

Perception of Gingival Exposure in Smile Attractiveness

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ABSTRACT

Background: The purpose of this study is to evaluate the influence of facial pattern in smile attractiveness on the different level of gingival exposure assessed by dental specialists and laypersons in subjects from Jharkhand.

Method- Frontal photographs of two Indian women were acquired one with a long face and the other with a balanced face with gingival exposure from 0 to 6mm. The data was collected from a sample of 50 participants, including five orthodontists, five periodontists, five maxillofacial surgeons, five prosthodontists, five pedodontists, 5 Endodontists and 20 laypersons, thus constituting 7 groups. Likert type of scale is used to assess the alluring of the smiles of these subjects with different level of gingival exposure. Kruskal-Wallis & Friedman test was used to compare the view of dental specialists and laypersons. Spearman rank correlation coefficient was used to find the correlation between the age of examiners and their rating outcomes. Statistical significance was set at $p < 0.05$.

Results- Statistically significant differences were observed for the following levels of exposure for the long-faced subject: 2mm, 3mm, 4mm, 5mm. The scores of laypersons and dental specialists were significantly different for gingival exposure levels of 2mm & 3mm in balanced face subjects. The balanced face was better rated than the long face by dental specialists & laypersons for all levels of gingival exposure.

Conclusion- Facial patterns influenced the smile attractiveness evaluation. The facial characteristics of balanced facial pattern attenuated the perception of gingival exposure.

Keywords: Aesthetics; Facial attractiveness; Alluring; Gingival exposure.

INTRODUCTION

Tooth morphology, colour & proportional relationship among teeth, lips & gingiva lay the foundation for ideal smile (^{1, 2}). This involves the subjective facial analysis by evaluation & judgement of aesthetics of individual

The present study is aimed to assess the influence of the facial pattern on the perception of gingival exposure & the differences between the perceptions of smile attractiveness in subjects from Jharkhand.

The different level of gingival exposure considered to be aesthetically acceptable or unacceptable was investigated in relation to different facial pattern.

MATERIALS & METHOD

This short study included 2 women, one with long face & the other with a balanced face were selected based on subjective facial analysis.

The eligibility criteria for selection included

Received: May. 24, 2020; Accepted: July. 17, 2020

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- 1) No previous orthodontic treatment.
- 2) No dental loss, agenesis or extractions.
- 3) No dental prosthesis.
- 4) No lip asymmetry.

Frontal facial photographs of these 2 subjects were acquired with the use of a digital camera (canon DS

12662). Images were taken of the subjects smiling with a low variation in the distance between the camera & the subjects. These photographs were transferred into adobe Photoshop 7 software & all photographs were arranged into the palette so that exposure was gradually placed from 0 to 6mm in both models with regular intervals of 1 mm.



Fig 1. Long-face subject showing a gradual increase (1mm) in the level of gingival exposure (from 0 to 6mm, left to right).



Fig 2. Balanced - Face subject showing a gradual increase (1mm) in the level of gingival exposure (from 0 to 6mm, left to right).

The photographs were analysed by 7 groups of examiners. First group (n=20) included laypersons (19-women, 1male; mean age =25 years). Other 6 groups included Orthodontists(n=5), Periodontists(n=5), Prosthodontists(n=5), Oral and maxillofacial surgeon (n=5), Pedodontists(n=5) & Endodontists(n=5).

Seven photographs of long-faced subjects & 7 photographs of balanced face subjects were shown to each examiner, and they were requested to judge the smile attractiveness in both types of faces (long and balanced). The set of images were printed on photographic paper & randomized on the level of gingival exposure when presented to the examiners. Each image was marked from A to G the amount of gingival exposure was not revealed to the evaluators to enable them to rate the gingival exposure in a scoring file. The examiners had 15

seconds to rate each image which was presented only once during this first assessment

The data was entered into the excel sheet. The data were analyzed using SPSS (Statistical Package for Social Sciences) 20.0 version. The descriptive statistics were performed. The comparison between the groups was made using Kruskal-Wallis test. The correlation amongst variables was analyzed using Spearman's correlation coefficient. P value<0.05 was considered statistically significant. The confidence interval was set at 95%.

