

Gender Differences in the Amount of Gingival Display During Smiling Using Two Intraoral Dental Biometric Measurements

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Abstract

Purpose: The aims of this study were to compare gender differences in the width and length of the maxillary right central incisor and the horizontal and vertical overlap of the anterior teeth and to determine the relationships of these two intraoral dental biometric measurements with the amount of gingival display during smiling.

Materials and Methods: A total of 61 men and 66 women were included in this study. For each participant, the gingival tissue display during smiling was judged to be either visible or not, and the maximum mesiodistal and incisogingival dimensions of the maxillary right central incisor were measured, along with the amount of horizontal and vertical overlap of anterior teeth using a digital caliper. Gender differences in these parameters and the relationship between subjects showing gingival display when smiling and the two intraoral dental biometric measurements were determined. Statistical analyses of data were performed using SPSS (V11) software. The mean scores for gender were calculated, and a Student's *t*-test was used to identify significant differences between both groups. Significance level was set to 0.05.

Results: The age of the participants ranged between 23 and 52, with a mean of 33.47 ± 9.07 years. A relatively small percentage of the subjects (22.05%) displayed gingiva when smiling. More women displayed gingiva when smiling than men, with a 2:1 female:male ratio. Men exhibited significantly (p < 0.05) wider (8.76 ± 0.66 mm) and longer (10.28 ± 0.88 mm) central incisors compared to women (7.92 ± 0.72 mm; 9.27 ± 0.93 mm width and length, respectively). No gender differences were found in the width-to-length ratio. Subjects with gingival display had significantly more horizontal (4.28 ± 1.21 mm; p < 0.001), and vertical (3.52 ± 0.66 mm; p < 0.05) overlap of anterior teeth compared to those who did not display gingiva when smiling (2.40 ± 1.03 and 2.30 ± 0.93 mm, respectively).

Conclusions: Significantly more women displayed gingiva in smiling. Men had significantly wider and longer central incisors. No differences were recorded between men and women relative to both the horizontal and vertical anterior tooth overlap. Subjects who displayed gingiva when smiling had more horizontal and vertical overlap of anterior teeth.

Driven by increased interest within dentistry and greater patient awareness outside the profession, facial esthetics and the desire of patients to improve their appearance have grown in importance.¹ Maxillary gingival display and the ultimate positions of the anterior teeth have definite effects on smile esthetics.^{2,3} It has been stated that the esthetically ideal amount of visible gingiva was about 1 mm,⁴ although 2 to 3 mm of gingiva might be esthetically acceptable⁵⁻⁷; however, the patient's age is a factor in crown height because of the rate of apical migration in the adolescent.⁸ The amount of esthetically acceptable gingival display during smiling can vary widely, but the relationship between gingival display and incisor show at rest is important.⁹ In broad terms, it is better to treat a smile with excessive gingival display less aggressively, because aging will naturally diminish this characteristic.¹⁰

Excessive gingival display (more than 3 mm) with smiling is often more esthetic than a smile with less tooth display.^{11,12} High smile lines have been attributed to short philtrum height, short incisor crown height, and mild vertical maxillary excess.¹³ Several investigators reported that female patients had greater gingival display with smiling compared to male patients,¹⁴⁻¹⁹ because men generally have longer upper lips than women.¹⁰

Restorative dentistry frequently entails correction of tooth size discrepancies associated with differing lengths and/or widths.²⁰ Consequently, tooth dimensions may be an important aspect of esthetic reconstruction, where identification of individual tooth size variations is critical to smile analysis, and correction of tooth size discrepancies are tantamount to smile design.²¹ Proper diagnosis of tooth size for each patient is critical in treatment planning for esthetic restorative dentistry.²²

Tooth size is the primary building block within the framework of a smile.²³ Correct tooth size allows for the successful arrangement of teeth in the anterior maxilla and enables esthetic treatment outcomes to be achieved.^{24,25}

The presence of maxillary anterior teeth plays an important role in facial esthetics.²⁶ The maxillary central incisor is considered to be the primary reference tooth, more important than the rest of the anterior teeth in regards to the amount of visible coronal tooth structure.^{22,27,28} Any prosthetic treatment involving their replacement is considered to be rather critical.²⁹ The maxillary central incisor is the most prominent tooth in the mouth; accordingly, extra care should be taken when selecting its size, form, and positioning.^{9,30,31}

