

Comparison of Upper Lip Length to the Incisal Exposure of Maxillary Anterior Teeth

Sana Naz, Shahab Adil, Zafar ul Islam, Ghazala, Imtisal Asim, Lalina Taj Hamid
Department of Orthodontics, Peshawar Dental College and Hospital, Peshawar.

Abstract

Background: The esthetics of the face and teeth help in the prognosis of the outcome of orthognathic surgery, implant surgery, operative dentistry, anterior aesthetic surgery, and fixed or removable prosthetic procedure.

Objective: To compare the amount of maxillary incisal exposure between patients with normal and short upper lip lengths.

Methods: This cross-sectional study was conducted at the Orthodontics Department of Peshawar Dental College and Hospital, Pakistan, and involved clinical measurements of upper lip length and incisal exposure using a digital vernier caliper. A total of 235 adult patients were assessed according to their upper lip length and their classification was done under short upper lip, normal upper lip or enhanced upper lip length. A digital vernier caliper was used to measure the amount of incisal exposure during the resting position as well as during the smiling phase.

Results: Out of total 235 participants, 112 (47.7%) were males and 123 (52.3%) females, with a mean age of $32.4 \pm \text{SD}$ years and an age range of 20-45 years. Normal lip length participants had the largest exposure with a mean of $8.19 \text{ mm} \pm 1.87 \text{ SD}$ (p value < 0.001) as shown by the outcome whereby different lip length groups presented significant differences in incisal exposures. The angular depth of the incisal edges was less exposed than that analyzed by the observers with increased or decreased labial lip lengths.

Conclusion: The study shows that upper lip length significantly affects maxillary anterior tooth visibility at rest and during smiling, with optimal esthetic incisal display observed in individuals with normal lip retraction. These findings emphasize the importance of lip morphology in esthetic dental treatment planning.

Key words: Maxillary anterior teeth, incisal exposure, upper lip length, dental aesthetics.

Introduction

The ultimate goal for a dentist is to regain the normal function, comfort, appearance, speech, and contour of a patient's stomatognathic system. Since anterior teeth are responsible for the aesthetic, phonetic, and incisal characteristics of food whenever anterior teeth are to be restored or replaced aesthetics takes the highest priority.¹

It has been speculated that a young adult's dentofacial look may have an impact on their social

desirability. More individuals seek dental care today in an effort to improve their appearance. It is typical to see individuals with numerous missing anterior teeth or dental anomalies in aesthetic dentistry practices.² Making a decision about the restorations' dimensions for these anterior teeth, particularly the maxillary central incisor, is crucial to the outcome of the cosmetic procedure. Examination of patients from the front in particular dynamic states, such as during conversation, with particular expressions on their faces, and when they were grinning, was used to evaluate dental esthetics.³

The relative gingival display and upper lip position are determined by two major factors. These two aesthetic factors are white and pink. The color, position, form, arrangement, orientation, and visibility of teeth, particularly the maxillary anterior teeth, are all considered white aesthetic features.⁴ The distance between the upper lip and the maxillary central incisors is known as the lip line. In contrast, a low lip line shows fewer than 75% of the maxillary anterior teeth. A high lip line reveals all of the clinical crowns together with continuous bands of gingival tissue. The typical difference between the

Corresponding Author:

Sana Naz

Peshawar Dental College and Hospital
Peshawar.

Email: khan009khan112@gmail.com

Received: 15 July 2025, Accepted: 30 December 2025

Published: 29 January 2026

Authors Contribution

SN & SA conceptualized the project. G & IA did the data collection. SN & ZUI performed the statistical analysis. SN & LT did the literature search. SN, SA & ZUI also did the drafting, revision & writing of manuscript.

Copyright © 2025 The Author(s). This is an Open Access article under the CC BY-NC 4.0 license.

lip lines of men and women is 1.5 mm, and a grin that displays 1-2 mm of gingival show at its fullest could be regarded as normal.^{5,6}

In men and women, the typical lip length at repose is approximately 23 mm and 20 mm, respectively, from the sub nasale (base of the nose) to the most inferior part of the upper lip at the midline (upper lip station).^{7,8} Subjects with an upper lip length of less than 20 mm in men and less than 18 mm in women will be classified as having a short upper lip.⁹ In girls, the average upper lip length is 18–22 mm, while in males, it is 20–24 mm. The commissure height, or the vertical distance from the commissure and a horizontal line from the subnasale, is about equal to the lip length. A backward resting upper lip line that lacks aesthetic appeal is caused by a short lip length in relation to the commissure height.⁹ While changing the commissure height is difficult, lip surgery can lengthen the lips, either on its own or in conjunction with a Le-Fort I osteotomy. When one smiles, the upper lip lifts to reveal 10 mm of the maxillary incisors, or around 80% of its original length. Lip elevation in women is 3.5% higher than in men.¹⁰