RESULTS

The study included 50 participants aged 22-55 years with the mean age of 32.74 ± 6.40092 years. There were 22 males (44%) and 28 females (56%). The study participants were asked to assign a score to the photographs of long face and balanced face

having different gingival exposure (i.e. 0mm, 1mm, 2mm, 3mm, 4mm, 5mm & 6mm) based on Likert scale ranging from 1-5;

Score 1-Highly unpleasant

Score 2-unpleasant

Score 3- acceptable

Score 4- pleasant

Score 5-highly pleasant

Table1: Median and standard error (SE) of scores considering the different groups of examiners and levels of gingival exposure in the balanced face subjects.

Gingi val expos ure	Orthodontist s		Periodontist s		Oral Surgeons		Prosthodont ists		Pedodontist s		Endodonti sts		Lay persons		P value [∞]
	Med ian	SE	Med ian	SE	Med ian	SE	Med ian	SE	Med ian	SE	Med ian	SE	Med ian	SE	
0 mm	5.0	0.24 495	5.0	0.24 495	4.0	0.24 495	5.0	0.24 495	4.0	0.24 495	5.0	0.244 95	4.0	0.15	0.9 45
1 mm	4.0	0.31 623	4.0	0.24 495	5.0	0.24 495	4.0	0.44 721	4.0	0.24 495	5.0	0.20	4.0	0.112 39	0.3 88
2 mm	3.0	0.24 495	4.0	0.20	5.0	0.24 495	4.0	0.20	4.5	0.20	4.0	0.20	4.0	0.15	0.0 08*
3 mm	3.0	0.24 495	4.0	0.24 495	3.0	0.24 495	4.0	0.24 495	4.0	0.00	3.0	0.20	4.0	0.142 81	0.0 15*
4 mm	3.0	0.54 772	3.0	0.24 495	3.0	0.20	3.0	0.20	3.0	0.00	3.0	0.20	3.0	0.135 24	0.7 20
5 mm	2.0	0.20	2.0	0.0	2.0	0.20	2.0	0.20	1.5	0.20	2.0	0.20	2.0	0.099 34	0.1 43
6 mm	2.0	0.24 495	1.0	0.24 495	1.0	0.0	1.0	0.20	1.0	0.20	2.0	0.244 95	1.0	0.091 77	0.2 26
P value [∞]	0.000*		0.000*		0.000*		0.000*		0.000*		0.000*		0.000*		

*p value<0.05 was considered statistically significant.[∞]Kruskal Wallis test.[∞]Friedman test

On viewing the photograph of a balanced face, the score assigned by orthodontists, Periodontists, Oral Surgeons, Prosthodontists, Pedodontists, Endodontists and laypersons did not differ significantly for gingival exposure of 0mm, 1 mm, 4mm, 5mm & 6 mm. However, the scores assigned to 2mm and 3 mm gingival exposure were significantly different among the groups. Orthodontists found 2 mm exposure to be less accepting as compared to others. On analyzing the difference in median score within the groups, it was found that a significant difference existed in the median score for different levels of gingival exposure. The Likert scale score was found to decrease with the increase in gingival exposure in all the groups.

Fig 1: Mean scores rated by each group of examiners considering the different levels of gingival exposure in the subject with a balanced face.

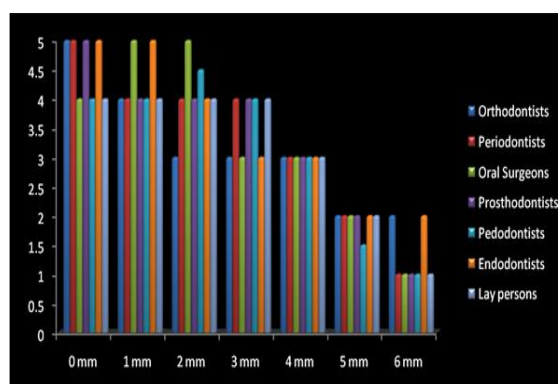


Table 2: Median and standard error of the scores considering the different groups of examiners and levels of gingival exposure in the long face subjects.

