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Association of Prevalence of Dental Caries in Mandibular Second Molar with Impacted Third Molar

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ABSTRACT

Background: An impacted tooth is a tooth which does not reach the occlusal plane even after two-thirds root formation. Conditions associated with impacted teeth include trismus, cystic lesions, and cervical caries of second molars. The objective of this study was to evaluate the occurrence of carious lesions in the distal aspect of the mandibular second molar and its association with the presence of mandibular third molars.

Methods: A cross-sectional study was conducted from September 2018 to September 2020. Approval was taken from the Institutional Review Committee with reference number 90/77/78. Orthopantomograms of patients aged 18 years or older were studied. Information on age, gender, mandibular second and third molars were recorded. Convenient sampling was done. Statistical analysis was done using Statistical Package for Social Sciences version 21.

Results: A total of 626 radiographs were studied of which mesioangular impaction (35.3%) was the most prominent type and followed by horizontal impaction, causing distal caries in second molars. The age group between 20-40 years and female gender had the higher prevalence of distal caries in second molar teeth. There was a significant correlation between gender and cavity existence ($p=0.00$), between impaction and existence of decay ($p=0.00$), and depth of impaction with cavity formation ($p=0.004$).

Conclusions: A total of 31.8% of the patients with impacted mandibular third molars had distal cervical caries in second molars. Mesioangular type, female gender, type A were the prominent factors associated with distal caries in second molar teeth due to impacted third molars.

Keywords: Impacted tooth; mandible; molars; root caries

INTRODUCTION

An impacted tooth is a tooth which is unable to erupt in the arch within the expected time because of malposition or impediments.^{1,2} Mandibular third molars are the most frequently impacted teeth with a reported prevalence ranging from 30.3% to 68.6%.³⁻⁴ It predisposes the adjacent second molar for caries, cystic lesions, pericoronitis, root resorption, and neoplasm.⁵⁻⁶

Due to horizontal partially impacted mandibular third molar with inadequate oral hygiene maintenance and accumulation of plaque, there is more risk of developing caries in the mandibular second molar.⁷⁻⁸ Dental caries is a multifactorial, biofilm-mediated, non-communicable disease resulting in destruction and demineralization of hard tissues of teeth by acid production from bacterial fermentation of food.⁹

The objectives of the study were to find out the prevalence of caries in mandibular second molar due to

impacted third molar and evaluate the epidemiological patterns of third molar impaction.

METHODS

A retrospective cross-sectional study was conducted. Authors examined Orthopantomograms (OPGs) belonging to patients aged 18 years old or older, who attended the out-patient of College of Dentistry, Gandaki Medical College, Pokhara from September 2018 to September 2020 for the treatment of caries in mandibular second molar and/or impacted the third molar. Ethical approval was taken from Institutional Review Board with reference 90/77/78.

The third molar was considered impacted, if it satisfied the two conditions: (1) there was no functional occlusion on the third molar occlusal surface; and (2) the roots of the third molar were completely formed except for horizontally or transversely impacted molars. Unerrupted transversely impacted molars were included

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even if their roots were not completely formed.

The inclusion criteria were: (1) patients of 18 years old or older; (2) presence of an OPG in patient record and (3) Patients having impacted mandibular third molars. Exclusion criteria were: (1) poor quality OPG; (2) incomplete patient record; (3) presence of any craniofacial anomalies, congenital deformities, or syndromes; (4) previous history of orthodontic treatment; (5) patients with missing mandibular second molar and (6) presence of any cyst, tumor, or other pathological condition in the molar area. Convenient sampling was done.

With reference to an article by Pentapati et al. prevalence of the disease as 61.45%, permissible error of 4%, at 95% confidence interval, and power of study as 80, the sample size calculated was 569.¹⁰ Our sample size is 626.

Examiner recorded the demographic, clinical, and radiographic information. The OPG was studied for evaluation of the depth of the lower third molar in relation to the occlusal plane, the distance between the ascending border of the anterior surface of mandibular ramus and the distal surface of the second molar, and angulation of third molar impaction classified as given by Winters¹¹ and Pell & Gregory classification¹² and the absence and presence of caries in an adjacent mandibular impacted third molar.

All the analysis was done using Microsoft Excel and IBM SPSS Statistics for Windows Software, version 21 (IBM Corp., Armonk, NY, USA). the p-value of <0.05 was considered statistically significant.

