



## Clinical evaluation of gingival thickness and width according to gender and position among Baghdad dental students

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### Abstract

**Aim of the study:** was to assess marginal gingival thickness and width of keratinized gingiva comparing them between males and females among Baghdad dental students.

**Materials & Methods:** Two methods were utilized to measure gingival thickness: visual and probe transparency. Gingival biotypes examination included upper and lower left central incisors of 100 subjects. The width of keratinized gingiva was measured by using a periodontal probe.

**Results:** Thick gingival biotype was more apparent among males, while thin biotype was more among females. There was no significant difference in gingival width between males and females.

**Conclusions:** Gingival thickness and width were not affected by gender. The visual method can be used efficiently to estimate gingival thickness.

**Keywords:** gingival biotype, gingival thickness, probe transparency.

### Introduction

The esthetic awareness of gingiva during the last years, focus on the concern of periodontics from therapeutic view<sup>1</sup>.

The importance of gingival biotype comes from the determination of the outcomes of different dental procedures, like dental implants, root coverage procedures, prosthetic and orthodontic treatment. The evaluation of gingival thickness (GT) and gingival width (GW) is essential before deciding the treatment plan<sup>2</sup>.

Different GT and width were observed among individuals and in the same individual<sup>3</sup>.

The gingival biotype term was used to describe the GT in facio-palatal dimension; whereas the periodontal biotype term was used to describe GT in addition to other features; like crown shape, contour of the gingiva, gingival width, and even alveolar bone thickness and contour<sup>4</sup>.

Dense gingival appearance and a wide zone of keratinized gingiva were observed in the thick gingival biotype, while delicate, translucent and friable with narrow

keratinized gingival tissue among the thin biotype<sup>5</sup>.

Thick gingival biotype resists trauma and recession, enables tissue manipulation, improves implant aesthetics, and exhibit less clinical inflammation<sup>6</sup>.

Thin gingival biotype is more susceptible to recession, inflammation, and also they are frequently characterized by osseous defects like fenestration and dehiscence, so careful treatment planning is required for the successful outcome of regenerative periodontal therapy<sup>7</sup>.

The adequate GW around implants for the health and stability of the mucosal tissues. Implant sites with inadequate GW had more plaque accumulation, more mucosal inflammation, and attachment loss. Thus, gingival augmentation procedures to increase GW prior to or following implant placement are importance<sup>8</sup>.

Various invasive and non-invasive methods were used to estimate GT. These include direct visual examination, or by direct measurements using endodontic spreaders, endodontic files, and calipers,<sup>9</sup> probe transparency method, utilizing a periodontal probe,<sup>10</sup> ultrasonic devices,<sup>11</sup> and cone-beam computed tomography scan<sup>12</sup>. The most reproducible and simple method was the probe transparency method (TRAN) through the sulcus<sup>13</sup>.

Many studies measured GT by using different methods. Vandana et al 2005,<sup>2</sup> measured GT by transgingival probing method, and observed that gingiva was thicker among the young aged group than the old age group. The gingiva was thinner in the mandible than maxilla, and in females than males.

In 2009, De Rouck et al,<sup>13</sup> found thin gingival biotype was more prevalence among females. In 2017, Lee WZ et al<sup>14</sup> found that GT was different in the anterior region than posterior, and GT and width were affected by plaque accumulation, recession, and tooth

type but not affected by age, gender or ethnicity. They found that there are different gingival widths in different sites in the oral cavity.

There is no data available about this subject among Iraqi population, so the aim of this study was to determine the differences in marginal GT and gingival width between males and females among Baghdad dental students.

## Materials And Methods

The sample population was consisted of one hundred dental students (50 males and 50 females). This study was approved by the ethical committee of the College of Dentistry Baghdad University, Iraq (089619). Each participant in this study was subjected to GT examination for the upper and lower left central incisors, by using visual and probe TRAN.

The inclusion criteria included healthy periodontium (the mean of gingival index and plaque index for each subject  $\leq 0.5$ ), angle class I occlusion, no history of any systemic disease and age ranged between 19 - 23 years.

The exclusion criteria included pregnant and lactate females, gingival recession in the anterior teeth, systemic diseases, extensive restorations in the gingival third of the anterior teeth, the use of any medication possibly affecting the periodontal tissues, smoking and orthodontic appliance. Each participant in this study informed about the aim of the study and signed a consent form.