Gingiv al expos ure	Orthodontists		Periodontists		Oral Surgeons		Prosthodontis ts		Pedodontists		Endodontists		Lay persons		P valu e ^o
	Medi an	SE	Medi an	SE	Medi an	SE	Medi an	SE	Medi an	SE	Medi an	SE	Medi an	SE	
0 mm	5.0	0.40	4.0	0.244 95	5.0	0.244 95	4.0	0.374 17	4.0	0.244 95	5.0	0.244 95	4.0	0.15	0.96 8
1 mm	4.0	0.374 17	4.0	0.20	4.0	0.244 95	5.0	0.40	5.0	0.244 95	5.0	0.20	4.0	0.112 39	0.63 7
2 mm	4.0	0.374 17	3.0	0.244 95	4.0	0.316 23	4.0	0.20	5.0	0.20	4.0	0.20	4.0	0.15	0.03 6*
3 mm	4.0	0.20	3.0	0.00	3.0	0.00	4.0	0.244 95	4.0	0.00	3.0	0.20	4.0	0.142 81	0.00 1*
4 mm	3.0	0.244 95	2.0	0.00	3.0	0.244 95	3.0	0.20	3.0	0.00	3.0	0.00	3.0	0.135 24	0.00 3*
5 mm	2.0	0.244 95	1.0	0.244 95	2.0	0.00	2.0	0.20	2.0	2.0	2.0	0.20	2.0	0.099 34	0.02 4*
6 mm	1.0	0.244 95	1.0	0.00	1.0	0.00	1.0	0.20	1.0	0.00	1.0	0.20	1.0	0.099 34	0.48 0
P value ^o	0.001*		0.000*		0.000*		0.000*		0.000*		0.000*		0.000*		

*p value<0.05 was considered statistically significant.^oKruskal Wallis test.⁶Friedman test

On viewing the photograph of long face, the score assigned by orthodontists, Periodontists, Oral Surgeons, Prosthodontists, Pedodontists, Endodontists and laypersons did not differ significantly for gingival exposure of 0mm, 1 mm & 6 mm. However, the scores assigned to 2mm, 3 mm, 4mm, 5mm gingival exposure were significantly different amongst the groups. The 2 mm exposure of gingival in long face subjects was found to be significantly more accepting by Pedodontists and significantly less accepting by Periodontists. Similarly, Periodontists found 4 mm and 5 mm gingival exposure to be significantly less accepting as compared to others. On analyzing the difference in median score within the groups, it was found that a significant difference existed in the median score for different levels of gingival exposure. The likert scale score was found to decrease with the increase in gingival exposure in all the groups.

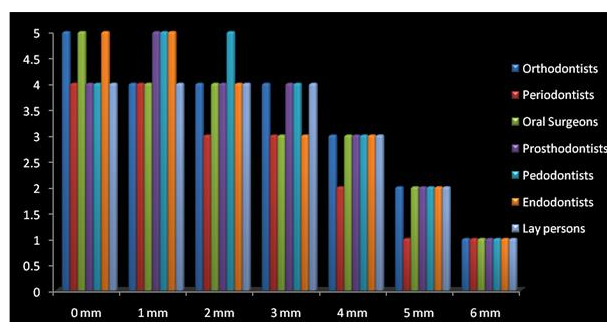


Fig 2: Mean scores rated by each group of examiners considering the different levels of gingival exposure in the subject with a long face.

Wilcoxon sign rank test was used to compare the scores between the long face and balanced face, given by evaluators of different groups to any level of gingival exposure. Perception of orthodontists differed significantly for 3mm gingival exposure between a long and balanced face (p value=0.039).

