

Assessment of pattern of mandibular third molar impaction and its associated clinical symptoms in patients visiting a tertiary center in Gandaki Province

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ABSTRACT

Introduction: Mandibular third molars show the highest rate of impaction. Eruption status, position, and angulation are associated with different symptoms. Thus, this study was conducted to assess the mandibular third molar impaction pattern and associated symptoms. **Methods:** A cross-sectional study was conducted on 426 patients visiting a tertiary center in Gandaki Province. Data collection was done from September 2023 to April 2024. Intraoral examination and orthopantomogram were assessed. The impaction depth and ramus relation of lower third molars were recorded according to the Pell and Gregory classification. The angulation was documented based on Winter's classification. The associated symptoms including pain, caries, pericoronitis, swelling, trismus, pus discharge, food lodgement, and halitosis were also noted. The frequency of level, angle, and depth of impaction were calculated. The chi-square test was used to assess the association of angulation of impaction with sex. **Results:** The mean age of the subject was 33.77 ± 8.86 (range 19 to 68). The most common angulation of impaction was vertical (35.68%) with Level A (46.47%) depth of impaction and Class I (46.47%) ramus relation. Pain (57.98%), distal caries in the second molar (15.49%), and pericoronitis (14.55%) were found to be the most commonly associated symptoms. **Conclusions:** Class I vertical level A impaction was most common impaction in this study. Pain followed by caries in distal aspect of second molar and pericoronitis were the common chief complaint presented by the patients with impacted mandibular molars.

Keywords: Impacted third molars, Pell and Gregory classification, Winter's angulation, symptoms.

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INTRODUCTION

Tooth impaction manifests as a pathological circumstance, wherein a tooth is unable to achieve its functional alignment. The impaction rate is higher for mandibular third molars when compared with other teeth.

It occurs due to the inadequate space between the distal aspect of the second mandibular molar and the anterior border of the ascending ramus of the mandible. The other factors related to it are limited skeletal growth, increased crown size, and the late maturation of third molars. It can be asymptomatic or lead to problems like caries, pericoronitis, cysts, tumors, and even root resorption of neighboring teeth.^{1,2} Furthermore, it is associated with pain, swelling, distal caries, bone loss. Eruption status, position, and angulation of the tooth can significantly impact these symptoms.³ The initial evaluation of these problems can be done by using panoramic radiographs.

Several studies have been conducted globally regarding the assessment of mandibular third molar impaction patterns with varying results. A limited study has been conducted on the Nepalese Population. This study aimed to assess the pattern of mandibular

third molar impaction pattern and associated clinical symptoms among patients visiting the Oral and Maxillofacial Surgery Department at Gandaki Medical College.

METHODS

This was a hospital-based cross-sectional study conducted at the Gandaki Medical College. The data collection was done from September 2023 to April 2024, after obtaining ethical approval from the Institutional Review Committee (Ref. No. 17/080/081-F). The nature of the study was explained to each participant and written consent was obtained. Convenience sampling was done and the sample size was calculated as 383, using the formula $n = z^2 p q / E^2$, where, n=sample size, z=1.96 at 95% confidence interval, P= prevalence (50.6)⁴, q= 1-p, d= Allowable error =5%. Considering a 10% nonresponse rate, the sample size was adjusted to 422.

Patients of 18 years with at least one impacted third molar detected radiographically and the presence of adjacent second molars were included in the study. Any pathological dentoalveolar conditions, craniofacial anomaly or syndromes such as Down’s syndrome, cleidocranial dysostosis, incomplete records or poor quality orthopantomogram (OPG), incomplete root formation of third molars and history of any permanent teeth extraction were excluded from the study. The data were collected by clinical examination and assessment of OPG by a single examiner. The clinical symptoms including pain, pericoronitis, swelling, distal caries in second molars, food lodgement, pain and swelling, pus discharge and halitosis were noted.

The angulation and levels of eruption were determined using OPG. The angulation of an impacted third molar were documented based on Winter’s classification⁵ as vertical impaction: the long axis of the third molar is parallel to the long axis of the second molar; mesioangular impaction: the impacted tooth is tilted towards the second molar in a mesial direction; horizontal impaction: the long axis of the third molar is horizontal; distoangular impaction: the long axis of the third molar is angled distally/posteriorly away from the second molar.

