeth are longer and create a line that comes slightly downward in the middle of the smile, traveling superiorly to the corners<sup>3,4</sup>.

Frush and Fisher proposed that there should be harmony between the curvature of the incisal edges of the maxillary anterior teeth and the curvature of the upper border of the lower lip; this is referred to as the smile arc<sup>5-11</sup>.

The smile arc is defined as the relationship of the curvature of the incisal edges of the maxillary incisors and canines to the curvature of the lower lip in the posed smile<sup>12</sup>. The ideal smile arc has the maxillary incisal edge curvature parallel to the curvature of the lower lip<sup>1,3</sup>. In an esthetic smile, the volume of the gingiva from the apical aspect of the free gingival margin to the tip of the papilla is about 40-50% of the length of the maxillary anterior tooth and fully fills the gingival embrasure<sup>13-14</sup>. Reverse smile arc occurs when the centrals are shorter than the canines along the incisal plane which can be due to occlusal malfunction or loss of vertical dimension .Parallel

and straight smiles provide better esthetic than reverse smile<sup>15</sup>.

A characteristic of the esthetic smile that has not been as well recognized is the relationship of the curvature of the maxillary anterior teeth (smile arc) in the esthetic smile<sup>1</sup>. In this in vivo short study it was planned to evaluate the smile arch angulation attractiveness using smile curvature guide with different angulation by lay person, dentist, Prosthodontist.

In this study a front photograph is taken of the participant with her consent .The photograph is then modified with different angulation of smile arc i.e 0°,5°,10°,15°,20°with the help of Photoshop . The modified photograph is then given to evaluators for evaluation.

With the obtained statistical data, there were three angulations of smile arc which were esthetically accepted by all three groups of evaluators were 5°, 10°, 15°. These angulations were incorporated in prefabricated clear acrylic number plate and were designed with the help of industrial cutting laser machine and a smile arc guide is prepared.



Fig .3: Smile Arc Curvature Guide 5°,10°,15°

David M. Sarver et al(2003) presented a study on Dynamic smile visualization and quantification . In this study they have concluded that the key element in evaluation is the direct measurement of lip–tooth relationships both dynamically and in repose .Author concluded that Visualization and quantification of the dynamics of the smile is based on the clinical examination in which they measure the lip tooth relationship both dynamic and in repose and also they use the digital photos ,videos and radiographs and plaster study cast to accurately record the dynamic and static attribute of smile<sup>1</sup>.

Roy Sabri et al (2005) presented article on the eight components of a balanced smile which are i) Lip line ii) Smile arc iii) Upper lip curvature iv) Lateral negative space v) Smile symmetry vi) Occlusal frontal plane vii) Dental components viii) Gingival component . Author concluded that an optimal smile is characterized by an upper lip that reaches the gingival margins, with an upward or straight curvature between the philtrum and commissures; an upper incisal line coincident with the border of the lower lip; minimal or no lateral negative space; a commissural line and occlusal frontal plane parallel to the pupillary line; and harmoniously integrated dental and gingival components<sup>2</sup>.

Edward Philips (1999) presented article on classification of smile patterns. In this article author has provided different classification of smile pattern and stages of smile and concluded that the smile classification scheme and vocabulary presented in this article will aid in discussions between patient and dentist regarding esthetic treatment<sup>8</sup>.

Miller, C.J (1989) presented article on the smile line as a guide to anterior esthetics where author explained the role of smile line in smile design. Author concluded that smile line plays important role in anterior aesthetics<sup>9</sup> .

Nicholas C. Davis (2007) presented article on smile design .In this study author concentrated on smile zone shapes which are i) Straight ii) Curved iii) Ellipse iv) Bow v) Rectangular vi) Inverted . In this article ,there is no description about the role of smile arc angulation in smile design<sup>13</sup>.

All the studies done prior emphasized on various parameters such as lip-tooth relationship , smile line , smile zone etc. to access the esthetics of patient . In this study, smile arc angulation shows a valuable contribution in designing anterior esthetics and smile arc curvature guide can be used as measuring tool for smile arc angulation.

### **Conclusion**

The smile arc angulation influences smile attractiveness. Within the limitations of the study it was concluded that smile arc angulation of 5°-10° is the esthetic characteristic preferred by all groups of evaluators in 0, 5,10,15,20 degree angulated smile arc. Till date no any smile arc angulation studies have been done. This study can be proposed as normal values for future reference.

### **References**

1. Sarver DM, Ackerman MB. Dynamic smile visualization and quantification: part 1. Evolution of the concept and dynamic records for smile capture. American journal of orthodontics and dentofacial orthopedics. 2003 Jul 1;124(1):4-12.
2. Sabri R. The eight components of a balanced smile. J Clin Orthod. 2005 Mar;39(3):155-67.
3. Sarver DM. The importance of incisor positioning in the esthetic smile: the smile arc. American Journal of Orthodontics and Dentofacial Orthopedics. 2001 Aug 1;120(2):98-111.
4. Goldstein RE. Change your smile: discover how a new smile can transform your life. Quintessence Pub.; 2009.

5. Frush JP, Fisher RD. The dynesthetic interpretation of the dentogenic concept. *Journal of Prosthetic Dentistry*. 1958 Jul 1;8(4):558-81.
6. Balani R, Jain U, Kallury A, Singh G. Evaluation of smile esthetics in central India. *APOS Trends Orthod*. 2014 Nov 1;4(6):162-8.
7. Dong JK, Jin TH, Cho HW, Oh SC. The esthetics of the smile: a review of some recent studies. *International Journal of Prosthodontics*. 1999 Jan 1;12(1).
8. Patterns IS. The classification of smile patterns. *J Can Dent Assoc*. 1999;65:252-4.
9. Miller CJ. The smile line as a guide to anterior esthetics. *Dental Clinics of North America*. 1989 Apr;33(2):157-64.
10. Matthews TG, Blatterfein L, Morrow RM, Payne SH. The anatomy of a smile. *The Journal of prosthetic dentistry*. 1978 Feb 1;39(2):128-34..
11. Ioi H, Kang S, Shimomura T, Kim SS, Park SB, Son WS, Takahashi I. Effects of buccal corridors on smile esthetics in Japanese and Korean orthodontists and orthodontic patients. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2012 Oct 1;142(4):459-65.
12. Tjan AH, Miller GD. Some esthetic factors in a smile. *The Journal of prosthetic dentistry*. 1984 Jan;51(1):24-8..
13. Davis NC. Smile design. *Dental Clinics of North America*. 2007 Apr 1;51(2):299-318.
14. Duggal S. The esthetic zone of Smile. *Virtual Journal of Orthodontics*. 2012 Jul 1;9(4).
15. Morley J, Eubank J. Macroesthetic elements of smile design. *The Journal of the American Dental Association*. 2001 Jan 1;132(1):39-45.