It has been reported that men had wider and longer maxillary central incisors than did women,^{29,32-38} whereas no gender differences were found in other studies.³⁹⁻⁴¹ In one study, male patients exhibited from 0.5 to 1 mm greater tooth width than female patients. The majority of men were +0.5 mm and women -0.5 mm of the mean.⁴² Although changes in tooth length can occur as a result of the aging process, tooth width generally remains constant.⁴³ Anterior occlusal relationships, malocclusions, and posterior occlusal relationships are intraoral parameters that can affect facial appearance.^{44,45}

Width-to-length ratios of the maxillary central incisors ranging from 72% to 124% have been recorded in the dental literature.^{1,29,30,37,46} It has been suggested that the width-to-length ratios of the maxillary anterior teeth were not affected by gender;³⁷ however, significant gender differences in width-tolength proportions were recorded in previous studies.^{29,41,47}

Significant gender differences in the horizontal and vertical overlap of anterior teeth has also been reported in some studies,^{39,45,48} whereas other studies showed no sex predilection.^{15,16} In addition, a correlation between anterior tooth overlap and gingival display with smiling was recorded.¹⁶

The aims of this study were to: (1) Compare gender differences with two intraoral parameters: widths and lengths of maxillary right central incisors and horizontal and vertical overlaps of anterior teeth. (2) Determine the relationship between the gingiva displayed during maximum smiling, and the above two intraoral parameters in the Jordanian population.

Materials and methods

This study was carried out in the Division of Dentistry, Marka Medical Center, Princess Aysha Bint Al-Hussien Medical complex, Marka, Amman, Jordan. One-hundred twenty-seven (127) participants (61 men, 66 women) were included in this study. The mean age of the participants was 33.47 ± 9.07 years, with a range between 23 and 52.

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. 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.

Measurements

Measurements were performed with the subjects seated in a dental chair with the head and back in an upright position. Cheek retractors were used to facilitate using the caliper intraorally so that the cheeks and lips could not interfere with accuracy of the measurements.

Measurements were carried out using a digital caliper (Fowler Electronic Digital Caliper; Kevelaer, Germany). The measuring gauge had a resolution of 0.01 mm, and measured dimensions were recorded to this degree of accuracy. The caliper has two edges, external and internal (Fig 1). External edges were used to measure the width and length of the maxillary right central incisors and the length of the mandibular right central incisor. Internal edges were used to measure the horizontal overlap of anterior teeth between the maxillary and mandibular right central incisors and the displayed length of the mandibular right central incisor in maximum intercuspal position.

Gingival display was noted by asking each participant for a maximum smile. The gingiva displayed was recorded. Gingival display was judged as either visible or not visible.

Width and length measurements were performed on the labial surface of the maxillary right central incisor. The maximum mesiodistal dimension (width) was measured parallel to the incisal edge. The maximum incisogingival dimension (length) was measured from the gingival margin to the incisal edge vertically slightly distal to the middle of the tooth.

The horizontal overlap of the anterior teeth was measured by inserting the internal edges of the caliper between the incisal edges of the upper and lower right central incisors at the incisal edge point of maximum maxillary right central incisor length, and horizontally to the opposing labial surface of the mandibular right central incisor. For participants with reverse occlusal relationships (class III cases), the measurements were performed from the incisal edge of the mandibular right central incisor and horizontally to the labial surface of the



Figure 1 Fowler electronic digital caliper used in the measurements.

opposing maxillary right central incisor. Where there was/were no horizontal and/or vertical overlap(s) of anterior teeth (edgeto-edge), the measurement(s) was/were recorded as zero.

The vertical overlaps of the anterior teeth were calculated by subtracting the displayed portions of the mandibular right central incisors in maximum intercuspation from the actual maximum vertical lengths measured on the labial surface of these teeth. For participants with reverse occlusal relationships (class III cases), the measurements were performed on the labial surfaces of maxillary right central incisors.

For each dimension, three measurements were made, and the means were calculated. The measurements were made by two independent dentist examiners (72 subjects from one dentist and 55 from the other). Interexaminer variability and bias in measurements were assessed by remeasuring the clinical crown lengths of the maxillary left central incisors of 13 (10.24%) randomly selected participants by each examiner. Cronbach's test and Student's *t*-test were performed for interexaminer reliability evaluation. Cronbach's internal consistency coefficient was 0.862. Paired *t*-test revealed no statistically significant deviation of measurements between the examiners at a 5% significance level (mean difference 0.07 ± 0.42 mm; p = 0.863). As there was strong Cronbach's coefficient and small mean difference between the two examiner's measurements, it was assumed that the other measurements would be reliable.

