



## Computation of width of attached gingiva and gingival biotype: Variations with regard to age, gender and arch

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### Abstract

The most important anatomic and functional landmark in the periodontium is attached gingiva. Evaluating the gingival topography plays a vital role in periodontal diagnosis and treatment planning. Therefore it is very important to know the variations in the gingival biotype and width of attached gingiva (WOA) with regards to age, gender and dental arch.

**Aims:** The aim of our present study was to i) To assess variations in the biotype of the gingiva with regards to age, gender and dental arch in anterior teeth (using k files). ii) To assess attached gingival width in anterior teeth (using measurement approach).

**Materials and Methods:** 50 participants of age varying between 18 – 50 yrs with good general health and with no loss of attachment was selected and splitted into 2 groups. Group A consists of 25 participants of age (19 – 35yrs) and Group B consists of 25 participants of age (36 – 55 yrs). Width of attached gingiva (WOA) and Gingival biotype was compared and evaluated between females and males and mandibular arch and maxillary arch.

**Results:** It was noticed that Width of Attached gingiva and Gingival biotype was significantly decreased with age in both arches. The gingiva was thicker in maxillary arch compared to the mandibular arch & heighest width of attached gingiva was seen in females & Gingival biotype was higher in males than females.

**Conclusion:** In present study it was concluded that width of attached gingival (WOA) and gingival biotype varies with respect to age, gender & arch location.

**Keywords:** width of attached gingival, gingival biotype, mucogingival junction

### Introduction

Anatomically gingiva is divided into 3 parts marginal gingiva, attached gingiva and interdental gingiva <sup>[1]</sup>. The gingiva which tightly adapts to the underlying alveolar bone is attached gingiva <sup>[2]</sup>. Mucogingival junction is the stable landmark for periodontal evaluation <sup>[3]</sup>. Attached gingiva is measured as the distance between projection of the external surface of the bottom of the sulcus or the periodontal pocket to the mucogingival junction <sup>[1]</sup>. An adequate width of gingiva is necessary for proper maintenance of oral hygiene and esthetics. Restoring gingival biotype & width of gingiva is an integral part of periodontal esthetic surgery <sup>[4]</sup>.

Based on gingival morphology Ochsenein and Ross <sup>[5]</sup> in 1969 divided the gingival morphology into two types, namely thin and scalloped or flat and thick gingiva. "Periodontal biotype" term was given by "Seibert and Lindhe" <sup>[6]</sup> later they categorized gingiva into "thick-flat" and "thin-scalloped" biotypes. "Claffey and Shanley" classified gingival biotype as thin biotype (Gingival thickness <1.5 mm) and thick biotype (Gingival thickness ≥2 mm) <sup>[7]</sup>. According to 2017 European World Workshop the term periodontal biotype was replaced by periodontal phenotype <sup>[8]</sup>. The identification of gingival phenotype is essential as differences in bony and gingival architectures manifest a significant effect on the outcome of restorative therapy <sup>[9]</sup>.

### Aims and objectives

1. To evaluate different variations in gingival biotype with regards to dental arch, age and gender in anterior teeth (using k files)
2. To evaluate different variations in gingival width (using measurement approach)

### Materials and methods

#### Subjects

Total of fifty systemically healthy patients who visited to AME's Dental College and Hospital, Raichur, India, after receiving consent were enrolled in the study.

### Inclusion criteria

1. Subjects who had all 6 anterior teeth in both upper and lower arch

2. No attachment loss

### Exclusion criteria

1. Any systematic disease
2. Medications that have negative impact on periodontium
3. Lactating mothers and pregnancy

The study was explained to the patients and finally we included the subjects who are willing for the study. Based on the age we divided subjects into 2 different groups. The 1<sup>st</sup> group consists subjects from 19–35 yrs of age & 2<sup>nd</sup> group consists subjects from 36-55 yrs of age. Each group consists of 26 males and 24 females.

### Methodology

Using lidocaine Hydrochloride topical gel (2%) facial gingival was anesthetised. The gingival width was calculated as a difference of sulcus depth from the keratinized tissue width. Using endodontic k file with rubber stopper the thickness of gingiva was measured (using 20 number k file) in the midbuccal aspect. The measurement was done 3 mm apical to the free gingiva in the attached gingiva. The gingival width and gingival biotype was recorded in all 6 maxillary and 6 mandibular anterior teeth. A single examiner was allowed to record all the measurements to reduce the errors. Final readings of gingival width and gingival thickness for maxillary and mandibular arch were obtained by calculating the total sum of all six measurements.

### Statistical analysis

Data was compiled and statistical analysis obtained by using unpaired t test.

