

## Association of Bone Loss around Mandibular Second Molar and Impacted Third Molar: A Retrospective Study

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### ABSTRACT

**Introduction:** Third molars that fail to attain a functional position may be associated with various pathological conditions in the adjacent tooth. In such areas, the maintenance of oral hygiene is difficult causing periodontal destruction to the adjacent second molars.

**Objective:** To determine the association between the alveolar bone loss in mandibular second molar and impacted third molar.

**Methods:** A retrospective cross-sectional study was conducted from Sept 21 to Nov 21, 2021 after obtaining ethical approval from the Institutional Review Committee of Gandaki Medical College. Convenience sampling was done for 380 orthopantomograms of patients aged 18 years or older. Information on age, gender, bone loss in mandibular second molars, and type of third molar impactions were recorded. Data were analysed using SPSS v.16.0.

**Results:** Among observed radiographs, mesioangular impaction (224, 58.9%) was the commonest type followed by vertical impaction that was associated with alveolar bone loss in second molars. Alveolar bone loss in second molar teeth were more prevalent among males and age group of 21-30 years (199, 52.4%). Further, there was a significant association between mesioangular impacted mandibular third molar and horizontal bone loss in adjacent second molars ( $P < 0.05$ ).

**Conclusions:** Awareness of the association between alveolar bone loss in mandibular second molars with impacted third molar helps in prevention and management of further complication due to such teeth. Thus, periodic clinical and radiographic examination is essential for patients with impacted teeth.

**Keywords:** Alveolar bone loss; mandibular second molar; mandibular third molar; orthopantomogram; retrospective study.

### INTRODUCTION

The maintenance of oral hygiene around impacted third molars appears to be the greatest challenge, resulting in plaque accumulation, pocket formation, and bone loss in the adjacent tooth.<sup>1-5</sup> Various studies confirmed their detrimental effect on adjacent periodontium.<sup>6-8</sup> Some authors have advocated guidelines for either retaining or extraction of impacted third molar.<sup>1,8</sup> However, patient's both risks and benefits must be considered individually before choosing appropriate treatment option. Thus, pathologies associated with impaction should be recognised early for maintaining healthy periodontium.<sup>9</sup>

The authors of current study could find no study evaluating the association between alveolar bone loss

in adjacent mandibular molars due to impacted teeth in Nepali populations. Therefore, this study was conducted to determine the association between alveolar bone loss around adjacent mandibular second molar due to impacted mandibular third molar. This result aids to aware the patients and clinicians about the consequences of retained impacted teeth and prevent periodontitis at an early stage.

### METHODS

This was a retrospective cross-sectional study which was conducted from Sept 2 to Nov 2, 2021 in the records the patients who attended the Outpatient Department of College of Dental Surgery, Gandaki Medical College, Pokhara, Kaski, Nepal. The records of all the patients who required treatment for chronic periodontitis and/or impacted mandibular third molars were retrieved from past three years (Sept 2, 2018 to Sept 2, 2021) using digitalised images from Oral Medicine and Radiology Department. Ethical approval was taken from the Institutional Review Committee of Gandaki Medical College, Pokhara, Kaski, Nepal (Ref. 16/2078/2079).

Orthopantomogram (OPG) of patients (18 years or older) with all forms of impacted mandibular third molar and fully erupted mandibular second molar were included in

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the study. Low-quality OPGs, missing mandibular second molars, bilateral impacted third molars, third molars with incomplete root formation, presence of any craniofacial anomalies, and with incomplete records were excluded from the study.

Convenience sampling was utilised for the study and the sample size was calculated as,  $N = Z^2 * p * q / E^2$  {N = sample size, Z = 1.96 for 95% confidence level, p = prevalence of p= prevalence of periodontal bone loss in mandibular second molars due to impacted third molars (44.4%),<sup>10</sup> E = Permissible error (5 %), and q = complement of p (100-44.4%)}. Thus,  $N = [(1.96)^2 * 44.4 * 55.6] / (5)^2 = 379.3$ . Hence, the final calculated sample size was 380.

Each case was reviewed by the principal investigator (SB) to record the demographic and radiographic details. The OPGs of the cases included were examined to determine the angular position and any associated pathologies. The third molar was defined as impacted if it was with no functional occlusion, was not allowed to erupt on its eruption path by other teeth, soft tissue, or bone, and its roots were fully formed.<sup>1</sup> According to the relationship between the long axis of impacted third molars and the adjacent second molars, Winter classified impacted third molars into vertical, mesioangular, distoangular, horizontal, and inverted.<sup>11</sup> Similarly, the vertical and horizontal patterns of bone loss in the adjacent second molars were recorded in the radiograph. The data were entered in SPSS Statistics for Windows, version 16.0 (SPSS Inc., Chicago, Ill., USA) and descriptive statistics were applied. Chi-square test was

applied to check the association between the type of bone loss in mandibular second molar and angulation of the impacted teeth.

## RESULTS

Among 380 samples, 212 (55.8%) were male, and the remaining were female (Table 1). Of all the age groups, the 21-30 years' age group reported greater prevalence of third molar impactions with the mean age of 32.78 years. The most common pattern of mandibular third molar impaction was mesioangular 224 (58.9%) followed by vertical, distoangular, and horizontal type (Table 1). Furthermore, the horizontal bone loss 279 (73.4%) was found to be more prevalent in adjacent mandibular second molar compared to the vertical pattern (Table 1).

The prevalence of alveolar bone loss was compared with different age groups (Table 2). It was found that horizontal bone loss was seen commonly in patients with age group 61-70 years (11, 84.7%), whereas vertical bone loss was more common in 21-30 years' age group (59, 29.6%). The horizontal bone loss was found to be more prevalent in males (161, 76%) than females (Table 2).