Statistical analyses

Statistical Package for Social Sciences, Version 11 (SPSS-V11) software was used for the analyses of data. A chi-square test was performed to determine whether there were differences in gingival display during maximum smiling between men and women. A two-sample *t*-test was performed to determine whether there were gender differences in the width, length, and width-to-length ratio of the maxillary right central incisors, and horizontal and vertical overlap of anterior teeth.

All recorded data were analyzed using a Student's *t*-test, which was performed to reveal statistically significant differ-

ences in mean values of the parameters evaluated (central incisor width, length, and width-to-length ratio, and amount of horizontal and vertical overlaps of anterior teeth). Ninety-five percent confidence intervals about the mean were constructed for differences between men and women, and between gingival display and nongingival display participants. The mean scores were calculated, and a Student's *t*-test was used to identify significant differences at a level of 5%.

Results

Age and sex distribution of the participants in relation to the display of gingiva during a maximum smile are shown in Table 1. The age of the participants ranged between 23 and 52, with a mean of 33.47 ± 9.07 years. Approximately, one-half of the participants were below 30 years of age. The mean age of men was slightly higher than that of women. Participants who displayed gingiva were approximately 7 years younger than those who did not display gingiva with smiling. All men who displayed gingiva were younger than 32 years of age.

Table 2 shows the gender distribution of participants according to the gingiva displayed when smiling. Statistically significant differences were recorded between subjects with displayed gingiva (22.05%) compared to those who did not display gingiva (77.95%) when smiling (p < 0.01). In addition, more women were found to significantly display gingiva when maximum smiling compared to male counterparts (p < 0.05); however, no gender differences were recorded between male and female subjects who did not display gingiva with smiling.

Table 3 shows gender difference between the intraoral parameters: width and length of the maxillary right central incisor and overlap of anterior teeth. The mean width and length of the maxillary right central incisors for all participants were 8.32 ± 0.69 mm and 9.75 ± 0.90 mm, respectively. The average width-to-length ratio for all participants was 0.85 ± 0.10 . Male participants exhibited significantly (p < 0.05) wider and longer central incisors than did female patients. No significant

		Gingival display			Nongingival displa	A		Total	
Age	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
21–25	6 (4.73)	7 (5.51)	13 (10.24)	7 (5.51)	7 (5.51)	14 (11.02)	13 (10.24)	14 (11.02)	27 (21.26)
26–30	2 (1.57)	5 (3.94)	7 (5.51)	14 (11.02)	14 (11.02)	26 (22.04)	16 (12.60)	19 (14.96)	35 (27.56)
31–35	1 (0.79)	4 (3.15)	5 (3.94)	9 (7.09)	8 (6.30)	17 (13.39)	10 (7.87)	12 (9.45)	22 (17.32)
36-40	0 (0.00)	2 (1.57)	2 (1.57)	9 (7.09)	7 (5.51)	16 (12.60)	9 (7.09)	9 (7.09)	18 (14.18)
41–45	0 (0.00)	1 (0.79)	1 (0.79)	7 (5.51)	7 (5.51)	14 (11.02)	7 (5.51)	8 (6.30)	15 (11.81)
46-50	0 (0.00)	0 (0.00)	0 (00.00)	4 (3.15)	3 (2.36)	7 (5.51)	4 (3.15)	3 (2.36)	7 (5.51)
51-55	0 (0.00)	0 (0.00)	0 (00.00)	2 (1.57)	1 (0.79)	3 (2.36)	2 (1.57)	1 (0.79)	3 (2.36)
Total n (%)	9 (7.09)	19 (14.96)	28 (22.05)	52 (40.94)	47 (37.01)	99 (77.95)	61 (48.03)	66 (51.97)	127 (100.00)
Mean age (SD)	25.22 (6.23)	28.84 (8.76)	27.82 (8.04)	36.36 (8.72)	33.73 (10.70)	35.07 (9.36)	34.72 (8.35)	32.32 (10.14)	33.47 (9.07)

Table 2	Gender	distribution	of	subjects	according	to	gingival	display
with max	kimum si	miling						