### Results

The mean of width of gingiva in the upper and lower arch for 19-35 yrs age group was 2.70 mm and 1.58 mm respectively and for 36-55 yrs age group it was 1.64 mm and 1.22 mm respectively, and when it was compared between upper and lower arch between 19-55 years age group was 2.12 mm and 1.39 mm respectively. [Table 1, Graph 1]

The mean gingival thickness in the upper and lower arch for 19-35 yrs age group was 0.74 and 0.58 mm respectively, for 36-55 yrs age group it was 0.67 mm and 0.55 mm respectively; and when it is compared between upper and lower arch between 19-55 years age group was 0.71 mm and 0.57 mm respectively. [Table 2, Graph 2]

The mean width of gingiva & gingival thickness (GT) significantly decreased with increase in age in both arches.

The mean width of gingiva in the upper and lower arch in males was 2.01 mm and 1.38 mm respectively, whereas in females, it was 2.25 mm and 1.39 mm respectively, and when it was compared between upper and lower arch in both males and females it was 2.12 mm and 1.39 mm. The mean width of gingiva was significantly higher in females than males. [Table 3, Graph 3]

The mean thickness of gingiva in the upper and lower arch in males was 0.74 mm and 0.60 mm respectively, whereas in females, it was 0.67 mm and 0.53 mm respectively and when it was compared between upper and lower arches in both males and females it was 0.71mm and 0.57 mm respectively. The mean thickness of gingival was significantly higher in males than females. [Table 4, Graph 4]

The mean width of gingiva in upper arch was 2.12 mm and in lower arch was 1.39 mm. Thus, mean width of gingiva was more in upper arch when compared to lower arch. [Table 1 & 3, Graph 1 & 3]

The mean gingival thickness in upper arch was 0.71 mm and in lower arch was 0.57 mm. Thus, gingival thickness was seen more in upper arch as compared to lower arch. [Table 2 & 4, Graph 2 & 4]

**Table 1:** Comparison of Mean width of attached gingiva between Maxillary and Mandibular arches in different age groups

Age	Arch location	N	Mean	SD	Mean difference	t value	P value
19-35	Maxillary	23	2.70	0.59	1.12	7.385	<0.001 S
	Mandibular	23	1.58	0.42			
36-55	Maxillary	27	1.64	0.41	0.42	4.198	<0.001 S
	Mandibular	27	1.22	0.30			
Total	Maxillary	50	2.12	0.73	0.73	6.264	<0.001 S
	Mandibular	50	1.39	0.40			

Statistical Analysis: Unpaired t test. S: Mean difference is statistically significant at the 0.05 level.

**Table 2:** Comparison of Mean width of gingival thickness between Maxillary and Mandibular arches in different age groups

++	Arch location	N	Mean	SD	Mean difference	t value	P value
19-35	Maxillary	23	0.74	0.21	0.16	2.782	0.008 S

	Mandibular	23	0.58	0.18			
36-55	Maxillary	27	0.67	0.23	0.12	2.461	0.017 S
	Mandibular	27	0.55	0.13			
Total	Maxillary	50	0.71	0.22	0.14	3.704	<0.001 S
	Mandibular	50	0.57	0.15			

Statistical Analysis: Unpaired t test. S: Mean difference is statistically significant at the 0.05 level.

**Table 3:** Comparison of Mean width of attached gingiva between Maxillary and Mandibular arches in males and females

Gender	Arch location	N	Mean	SD	Mean difference	t value	P value
Male	Maxillary	26	2.01	0.65	0.63	4.151	<0.001 S
	Mandibular	26	1.38	0.40			
Female	Maxillary	24	2.25	0.80	0.86	4.695	<0.001 S
	Mandibular	24	1.39	0.41			
Male + Female	Maxillary	50	2.12	0.73	0.73	6.264	<0.001 S
	Mandibular	50	1.39	0.40			

Statistical Analysis: Unpaired t test. S: Mean difference is statistically significant at the 0.05 level.

**Table 4:** Comparison of Mean gingival thickness between Maxillary and Mandibular arches males and females

Gender	Arch location	N	Mean	SD	Mean difference	t value	P value
Male	Maxillary	26	0.74	0.15	0.14	3.524	0.001 S
	Mandibular	26	0.60	0.14			
Female	Maxillary	24	0.67	0.27	0.14	2.132	0.038 S
	Mandibular	24	0.53	0.17			
Male + Female	Maxillary	50	0.71	0.22	0.14	3.704	<0.001 S
	Mandibular	50	0.57	0.15			

Statistical Analysis: Unpaired t test. S: Mean difference is statistically significant at the 0.05 level.