Male maxillary central incisors average 10.6 mm in height, while female maxillary central incisors average 9.8 mm.¹¹ When the upper lip is in the maximal grin posture, incisal exposure is defined as the distance between the central incisor and the inferior half of the upper lip, or upper lip station.⁹ Prolonged gingival invasion or attrition may be the cause of a short crown. Cosmetic surgery can raise the crown height when the incisors show little or nothing at rest and the lip line is normal when smiling. When short clinical crowns are linked to a gingival grin and a normal resting incisor presentation, gingivectomy or a crown-lengthening treatment with crestal bone removal is advised.¹²

Adequate incisal show is the basic goal of dental treatment. A short upper lip is one of the common signs in clinical practice. There are variations in results among various populations due to genetic and environmental factors.⁹ In this study, we want to find out whether a short upper lip is comparable with increased incisal exposure or not. In our population, there is a lack of local literature on this subject. This study will help the clinician to customize their treatment plan in cases with short upper lip to produce adequate incisal show.

The objective of this study is to compare the amount of maxillary incisal exposure between patients with normal and short upper lip lengths.

Methods

This cross-sectional study was conducted at the Orthodontics Department of Peshawar Dental

College & Hospital, Pakistan during October 2023 to March 2024. After taking informed consent a total of 235 non-growing patients (age above 20 years) with normal and short upper lip length and incisal exposure at rest and smile were included. Patients (both male and female) of any malocclusion (Angle class I, II, III) who visited the Outpatient Department of Peshawar Dental College & Hospital were included. Patients having gingival hyperplasia or any other gum disease like gum recession etc. have plastic surgery, missing anterior teeth, history of orthodontic treatment, or have supra or infra erupted maxillary incisors were excluded. Demographics like age and gender were also noted and clinical measurements were performed under standardized conditions to assess upper lip length and incisal exposure at rest and during smiling using a digital vernier caliper. Upper lip length was classified as short (<20 mm in males and <18 mm in females), normal (20–24 mm in males and 18–22 mm in females), or increased (>24 mm in males and >22 mm in females). Measurements were taken from the subnasale to the most inferior part of the upper lip at the midline (upper lip station) using a digital vernier caliper.

Subjects were examined for normal and short upper lip length and incisal exposure was measured at the maximum smile position and data was recorded using proforma. Data were then entered in Statistical Package for the Social Sciences (SPSS) version 26. Mean and SD was calculated for numerical variables like incisal exposure at rest and incisal exposure at a smile. A cross-sectional comparative analysis was done to find out the frequency and percentages. The comparison of incisal exposure at smile and at rest among short, normal and increased lip lengths was performed using ANOVA, followed by Post Hoc Bonferroni test.

Results

The study included 235 participants, comprising of 112 (47.7%) males and 123 (52.3%) females, with a mean age of 32.4±SD years and an age range of 20-45 years. Demographic analysis revealed that the majority of participants presented with Angle Class I malocclusion (68%), followed by Class II (24%) and Class III (8%). No significant age or gender-based differences were observed in the distribution of upper lip length categories (short, normal, or increased).

The one-way ANOVA results in Table-1 show that there are statistically significant differences in maxillary incisal exposure at both smile and rest among the three upper lip length groups (short, normal, and increased). For incisal

Table 1: Comparison of the incisal exposure at smile and rest among short, normal, and increased lip lengths. (n=256)

	Variables	N	Mean	SD	p-value
Incisal exposure at the smile	Short upper lip length	27	6.81	2.61	< .001*
	Normal upper lip length	201	8.1919	1.86787	
	Increased upper lip length	28	6.6964	1.65741	
Incisal exposure at rest	Short upper lip length	27	.8889	1.25064	< .001*
	Normal upper lip length	201	1.9853	2.06606	
	Increased upper lip length	28	.6071	1.57149	

Table 2: Post Hoc comparison of the incisal exposure at smile and rest among short, normal, and increased lip lengths.

