

COMPARISON OF PERCEPTION FOR THE GINGIVAL DISPLAY BETWEEN DENTAL PROFESSIONALS AND NON-PROFESSIONALS

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ABSTRACT

OBJECTIVES

This study aimed to compare the mean perception scores of gingival display between dental professionals and non-professionals.

METHODOLOGY

A comparative cross-sectional study was conducted at Rehmat Memorial Hospital, Abbottabad, involving 60 participants: 30 non-professionals and 30 dental professionals, aged 18 to 50 years. Using non-probability consecutive sampling, individuals with intellectual disabilities, color vision deficiency, or dental training were excluded. Standardized photographs of a female subject were digitally edited in Adobe Photoshop CS6 to simulate gingival display levels ranging from 0 to 5 mm. Evaluators viewed each image for 1 minute and rated it on a 10-point visual analog scale, with 00 indicating the least attractive and 10 the most attractive. Dental professionals included general dentists without orthodontic specialization, while non-professionals were patients with no prior orthodontic treatment or dental education. The Mann-Whitney U test was used to compare group differences. Stratification was done based on age, gender, and education level.

RESULTS

The mean age of dental professionals (33.73±5.15 years) was slightly higher than that of non-professionals (31.70±7.63 years), but not significantly (p=0.23). Gender distribution and educational backgrounds were comparable. Overall, non-professionals favored minimal gingival display, while dental professionals were more tolerant of increased gingival exposure.

CONCLUSION

Non-professionals and dental professionals differ significantly in their perception of gingival esthetics. These differences show the importance of patient-centered treatment planning and individualized aesthetic goals.

KEYWORDS: Gingival Display, Perception, Dental Professional, Non-Professional

INTRODUCTION

Aesthetically pleasing smiles are integral to overall facial attractiveness and are among the most prevalent motivations for individuals seeking orthodontic intervention.¹ The term *aesthetics* is etymologically derived from the Greek word *aisthesis*, which denotes perception.² The concept of beauty is inherently subjective, with each individual applying personal criteria to define it. Although advancements in dental science have significantly reduced the incidence of dental caries, there has been a concomitant increase in patient expectations regarding dental aesthetics.³ Consequently, clinicians are required to possess comprehensive knowledge of orofacial and dental aesthetic principles to address these demands effectively.⁴ A multitude of factors, including sociocultural, environmental, and experiential variables,

influence the perception of smile aesthetics.⁵ Additionally, cultural background and ethnic identity play a pivotal role in shaping aesthetic preferences. The visual appeal of the anterior dentition is generally regarded as more critical to perceived dental aesthetics than that of the posterior teeth.⁶ Research has shown that dental professionals, particularly orthodontists, tend to perceive smile aesthetics differently from the general population.⁷ Orthodontists are generally more critical in their evaluations, likely due to their specialized training in areas such as facial balance, dental alignment, and gingival display. While the general public often bases its judgments on cultural influences or personal preferences, orthodontists rely on clinical guidelines and detailed analysis. This difference in perception highlights the importance of clear communication between clinicians and patients to ensure shared understanding and satisfaction with

esthetic outcomes.⁸ Gingival display has a key role in smile preferences.^{8,9} The ideal gingival display should be zero, but in females, up to 2mm of gingival show is considered youthful.¹⁰ Previous studies reported differences in perceptions among orthodontists, dental professionals, and patients regarding gingival display and smile arch.^{8,9,10} A previous study reported that the mean perception score was 7.62 ± 2.41 for dentists and 5.27 ± 2.35 for dentists for a 4mm gingival show, and the difference was statistically significant.¹¹ This study examines differences in the perception of gingival display between orthodontists and patients, an esthetic parameter that directly influences orthodontic diagnosis, treatment planning, and overall treatment outcomes. In the local clinical setting, the limited number of qualified orthodontists means many orthodontic cases are managed by general dental practitioners, making it important to understand how professional assessments align with patient expectations. At present, there is a lack of locally generated evidence addressing perceptions of gingival show. Moreover, aesthetic preferences are known to vary by ethnic background, cultural context, and educational level, limiting the applicability of findings from other populations to our own. As patient satisfaction remains a central goal of orthodontic treatment, gaining insight into patient perceptions is essential for improving communication, enhancing treatment acceptance, and achieving favorable outcomes. The findings of this study may therefore contribute to more informed, patient-centered, and interdisciplinary treatment planning within the local context. The objective of this study was to compare the mean perception score between dental professionals and non-professionals about the gingival display.