The depth of impacted lower third molars were recorded according to Pell and Gregory classification⁶ as Level A: the occlusal plane of the impacted tooth is at the same level as the occlusal plane of the second molar; level B: the occlusal plane of the impacted tooth is between the occlusal plane and the cervical margin of the second molar and level C: the impacted tooth is below the cervical margin of the second molar.

The ramus relation which is the distance between the anterior margin of the ascending mandibular ramus and the distal surface of the mandibular second molars was measured and classified as; Class I: Sufficient space available between the anterior border of the ascending ramus and the distal aspect of the 2nd molar which is more than the mesio-distal width of the crown of the 3rd molar; Class II: Space available between the anterior border of the ramus and the distal aspect of the 2nd molar is less than the mesio-distal width of the crown of the 3rd molar. It denotes that the distal portion of the third molar crown is covered by a bone of the ascending ramus and Class III: The third molar is totally embedded in the bone of the ascending ramus because of the absolute lack of space. (Figure 1)

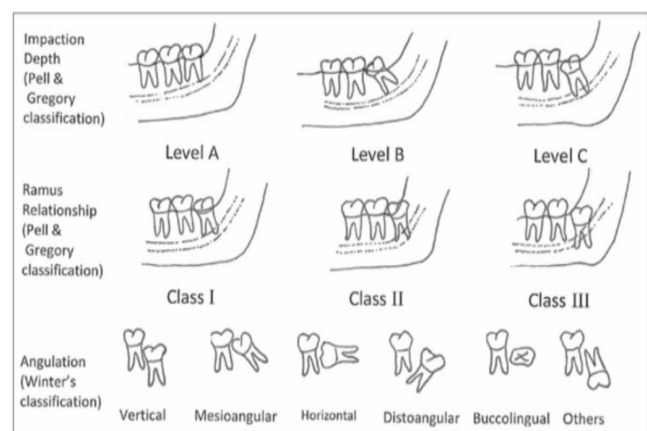


Figure 1: Winters classification and Pell and Gregory classification^{5,6}

Statistical analysis

The obtained data were entered into a Microsoft Excel sheet 2007. The data was analyzed in Statistical Package for Social Sciences (SPSS) version 16.0. The frequency of level, angle, and depth of impaction were calculated. The chi-square test was used to assess the association of angulation of impaction with sex.

RESULTS

A total of 426 patients presented with at least one impacted mandibular molar. The mean age of the participants was 33.77±8.86 (ranging from 19 to 68) years. Among 426 patients, 219 (51.41%) were males.

The most common angulation was vertical 152(35.68%) followed by mesioangular 138(32.39%), horizontal 88(20.66%) and distoangular 48(11.27%) being the least common type. The most common depth of impaction was A 198 (46.47%) followed by B 119(27.93%) and C 109(25.58%).(Table 1) The most common level of impaction was class I 198(46.47%) followed by class II 166(38.96%) and class III 62(14.55%) (Table 1).

Table 1: Distribution of mandibular third molar impaction by angulation, depth and level of impaction (N=426)

Parameters	Frequency(n)	Percentage(%)
A) Angle of impaction		
Mesioangular	138	32.39%
Distoangular	48	11.27%
Horizontal	88	20.66%
Vertical	152	35.68%
B) Impaction depth		
Level A	198	46.47%
Level B	119	27.93%
Level C	109	25.58%
C) Ramus relation		
Class I	198	46.47%
Class II	166	38.96%
Class III	62	14.55%

Majority of patients presented with pain 236 (55.40%), followed by dental caries distal to second molar 66(15.49%) and pericoronitis 62(14.55%). Very few patients presented with food lodgement 2(0.47%) and pus discharge 1(0.23%). (Table 2)

Table 2: Chief complaint of patients presenting with impacted mandibular third molar (N= 426)

Symptoms	Frequency	Percentage(%)
Pain	247	57.98%
Distal caries in second molars	66	15.49%
Pericoronitis	62	14.55%
Swelling	43	10.09%
Trismus	8	1.83%
Pus Discharge	1	0.23%
Food lodgement	2	0.47%
Halitosis	8	1.88%
Total	437*	

*Because some patients exhibited more than one symptoms

Table 3 depicts association of sex with angulation of impacted mandibular third molars. Mesioangular impaction was the most common form of impaction in female 98(50.78%) whereas vertical impaction was common in male 106(45.49%) which was found to be statistically significant (p<0.05).(Table 3)