	Gingival display Number (%)	Nongingival display Number (%)	Total Number (%)
Male (n = 61) Female (n = 66) Total (n = 127)	9 (7.09) ^{A**, a*} 19 (14.96) ^{A*, b*} 28 (22.05) ^{A**}	52 $(40.94)^{B^{**},a}$ 47 $(37.01)^{B^*,a}$ 99 $(77.95)^{B^{**}}$	61 (48.03) ^a 66 (51.97) ^a

Different uppercase letters across rows and lowercase letters in columns indicate significant difference *p < 0.05; **p < 0.01.

gender differences were found in the width-to-length ratio. The mean horizontal (overjet) and vertical (overbite) overlap of anterior teeth were 2.82 ± 1.07 mm and 2.56 ± 0.87 mm, respectively. Although female subjects had more anterior teeth overlap, the differences were not significant.

Subjects who displayed gingiva had slightly narrower and shorter maxillary right central incisors compared with those who did not display gingiva with maximum smiling, but the differences were not significant. In addition, a width-to-length ratio of 0.85 was recorded for each group. In both groups, men had wider and longer maxillary right central incisors than women (p < 0.05); however, there were no gender differences in the width-to-length ratios. Subjects who displayed gingiva during smiling had significantly more horizontal and vertical overlap compared with those who did not display gingiva when smiling; however, no significant gender differences in the overlap of the anterior teeth within each group were recorded (Table 4).

Discussion

The results of this study have shown that more female participants displayed gingiva during maximum smiling compared to male participants. These results are in accordance with previous studies.^{13,14}

Tjan et al¹⁵ reported that 37% of male subjects displayed gingiva when smiling compared to 80% of female subjects. Peck et al¹⁶ reported that excessive gingival display during smiling is rare among men. Some amount of gingival display is certainly acceptable and, in many cases, is even esthetic and youthful appearing.⁸ Conversely, a complete lack of gingival display is not as attractive as complete tooth display or even some gingival display.¹¹ In many studies, female subjects have been shown to display significantly more gingiva than male subjects.¹⁷⁻¹⁹

Up to 3 mm of gingival exposure above the cervical margins of the maxillary teeth is esthetically acceptable.^{3,6} Gingival display in excess of 3 mm is considered to be excessive, requiring correction by orthodontic or surgical intervention to avoid visual tension.^{5,7} Men generally have longer maxillary lips than females, leading to an average maxillary tooth display of 1.91 mm for men and 3.40 mm for women.⁹ Consequently, gender differences account for women displaying nearly twice the amount of maxillary teeth as do men.¹⁰

One of the most important aspects of dental and facial esthetics is anterior tooth display.²³ Tjan et al¹⁵ divided the smile line into three types: a high smile line, completely revealing

SD, standard deviation; n, number.

Table 1 Age and sex distribution of the participants in relation to gingival display with maximum smiling

Table 3 Gender differences of width, length, and width-to-length ratio of the maxillary right central incisor and horizontal and vertical overlap of the anterior teeth

		Male $(n = 61)$	Female (n = 66)	Total (n = 127)	Signifi	cance
Intraoral esthetic dental paramet	ters	Mean (SD)	Mean (SD)	Mean (SD)	<i>t</i> -test	<i>p</i> -Value
Maxillary right central incisor	W (mm)	8.76 (0.66)	7.92 (0.72)	8.32 (0.69)	0.66	p < 0.05
	L (mm)	10.28 (0.88)	9.27 (0.93)	9.75 (0.90)	0.79	p < 0.05
	W:L ratio	0.85 (0.13)	0.85 (0.08)	0.85 (0.10)	0.0079	NS
Overlap of anterior teeth	H (mm)	2.73 (0.96)	2.90 (1.17)	2.82 (1.07)	0.13	NS
	V (mm)	2.44 (0.74)	2.68 (0.93)	2.56 (0.87)	0.19	NS

SD, standard deviation; W, width; L, length; H, horizontal; V, vertical; NS, not significant; n, number.

the maxillary incisors and a continuous band of the gingiva; an average smile, revealing 75% to 100% of the maxillary incisors; and a low smile, revealing less than 75% of the maxillary incisors.

The central incisors are the most dominant anterior teeth in the dental arch because their dimensions are fully visible from a frontal view.^{22,28} The width of the left and right maxillary central incisors varies little in the same patient.^{21,27} The width of the maxillary right central incisor was therefore used as a parameter to assess gender differences between subjects evaluated.

In this study, the mean width and length of the maxillary right central incisor for all subjects were 8.32 and 9.75 mm, respectively. The results of this study showed that men had

wider and longer maxillary right central incisors than did their female counterparts.