METHODOLOGY

This comparative cross-sectional study was conducted in the Department of Orthodontics at Rehmat Memorial Hospital, Abbottabad, from 1st September 2024 to 1st May 2025, using consecutive non-probability sampling. The calculated sample size is 22 (11 non-professionals and 11 dental professionals) at the 5% level of significance, with 90% power, using a mean perception of 7.62 ± 2.41 for non-professionals and 5.27 ± 2.35 for dental professionals from a previous study for a 4mm gingival show.¹¹ However, to improve the power of our study further and to ensure the normality assumption, the total sample size was 60 (30 non-professional and 30 dental professionals). The study included participants aged 18 to 50 years, both genders, and Pakistani nationals, as confirmed by their National Identity Card (NIC). Eligible individuals had no formal orthodontic training and were willing to participate in the study.

Exclusion criteria comprised individuals with intellectual disabilities, those who were uncooperative, persons with color vision deficiency, as well as dental students, dental attendants, and dental technicians. Approval was obtained from the hospital ethical committee (RMPD&HI/EM/4077) and the CPSP (CPSP/REU/DSG-2021-011-3814). Participants who met the inclusion criteria were invited to participate in the study. The purpose, procedures, risks, and benefits of the study were thoroughly explained to them. Informed consent was obtained, and their voluntary participation was confirmed. Participants were assured that the confidentiality of their personal information and data collected from their records would be strictly maintained. A photograph of a female subject's smile was taken to capture the gingival zeniths, allowing for the study of a high smile. The subject was positioned so that both the Frankfort horizontal plane and the bipupillary line were parallel to the ground. The mouth was kept slightly open to minimize exposure of the mandibular incisors, and a dark background was used to create contrast with the maxillary teeth. The photograph was then digitally edited in Adobe Photoshop CS6. All images were of equal size (4 by 6 inches). Each photo will be shown to each evaluator separately. Evaluators were not permitted to compare images. Each photo was shown for 1 minute only. Both non-professionals and dental professionals were asked to assess perception scores using a 10-point visual analog scale, ranging from 0 to 10, where 0 represented the least attractive and 10 the most attractive. Each rater received a sheet containing these scales and was instructed to score a series of photographs depicting varying degrees of gingival display, with 0 indicating the least attractive and 10 the most attractive appearance. The dental professionals consisted of dentists without postgraduate qualifications working in departments other than orthodontics. At the same time, the non-professionals were individuals aged 18 to 50 years, of both genders, with no prior knowledge of the research topic, no dental training, and no history of orthodontic treatment within the last five years. These lay participants were selected from patients visiting the outpatient department for routine dental treatments, such as fillings, but not for orthodontic care. The gingival display was evaluated using photographs digitally altered with Adobe Photoshop CS6 to simulate different levels of gingival exposure, based on the relationship between the upper lip and the gingival margin of the maxillary incisors. The images included: (a) the original, unmodified photo; (b) an increase in gingival display by 1 mm; (c) by 2 mm; (d) by 3 mm; (e) by 4 mm; and (f) by 5 mm. (Fig. 1) Visual analog scale inter-observer reliability was assessed on five cases using kappa test ($k=0.88$), indicating excellent consistency. Data computation was

performed using R software 4.3.3. Mean and standard deviation were calculated for continuous variables, such as age and perception scores, while frequencies and percentages were used to summarize categorical variables, such as gender and educational level. The normality of the outcome variable (perception score) was assessed using the Shapiro-Wilk test. Preferences between dental professionals and non-professionals were compared using the Student's t-test. Stratification was performed based on gender, age group, and educational level to evaluate potential effect modification, followed by post-stratification Student's t-tests. When the normality assumption was violated, the Mann-Whitney U test was used. Linear regression was run with gingival show as the dependent variable and group, gender, and age as independent variables. A p-value of ≤ 0.05 was considered statistically significant.