DISCUSSION

This study is focussed on evaluating the influence of facial pattern (balanced & long faced) in smile alluring based on gingival exposure assessed by dental specialists of 6 department & laypersons from Jharkhand. Here photographs of the different smiles were evaluated using Likert type scale. Another researcher (Parekh et al.³Krishnan et al.⁴Ioe et al.⁵) used Visual Analogue Scale(VAS) to judge smile attractiveness. The former method in rating aesthetics produces simple, rapid & reproducible results, whereas VAS may mean things different to different raters. Here we found that in balanced face scores assigned to 2 mm & 3mm gingival exposure is significantly different [Table 1] among the other group when compared to 0mm,1mm,4mm& 6mm. Orthodontist found more than 1mm gingival exposure less accepting.

Table 3: Correlation between age and score assigned by participants belonging to different groups.

Type of face	Gingival exposure	Orthodontists		Periodontists		Oral Surgeons		Prosthodontists		Pedodontists		Endodontists		Lay persons	
		R	P value	R	P value	r	P value	r	P value	r	P value	R	P value	R	P value
Balanced face	0 mm	0.577	0.308	0.000	1.000	-0.289	0.638	-0.889	0.044*	-0.289	0.638	0.296	0.628	-0.274	0.242
	1 mm	0.671	0.215	-0.444	0.454	0.289	0.638	0.000	1.000	0.866	0.058	-0.544	0.343	-0.189	0.426
	2 mm	0.000	1.000	-0.725	0.165	0.000	1.000	-0.725	0.165	0.707	0.182	0.544	0.343	0.022	0.925
	3 mm	0.577	0.308	0.000	1.000	0.000	1.000	-0.444	0.454	Constant	Constant	0.544	0.343	0.093	0.695
	4 mm	0.949	0.014*	0.000	1.000	0.354	0.559	0.181	0.770	Constant	Constant	0.363	0.548	0.210	0.374
	5 mm	0.707	0.182	Constant	Constant	0.354	0.559	-0.181	0.770	0.707	0.182	0.544	0.343	0.183	0.440
	6 mm	0.000	1.000	-0.148	0.812	Constant	Constant	-0.181	0.770	-0.354	0.559	0.592	0.293	0.374	0.104
Long face	0 mm	0.671	0.215	0.000	1.000	0.289	0.638	-0.460	0.436	-0.289	0.638	0.296	0.628	-0.274	0.242
	1 mm	0.158	0.800	0.181	0.770	-0.577	0.308	-0.287	0.640	0.866	0.058	-0.544	0.343	-0.189	0.426
	2 mm	0.000	1.000	0.740	0.152	0.224	0.718	-0.725	0.165	0.707	0.182	0.544	0.343	0.022	0.925
	3 mm	0.000	1.000	Constant	Constant	Constant	Constant	-0.444	0.454	Constant	Constant	0.544	0.343	0.093	0.695
	4 mm	0.577	0.308	Constant	Constant	-0.866	0.058	0.181	0.770	Constant	Constant	Constant	Constant	0.210	0.374
	5 mm	0.577	0.308	0.296	0.628	Constant	Constant	-0.181	0.770	0.707	0.182	0.544	0.343	0.183	0.440
	6 mm	-0.577	0.308	Constant	Constant	Constant	Constant	-0.181	0.770	Constant	Constant	0.544	0.343	0.295	0.207

*p value<0.05 was considered statistically significant. r- Spearman's correlation coefficient

Null gingival exposure (0mm) is more attractive than excessive gingival exposure (Alhaijaet al.,⁽⁶⁾. Anderson et al. ⁽²⁾ reported better grades for 0 mm by periodontists compared with laypersons. In the present study, the analysis of the balanced facial pattern indicated decreasing scores with increasing gingival exposure which is similar to previous studies^(6,7,8,9,10, 11)

Based on the result of the present study, 2mm of gingival exposure was considered to be 'pleasant' by dental specialists. This finding was similar to the findings of Anderson et al.⁽²⁾ but in contrast to the finding of others^(6,7,8,9) where 2mm of gingival

exposure was considered to be just 'acceptable' and not 'pleasant'.