Racial and gender differences in the average dimensions of the maxillary anterior teeth have been reported;^{29,32-38,42} however, some populations demonstrated no correlation between dental morphology and gender.³⁹⁻⁴¹ The finding of significant gender differences in the width of the maxillary right central incisor strongly suggests that this parameter should be evaluated carefully when replacing anterior teeth.

Comparative proportional analysis of tooth size relationships between mesiodistal anterior tooth dimensions and other teeth in the arch can ensure more accurate analysis of arch space. If implants are being considered as part of the prosthodontic treatment plan, data of this nature may aid in the selection of

 Table 4
 Relationship of width, length, and width-to-length ratio of the maxillary right central incisors and horizontal and vertical overlap of the anterior teeth to the gingival display with maximum smiling

	Gingival display			Nongingival display			Significance	
	Male Female		Total	Male	Female	Total		
	(n = 9)	(n = 19)	(n = 28)	(n = 52)	(n = 47)	(n = 99)	<i>t</i> -test	<i>p</i> -Value
Width								
Mean	8.57	8.08	8.24	8.79	7.86	8.35	0.087	NS
SD	0.53	0.46	0.49	0.68	0.82	0.75		
t-Test (p-value)	0.39 (µ	0 < 0.05)		0.73 (p	< 0.05)			
Length								
Mean	10.37	9.33	9.66	10.26	9.25	9.78	0.094	NS
SD	1.19	0.97	1.04	0.79	0.94	0.86		
t-Test (p-value)	0.82 (µ	0 < 0.05)		0.80 (p	< 0.05)			
W:L ratio								
Mean	0.83	0.87	0.85	0.86	0.85	0.85	0.0079	NS
SD	0.27	0.11	0.16	0.098	0.066	0.083		
t-Test (p-value)	0.03	81 (NS)		0.007	9 (NS)			
Horizontal overlap								
Mean	4.12	4.35	4.28	2.49	2.31	2.40	1.48	P<0.001
SD	1.15	1.24	1.21	0.98	1.08	1.03		
t-Test (p-value)	0.18	B (NS)		0.14	(NS)			
Vertical overlap								
Mean	4.27	3.16	3.52	2.12	2.49	2.30	1.16	P<0.05
SD	0.62	0.68	0.66	0.88	0.99	0.93		
<i>t</i> -Test (<i>p</i> -value)	0.8	7 (NS)		0.29	(NS)			

NS, not significant; SD, standard deviation; W, width; L, length; n, number.

potential sites for implant placement. In this way, prosthetic teeth can be centered over the implants to improve biomechanics and enhance esthetic outcomes.

The size and form of the maxillary anterior teeth are important not only to dental esthetics, but also to facial esthetics.²⁵ The goal is to have the maxillary anterior teeth restore optimal dentolabial relations in harmony with the overall facial appearance.²² The most influential factors contributing to a harmonious anterior dentition are the size, shape, and arrangement of the maxillary anterior teeth, particularly the maxillary central incisors as viewed from the front.^{30,31}

Intraoral measurements were used in this study; however, other studies measured the clinical tooth dimensions either on casts,^{29,39} or using computer-based images,⁴³ or intraoral evaluations.^{37,40} The crown width-to-height ratio was accepted as the most stable reference, as it showed minimal variation between genders or between teeth.⁴ In this study, the mean widthto-length ratio was 85% with no gender differences. Ratios ranging from 78% to 92% were recorded, compared to ratios ranging from 76% to 86% reported in a previous study.¹ In addition, significant gender differences in width-to-length ratios have been reported.⁴⁷ In this study, the width-to-height ratios of the maxillary anterior teeth in both genders were found to be greater than those in previous studies.^{37,46} A higher average width-to-length ratio of 81% was reported;³⁷ however, a width-to-height ratio of 75% was preferred and found to be more esthetically appealing than others.³⁰

The maxillary central incisors should have a width-to-height ratio of approximately 80% to achieve the best appearance.¹ The width-to-length ratio should range from 0.75 to 0.8; a value less than 0.6 creates a long narrow tooth, and beyond this number results in a short, wide tooth.¹² In this study, the width-to-height ratios of the central incisors exceeded the proportion of 80% suggested as ideal for an attractive appearance in both men and women.

