Original Article

Influence of Gender on Smile Characteristics; Gingival Display and Exposure of Maxillary Central Incisor

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ABSTRACT

OBJECTIVE: To evaluate the relationship of gingival display and amount of maxillary central incisor exposure with genders dimorphism during posed smiles.

METHODOLOGY: A cross-sectional study was conducted from May to November 2018 in the Department of Prosthodontics in a private dental teaching hospital, Karachi. Total 154 subjects were selected using a consecutive non-probability sampling technique. Posed smile photographs were taken using a digital Nikon camera D5300 (105-mm lens) under constant camera settings. Each photograph was imported to Computer software AutoCAD 2017 and calibrated using millimeter markings on the L-shaped metallic scale which was held along the face while taking the photographs. The gingival display was scored as being present or absent. To measure the extent of exposure of the upper central incisor, the length of the tooth visible during the smile was measured from the inferior border of the upper lip to the incisal edge of the maxillary central incisor. Statistical analysis of data was done using Statistical Package for social sciences (SPSS) software version 23. The statistical test applied was the Pearson Chi-square test and independent-sample T-test. The level of significance was kept at 0.05.

RESULTS: Out of 154 subjects 43% were males and 57% were females. A statistically non-significant relationship of gender was observed with gingival display (*p*-value >0.05) and amount of exposure of maxillary central incisor (*p*-value >0.05) during a smile.

CONCLUSIONS: gingival display and amount of maxillary central incisor display are not affected by gender in the studied sample.

KEYWORDS: Gingival display, gender, maxillary incisor exposure, smile characteristics

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INTRODUCTION

Facial appearance plays a pivotal role in the public dealings of an individual[1]. Studies have proved that a visually pleasant smile is second to eyes in facial attractiveness and it greatly impacts esthetics[2]. A pleasing smile has been shown to influence an individual's personality, interaction with society alongwith how a person is judged by others[1,3]. A smile can broadly be divided into posed and spontaneous[4]. By definition, the Posed smile is intentional and social. This may not be elicited by emotions. Posed smiles are deliberate, learned greetings that can be maintained and dependably reproduced and sustained[4,5]. On the contrary wise spontaneous smiles, are natural, dynamic, and influenced by feelings[5].

Various variables influence smiles. Some of which are tooth color, shape, position, and quality of restorations. The arrangement of the dentition, amount of gingival display, lip length, and gender also contribute towards an aesthetic smile[6]. The effect of the factors that contribute towards a well-balanced and attractive smile can be considered independently as well as about each other[7]. One of such parameters that control smiles is gingival visibility during smiling. The gingival display itself is affected by variable factors including gender, muscular lip activity, lip length, and age[8]. Ideally, only 1mm of the gingival show during smiling is considered to be esthetic, with some reports showing up to 2 to 3mm display to be considered aesthetically acceptable[4,8,9]. Excessive gingival show during smiling is generally not perceived to be attractive[10].

Another factor considered about smile characteristics is the amount of maxillary incisor exposure. The maxillary central incisors play a pivotal role in smile esthetics as they are considered to be the primary referencing teeth when determining the amount of visibility of anterior teeth during smiling[11]. Therefore when placing any restorations on these teeth, it demands that careful treatment planning is done to achieve the best possible esthetics for patients.[11] The amount of gingival display and maxillary anterior teeth exposure is related to the smile line[12,13]. Tjan A 1984[14] classified the smile line into three categories as high, average, and low. Persons showing entire maxillary incisors as well gingiva have high smile lines, whereas people with less than 75 percent of maxillary incisor exposure have low lip lines. Researchers have found that males usually have a low smile line as compared

to females[15,16].

Knowledge of the factors affecting gingival display during a smile has become vital to creating an esthetic smile[7]. It's also essential for producing esthetic restorations that provide long-lasting and biologically compatible results[9,17]. Limited data is available in the Pakistani population regarding factors affecting gingival display and tooth display during a smile. The purpose of this study was to evaluate the relationship of gingival display and amount of maxillary central incisor exposure with genders dimorphism during posed smiles.

