

Evaluation of various components affecting dento-facial esthetics in young Indian population- *A cross-sectional Study*

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Introduction: Smile is a person's ability to express a range of emotions with the structure and movement of the teeth and lips, can often determine how well a person can function in society.¹ The search for beauty can be traced to the earliest civilizations; both the Phoenicians (app 800 BC) and Etruscians (app 900 BC) carefully carved animal tusks to stimulate the shape, form and hue of natural teeth. The ideal goal of prosthetic dentistry is to restore occlusion, esthetics, phonetics, form, function appearance and overall health of patient.² A balanced symmetrical smile is considered essential in facial esthetics as it influences facial expression, general physical appearance and the expression of emotions. Many researchers have evaluated parameters affecting pleasant smile in patients. Relationship of age, sex, race and lip length on exposure of maxillary teeth was first evaluated by Brundo GC et al.³ Heartwell et al evaluated correlations between lip length and teeth exposure and reported that vertical position of the central incisor primarily determined by their relationship with lip in repose regardless of age and sex.⁴ Frush JP et al stated that smiling line helped to determine vertical position of the maxillary teeth in complete denture, as well as central incisors were longer than other maxillary teeth. The golden proportion (1.618 : 1.0) is a mathematically constant ratio that defines the dimensions between larger and a smaller length.⁵ This specific relation is unique, perfect, ideal, and desirable. It has been used from studying beauty to design esthetic restorations.⁶⁻⁷

Mahshid M, et al evaluated Golden proportion assessment between maxillary and mandibular teeth in esthetic smiles.⁸⁻⁹ However these studies have been done on Western population. There is lack of evidence regarding these parameters in Indian population. Hence this study has been planned to evaluate naturally occurring esthetic parameters in

young Indian population and how they can be correlated between different sexes and age groups.

Materials and methods: This study was carried out in VSPM Dental College, Nagpur. One-hundred (100) participants (50 men, 50 women) were included in this study. The mean age of the participants was 20-29 years.

● Inclusion/exclusion criteria:

The inclusion criteria were no missing maxillary and mandibular anterior teeth, no gingival and periodontal conditions or therapy that would undermine a healthy tissue-to-tooth relationship; no interdental spacing or crowding, no anterior restoration, and no history of orthodontic treatment. Patients of both sexes from young age group 20-29 years. All patients having Class I molar occlusion. Exclusion criteria eliminated subjects with evidence of gingival alteration or dental irregularities; apparent loss of tooth structure due to attrition, fracture, caries, or restorations; obvious problems that could disfigure or otherwise affect the face and dentition; and history of trauma, congenital, or acquired defects in the head and neck region, loss or prosthetic replacement of anterior teeth, or a history of maxillofacial surgery. Completely edentulous or partially edentulous patients

Measurements: Measurements were performed with the subjects seated in a dental chair with the head and back in an upright position. For golden proportion evaluation, the widths of the teeth were measured at the mesio-distal contact points of teeth. Anterior teeth width was measured from distal contact point of 13 to distal contact point of 23 in maxilla and distal contact point of 33 to distal contact point of 43 in mandibular teeth using flexible ruler (Fig. 1). Each measurement was made thrice by the same operator

and the repetitive value was used for accuracy and calibration of results. The golden proportion for each subject was assessed by multiplying the width of the larger component by 62% and compared the width of the smaller component for proportion to be analyzed. The width of central incisor was multiplied by 62% and compared with the width of the adjacent lateral incisor (Fig: 2). Similarly the width of the lateral incisor, canine and the maxillary and mandibular teeth were evaluated for golden proportion. Smile line is esthetic display of teeth when person smiles. It is imaginary line along incisal edges of the maxillary anterior teeth which mimics curvature of superior border of lower lip. It basically exposure of the midfacial cervical margin of the clinical crown relative to vermilion border of upper lip. Open smiles were divided into three categories. High smile (Reveals the total cervicoincisal length of the maxillary anterior teeth and a contiguous band of gingiva (Fig. 3, A). Average smile (Reveals 75% to 100% of the maxillary anterior teeth and the interproximal gingiva only (Fig. 3, B). low smile (Displays less than 75% of the anterior teeth (Fig. 3, C). Upper lip length was measured with the help of millimetre flexible ruler from subnasal to most inferior portion of upper lip. Shade of tooth was evaluated using Vitapan shade tab(fig 4) in northern