Chi-square test was used to evaluate the association between type of impaction and alveolar bone loss (Table 3). It was observed that mesioangular impacted teeth were significantly associated with horizontal bone loss ( $P < 0.05$ ). Horizontal type of impaction was least prevalent and associated with horizontal bone loss ( $P < 0.05$ ).

**Table 1: Distribution of age, gender, type of impaction, and bone loss.**

Parameters	Frequency (Percent)
<b>Age categories (years)</b>	
18-20	10 (2.6)
21-30	199 (52.4)
31-40	104 (27.4)
41-50	34 (8.9)
51-60	20 (5.3)
61-70	13 (3.4)
<b>Gender</b>	
Male	212 (55.8)
Female	168 (44.2)
<b>Impaction</b>	
Vertical	78 (20.5)
Horizontal	1 (0.3)
Mesioangular	224 (58.9)
Distoangular	77 (20.3)
<b>Bone loss</b>	
Vertical	101 (26.6)
Horizontal	279 (73.4)

**Table 2: Prevalence of type of bone loss in relation to age and gender, n (%).**

Parameters	Vertical bone loss	Horizontal bone loss
Age categories (years)		
18-20	2 (20)	8 (80)
21-30	59 (29.6)	140 (70.4)
31-40	23 (22.1)	81 (77.9)
41-50	10 (29.4)	24 (70.6)
51-60	5 (25)	15 (75)
61-70	2 (15.3)	11 (84.7)
Gender		
Male	51 (24)	161 (76)
Female	50 (30)	118 (70)

**Table 3: Association between type of impaction and alveolar bone loss.**

Impaction	Bone loss		P value
	Vertical	Horizontal	
Vertical	33	45	0.005
Horizontal	-	1	
Mesioangular	49	175	
Distoangular	19	58	

## DISCUSSION

The third molars are the last teeth to erupt and are located most posteriorly in the oral cavity. Among them, mandibular third molars are the most commonly impacted.<sup>12</sup> When symptomatic, they can affect the adjacent second molar predisposing to caries, periodontitis, cervical resorption, and root resorption.<sup>13</sup> Periodontitis in second molars is usually caused by plaque accumulation in crevices created by the occlusal surfaces of the impacted lower third molars against the distal surfaces of second molars.<sup>5</sup>

It has been evidenced that the prevalence of alveolar bone loss in mandibular second molars due to impacted third molars was 44.4%.<sup>10</sup> In this study, it was observed that the prevalence of horizontal bone loss was seen in 279 (73.4%) whereas the remaining 101 (26.6%) had vertical bone loss.

The most frequently encountered type of impaction in the present study was mesioangular followed by vertical, distoangular, and horizontal. Furthermore, current study finding illustrates greater prevalence of horizontal bone loss compared to vertical bone loss resulting due to mesioangular (224, 58.9%) impacted third molars. This outcome was similar to the findings of Polat et al.,<sup>8</sup> who reported mesioangular impaction to be the most common among impacted teeth causing periodontal bone loss in adjacent teeth. The association between mesioangular impacted third molars and periodontal bone loss in adjacent second molars was also witnessed by Sarica et al.,<sup>10</sup> Altan et al.<sup>12</sup> On the contrary, the conclusions from the previous study conducted by Salemi et al.<sup>2</sup> stated

that vertical and distal impactions were a more prevalent etiologic factor for initiating periodontal destruction in adjacent teeth. Horizontal impaction was seen minimally associated with bone loss in this study which was different from the findings from Polat et al.,<sup>8</sup> who conveyed it as the second most common cause for periodontal bone loss in adjacent teeth. This variation of prevalence of bone loss can be explained by the diverse definition of bone loss followed by previous studies.<sup>8,10,12</sup> However, in this study we included all the subjects with periodontal bone loss in adjacent second molars due to impacted third molars and even assessed the prevalence of horizontal and vertical bone loss in mandibular second molars.

In the current study, it was observed that the 21-30 years of age group had greater amount of horizontal bone loss (140, 70.4%) than vertical bone loss (59, 29.6%). According to the previous study conducted by Sejfija et al.,<sup>1</sup> different pathologies were associated with impacted teeth dominantly seen in the younger age group (21-30 years). However, periodontal bone loss in their study was more prevalent among patients with age group 18-20 years unlike the results of this study. The reason behind the difference in the result may be due to difference in sample size between this and previous study. Similarly, when the bone loss was compared gender-wise, it was found more prevalent among males compared to females, which is in favour with other studies.<sup>2</sup> But this result was inconsistent with the findings by Sejfija et al.<sup>1</sup> The reason behind the variability between findings may be due to cultural and socioeconomic level differences among the patients.

From a periodontal perspective, impacted third molars should be removed before it causes irreversible damage to dental or periodontal tissues of second molars.<sup>9</sup> However, there is always controversy in prophylactic removal of the impacted third molar.

With certain limitations, this study evaluated the association between impacted third molars and alveolar bone loss in adjacent teeth. The limitations were the retrospective nature of the study, which did not allow us to study how the impacted third molars respond to conservative management on long-term follow-up and this was a single institutional experience that limits the generability of the result. Extraoral radiographs were used in this study which has low sensitivities compared to intraoral radiographs in detecting interdental bone loss. Thus, further prospective

studies adopting the stratified sampling technique to ensure representation from all age groups are necessary to be conducted.

## CONCLUSIONS

It can be concluded from the results of this study that there was a significant association between the mesioangular impacted third molar and horizontal bone loss in adjacent second molars. These data concerning the angulation of impacted teeth may contribute to both more precise predictions of the complication and risks associated with impacted mandibular third molars and to the identification of the prophylactic approach to be applied to avoid any pathologies related to the adjacent tooth.

**Conflict of Interest:** None.

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