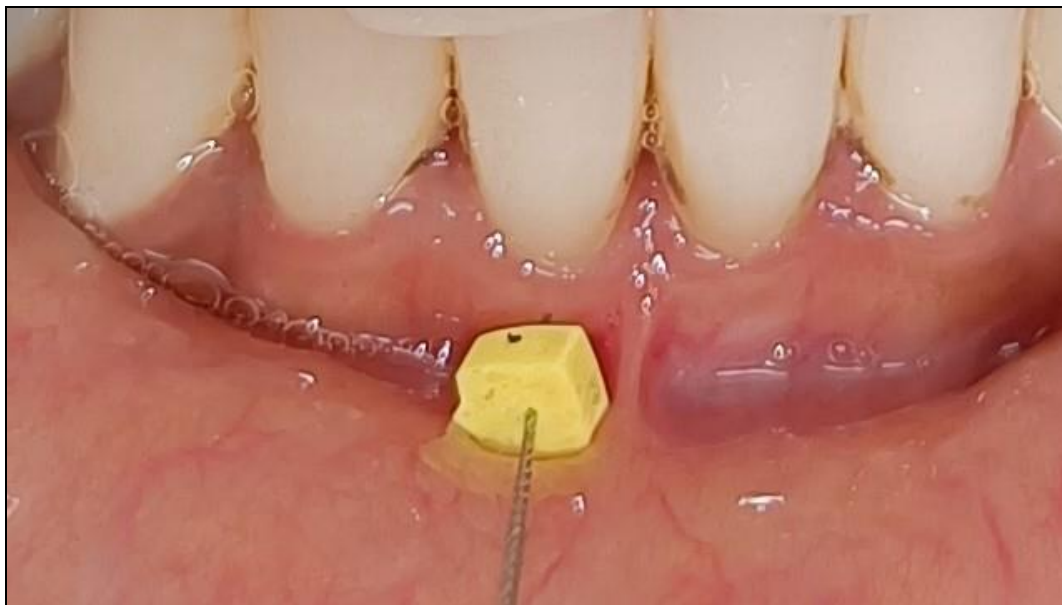
**Fig 1:** Measurement of width of attached gingiva in maxilla



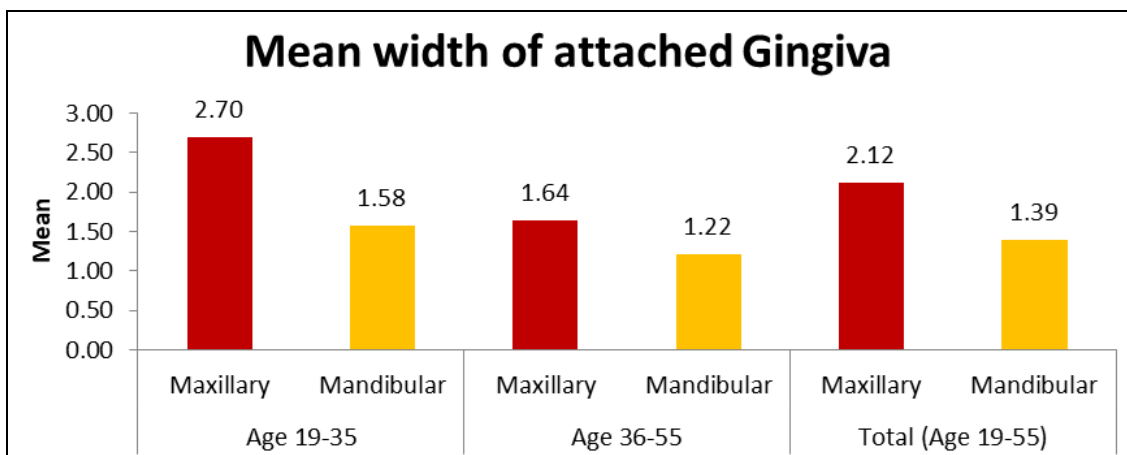
**Fig 2:** Measurement of width of attached gingiva in mandible