RESULTS

Among 626 samples, 53.8% (337) were female, and the remaining 46.2% (289) were male. Of all the age group, 20-40 yrs age group has been reported most frequently.

Among the impacted teeth, mesioangular impaction (35.3%) has been the most common variant followed by horizontal (29.7%). In reference to Pell and Gregory, level A (59.6%) was the most common type, followed by type B (20.4%). Similarly, Class I (56.5%) was followed by class II (34.7%). (Table 1)

Table 1. Distribution of mandibular third molars status according to sex, age-group, Pell and Gregory classification and Winters Classification.

Variable	Number	Percentage
Sex		

Male	289	46.2
Female	337	53.8
Age Group (years)		
0-20	112	19.5
20-40	383	61.2
40-60	85	13.6
60-80	35	5.6
<80	1	0.2
Lower Third Molar Angulation		
Horizontal	186	29.7
Vertical	68	10.9
Mesioangular	221	35.3
Distal	128	20.4
Others	23	3/7
Impaction depth		
A	373	59.6
B	128	20.4
C	125	20
Distal Space		
I	354	56.5
II	217	34.7
III	55	8.8

There was significant co-relation between gender and cavity existence (p=0.00), between impaction and existence of decay (p=0.00) and depth of impaction with cavity formation (p=0.004) at 0.05 level of significance (Table 2).

Table 2. Relationship between second molar caries, third molar angulation, distal space and impaction depth.

	Distal caries in Lower 2 nd molar		Bivariate (p value)
	Yes	No	
Sex			00
Male	192	97	
Female	235	102	
Age Group (years)			0.390
0-20	76	46	
20-40	285	98	
40-60	49	36	
60-80	17	18	
>80	0	1	
Lower 3rd molar Angulation			00
Horizontal	109	77	
Vertical	30	38	

Mesioangular	172	49
Distal	97	31
Others	19	4
Impaction depth		0.004
A	271	102
B	73	55
C	83	42
Distal Space		0.351
I	236	118
II	149	68
III	427	13

When genders were compared separately, it was found that mesioangular impaction was slightly more prevalent in males than females, horizontal impaction more common in females while vertical impaction was more common in males. The correlation was significant with p value 0.043 (Figure 1)

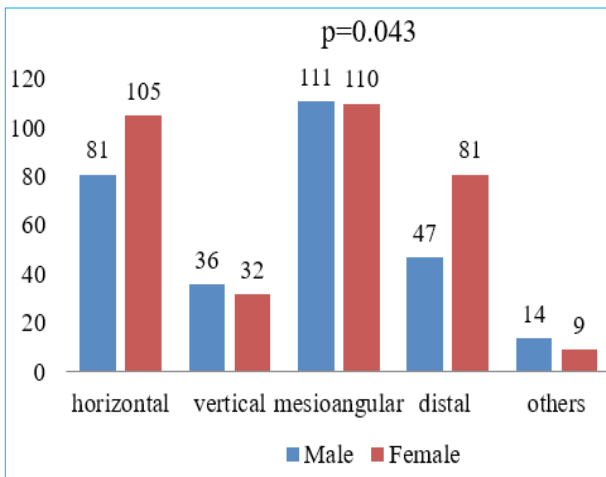


Figure 1. Relation between gender and type of impaction.

DISCUSSION

Impacted third molars can predispose the adjacent second molar to an array of detrimental effects such as caries, periodontitis, cervical resorption, and root resorption.⁶ Mandibular third molars are the most frequently impacted teeth with the highest rate of developmental anomalies, because they are the last teeth erupting into dental arch and improper angulation of the long axis of the tooth in relation with the second molars or tooth size and arch length incongruity.¹³ Distal caries of mandibular second molar is a frequently noted complication of impacted third molars because of accumulation of plaque and the former has to bear the maximum masticatory load.¹³The depth of impacted

third molar and the occlusal angulation between the impacted tooth and the occlusal surface of the second molar influences distal caries in the second molar.¹⁴

There is always controversy in prophylactic removal of the impacted third molar. The justification given for the prophylactic removal is minimizing the risk of cyst and tumor development, reduced probability of mandibular angle fracture, ease of surgery, better healing of extraction site at a younger age, and no comorbidity to second molars.¹⁵⁻¹⁶