### Assessment of gingival thickness:

#### Visual examination

The gingiva was categorized (visually) into:

- Thick: (the marginal gingiva appear flat, wide attached gingiva, square crowns).
- Thin: (the marginal gingiva appear scalloped and delicate, triangular crowns).<sup>4</sup>

Score (0) was given for participant with thin gingival biotype and score (1) for thick gingival biotype.

### Probe transparency method (TRAN)

The gingival thickness was determined by probe transparency (TRAN) method, this method was based on whether the periodontal probe (Michigan O probe with William's marketing) was visible through the gingival margin while probing the sulcus at the midfacial aspect of both upper and lower left central incisors. When the underlying periodontal probe was seen through the gingiva, it was classified as thin (score 0), otherwise, it was considered thick (score 1).<sup>15</sup>

### Gingival width

Keratinized gingival width was measured vertically from mucogingival junction to the free gingival margin at the midfacial surface of the tooth.<sup>14</sup>

### Statistical Analysis

Statistical analysis was performed using a set of data that consisted of gingival biotype scores and gingival width assessed by three examiners, statistics included; percentage, frequency, tables, student T-test (values with  $P < 0.05$  were considered statistically significant), and chi-square. Inter-examiner agreement was evaluated for the examination with kappa test (k) (value 0.7).

### Results

The data was collected by three examiners, using a periodontal probe. Fifty males and fifty females were included as a study sample.

Thick gingival biotype was observed in males (68%) more than in females (44%) by TRAN method. While thin gingival biotype was observed in females (56%) more than in males (30%). In visual examination method, thick gingival biotype was more obvious in males (68%), while thin gingival biotype was more noticed among females (60%). There

was a great matching of results between visual and TRAN methods (Table 1).

There were different results between upper and lower central incisors biotypes in the same patient by using TRAN methods. In upper central incisor, a thin gingival biotype in males was (30%) and (70%) was thick; while in lower central incisor, (40%) was thin and (60%) was thick gingival biotypes. In females, upper thin biotype was (56%) and (44%) was thick, while for lower (76%) was thin and (24%) was thick (Table 2).

In comparison between visual and TRAN methods, there was no significant differences between results measured by using these two methods (Table 3).

There was no significant difference between upper and lower marginal GT of left central incisors among males; while there was a significant difference among females (Table 4).

There was no significant difference between gingival width of males and females (Table 5).

### Conflicts of Interest

The authors reported that they have no conflicts of interest.

### Discussion

The objective of this study was to estimate the marginal GT by using visual and TRAN methods; and the width of keratinized gingiva (WKG) between males and females. The hypothesis was that males have thicker gingival margin in comparison with females.

Measurement of the marginal GT is important in considering visibility of restorative materials, while measurement of flap thickness by transgingival probing method can affect the surgical outcomes.<sup>16</sup>

Warasswapati et al. in 2001<sup>17</sup> showed that gingival biotypes affected also by racial and genetic factors.

Marginal GT differs from subject to subject and influenced by gender, growth, age, and tooth size, shape and position.<sup>18</sup>

Tao J et al in 2014<sup>19</sup> concluded that crowned teeth with thin marginal gingiva had a mean of 0.7 mm recession compared to crowned teeth with thick marginal gingiva over 5 years.

In this study, there was no significant difference between results of the visual examination method and the results of the TRAN method, in determining marginal GT,

Kan et al in 2010<sup>20</sup>, showed a statistically significant difference between visual examination and probe method, in determining gingival width of maxillary anterior teeth, by using the McNemar test, and non-significant difference between probe method and direct tension-free caliper.

The thicker marginal gingiva was found more among males; while thinner marginal gingiva was found more among females; in both methods, but there was no significant difference between them. This result was in disagreement with the result of De Rouck et al. in 2009,<sup>13</sup> they found a significant difference between males and females in marginal GT measured by TRAN method. They concluded that 84% of all measured central incisors of male participants showed thick biotype compared to females.

In this study, there was no significant difference between males and females in the mean width keratinized gingiva. This result was disagreed with the result of Kolte et al in 2014,<sup>21</sup> who found that the width of keratinized gingiva was more in males than females with statistically significant differences. This conflict may be due to ethnic differences where the mentioned study was done in Belgium and this study was done in Iraq.

Healthy periodontal tissue usually related with thick periodontal biotypes as tissue is fibrotic and dense with a large width of attached gingiva as well as thicker underlying bone.<sup>22</sup>

## Conclusion

Visual assessment of marginal GT is reliable method as with a TRAN method.