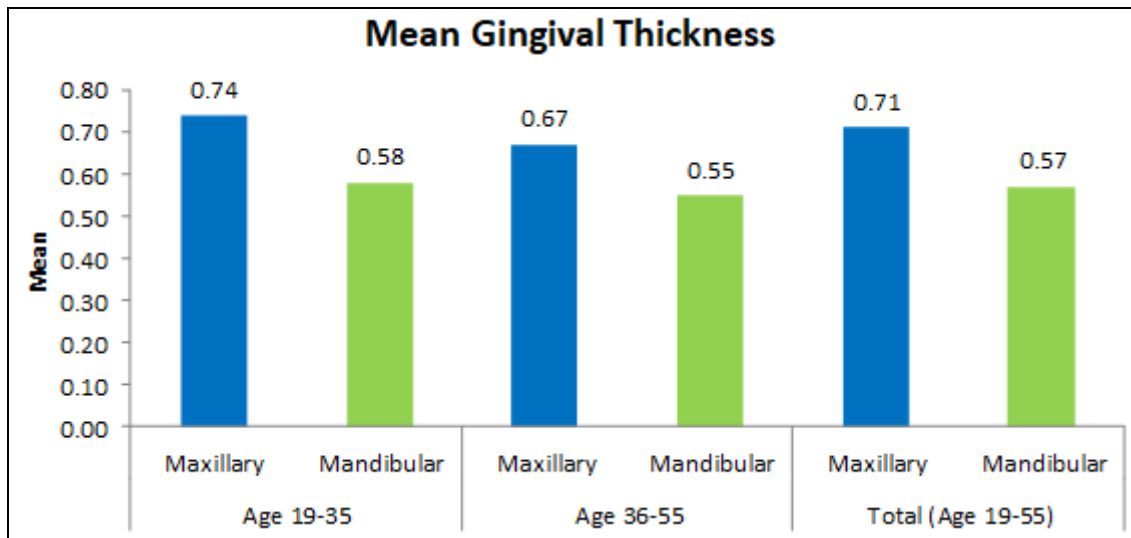
**Fig 3:** Measurement of gingival thickness in maxilla



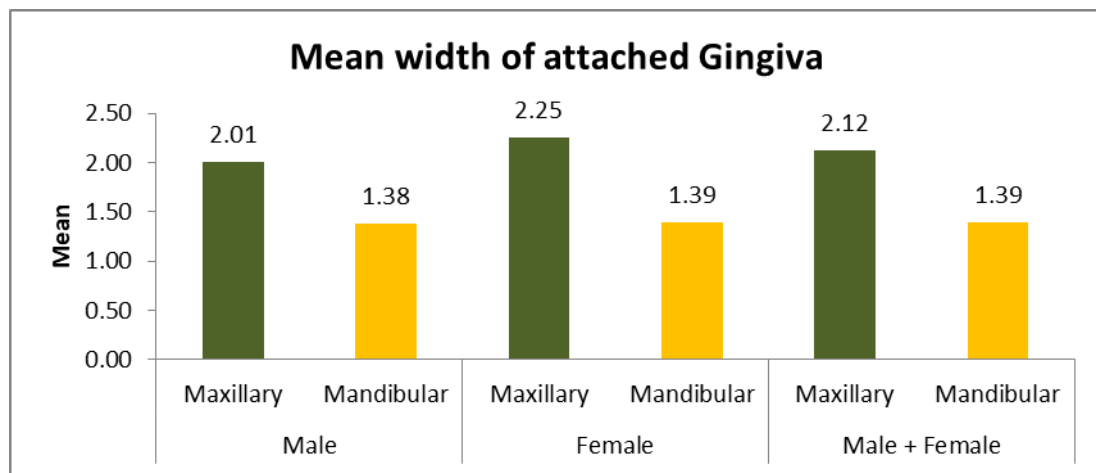
**Fig 4:** Measurement of gingival thickness in mandible



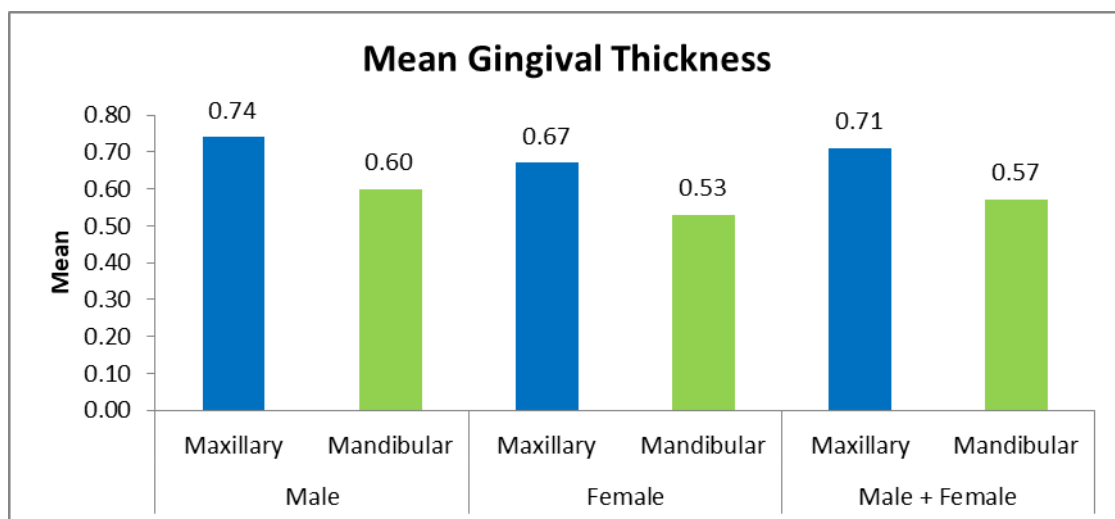
**Graph 1:** Comparison of Mean width of attached gingiva between Maxillary and Mandibular arches in different age groups