Presence of caries on the distal aspect of the mandibular second molar due to impacted third molar is of prime concern to endodontists. Impacted third molar in close proximity with the second molar has higher risk of developing caries and with time infects the pulp. This will be the main reason for extraction of third molar and second molar.¹⁶⁻¹⁷

The present study showed the prevalence of mandibular second molar caries as 31.8%, confirming the findings reported by Toedtling V et al. (38%)¹⁶ and van der Linden *et al.* (32%).¹⁸ The prevalence rate of caries on the distal surface of the second molar in series by Syed et al. was 39%.⁸ Our study showed females having more caries in mandibular second molar in association with impacted third molar than males which is in favour with other studies.^{16,18}

The position of impacted third molar is a more relevant factor for distal caries in mandibular second molar development in comparison with other variables such as high susceptibility to dental caries in general. Regarding the angulation of the impacted tooth, most authors state that a mesioangular tilt seems to be highly associated with caries occurrence. Mesioangular position characterized by second molar making a convergence angle of >30° (i.e., 40% and 80%) is the most common type of third molar impaction.¹⁹ Mesioangular tilt was seen in 35.3% in our study which is in concordance with other studies. However, the present study shows that horizontal angulation might also be an important risk factor. McArdle and Renton evaluated that the record of 100 patients who had 122 mandibular third molars removed because of distal cervical caries in the mandibular second molars. The majority of these third molars had a mesial angulation between 40° and 80°.²⁰

Initiation and severity of distal caries in second molars have been found to increase with age, and that older patients have higher incidences of this complication.²¹ Nevertheless, the results of our study did not show any significant relation (p=0.390) between these two

variables. The study by Syed et al. also pointed that the higher age groups had a lower prevalence of distal caries. This can be attributed to the fact that elderly patients often neglect oral and dental care.

Level A impaction was the most common among other levels (59.6%). Level A was more prevalent in patients aged from 20 to 40 years old.

The limitation of this study was the use of panoramic radiographies, rather than intraoral techniques. Therefore, early carious lesions may not have been detected, leading to an underestimation in the diagnosis of Lower 2nd molar caries. It was carried out in a single tertiary care hospital in the Western Region of Nepal; hence, this may not represent the entire population of this province. Similar studies with larger sample size and multi-centre studies should be conducted.

CONCLUSIONS

Distal cervical caries in second molars were present more in patients with impacted mandibular third molars with mesioangular and horizontal type of impaction being the most prominent type causing caries. The female gender had a significantly higher incidence of cervical caries. Prophylactic removal cannot always be indicated or justified. High-risk patients who are susceptible to the development of distal caries in mandibular second molars should be identified in order to formulate a strict screening and follow-up protocol.