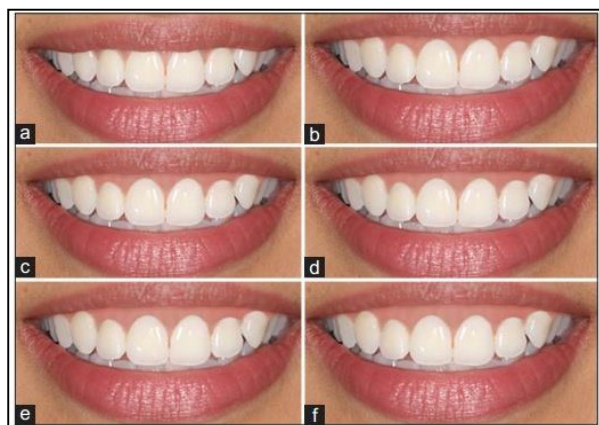


Figure 1: Photographs Showing Alteration of the Gingiva Show

RESULTS

The normality of gingival display measurements at different levels (0, 1, 3, and 5 mm) was assessed using the Shapiro-Wilk test. For all gingival display categories, the W statistics ranged from 0.749 to 0.877, with p-values less than 0.001. These results indicate a significant deviation from normal distribution across all measured levels of gingival display. Consequently, the assumption of normality was not met for any of the gingival display groups. The comparison of baseline characteristics between dental professionals and non-professionals included age and gender distribution, with each group comprising 30 participants. The mean age of dental professionals was 33.73 ± 5.15 years, while that of non-professionals was 31.70 ± 7.63 years. This difference was not statistically significant ($p = 0.23$), indicating comparable age profiles between the two

groups. Regarding gender distribution, females constituted the majority in both groups, accounting for 63.33% among dental professionals and 56.67% among non-professionals, whereas males represented 36.67% and 43.33%, respectively. The gender distribution did not differ significantly between the groups ($p = 0.60$), suggesting that the two cohorts were well matched in terms of demographic characteristics.

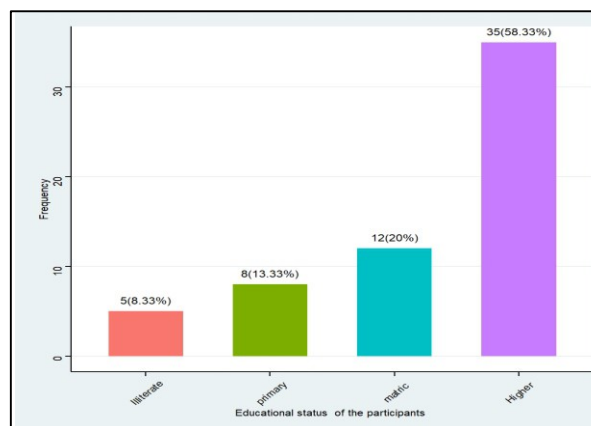


Figure 2: Educational level of the participants

Table 1: Perception of the Gingiva Shows Differences Between Dental Professionals and Non-Professionals

Characteristic	Dental professional n = 30	Non-professional n = 30	P-V value
Gingival shows 0mm	6.00 (6.00, 7.00)	7.00(6.25, 7.00)	<0.001
Gingival shows 1mm	7.00 (7.00, 8.00)	7.00(6.00, 7.00)	0.04
Gingival shows 3mm	5.00 (5.00, 6.00)	5.00(4.00, 5.00)	0.04
Gingival shows 5mm	3.00 (3.00, 4.00)	2.00(1.00, 2.00)	<0.001

Median (IQR); Wilcoxon rank sum test

Table 2: Perception of Gingival Shows Between Dental Professionals and Non-Professionals Stratified by Gender

Characteristics	Female			Male		
	Dental Professional, N=19	Non-Professional, N=11	P-Value	Dental Professional, N=11	Non-Professional, N=13	P-value
Gingival shows 0mm	6.0 (6.0,7.0)	7.0 (6.0,7.0)	0.09	6.0 (6.0,7.0)	7.0 (7.0,7.0)	0.001
Gingival shows 1mm	7.0 (7.0,8.0)	7.0 (7.0,7.0)	0.25	7.0 (7.0,7.0)	7.0 (6.0,7.0)	0.06
Gingival shows 3mm	5.0 (5.0,6.0)	5.0 (5.0,5.0)	0.25	5.0 (5.0,5.0)	5.0 (4.0,5.0)	0.06
Gingival shows 5mm	3.0 (3.0,4.0)	2.0 (2.0,2.0)	<0.001	3.0 (3.0,3.0)	2.0 (1.0,2.0)	<0.001