There was no difference of GT and width between males and females.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

## References

- 1- Tasneem S, Venugopal K, Ravishankar PL, Chakraborty P, Kandukuri VG, Saravanan AV. Determining the gingival biotype based on dentopapillary compound. *J Int Clin Dent Res Organ* 2018;10(1):37.
- 2- Vandana KL, Savitha B. Thickness of gingiva in association with age, gender, and dental arch location. *J Clin Periodontol* 2005; 32: 828–830.
- 3- Seibert, J. & Lindhe, J. (1989) *Textbook of Clinical Periodontology and Implant Dentistry*, 2nd edition, pp. 477–517. Copenhagen: Munksgaard.
- 4- Cohen ES. *Atlas of Cosmetic and Reconstructive Periodontal Surgery*. 3<sup>rd</sup> ed. Hamilton: BC Decker Inc.; 2007. p. 247.
- 5- Kao RT, Pasquinelli K. Thick vs. thin gingival tissue: A key determinant in tissue response to disease and restorative treatment. *J Calif Dent Assoc* 2002; 30:521-6.
- 6- Joshi N, Agarwal MC, Madan E, Gupta S, Law A. Gingival biotype and gingival bioform: determining factors for periodontal disease progression and treatment outcome. *Int J Sci Stud* 2016;4(3):220–225.
- 7- Divya Saxena<sup>1</sup> Rosheni A. Mamen<sup>1</sup> Sanjeev Jain<sup>1</sup> Gaurav Pandav<sup>1</sup> Riddhi Aggarwal<sup>1</sup> Shreanshi Jolly. Clinical Evaluation of Gingival Thickness and Width according to Dental Arch and Location in Pigmented and Nonpigmented Gingiva. *Dent J Adv Stud*:2021;9:31–35.
- 8- Lin GH, Chan HL, Wang HL. The significance of keratinized mucosa on implant health: a systematic review. *J Periodontol*. 2013; 84:1755-1767.
- 9- Manjunath RG, Rana A, Sarkar A. Gingival biotype assessment in a healthy periodontium: transgingival probing method. *J Clin Diagn Res* 2015;9(5):ZC66–ZC69.

- 10- De Rouck T, Eghbali R, De Bruyn H, et al. The gingival biotype revisited: Transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. *J Clin Periodontol* 2009;36:428–33.
- 11- Muller HP et al. Repeatability of ultrasonic determination of gingival thickness. *Clin Oral Investig* 2003;11:439–42.
- 12- Barriviera M, Duarte WR, Januario AL, Faber J, Bezerra AC. A new method to assess and measure palatal masticatory mucosa by cone- beam computerized tomography. *Journal of clinical Peri-odontology* 2009;36:564–8.
- 13- De Rouck T, Eghbali R, Collys K, De Bruyn H, Cosyn J. The gingival biotype revisited: transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. *J Clin Periodontol* 2009; 36: 428–433.
- 14- Lee WZ, Ong MMA, Yeo AB-K. Gingival profiles in a select Asian cohort: A pilot study. *J Invest Clin Dent*. 2017;00:e12269.
- 15- Kan JYK, Rungcharassaeng K, Lozada JL. Immediate placement and provisionalization of maxillary anterior single implants. 1-Year prospective study. *Int J Oral Maxillofac Implants*. 2003; 18:31-39.
- 16- Burkhardt R, Lang NP. Role of flap tension in primary wound closure of mucoperiosteal flaps: a prospective cohort study. *Clin Oral Implants Res*. 2010; 21:50-54.
- 17- Wara-aswapati N, Pitiphat W, Chandrapho N, Rattanayatikul C, Karimbux N. The thickness of palatal masticatory mucosa associated with age. *J Periodontol*. 2001; 72:1407–12.
- 18- Muller, H. P. & Eger, T. (1997) Gingival phenotype in young male adults. *Journal of Clinical Periodontology* 24, 65–71.
- 19- Tao J, Wu Y, Chen J, Su J. A follow-up study of up to 5 years of metal-ceramic crowns in maxillary central incisors for different gingival biotypes. *Int J Periodontics Restorative Dent*. 2014; 34:e85-e92.
- 20- Kan JY, Morimoto T, Rungcharassaeng K, Roe P, Smith DH. Gingival biotype assessment in the esthetic zone: visual versus direct measurement. *Int J Periodontics Restorative Dent*. 2010 Jun; 30(3):237-43.
- 21- Kolte Rajashri, Kolte Abhay, Aaditi Mahajan. Assessment of gingival thickness with regards to age, gender and arch location. *J Indian Soc Periodontol*, 2014 Jul-Aug; 18(4): 478–481.
- 22- Fu JH, Yeh CY, Chan HL, et al. Tissue biotype & its relation to the underlying bone morphology. *J. Periodontal*. 2010; 81:569–74.