METHODOLOGY

This study was conducted from May to November 2018 in the Department of Prosthodontics in a Private Dental Teaching Hospital, Karachi. Participants were selected using non-probability consecutive sampling technique and WHO calculator was used for sample size determination keeping confidence interval at 95%. Total 154 participants were included with inclusion criteria of age range from 19-30 years, all anterior teeth present with normal alignment and visibility (more than half of the tooth height) during a smile. Participants with a history of dentofacial trauma, previous orthodontics or orthognathic treatment, restoration in the anterior teeth, acquired or congenital facial abnormalities, crowding or marked spacing in the anterior teeth, facial neuro-muscular abnormality, marked tooth surface loss were not included.

Research approval from the Ethical and Scientific Review Board of the institute was obtained (Ref No. AUG-2017-PRT05/ 24-july2017) and consent was taken from each subject in writing. Smiling photographs of 154 individuals were taken, digital Nikon camera D5300 (105-mm lens) was used under constant camera settings. Photographs focused on the area between the nose and the chin while the individual was giving a posed smile. The social smile was used because of its reproducibility. Each image was imported to Computer software AutoCAD 2017 and calibrated using millimeter markings on the L-shaped metallic scale which was held along the face while taking the photographs to measure the incisor exposure (**Figure I)**. Length of maxillary central incisors tooth visible during smile calculated from lower border of the upper lip to incisal edge of the maxillary right central incisor. The gingival display was scored as present or absent. Measurements were done by a single assessor and repeated twice.

Statistical analysis of data was done using the Statistical Package for social sciences (SPSS-23). Pearson Chi-square test applied to evaluate the effect of gender on gingival display and independent sample T-test for the amount of maxillary central incisor exposure.

FIGURE I: SMILING PHOTOGRAPH SHOWING THE LENGTH OF RIGHT MAXILLARY CENTRAL INCISOR FROM INCISAL EDGE TO LOWER LIMIT OF THE UPPER LIP

RESULTS

Total 154 participants out of which 43% (66) were males and 57% (88) were females with mean age 22.69±1.4.

Gingival display during smile was present in 59.7 % of the studied sample, out of which 53 individuals were female and 39 were male, also, 40.2 % of the studied sample did not show gingiva during a smile.

Mean exposure of maxillary central incisor during smile in females was 8.01 and in males was 7.34 in millimeters.

Hence, it was found that there was no effect of gender on gingival display and amount of exposure of maxillary central incisor during smile as indicated by the statistically non-significant relationship (*p*-value >0.05)

Furthermore, the mean value of maxillary central incisor exposure during the smile was observed to be 7.72±2.54 in the studied sample (**Table I** and **II**).

TABLE I: RELATIONSHIP OF GINGIVAL DISPLAY AND GENDER

		Gender		Total	P-value
		Male	Female		
Gingival display	Absent	27	35	62(40.25%)	0.887
	Present	39	53	92(59.74%)	
Total		**66**	**88**	**154**	

P value > 0.05 is non-significant

DISCUSSION

A smile is a vital component of a person's attractiveness and influences an individual's personality[14,18]. It is one of the most significant ways in which humans convey their feelings[14]. Smile "involves a transformation of facial look which includes

TABLE II: RELATIONSHIP OF MAXILLARY CENTRAL INCISOR EXPOSURE WITH GENDER

	Gender	N	Mean	Std. Deviation	P-value
Amount of central incisor display	Male	66	7.34	2.97	0.158
	Female	88	8.01	2.15	

Non-significant P value > 0.05

brightening of the eyes, along with uplifting of the lips to communicate joy, happiness, affection, delight, and agreement or a variety of other sentiments.[19,20]

Present-day social and corporate cultures emphasize the need for having an esthetically pleasing smile.[4] Considering this dentists today face a great challenge in treating patients with a gummy smile since too much gingival display is not considered esthetic[21]. Furthermore, in such patients, there are issues with restoring teeth with indirect restorations, especially when placing the crown margins[9,21].

