Assessment of distribution of clinically undetectable mucogingival junction in mandibular anterior region: A single-institutional study

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ABSTRACT

Introduction: The mucogingival junction is considered one of the vital anatomic structures that mark the apical termination of the attached gingiva. However, due to various pathologies and conditions, it can be undetectable. This study aimed to assess the distribution of patients having teeth without clinically detectable mucogingival junction in mandibular anteriors. Various etiologies leading to clinically undetectable mucogingival junction were also identified. **Methods**: This cross-sectional study involved 312 patients who visited the department of Periodontics of Gandaki Medical College Teaching Hospital and Research Center, Pokhara from July 26 to November 26, 2022. The visual method, rolling probe method, tension test and histochemical staining were used to detect the mucogingival junction. To ascertain the relationship between age and gender with the distribution of data, descriptive analysis and the Pearson Chi-square test was used. A p-value <0.05 was considered statistically significant. **Results:** The majority of the patients 242(77.6%), had clinically detectable mucogingival junction, whereas the remaining 70(22.4%) didn't show its absence. Gingival recession, keratosis, deep pockets, and aberrant frenal attachment were all common etiologic factors for clinically undetectable mucogingival junction. Statistically significant number of male patients from age group above 45 years presented with clinically undetectable mucogingival junction. **Conclusions:** Nearly one-third of the study population presented with clinically undetectable mucogingival junction, which provides baseline data to determine the periodontal health of the study population and can represent as one of the significant diagnostic clues.

Keywords: Attached gingiva, baseline data, gingival recession, mucogingival junction.

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INTRODUCTION

The mucogingival junction (MGJ) is an anatomical structure present in oral mucosa except the palatal surface. It is defined as a scalloped line separating the gingiva from the alveolar mucosa.[1] MGJ often serves as a clinical landmark in periodontal evaluation, specifically to determine the width of the attached gingiva. It can be identified by various methods including visual method, tension test, functional method, using Lugol's iodine solution, etc.[2-4]

Recently Tarnow et al.[5] suggested new definitions for attached gingiva considering locations of MGJ, alveolar crest, and base of the intrabony defect around healthy and diseased teeth and implants. Hence, it can be considered an important landmark in determining periodontal health. It is well known that reduced periodontium secondary to periodontitis, advanced recession, or the presence of deep pockets leads to loss of tissue upto and beyond MGJ.[6] These conditions make MGJ clinically non-detectable. Some conditions like the malpositioning of teeth, severe abrasion, abnormal frenal attachments, and abnormal habits may lead to marginal tissue recession beyond MGJ, making it undetectable.[7] During the literature

review, we could not obtain any directed study exactly to report the absence of clinically detectable MGJ. However, various studies considered zero width of attached gingiva, immobile mucosa, or keratinized gingiva as an equivalent to the absence of MGJ.[8]

In light of the above reasons, and the paucity of such studies on Nepalese patients, it is important to have epidemiological data to estimate the distribution of such clinical landmarks during periodontal evaluation. Therefore, this study was conducted to assess the distribution of patients having teeth without clinically detectable MGJ on the labial aspect in mandibular anteriors and identify the etiologic factors.

METHODS

This descriptive cross-sectional study was conducted for four months (26 to November 26, 2022) in department of Periodontology and Oral Implantology of Gandaki Medical College Teaching Hospital and Research Centre (GMCTHRC) Pokhara, Nepal. Ethical approval was taken from the Institutional Review Committee of GMCTHRC. (Reference number 163/79/80. Informed consent was obtained from the participants before beginning of the study. The inclusion criteria of this study were patients (i) with permanent dentition having all the teeth present in mandibular anteriors (ii) with/without periodontal diseases and (iii) those who were willing to participate. Patients with mental and physical disabilities, uncontrolled systemic conditions, smokers, pregnant women, and those who were allergic to iodine or related products were excluded.

Convenience sampling was utilized for the study and the sample size was calculated based on a study conducted by Baghele et al.[8]

$N= Z^2 p\times q/e^2$

Where,

N= sample size

Z= 1.96 for 95% confidence level,

p= prevalence of absence of MGJ (24.54%)

e= permissible error (5%)

q= complement of p (100-24.54%)

Thus,

$N= (1.96)^2\times 24.54\%\times 75.46/ (5)^2 = 284$

Adding a 10% non-respondent rate, the total sample size of 312 was calculated. Patients who fulfilled the inclusion criteria were selected for the study. After explaining the nature of the study, the demographic details of the participants were recorded. Under the strict aseptic conditions, MGJ was clinically assessed by using the following four different methods:

1. Visual method (VM)[1]: VM assessment was based on the color difference between the attached gingiva and alveolar mucosa. The mucosa beyond MGJ is darker red than that of the attached gingiva which is separated by scalloped MGJ (Figure 1).