The dental specialists of the present study is more tolerant regarding smile aesthetics and confirm the study of Springer et al. ⁽¹²⁾ & Anderson et al.,⁽²⁾ which suggested that the attractiveness of other facial structures may attenuate an unbalanced smile.

In present study, the scores assigned to gingival exposure of 2mm,3mm,4mm,5mm in long face were statistically significant (p values<0.05) [Table 2]. Gingival exposure of 3 mm was considered to be

'acceptable' by dental specialists in the present study, which is consistent with previous studies^(2,6,7,8,9,10) on the other hand our findings are inconsistent with those reported by Oshagh et al.,⁽¹⁰⁾ according to his similar study on the long face he found that dental specialist tolerated the gingival exposure of 1mm. Few reported that gingival exposure of 1mm becomes 'unpleasant' for the layperson in the long face⁽⁹⁾ whereas others⁽⁸⁾ reported gingival exposures above 2mm as unpleasant' for laypersons in the long face. There are also some studies showing that laypersons may 'accept' gingival exposures up to 3mm on long face.^(7,11) But all of these studies were restricted to mouth region only which was major criticism by scientific literature⁽¹³⁾.

In the present significantly strong positive correlation was observed between the score assigned to 4mm gingival exposure in balance face photograph. I.e. with the increase in age of the participants the score assigned to 4mm gingival exposure increased amongst orthodontists for balance face photograph [Table no 3].

Significantly strong negative correlation was observed between the score assigned to 0mm gingival exposure in balanced face photograph (p value<0.05) i.e. with the increase in age of the participants the score assigned to 0mm gingival exposure decreased amongst prosthodontists for balance face photograph. Other correlations were found to be statistically non-significant (p value>0.05) [Table no 3].

In other studies no statistically significant differences were observed considering the outcomes according to the ages of dental specialists^(2,14). In the study by Lauria et al.,⁽¹⁴⁾ which highlighted a slight negative correlation with age in the group of lay persons, with statistical significance for gingival exposure of 3mm. Older examiner tended to give lower scores to higher levels of gingival exposure, which is in line with a study by Pithon et al.,⁽⁹⁾. According to that report, examiners aged 35-44 years preferred the upper lip covering the extension of the upper incisors i.e. young person preferred more gingival exposure compared with older person, thus following natural process of human being. Our results also indicated that the scores given for the balanced face were higher than long face, with statistically significant differences in

all levels of gingival exposure. In our present study there were no such significant differences were found between lay person & dental specialists regarding smile aesthetics. But according to Anderson et al.,⁽²⁾ lay persons were more tolerant regarding smile aesthetics than dental specialists.

Vergo et al.,⁽¹⁵⁾ stated that patients decided to undergo aesthetics treatment based on opinion of other lay person. When smile attractiveness is assessed, proportion & harmony of facial structure analysis is equally important as of analysis of attractiveness to the occlusion. Restricting the analysis to the occlusion is a major mistake in clinical routine, although establishing a proper occlusion is desirable in every treatment plan.

The facial pattern must be considered when diagnosing & treating gingival exposure. In the present study, the dental specialists & laypersons rated the gingival exposure differently in the different facial pattern in Jharkhand population, thus indicating that facial aesthetics must be considered for the diagnosis & treatment of gingival smile. Major limitations of this study are comparison with male and female group of laypersons from Jharkhand population was not possible, as majority of subjects were selected female only. These results are from East Singhum region of Jharkhand. Other areas subjects should include because these aesthetics concepts are influenced by cultural, ethnic, & contemporary aspects.

CONCLUSION

Smile perception in subjects from Jharkhand population is influenced by facial pattern. For dental specialists, the maximum gingival exposure for long faced subjects considered to be "acceptable" is 3mm. There are no significant differences between dental specialists and laypersons perception regarding gingival smile. In the balanced face subject, dental specialists tolerated up to 4mm of gingival exposure in clinical practice. But for orthodontists 2mm gingival exposure was less accepting.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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