**Graph 2:** Comparison of Mean width of gingival thickness between Maxillary and Mandibular arches in different age groups



**Graph 3:** Comparison of Mean width of attached gingiva between Maxillary and Mandibular arches in males and females



**Graph 4:** Comparison of Mean gingival thickness between Maxillary and Mandibular arches males and females

**Discussion**

Assessing the gingival phenotypes help to assess future risk for periodontium so there exists a need to know the normal values. There are numerous methods which has been used by many researchers and periodontists to calculate the gingival phenotypes which is of enormous importance and their utility must be taken into consideration for further rectifying of mucogingival problems. However, there are many other techniques, which

depend on adequacy of gingival phenotypes on the facial aspect. We conducted this study to determine the gingival thickness and width of gingiva on the labial aspect in the anterior sextant by using endodontic k file and periodontal probe under local anesthetic gel. Analysis of gingival width and gingival thickness was performed in Group A (19-35) yrs and Group B (36 – 55) yrs age groups, between upper and lower arches and gender variability was also taken into deliberation (26 males and 24 females). There are very few studies that have compared between arch location, age and gender. The results indicated that gingival thickness and width of gingiva significantly decreased with increase in age in both arches. The maxillary arch had a thicker gingiva than mandibular arch & Width of gingiva was highest in females & Gingival biotype was higher in males than females.

The width of the gingiva was found to be more in females compared to males. This finding was contradictory to study conducted by Kolte *et al* 2014<sup>[10]</sup> where width of attached (WOA) was more in males than females. This finding was similar to alhajjo in 2020<sup>[11]</sup> where in his study keratinized gingival tissue was more in females compared to males with significance difference. This finding commensurate with the commentary stated that females were more found to have gummy smile than males.

In current study thickness of gingiva was more associated with males than females. This finding is similar to study conducted by Vandana and savitha in 2015<sup>[12]</sup> *et al* in which they have showed that women had very thinner gingiva than men. Zawaki in 2012<sup>[13]</sup> also stated that thin gingiva represents 64% females and 25% males. Tim De rouck in 2009<sup>[14]</sup> agreed with our present study he noticed that females have thin gingiva. Present study measures width of attached gingival (WOA) using UNC 15 probe which is similar to the study conducted by Ainamo in 1976<sup>[15]</sup>. Ainamo<sup>[15]</sup> and Vincent<sup>[16]</sup> in 1976 noticed that the width of attached gingiva (WOA) increases with age where as in our study found that width of gingiva was greatest in the 19-35 yr age group while in 36-55 years age group it was minimal.

In present study gingival thickness was higher in younger age than in older age. This findings was similar to kolte<sup>[10]</sup> and vandana<sup>[12]</sup> *et al.* which might be because of alteration in the oral epithelium which is caused due to age related thinning of the epithelium and also because of diminished keratinisation. In present study we have recorded findings only in the midfacial aspect, because contours of the bone is different in interdental area as this might vary with the thickness of soft tissue. So recording of our present study appears to be more appropriate. The results indicated that biotype of gingiva is more in males than females. This findings was similar to studies conducted by muller *et al* 2000<sup>[17]</sup>, kolte *et al* 2014<sup>[10]</sup> and contradictory to the studies conducted by barriviera *et al.* 2009<sup>[18]</sup> and studer *et al.* 1997<sup>[19]</sup>. These variations can be because of different methods used for measurements.

## Conclusion

It was noticed that Gingival thickness (GT) and Width of attached gingiva (WOA) was significantly decreased with age in both maxillary and mandibular arches. The maxilla had a thicker gingiva than mandible & Width of attached gingiva (WOA) was higher in females & Gingival biotype was higher in males than females. However, other factors like bucco lingual position of teeth, racial and genetic factors likely said to have a effect on the measurements, which has to be further investigated.

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