Dependent Variable	Upper lip length	Upper lip length	Mean Difference (I – J)	Std. Error	p-value
Incisal exposure at the smile	Short upper lip length	normal upper lip length	-1.37708 ^a	.39708	.002*
		increased upper lip length	.11839	.52253	1.000
	Increased lip length	normal upper lip length	-1.49546 ^a	.39078	.000*
Incisal exposure at rest	Short upper lip length	normal upper lip length	-1.09638 ^a	.39949	.019*
		increased upper lip length	.28175	.52570	1.000
	Normal lip length	increased upper lip length	1.37813 ^a	.39315	.002*

*Post Hoc Bonferroni, Level of significance ≤ 0.05 *

exposure at smile and at rest the overall difference between groups and the linear trend is significant.

These results confirm that upper lip length is a significant factor associated with maxillary incisal display, both at smile and at rest. Participants with normal upper lip length had the greatest incisal exposure, while those with short and increased upper lip length had progressively less exposure.

In Table-2 the Bonferroni post hoc test confirms that participants with normal upper lip length had significantly greater maxillary incisal exposure, both at smile and at rest, compared to those with short or increased upper lip length. It also shows that there is no significant difference in incisal exposure at rest between participants with short and increased upper lip length.

Discussion

An important criterion in patients missing these teeth is identifying the vertical position of the maxillary anterior teeth. Replacing missing teeth in a manner that is comparable to dentate patients of the same gender, age, race, and facial anatomy is one of the primary goals of prosthetics.¹³

Based on the findings of this study, it was determined that the length of the upper lip has a major effect on the amount of incisal exposure of the maxillary anterior teeth both at rest and while smiling. The study further showed that the people with a normal width of the upper lip had the most exposure of the incisal edge while people with either less or more than a normal width of the lip had lesser exposure revealed. Specifically, at maximum

smile, the mean incisal exposure for individuals with normal upper lip length was 8.19 mm, significantly higher than the 6.81 mm and 6.70 mm observed in those with short and increased upper lip lengths, respectively. The results also demonstrated that notch width at rest in individuals with normal upper lip length (6.97 mm) was greater than those with short upper lip length (6.86 mm) and increased upper lip length (6.54 mm), though no significant difference was noted in the incisal exposure of 1.98, 0.89, 0.61 mm respectively.

The results of this study are consistent with other studies that have emphasized the importance of the length of the upper lip to establish dental aesthetics. For example, Patel et al.¹³ stated that the group of subjects with shortened upper lips had relatively more exposure to gingiva but did not have more exposure initially at rest position. In the same vein, Khan et al.¹⁴ also noted a decline in tooth exposure with increasing upper lip length – in other words, the lower incisal exposure in the increased lip length group of this study.

During smiling, the findings also revealed that the sample group with normal upper lip length still revealed more extents of incisal exposure than those with short or longer upper lips. This supports the studies made by Miron et al.¹⁵ who pointed out that the most desirable esthetic results are observed in situations when maxillary incisors are visible during smiling. In particular, it has been reported by Miron et al.¹⁵ that the normal lip line, which is equivalent to the normal upper lip length group in the present study, gives an average of 10 mm of incisal exposure while smiling and this compares well with our mean observation of 8.19 mm.

The study revealed no statistical difference in the level of incisal exposure at rest between the short and augmented upper lip groups. This implies that while the lip length functionality is visible with the formation of the specific facial expression such as smiling, it is not as significant when the facial muscles are relaxed. This result is slightly different from a previous study by Kristek et al.¹⁶ who reported a larger degree of variation at rest depending on lip fullness. However, this may be attributed to variations in content, population samples, or actual measurement instruments that were deployed.

Moreover, the large differences in incisal exposure between the observed groups, with the aid of the Bonferroni post hoc test, suggest that more personalized treatment planning should be done in dental practice. In those cases, when the patient's upper lip is short, crown lengthening or orthodontic treatment could help in augmenting incisal exposure. In contrast, those participants who had a larger length of the upper lip had these aspects better covered and might need surgical or nonsurgical treatment with the purpose of minimizing the coverage of the upper lip. Borhes et al.¹⁷ also highlighted the significant role of the upper lip in defining the smile and the aesthetics, which is in line with the conclusion made by the researchers that normal upper lip length gives the optimal esthetic exposure of the incisors. Furthermore, Mirabella et al.¹⁸ argued that a customized treatment plan is mandatory as patients' differences in lip length and incisal open bite require different clinical approaches, supporting the generalisability of our findings.