The factors of the gingival display were evaluated by multiple researchers [6-10,17,21]. Still, there is a knowledge gap between the relationship of gender and the gingival display and tooth display in the local population. Therefore in this study authors have assessed the inter-relationship of gingival exposure, amount of tooth display, and gender distribution.

The findings of this study indicate that gingival exposure was not related to gender. The authors' findings are however in contrast to most of the previous studies which signify that gender has a significant effect on the gingival display. Miron H 2012[15] conducted a study in which they included 72 (36 for each gender) volunteers. They found that 55.6% (n=20) females showed gingival display during smiling whereas it was prevalent in only 22.2% (n=8) of males.

Peck S 1992[16] also found a statistically significant difference in gingival exposure during smiling in males and females ($p < 0.01$), with females showing 1.5mm more gingiva than males at a maximum smile. Their results showed that the portion of females showing gingiva during smiling was almost double that of males (25 female subjects compared to 11 male subjects displayed gingiva), their study was done on orthodontic patients by taking direct measurements on patient's face which is different from the present study which has been carried out in healthy dentate individuals.

Das G 2016[17] conducted a study to evaluate the relation of gingival display with gender dimorphism and facial profile. They recruited 400 participants 200 each gender age range 29.608±11.298 (18-53). They found 21% (n=42) male and 48.7% (n=116) female have gingival display.

Khan F 2014[9] evaluated the presence of gingival display during posed smiles in 275 participants (male =121 and female = 154). They observed that 104 (37.8%) of the sample population had gingival display (male =35 and female = 69) whereas 171(62.2%) did not display gingiva during posed smile (male =86 and female = 85). They also found that significantly more females showed gingiva during smiling in comparison to males ($p < 0.001$). This study was also done on a similar population compared to our study but the difference in the results may be attributed due to the age group selected by Khan F 2014[9]. The participants in their study were range from 21-65 years old with a mean age of 33.01±12.26. On the other hand, the present study included only young subjects with a mean age of 22.69±1.4.

Al-Habahbeh R 2009[22] assessed gingival display among the Jordanian population during static and smiling. They did direct measurements with a digital Vernier caliper and found more gingival display in females than in males during a smile. This dissimilarity may be due to unlike methodology or a large difference in the age of the selected group.

Similarly, Sepolia S *et al*.[23] in 2014 conducted a photographic study in the Indian population, with a sample size of 400 participants and aged from 18-49 years. They reported a higher percentage of females 76.96% (n=186) displayed gingiva during forced smile as compared to males 73.42% (n=116). However, the difference is not large. Moreover, they did not describe a method of obtaining photographs in detail. This difference between the results of the two studies may be related to the sample selection and method of photography.

Similarly, Jensen J 1999[24] reported that the smile line was at a higher level in females when compared to males. Tjan A 1984[14] studied the smile line pattern on students between 20 and 30 years and found that females had high and very high smile lines (14% and 75%) in comparison to males (7% and 63%). These studies were carried out in the Caucasian population which differs from the ethnic background of the target population of this study.

Another factor was considered in this study is the quantity of maxillary central incisor revelation during smiling. The dimensions and exposure of anterior teeth particularly the central incisor during smiling are the determining factors of a harmonious and esthetically pleasant smile[11,25]. The maxillary central incisor is the most noticeable tooth of the anterior teeth and the dental arch as it is easily visible and is usually chosen in studies for referencing[11,14,22,25]. Considering these factors, the authors chose the maxillary central incisor as the reference tooth for

assessing the relationship between gender and maxillary central incisor exposure. They found that there is no effect of gender on the amount of exposure of maxillary central incisor (*p*-value >0.05) with females showing 8.01±2.15mm of central incisor during smiling and males showing 7.34±2.97 mm during smiling.