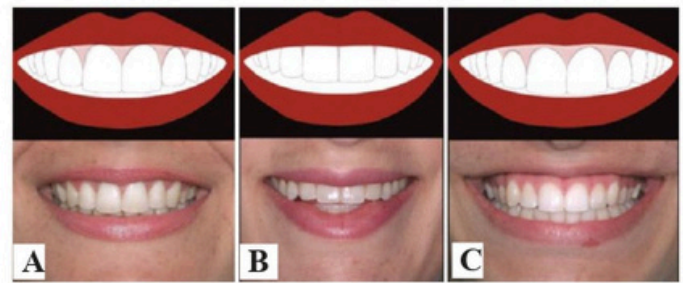


Figure 3: Three general and photographs illustrating types of smiles. A: high smile; B: average smile and C: low smile.



Figure 4: Vitapan Shade Guide for shade measurement day light.

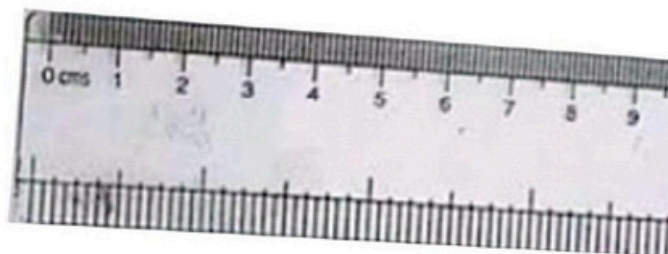


Figure 1: Flexible ruler

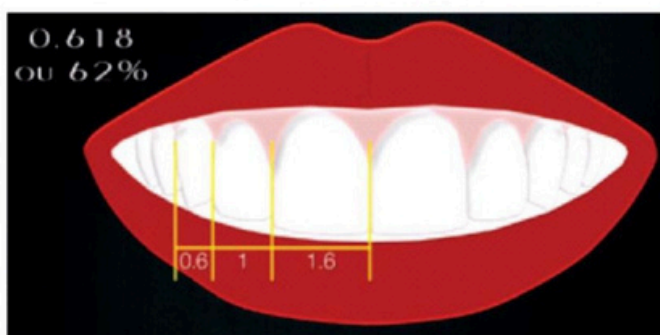


Figure 2: Golden proportion

Statistical analyses: Statistical Package for Social Sciences, Version 10 (SPSS-V10) software was used for the analyses of data. Spearman's (rho) was used to find correlation between smile line and upper lip. Chi square analysis was done to find the correlation between various ratios of golden proportion, smile line, shade and upper lip length during smiling amongst different sexes. An independent t-test was used to compare mean measured values between genders ($p \leq 0.05$). Descriptive analysis was done by setting alpha error at 5% and p value less than 0.05 was considered statistically significant.

Results: Frequency and percentage of golden proportion ratio between different sexes during a maximum smile are shown in Table 1.

The data revealed no statistical significance in the ratio of golden proportions based on gender. The data obtained from this study is summarized in Table 1. There is no golden proportion exist in between the population. The ratio of 1.2 and 1.3 were more common than 1.618 which is observed in 39% of the samples and 35% of individuals. Ratio of 1.5 and 1.6 was observed in 2% and 3%. No major differences in proportion existed between different sexes and symmetry of teeth.

Correlation of shade of tooth and sex: The results indicated that the most common shade for the maxillary and mandibular central incisors for males and females in the age group of 20–29 years using the three shade guides Vitapan are A2 and A1. Females had more tendency for brighter A1 shade compared to little darker and yellower A2, A3 and A3.5 shades found in males.

Correlation of smile line and sex: Age and sex distribution of the participants in relation to the display of gingiva during a maximum smile are shown in Table 3. The age of the participants ranged between 20 -29 years. The data shows 36% of male and 29% of female had average smile line and 6% of male and 12% of female have high smile line.