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REFERENCES

1. Archer WH. Oral Surgery: A Step-By-Step Atlas of Operative Techniques, 4th ed. Philadelphia: W.B. Saunders Company; 1966. p. 507-10.
2. Juodzbalys G, Daugela P. Mandibular third molar impaction: review of literature and a proposal of a classification. *J Oral Maxillofac Res.* 2013;4(2):e1. Published 2013 Jul 1. doi:10.5037/jomr.2013.4201. [[PubMed](#)]
3. Srivastava N, Shetty A, Goswami RD, Apparaju V, Bagga V, Kale S. Incidence of distal caries in mandibular second molars due to impacted third molars: Nonintervention strategy of asymptomatic third molars causes harm? A retrospective study. *Int J Appl Basic Med Res.* 2017;7(1):15-19. doi:10.4103/2229-516X.198505. [[PubMed](#)]
4. Yilmaz S, Adisen MZ, Misirlioglu M, Yorubulut S. Assessment of Third Molar Impaction Pattern and Associated Clinical Symptoms in a Central Anatolian Turkish Population. *Med Princ Pract.* 2016;25(2):169-75. [[PubMed](#)]
5. Ali FM, Khan MA, Derrbishi AA, Al-Mughalis GA, Almasrahi M, Kinani A. Study of Prevalence of Caries on Distal Side of Second Mandibular Molar Due To Impacted Mandibular Third Molar. *Ann. Int. Med. Den. Res.* 2017; 3(3):DE41-DE43. [[Download PDF](#)]
6. Yee W, Rahman R, Taib H. Effects of lower third molar removal on attachment level and alveolar bone height of the adjacent second molar. *Arch Orofac Sci* 2009;4(2):36-40. [[Article](#)]
7. Nunn ME, Fish MD, Garcia RI, Kaye EK, Figueroa R, Gohel A et al. Retained asymptomatic third molars and risk for second molar pathology. *J Dent Res* 2013 Dec;92(12):10959. DOI: 10.1177/0022034513509281. [[PubMed](#)]
8. Syed KB, Alshahrani FS, Alabsi WS, Alqahtani ZA, Hameed MS, Mustafa AB et al. Prevalence of Distal Caries in Mandibular Second Molar Due to Impacted Third Molar. *J Clin Diagn Res.* 2017;11(3):ZC28-ZC30. [[PubMed](#)]
9. Machiulskiene V, Campus G, Carvalho JC, Dige I, Ekstrand KR, Jablonski-Momeni A. Terminology of Dental Caries and Dental Caries Management: Consensus Report of a Workshop Organized by ORCA and Cariology Research Group of IADR. *Caries Res.* 2020;54(1):7-14. [[Article](#)]
10. Pentapati KC, Gadicherla S, Smriti K, Vineetha R. Association of Impacted Mandibular Third Molar with Caries on Distal Surface of Second Molar. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada.* 2019; 19:e4455. [[Article](#)]
11. Winter G. Principles of Exodontia as Applied to the Impacted Mandibular Third Molar. A Complete Treatise on the Operative Technic with Clinical Diagnoses and Radiographic Interpretations. St Louis: American Medical Books; 1926. 835pp. [[PMC 2606205](#)]
12. Pell GJ, Gregory GT. Impacted mandibular third molars: Classification and modified technique for removal. *Dent Dig* 1933; 39:330-8. [[Article](#)]
13. Santosh P. Impacted Mandibular Third Molars: Review of Literature and a Proposal of a Combined Clinical and Radiological Classification. *Ann Med Health Sci Res.*

- 2015;5(4):229-34. [\[PubMed\]](#)
14. Toedtling V, Coulthard P, Thackray G. Distal caries of the second molar in the presence of a mandibular third molar - a prevention protocol. *Br Dent J*. 2016 Sep 23;221(6):297-302. [\[PubMed\]](#)
 15. Kandel L, Mishra R, Yadav D, Tripathi S, Shubham S, Chhetri P. Impact of mandibular third molars on angle fractures: A retrospective study. *Dent Traumatol*. 2021;37(1):103-7. [\[PubMed\]](#)
 16. Nunn ME, Fish MD, Garcia RI, Kaye EK, Figueroa R, Gohel A, et al. Impacted third molars increase the risk for caries and periodontal pathology in neighboring second molars. *J Evid Base Dent Pract*. 2014;14:89-90. [\[Article\]](#)
 17. Marques J, Montserrat-Bosch M, Figueiredo R, Vilchez-Pérez MA, Valmaseda-Castellón E, Gay-Escoda C. Impacted lower third molars and distal caries in the mandibular second molar. Is prophylactic removal of lower third molars justified?. *J ClinExp Dent*. 2017;9(6):e794-e798. [\[PubMed\]](#)
 18. Van der Linden W, Cleaton-Jones P, Lownie M. Diseases and lesions associated with third molars. Review of 1001 cases. *Oral Surg Oral Med Oral Pathol Oral RadiolEndod*. 1995;79:142-5. [\[PubMed\]](#)
 19. Bereket C, Cakir-Özkan N, Sener I, Kara I, Aktan AM, Arici N. Retrospective analysis of impacted first and second permanent molars in the Turkish population: A multicenter study. *Med Oral Patol Oral Cir Bucal*. 2011 Nov 1;16 (7):e874-8. [\[Download PDF\]](#)
 20. McArdle LW, Renton TF. Distal cervical caries in the mandibular second molar: an indication for the prophylactic removal of the third molar? *Br J Oral Maxillofac Surg*. 2006 Feb;44(1):42-5. [\[PubMed\]](#)
 21. Kang F, Huang C, Sah MK, Jiang B. Effect of Eruption Status of the Mandibular Third Molar on Distal Caries in the Adjacent Second Molar. *J Oral Maxillofac Surg*. 2016 Apr;74(4):684-92. [\[PubMed\]](#)