Figure 1: Visual method for detecting mucogingival junction

2. Tension test (TT):[2,3] This was done by stretching the lip or cheek in outward, downward/upward, and lateral directions. The gingival margin was then observed for any movement of the free gingiva. Any observable movement of the free gingival margin while stretching lips/cheeks indicated positive TT with inadequate attached gingiva and absence of MGJ.

3. Rolling probe method (RP) or functional method:[3] MGJ was assessed as a borderline between alveolar mucosa and attached gingiva. Tissue mobility was elicited by pushing the adjacent alveolar mucosa coronally with a blunt end of the University of North Carolina-15 (UNC-15) probe. If the tissues moved with the instrument without a definite tissue stop coronally, then the width of attached gingiva was considered to be inadequate with the absence of MGJ. The fold formation of loose movable tissue during coronal movement with a definite coronal stop indicated the presence of MGJ.

4. Using Lugol's iodine (LI) solution:[9] The staining of the mucogingival complex with 5% LI solution is based on the difference in the glycogen content. The attached gingiva is keratinized with no glycogen in the most superficial layer and gives an iodine-negative reaction. Thus, LI solution stains only the alveolar mucosa and demarcates the MGJ. If the whole of the marginal tissue got stained, it was considered as the absence of MGJ. The LI 5% solution (SRL Pvt. Ltd.) was thoroughly applied with a cotton pellet with light-pressure burnishing technique on the patient's gingiva and alveolar mucosa till a sharp demarcation between keratinized tissue and alveolar mucosa was observed (Figure 2).

Figure 2: Staining the mucosa using Lugol's iodine solution

Out of these methods, if MGJ was appreciated in all four methods then it is considered to be present and clinically detectable. Similarly, if MGJ was not detected in any of the four methods, then it will be considered absent and clinically undetectable. In addition to this, the various etiologic factors responsible for absence of MGJ were also assessed.[10-19]

The data collected by a single periodontist using predetermined subject proforma. The collected data were entered into the excel sheet and analyzed using the statistical package for the social sciences (SPSS) version 16.0. Univariate analysis was done including frequencies and percentage of the demographic data. The presence or absence of MGJ and the etiologic factor for the absence of MGJ were calculated. Pearson Chi-square analysis test was used to determine the association between MGJ with age and gender where p-value <0.05 was considered statistically significant.

RESULTS

A total of 312 participants were studied in the study. The mean age was 37.60 years. Nearly one-third 70 (22.4%) of the examined patients presented the absence of clinically detectable MGJ. Among the various etiologic factors for the absence of mucogingival junction, gingival recession 47(15.1%) was found to be the commonest cause. (Table 1)

Table 1: Demographic details of the study patients (N=312)

Demographic details	Frequency(%)
Age	
18-29	120(38.5%)
30-45	100(32.1%)
>45	92(29.5%)
Gender	
Male	128(41%)
Female	184(59%)
Mucogingival junction	
Present	242(77.6%)
Absent	70(22.4%)
Etiogical factors	
Gingival recession	47(15.1%)
Pocket beyond MGJ	6(1.9%)
Abnormal frenal attachment	2(0.6%)
Miscellaneous	15(4.8%)

Additionally, in our study, out of 1872 teeth examined, 1720(91.8%) of the teeth showed clinically detectable mucogingival junction, whereas 152(8.1%) of teeth showed its absence. Among patients with clinically detectable mucogingival junction, 297(95.2%) of the teeth showed its presence at the left lateral incisor. Further, 34(10.9%) of the teeth showed an absence in the left canine (Table 2).

Table 2: Presence or absence of mucogingival junction based on individual teeth

Mucogingival junction	Mandibular anterior teeth: n(%)					
	31	32	33	41	42	43
Clinically detectable	282 (90.4%)	297 (95.2%)	278 (89.1%)	284 (91%)	296 (94.9%)	283 (90.7%)
Clinically undetectable	30(9.6%)	15(4.8%)	34(10.9%)	28(9%)	16(5.1%)	29(9.3%)

Agewise association with MGJ revealed, 111(45.87%) patients between 18 to 29 years had clinically detectable mucogingival junction, whereas 45(64.28%) patients above 45 years showed its absence. This association was found to be statistically significant (p<0.05). Similarly, gender-wise association with MGJ showed a majority of females 155(64.04%) had clinically detectable mucogingival junction compared to males 87(35.95%), which was statistically significant (p<0.05) (Table 3).