Correlation of upper lip length during smiling and sex: Upper lip length in males:- range (16-20mm) 39 individuals; followed by (21-25mm) 8 individuals. Upper lip length in females:- range (10-15mm) 5 female individuals followed by(16-20 mm) in 44 individuals(Table 4) .

Correlation between smile line and upper lip length during smiling: Out of 17 individuals who showed low smile line, mean upper lip length during smiling was found 19.52±1.62 mm. Out of 65 individuals who showed average smile line, mean upper lip length during smiling was found 18.09±1.49 mm. Out of 18 individuals who showed high smile line, mean upper lip length during smiling was found 16.05±1.62 mm. (Table 5)

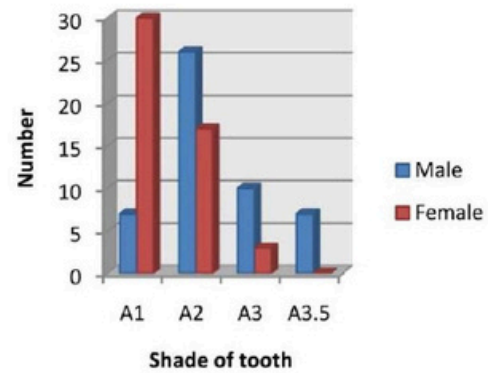
Ratio	Males	Females	Total
1.1	3	4	7
1.2	22	17	39
1.3	17	18	35
1.4	6	8	14
1.5	1	1	2
1.6	1	2	3
Total	50	50	100
Chi2 –value	2.3128		
p-value	0.804, NS		

Table 1: Golden proportion ratio between different sexes

Shade of tooth	Male	Female
A1	7	30
A2	26	17
A3	10	3
A3.5	7	0
Total	50	50
Chi2 – value	26.9502	
p-value	<0.0001, Highly Significant	

Table2: Correlation of shade of tooth and sex

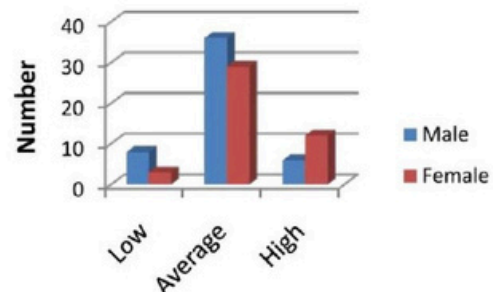
Correlation of shade of tooth and Sex



Smile line	Male	Female
Low	8	9
Average	36	29
High	6	12
Total	50	50
Chi2 – value	2.8127	
p-value	0.245, NS	

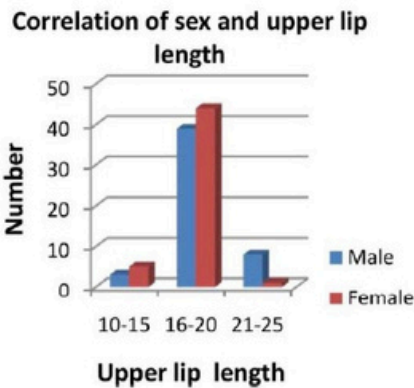
Table 3 shows : correlation of smile line and sex

Correlation of sex and smile line



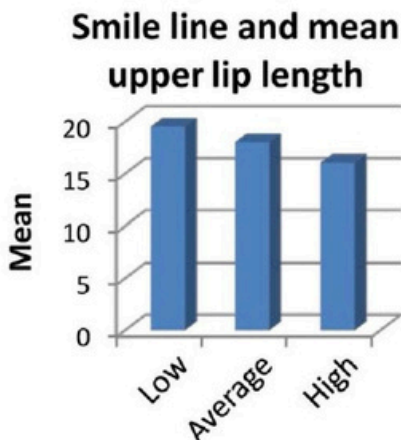
Upper lip length(mm)	Male	Female
10-15	3	5
16-20	39	44
21-25	8	1
Total	50	50
Chi2 – value	6.2456	
p-value	0.044, Significant	

Table 4: Correlation of upper lip length during smiling and sex



Smile line	Number	Mean upper lip length (mm)	Range
Low	17	19.52 ± 1.62	17-22
Average	65	18.01 ± 1.49	15-22
High	18	16.05 ± 1.62	13-19
Total	100		
Spearman's (rho)	- 0.5410		
p- value	<0.0001, highly significant		