These conclusions are similar to the findings of Al-Habahbeh R 2009[22], who assessed gingival and tooth display among the Jordanian population in a static position and during smiling. The mean age of the sample was 34.3 (±10.76). They did direct measurements with digital Vernier caliper found that there was non-significant relation between gender and maxillary central exposure however females 9.14±1.27mm (87% of the buccal length of maxillary front teeth) showed more central incisor during smiling than males 8.72±1.45mm (78% of the buccal length of maxillary anterior teeth) with males displaying more of their mandibular incisors.

Drummond S 2016[26] evaluated the volume of maxillary anterior teeth display on rest and during dynamic motion (speech and smile) concerning age and gender. They found that in addition to the effect of age on maxillary central incisor exposure there is also an effect of gender. Their observation showed that after 25 years there is a variance in the exposure of maxillary central incisor exposure in both genders with males having lesser show than females.

Peck S 1992[12] reported that males had 9.8±2.2mm of central incisor exposure during smiling whereas females had slightly more exposure 10.5 ± 2.1 mm.

Ackerman MB 2004[27] conducted a retrospective study to analyze the lip-tooth features of 50 adolescent patients (27 boys, 23 girls) with a mean age of 12.5 years. Pretreatment video clips were made to measure the smile index, width between commissures (mm), the gap between lips(mm), incisor visibility below the inter-commissure line, and maximum incisor show in millimeters. They found only a slightly significant difference (P = 0 .0983) for girls in maximum exposure of incisor between speech and the posed social smile.

Qamar K 2017[28] found a significant difference in mean inci so-cervical height of maxillary central incisors among males and females with men having longer central incisors (9.8015±0.75mm) as compared to females (9.4172±0.759mm), however, in their study the measurement of central incisor was made irrespective of lip position.

There is a need to thoroughly investigate the amount of gingival and anterior teeth exposure at rest and at smiling as currently there is a lack of such data available locally. The possibility of any association between the tooth and gingival display, at rest and smiling, could be used as guidelines for prosthodontics. In addition, these factors should be related to soft tissue elements in further studies.

CONCLUSION

- The current study signifies that gingival display and amount of maxillary central incisor display during smile are not affected by gender in the studied sample.
- The results of this study could be utilized in the esthetic smile design of individuals.

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AUTHOR CONTRIBUTIONS

Khan M: Perceive idea, data collection, data analysis, methodology
Musharraf H: Refinement of the idea, literature review, writeup
Yousuf W: Statistical analysis, interpretation of results, improved discussion
Ahmed J: Literature review, discussion

REFERENCES

1. Aguiar T, Andre C, Arrais C, Bedran-Russo A, Giannini M. Micromorphology of resin–dentin interfaces using self-adhesive and conventional resin cements: a confocal laser and scanning electron microscope analysis. Int J Adhesion Adhesives. 2012; 38: 69-74.
2. Byrne D, London O, Reeves K. The effects of physical attractiveness, sex, and attitude similarity on interpersonal attraction. J Pers. 1968; 36(2): 259-71. doi: 10.1111/j.1467-6494.1968.tb01473.x.
3. Miller AG. Role of physical attractiveness in impression formation. Psychon Sci. 1970; 19(4): 241-3.
4. Gill DS, Naini FB, Tredwin CJ. Smile aesthetics. Dental Update. 2007; 34(3): 152-4, 157-8. doi: 10.12968/denu.2007.34.3.152.
5. Miles L, Johnston L. Detecting happiness: Perceiver sensitivity to enjoyment and non-enjoyment smiles. J Nonverbal Behavior. 2007; 31 (4): 259-75.
6. Cheng HC, Cheng PC. Factors affecting smile esthetics in adults with different types of anterior overjet malocclusion. Korean J Orthod. 2017; 47 (1): 31-8.
7. Bhuvaneswaran M. Principles of smile design. J Conserv Dent. 2010; 13(4): 225-32.