Conclusion

This study demonstrates that upper lip length influences maxillary anterior tooth visibility at rest and during smiling, with the most esthetically acceptable incisal display observed in individuals with normal lip retraction. The findings highlight the importance of lip contact patterns in dental treatment planning due to variability in lip morphology and their impact on smile aesthetics.

Funding: None.

Availability of Data: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval: The Institutional Review Board of Prime Foundation Pakistan, Peshawar Medical

College, Peshawar approved the study via letter no. Prime/IRB/2022-476.

Conflict of Interest: None declared.

References

1. Ku JE, Yang HS, Yun KD. A morphometric analysis of maxillary central incisor on the basis of facial appearance in Korea. *J Adv Prosthodont* 2012; 4: 13-7.
2. Machado RM, Duarte MEA, da Motta AFJ, Mucha JN, Motta AT. Variations between maxillary central and lateral incisal edges and smile attractiveness. *Am J Orthod Dentofacial Orthop* 2016; 150(3): 425-35.
3. Pontos M, Carlos J, Pizzatto E, Furuse AY, Mondelli J. A conservative approach for restoring anterior guidance: a case report. *J Esthet Restorat Dent* 2012; 24(3): 171-82.
4. MacAulay L. Contemporary esthetic dentistry. *Br Dent J* 2012; 213(1): 42.
5. Sethna G, Parmar H, Gaikwad R, Nabazza S. Objective smile analysis and its relationship with the lip length in an Indian population—An institution based study. *J Dent Med Sci* 2019; 18: 67-75.
6. Melo M, Ata-Ali J, Ata-Ali F, Bulsei M, Grella P, Cobo T, et al. Evaluation of the maxillary midline, curve of the upper lip, smile line and tooth shape: a prospective study of 140 Caucasian patients. *BMC Oral Health* 2020; 20(1): 1-9.
7. Sarver DM, Ackerman MB. Dynamic smile visualization and quantification: Part 2. Smile analysis and treatment strategies. *Am J Orthod Dentofacial Orthop* 2003; 124(2): 116-27.
8. Singla S, Lehl G. Smile analysis in orthodontics. *Indian J Oral Sci* 2017; 5(2): 49.
9. Roe P, Rungcharassaeng K, Kan JY, Patel RD, Campagni WV, Brudvik JS. The influence of upper lip length and lip mobility on maxillary incisal exposure. *Am J Esthet Dent* 2012; 2(2): 116-25.
10. Lira dos Santos EJ, Dantas AMX, Vilela RM, de Lima KJRS, Beltrão RTS. The influence of varying maxillary central incisor vertical dimension on perceived smile aesthetics. *J Orthod* 2019; 46(2): 137-42.
11. Manjula W, Sukumar M, Kishorekumar S, Gnanashanmugam K, Mahalakshmi K. Smile: A review. *J Pharmacy Bioallied Sci* 2015; 7(Suppl 1): S271-76.
12. Chandran N, Muralidhar NV, Suma S, Munaif V, Aishwarya R. Smile, its anatomy, types, components and cosmetics in orthodontics: a review. *Int J Dent Sci* 2019; 5(4): 297-302.
13. Patel J, Prajapati P, Sethuraman R, Naveen Y. A comparative evaluation of effect of upper lip length, age and sex on amount of exposure of maxillary anterior teeth. *J Contemp Dent Pract* 2011; 12(1): 24-9.
14. Khan F, Abbas M. The mean visible labial length of maxillary and mandibular anterior teeth at rest. *J Coll Physicians Surg Pak* 2014; 24(12): 931-4.

15. Miron H, Calderon S, Allon D. Upper lip changes and gingival exposure on smiling: vertical dimension analysis. *Am J Orthod Dentofac Orthop* 2012; 141(1): 87-93.
 16. Kristek E, Čelebić A. Analysis of width/length ratios of normal clinical crowns of the maxillary anterior dentition: correlation between dental proportions and facial measurements. *Int J Prosthodont* 2007; 20(3): 313-5.
 17. Borges ACG, Seixas MR, Machado AW. Influence of different width/height ratio of maxillary anterior teeth in the attractiveness of gingival smiles. *Dental Press J Orthod* 2012; 17: 115-22.
 18. Mirabella D, Bacconi S, Gracco A, Lombardo L, Siciliani G. Upper lip changes correlated with maxillary incisor movement in 65 orthodontically treated adult patients. *World J Orthod* 2008; 9(4): 337-48.
-