**Table (1): effect of gender in determining the gingival thickness by using visual and transparency methods.**

	Thin biotype				Thick biotype				Chi-square	p-value
	M1		M2		M1		M2			
	No.	%	No.	%	No.	%	No.	%		
Male	16	32%	15	30%	34	68%	35	70%	0.046	0.82 (NS)
female	30	60%	28	56%	20	40%	22	44%	0.164	0.685 (NS)

M1: visual method; M2: TRAN method; No.: number; NS: non-significant.

**Table (2): distribution (frequency & percentage) and association of gingival thickness measured by TRAN method, between upper and lower left central incisors for males and females.**

	Thin biotype				Thick biotype				Chi-square	p-value
	Upper left central incisor		Lower left central incisor		Upper left central incisor		Lower left central incisor			
	No.	%	No.	%	No.	%	No.	%		
Male	15	30%	20	40%	35	70%	30	60%	1.098	0.204 (NS)
female	28	56%	38	76%	22	44%	12	24%	4.456	0.034 (S)

No.: number; NS: non-significant; S: significant

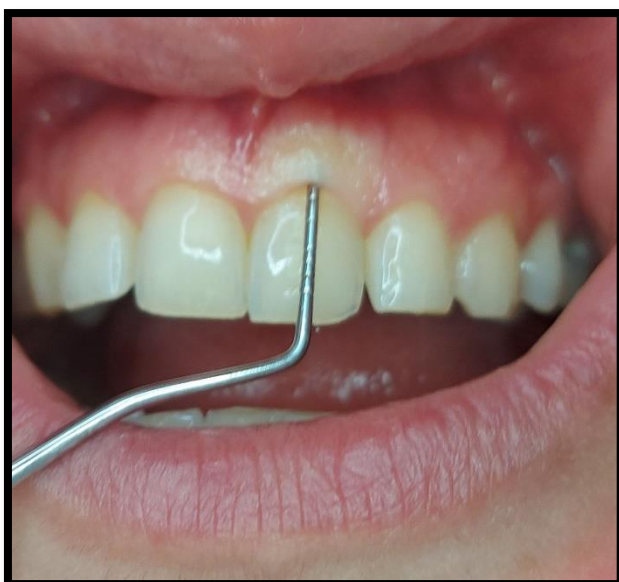
**Table (3): Significant differences between the mean of gingival width of males and females**

	Gingival width		Student T- test	p-value
	Mean	SD±		
Male	7.76	1.15	0.719	0.546 (NS)
Female	7.88	1.14		

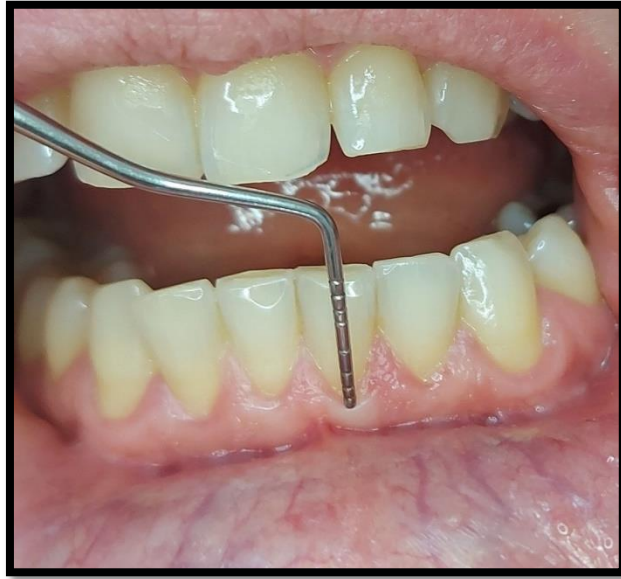
NS: non-significant



**Figure 1: according to visual examination method; the marginal gingiva look flat, with square crown, it means a thick gingival biotype.**



**Figure 2: TRAN method; the end of Michigan O probe with William's marketing was invisible through the gingival sulcus, it means a thick gingival biotype.**



**Figure 3: TRAN method, determination of gingival thickness while probing the sulcus at the midfacial aspect of lower left central incisor.**