8. Hunt O, Johnston C, Hepper P, Burden D, Stevenson M. The influence of maxillary gingival exposure on dental attractiveness ratings. Eur J Orthod. 2002; 24(2): 199-204. doi: 10.1093/ejo/24.2.199.
9. Khan F, Abbas M. Frequency of gingival display during smiling and comparison of biometric measurements in subjects with and without gingival display. J Coll Physicians Surg Pak. 2014; 24(7): 503-7.
10. Sabri R. The eight components of a balanced smile. J Clin Orthod. 2005; 39(3): 155-67.
11. Machado AW. 10 commandments of smile esthetics. Dental Press J Orthod. 2014; 19(4): 136-57. doi: 10.1590/2176-9451.19.4.136-157.sar.
12. Peck S, Peck L, Kataja M. The gingival smile line. Angle Orthod. 1992; 62(2): 91-100.
13. Davis NC. Smile design. Dent Clin North Am. 2007; 51(2): 299-318. doi: 10.1016/j.cden.2006.12.006.
14. Tjan A, Miller GD. Some esthetic factors in a smile. J Prosthet Dent. 1984; 51(1): 24-8. doi: 10.1016/s0022-3913(84)80097-9.
15. Miron H, Calderon S, Allon D. Upper lip changes and gingival exposure on smiling: vertical dimension analysis. Am J Orthod Dentofacial Orthop. 2012; 141(1): 87-93. doi: 10.1016/j.ajodo.2011.07.017.
16. Peck S, Peck L, Kataja M. Some vertical lineaments of lip position. Am J Orthod Orthop. 1992; 101(6): 519-24. doi: 10.1016/0889-5406(92)70126-U.
17. Das G, Qamar K, Naeem S. Effect of gender and facial profiles on gingival display. Pak Oral Dent J. 2016; 36(3): 512-514.
18. Ioi H, Nakata S, Counts AL. Influence of gingival display on smile aesthetics in Japanese. Eur J Orthod. 2010; 32(6): 633-7. doi: 10.1093/ejo/cjq013.
19. Garber DA, Salama MA. The aesthetic smile: diagnosis and treatment. Periodontol 2000. 1996; 11: 18-28. doi: 10.1111/j.1600-0757.1996.tb 00179.x.
20. Manjula W, Sukumar MR, Kishorekumar S, Gnanashanmugam K, Mahalakshmi K. Smile: A review. J Pharm Bioallied Sci. 2015; 7(Suppl 1): S271-5. doi: 10.4103/0975-7406.155951.
21. Silberberg N, Goldstein M, Smidt A. Excessive gingival display--etiology, diagnosis, and treatment modalities. Quintessence Int. Nov-Dec 2009; 40(10): 809-18.
22. Al-Habahbeh R, Al-Shammout R, Al-Jabrah O, Al-Omari F. The effect of gender on tooth and gingival display in the anterior region at rest and during smiling. Eur J Esthet Dent. 2009; 4(4): 382-95.
23. Sepolia S, Sepolia G, Kaur R, Gautam DK, Jindal V, Gupta SC. Visibility of gingiva - An important determinant for an esthetic smile. J Indian Soc Periodontol. 2014; 18(4): 488-92.
24. Jensen J, Joss A, Lang NP. The smile line of different ethnic groups in relation to age and gender. Acta Med Dent Helv. 1999; 4(2): 38-46.
25. 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): 137-142. doi: 10.1177/1465312519839713.
26. Drummond S, Capelli Jr J. Incisor display during speech and smile: Age and gender correlations. Angle Orthod. 2016; 86(4): 631-7. doi: 10.2319/042515-284.1.
27. Ackerman MB, Brensinger C, Landis JR. An evaluation of dynamic lip-tooth characteristics during speech and smile in adolescents. Angle Orthod. 2004; 74(1): 43-50. doi: 10.1043/0003-3219(2004)074<0043:AEODLC>2.0.CO;2.
28. Qamar K, Das G, Permanand, Naeem S. Effects of gender and facial profiles on the size of maxillary central incisors. Pak Oral Dent J. 2017; 37(1): 179-182.

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