Table 3: Association between age and gender with MGJ

	Presence of MGJ	Absence of MGJ	p-value
Age			
18-29	111(45.87%)	9(12.86%)	
30-45	84(34.71%)	16(22.86%)	
>45	47(19.42%)	45(64.28%)	0.001*
Gender			
Male	87(35.95%)	41(58.57%)	
Female	155(64.04%)	29(41.42%)	0.001*

*Signifies statistically significant

DISCUSSION

This study was a unique attempt to determine the proportion of patients having teeth without clinically discernible MGJ in mandibular anterior region. We also evaluated the etiologic variables for the absence of MGJ. Because it serves as an important anatomical structure for measuring the width of attached gingiva, the MGJ is regarded as a significant clinical landmark. An improved level of protection from stress and insults is correlated with the existence of an adequate amount of attached gingiva. Additionally, it serves as the most important diagnostic hint for determining the likelihood of successful periodontal therapy.[20] However, we only came across a relatively small number of studies that dealt explicitly with the lack of clinically detectable MGJ in the literatures.[8,21]

In the current study, MGJ was recognized in 77.6% of patients, while 22.4% of patients demonstrated its absence. This outcome was remarkably comparable to that of Baghele et al.[8] who found that 75.4% of their patients had MGJ and 24.6% did not. Additionally, in our investigation, 1720(91.8%) of the 1872 teeth evaluated revealed clinically detectable MGJ, while 152(8.1%) of the teeth did not. The proportions of the absence of MGJ were higher than those of the study by Baghele et al.[8] which found that 91(2.5%) of the teeth lacked MGJ. More evidence in favour of this was provided by Gliksberg et al.[22] who discovered that only 1% of the teeth showed absence of MGJ. This difference seems more than plausible when taking into account our study's subjects and its design.

Additionally, the causes of teeth that had clinically undetectable MGJ were identified. It included gingival recession,[10] pocket depth beyond MGJ,[11] parafunctional habits,[12] malpositioned teeth,[13,14] trauma,[15] severe abrasion,[16] abnormal frenal attachments,[17] and any other abnormalities (tobacco pouch keratosis, leukoplakia, desquamated gingivitis, and chemical).[18,19] Among the various etiologic factors recorded, gingival recession was found to be the most prevalent cause. This outcome demonstrates resemblance to the research done by other study.[23] Miller's Classes II, III, and IV gingival recession show an expansion of marginal tissue to or beyond MGJ, causing MGJ to be clinically undetectable.[10] However, compared to another study[8] of a comparable nature, our study found a higher rate of gingival recession. Additionally, few individuals showed lack of clinically discernable MGJ brought on by other abnormalities like tobacco pouch keratosis and leukoplakia, which is in line with the results of other investigations.[18,19] Conversely, this was not identified in the study by Baghele et al.[8]

In the current study, the presence of MGJ was significantly more common in patients belonging to 18 to 29 years whereas its absence was more frequent in patients belonging above 45 years. This finding was supported by previous studies,[20,23] where different types of mucogingival problems can be seen with increasing age. It possibly indicates that youths tend to be more concerned about aesthetics and are more aware of their oral health when compared to older adults.[24] Similarly, when the prevalence of the presence of MGJ was compared genderwise, we found it more prevalent among females, which was statistically significant. This finding was in accordance with another study.[8] This indicates that women are more concerned with maintaining good oral hygiene for optimal periodontal health.[25]

Periodontitis in mandibular anterior teeth most often leads to horizontal destruction of the periodontium. This was perceived in the previous study conducted by Baghele et al.[8] as they stated that 88% of their patients had lower anterior teeth (canine to canine) which were highly affected. Therefore, we observed the presence or absence of MGJ in mandibular anterior teeth. In our study, mandibular canines were more affected by mucogingival problems followed by central incisors and lateral incisors. On the contrary, the results from the previous study[8] showed that mandibular central incisors were more affected by mucogingival problems leading to an absence of MGJ. This was consistent with the findings by Humagain et al.[23] The variation in the results could be the result of different sample sizes.

The limitations of this study are that the findings cannot be generalized to whole population. The relative merits of the four approaches used in this study to determine whether MGJ was present or not were not considered. However, the findings of this study can serve as baseline information to assess periodontal health and can also serve as one of the key diagnostic marker for determining the prognosis of periodontal treatment.

CONCLUSIONS

Nearly one-third of the study population presented the absence of clinically detectable MGJ, which suggests the initiation of mucogingival deformities and conditions. Timely recognition of such circumstances and management of the etiologic factors is necessary to maintain a healthy periodontium.

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