Table 5: Correlation between smile line and upper lip length during smiling



DISCUSSION: The golden proportion (1.618 : 1.0) describes the ratio between the dimensions of a larger and a smaller length. Various researchers have opined for and against the use of this mathematic proportions in dentistry. Levin observed the golden proportion between the width of central incisor, lateral incisor and the canine.⁶ Golden proportion assessment between maxillary and mandibular teeth on Indian population was done by Chander NG et al. in year 2012. The clinical tooth width measurements were recorded with the digital vernier calipers on 576 patients of both sexes in the age group of 21-30 years. Flexible ruler was used to determine the width of maxillary and mandibular anterior teeth on the patients by the same operator. They said that golden proportion was not found between the width of the right central and lateral incisors in 53% of women and 47% of men. Also, The golden proportion is an inappropriate method to relate the successive widths of the maxillary anterior teeth in Indian population.⁵ From the results obtained and within the limitations of the study the following were appraised. Ethnic differences should be considered for esthetics and proportion studies especially with Indian population which varies with cultural diversity. The golden proportion was not found between maxillary and mandibular anterior teeth in majority of Indian population and the ratio of 1.2 and 1.3 is seen in 39% and 35% respectively. There were no major changes seen in the proportions between sexes and symmetry of teeth in Indian population.

Rodrigues S et al evaluated Shade Differences Between Natural Anterior Teeth in Different Age Groups and Gender Using Commercially available Shade Guides in year 2012 and concluded that the most common shade for maxillary and mandibular incisors in the younger age group is A2/2R1.5/140 and A1/1M2/120 for the males and females using Vita Lumin, Vita 3D Master and Chromascop shade guides respectively. Although the incidence of males with darker teeth as compared to females was higher. They said that there is no statistical significant correlation between shade differences in both the sexes.¹⁰ In present study, for male individuals, A2

shade - 26 individuals, A3 shade - 10 individuals and A3.5 shade - 7 individuals. For females, A1 shade - 30 individuals, A2 shade - 17 individuals and A3.5 shade - not found.

Tjan A et al in 1984 investigated some esthetic factors in a smile. A survey of the characteristics of an open smile was conducted with 454 full-face photographs of randomly selected dental and dental hygiene students. Findings show that an average smile exhibits approximately the full length of the maxillary anterior teeth, has the incisal curve of the teeth parallel to the inner curvature of the lower lip.¹¹ In males, average smile line - 36 individuals and high smile line - 6 individuals. In females average smile line - 29 individuals and high smile line - 12 individuals.

Vig et al done a survey that correlates measurements of upper lip type, sex, race, and age of dentulous patients with the amount of exposure of the maxillary and mandibular anterior teeth with the lips gently parted and in the resting position. Perhaps the most interesting finding was the gradual reduction in the amount of maxillary central incisor exposure with an increase in age, accompanied by a gradual increase in the mandibular tooth exposure.¹² In our study upper lip length in males range (16-20mm) 39 individuals; followed by (21-25mm) 8 individuals. Upper lip length in female range (10-15mm) 5 female individuals followed by (16-20 mm) in 44 individuals. Also, out of 17 individuals who showed low smile line, mean upper lip length during smiling was found 19.52 ± 1.62 mm. Out of 65 individuals who showed average smile line, mean upper lip length during smiling was found 18.09 ± 1.49 mm. Out of 18 individuals who showed high smile line, mean upper lip length during smiling was found 16.05 ± 1.62 mm.

Conclusion: Within the limitations of this study, the following conclusions were drawn:

1 Golden proportion between the widths of maxillary anteriors was not observed in majority of population. No major differences in proportion existed between different sexes and symmetry of teeth.

- 2 For shade of the tooth, females had more tendency for brighter A1 shade compared to little darker and yellower A2, A3 and A3.5 shades found in males.
- 3 For smile line, females have more tendency for display of maxillary anterior teeth due to high smile line compared to males.
- 4 For lip length during smiling, females have tendency for shorter lip length's compared to more prominent and longer lip length's in males.
- 5 Correlation between smile line and upper lip length during smiling, smile line is inversely proportional to mean upper lip length during smiling.

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