Table 3: Perception of Gingival Shows Between Dental Professionals and Non-Professionals Stratified by Educational Level

Characteristic	Dental Professional	Non-Professional	P-Value
Higher			
Gingival_show_0mm	6.00 (6.00, 7.00)	7.00 (7.00, 7.00)	0.055
Gingival_show_1mm	7.00 (7.00, 8.00)	7.00 (7.00, 8.00)	0.7
Gingival_show_3mm	5.00 (5.00, 6.00)	5.00 (5.00, 6.00)	0.7
Gingival_show_5mm	3.00 (3.00, 4.00)	2.00 (2.00, 3.00)	0.009
Illiterate			
Gingival_show_0mm	6.00 (6.00, 7.00)	-	-
Gingival_show_1mm	7.00 (7.00, 7.00)	-	-
Gingival_show_3mm	5.00 (5.00, 5.00)	-	-
Gingival_show_5mm	2.00 (2.00, 2.00)	-	-
Matric			
Gingival_show_0mm	7.00 (6.75, 7.00)		
Gingival_show_1mm	7.00 (6.00, 7.00)		
Gingival_show_3mm	5.00 (4.00, 5.00)		
Gingival_show_5mm	2.00 (1.00, 2.00)		
Primary			
Gingival_show_0mm	7.00 (7.00, 7.25)		
Gingival_show_1mm	6.50 (6.00, 7.25)		
Gingival_show_3mm	4.50 (4.00, 5.25)		
Gingival_show_5mm	1.50 (1.00, 2.25)		

Median (IQR); Wilcoxon rank sum test

Table 4: Perception of Gingival Shows Between Dental Professionals and Non-Professionals Stratified by Age Group

Characteristic	Dental Professional	Non-Professional	P-Value
18- 30			
Gingival_show_0mm	6.00 (6.00, 7.00)	7.00 (7.00, 7.00)	0.044
Gingival_show_1mm	7.00 (7.00, 7.75)	7.00 (7.00, 7.00)	0.3
Gingival_show_3mm	5.00 (5.00, 5.75)	5.00 (5.00, 5.00)	0.3
Gingival_show_5mm	3.00 (3.00, 3.75)	2.00 (2.00, 2.00)	<0.001
31- 50			
Gingival_show_0mm	6.00 (6.00, 7.00)	7.00 (6.00, 7.00)	0.042
Gingival_show_1mm	7.00 (7.00, 8.00)	6.50 (6.00, 7.25)	0.059
Gingival_show_3mm	5.00 (5.00, 6.00)	4.50 (4.00, 5.25)	0.059
Gingival_show_5mm	3.00 (3.00, 4.00)	1.50 (1.00, 2.25)	<0.001

Table 5: Univariable and Multivariable Linear Regression Analysis by Gingival Show Level

Gingival show	Predictor	Category	Univariable β (95%CI)	P-value	Multivariable β (95%CI)	P-value
0 mm	Profession	Dental professional	Reference	<0.001	Reference	<0.001
		Non-professional	0.57 (0.22, 0.91)		0.55 (0.20, 0.91)	
	Gender	Female	Reference	0.57	Reference	0.66
		Male	0.11 (-0.27, 0.50)		0.08 (-0.29, 0.45)	
	Age group	18-30	Reference	0.57	Reference	0.79
		31-50	-0.11 (-0.50, 0.27)		-0.05 (-0.42, 0.32)	
		Model fit	-	-	R ² = 0.159; Adj. R ² = 0.114	-
1 mm	Profession	Dental professional	Reference	0.03	Reference	0.03
		Non-professional	-0.37 (-0.70, -0.03)		-0.37 (-0.71, -0.03)	
	Gender	Female	Reference	0.12	Reference	0.20
		Male	-0.28 (-0.63, 0.07)		-0.22 (-0.57, 0.12)	
	Age group	18-30	Reference	0.44	Reference	0.40
		31-50	-0.14 (-0.49, 0.22)		-0.15 (-0.50, 0.20)	
		Model fit	-	-	R ² = 0.122; Adj. R ² = 0.075	-
5 mm	Profession	Dental professional	Reference	<0.001	Reference	<0.001
		Non-professional	-1.33 (-1.69, -0.98)		-1.34 (-1.70, -0.97)	
	Gender	Female	Reference	0.23	Reference	0.31
		Male	-0.31 (-0.81, 0.20)		-0.19 (-0.56, 0.18)	
	Age group	18-30	Reference	0.91	Reference	0.51
		31-50	0.03 (-0.48, 0.54)		-0.12 (-0.50, 0.25)	
		Model fit	-	-	R ² = 0.506; Adj. R ² = 0.480	-