The perceived dimensions of the maxillary anterior teeth are more important than the actual dimensions, because most of the proportional relationships are based on perceived sizes rather than actual dimensions.²⁸ In addition, there is no definitive value for the width-to-length ratio, and the mesiodistal width is more important than the incisogingival length.⁴⁸

Restored tooth length can be calculated with the following equation:

$$L = \frac{W}{\text{Tooth proportion (\%)}}$$

where the tooth proportion ratio ranges from 72% to 81%.²² Tooth size range for men was consistently 0.5 mm larger than the mean, whereas for women it was 0.5 mm smaller. These findings have significant clinical relevance in that proper tooth biometry exists for each patient; individual tooth size must therefore be identified prior to any attempt to create an esthetic smile via dental restorations.²⁴

Horizontal and vertical overlap of anterior teeth not only have a close relationship to esthetic perceptions,⁴⁴ but they can differ significantly among races and between genders.^{39,45,48} The mean horizontal (overjet) and vertical (overbite) overlap of anterior teeth were 2.82 and 2.56 mm, respectively. Although female subjects had more anterior tooth overlap, the differences were not significant. The results from this study are in general agreement with previous studies.^{15,16}

In their study, Peck et al¹⁶ reported a link between horizontal and vertical overlap in patients with significant gingival display with maximum smile. They found that subjects with excessive gingival display had mean overjets of 1.5 mm and overbites of 1.0 mm larger values in both dimensions compared to the sample who had no gingival display with smiling. In this study it was found that the mean horizontal and vertical overlaps of anterior teeth in subjects who displayed gingiva when smiling were significantly higher than those who did not display gingiva. It was reported that patients with extensive gingival display also had excessive horizontal and vertical overlap of the anterior teeth.²⁶

Horizontal and vertical overbite depends on the incisogingival length of the anterior teeth (both maxillary and mandibular), the shape of the arches, and angulations of the teeth in the sagittal plane. In ideal circumstances, the maxillary central incisors are 12 mm long, perfectly aligned, and the arch form is within the norm, with the mandibular central incisor 10 mm long. In this case, the vertical overlap and horizontal overlap were 4 and 2 mm, respectively.¹² The current interest in soft tissue dental esthetics has emerged in part due to a more critical analysis of the esthetic interrelationship between gingival tissues and teeth.²

The results of this study can be helpful in the esthetic management of gingival abnormalities, especially for patients with gingival display when smiling. The importance of the results of width-to-length ratio may aid the clinician in determining the final tooth length, when exposed to attrition, and to determine the size of central incisors in cases of tooth loss or when anterior restorative procedures are considered. This process is accomplished by dividing the patient's tooth width by the mean tooth width-to-length ratio. Such an equation could be used in conjunction with other clinical parameters, such as anterior horizontal and vertical overlap of anterior teeth, to determine the final position of the gingival margin during surgery. Similarly, the restorative clinician can determine appropriate tooth length in cases that have undergone excessive occlusal wear by using similar calculations; again, if tooth width can be determined.

The finding of significant gender differences in the size of the maxillary right central incisor strongly suggests that this parameter should be evaluated carefully when replacing anterior teeth. Comparative proportional analysis of tooth size relationships between mesiodistal anterior tooth dimensions and other teeth in the arch can ensure more accurate analysis of arch space. If implants are being considered as part of the prosthodontic treatment plan, data of this nature may aid in the selection of potential sites for implant placement. In this way, the prosthetic teeth can be centered over implants to improve biomechanics and enhance esthetic outcomes.

Conclusion

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

1. Significantly more female participants were found to display gingiva during maximum smiles, compared with their male counterparts (p < 0.05).

- 2. Men had significantly (p < 0.05) wider (8.76 ± 0.66) and longer (10.28 ± 0.88) maxillary right central incisors, compared with female participants, 7.92 ± 0.72 and 9.27 ± 0.93 , width and length, respectively; however, the mean value of width-to-length ratio was 0.85, with no gender differences.
- 3. No significant differences in both horizontal and vertical anterior teeth overlap were found between men and women.
- 4. Subjects who displayed gingiva during a maximum smile had significantly more horizontal (4.28 \pm 1.21 mm) and vertical (3.52 \pm 0.66 mm) overlap of anterior teeth compared with subjects who did not show their gingival tissues when smiling; (p < 0.001) (p < 0.05) for horizontal and vertical overlaps, respectively.
- 5. No significant differences in width, length, and width-tolength ratio between subjects with and those without gingival display in maximum smiling were recorded.

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