DISCUSSION

The present study found differences in the perception of gingival display between dental professionals and non-professionals. A substantial proportion of

respondents (58.33%) possessed higher educational qualifications, which may have contributed to more discerning aesthetic evaluations. Non-professionals demonstrated a strong preference for smiles with 0 mm of gingival display, consistently rating them more favorably than their professional counterparts. In contrast, dental professionals exhibited greater tolerance for increased gingival display, particularly at the 5 mm level, where their aesthetic ratings were significantly higher ($p < 0.001$) compared to those of non-professionals. Individuals with higher educational attainment displayed more sensitivity to excessive gingival display. The difference in perception between dental professionals and non-professionals can be attributed to professional training, which leads to greater acceptance of anatomical and clinical variations in smile esthetics. Professionals often balance aesthetic judgments with functional and biological considerations.¹² On the other hand, non-professionals may rely more on cultural norms and media-influenced standards of beauty, which often portray smiles with little to no gingival display as ideal.¹³ Furthermore, higher education among non-professionals appears to amplify sensitivity to esthetic deviations, possibly due to greater exposure to social standards, increased access to information, or a heightened awareness of facial and dental esthetics.¹ These findings are consistent with the observations of Ahmed et al., who, in a cross-sectional study among a Saudi population, found that gingival display greater than 2 mm was generally viewed as unattractive by both non-professionals and dental professionals.¹⁴ Their results further demonstrated that non-professionals were significantly less tolerant of increased gingival exposure, a pattern that parallels the present study and suggests that professional training may lead to a broader acceptance of gingival display. In contrast, patients tend to prefer more conservative esthetic outcomes. Pinzan-Vercelino et al.¹⁵ compared smile esthetic perceptions among dental specialists and non-professionals, focusing on gingival display. Using altered images with 1, 3, and 5 mm exposure, they found that specialists—especially orthodontists and periodontists—were more sensitive to gingival changes. All groups preferred a 1 mm display, while a 5 mm display was least attractive. The study highlights the need to consider patient preferences in esthetic treatment planning. Jan et al.¹⁶ examined esthetic perception of gingival display in Pakistani subjects and reported that non-professionals preferred 0–2 mm gingival exposure, with a sharp decline in perceived attractiveness at ≥ 3 mm. Dental professionals were more lenient, particularly with 3 mm, but agreement between groups diminished significantly at 5 mm, which was rated poorly by non-professionals. Pithon et al.¹⁷ examined the esthetic impact of gingival smiles

among non-professionals, dental professionals, and dental students by using digitally altered photographs simulating varying levels of gingival display. Their results indicated that significant gingival exposure does not necessarily reduce smile attractiveness. However, they found that insufficient visibility of the maxillary incisors was consistently rated as less attractive across all groups, highlighting the importance of tooth display in overall smile esthetics.

LIMITATIONS

This study has a few limitations. Only one female smile was used to ensure the results would not differ from those of other faces or male subjects. Being cross-sectional, it captures perceptions at a single point in time. Participants were from a single hospital and were selected non-randomly, which may limit the generalizability of the results. Even though viewing conditions were standardized and reliability was high, smile esthetics are subjective and can be influenced by personal or cultural preferences.

CONCLUSIONS

Non-professionals prefer minimal gingival display, while dental professionals accept greater exposure. Education and age affect aesthetic perceptions, showing that judgment is both objective and subjective. There is a need for patient-centered planning and open communication to meet individual aesthetic expectations.

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The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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