Table 3: Association of angulation of impacted mandibular third molars with sex

Sex	Mesioangular n(%)	Distoangular n(%)	Horizontal n(%)	Vertical n(%)	Total	Chi-square value	p-value
Male	40 (17.17%)	40 (17.17%)	47 (20.17%)	106 (45.49%)	233	66.63	<0.001*
Female	98 (50.78%)	8 (4.15%)	41 (21.24%)	46 (23.83%)	193		

*p<0.05 denotes statistical significance

DISCUSSION

Impaction is the failure of tooth eruption into its anatomical position due to hindrance in the eruption path, improper positioning of a tooth, absence of space, or other impediments. Impacted teeth are those that are unable to erupt in the dental arch within the usual expected timeframe.⁷

This study showed a high prevalence rate of mandibular

third molar impaction in the vertical position. This finding was in accordance to the previous studies by Almendros-Marques et al.,⁸ Bataineh et al.⁹ and Hugoson et al.¹⁰ According to the review of literatures, root formation is the primary period during which the occlusal surface changes from a mesial-straight to a vertical-straight orientation. It is therefore possible that during this phase, the tooth rotates primarily from a horizontal to a mesioangular and then to a vertical position. In addition, another study argued that depending on the level of development in the root, differences in mesial and distal roots rates of root growth cause roots to either remain mesially or shift to a vertical position.¹¹ However, other studies have shown that the most common type was mesioangular impaction.^{12,13}

The level of impaction indicates the depth at which the tooth is buried in the bone. Our study showed that level A impaction depth was the most common type. This finding was in accordance with the previous study done by KalaiSelvan et al.¹⁴ On the contrary Blondeau et al.,¹⁵ and Almendros Marques et al.⁸ reported level B impacton depth to be the most common type of mandibular third molars. These differences in level of impaction could be due to the difference in race, patient selection criteria, and study population.

The eruption of the third molar is usually predicted based on the amount of space available between the second molar and the ascending ramus of the mandible. If the available mesiodistal space is equal to or greater than the mesiodistal width of the crown, then there is a 70% probability for its eruption.¹⁴ This study showed Class I ramus relationship (14.55%) was the most common type which is consistent with the study done by Kumar et al.¹⁶ However in other studies, the Class II ramus relationship was most prevalent.^{14,17} The least occurrence is class III (6.86%), which is in accordance with this study.¹⁷ The differences between the present study and other investigations might be due to the ethnic and genetic divergences.

Impacted teeth may be associated with complications of clinical importance in dental practice.¹ In the present study, the most common chief complaint of the patients with impacted mandibular third molar was pain followed by caries on the distal surface of second molars and pericoronitis. The findings of this study are in correlation with the studies done in Turkish population.³ Several studies have also presented pain as the most common symptoms.^{3,18,19} The delay in seeking appropriate medical or dental health care could be the main reason for the pain that patients presented with. This delay in reporting may be attributed to ignorance, socio-cultural factors and lack of adequate oral health care services in our country.

In studies done by Prajapati et al.¹⁹ and Oderinu et al.²⁰ caries of the distal surface of the second molar was found as the most common complaint. Partially erupted mesioangular impacted mandibular third molars which are in proximity and contact with the cemento-enamel junction of the second molar have a higher risk of developing caries at this site.²¹ Further lack of enough space for cleansing and improper oral hygiene practice, teeth which are malaligned, malposed, rotated, or otherwise not normally situated may be difficult to cleanse and tend to favor the accumulation of bacterial plaque and debris.

Pericoronitis was the third most common complaint in this study. This finding is in accordance with the previous studies.²²⁻²⁴ Leone et al.²² and Halverson et al.²⁵ reported a link of pericoronitis with the third molar positioned at, above, or below the occlusal plane. Asif et al.²⁶ highlighted that certain depths are often linked with soft tissue impaction which can lead to often formation of a cuff over partially erupted teeth and initiate pericoronitis.

Our study showed vertical impaction to be predominant in males while mesioangular impaction were more prevalent in females. The failure of eruption of mandibular third molars could be due to the lack of retromolar space. This may account for the increased predominance of mesioangular impaction in females as the mandibular growth stops during early ages.²⁷

The study indicates that while the symptoms and type of impaction in mandibular third molars may be similar, differences are observed in terms of position, angulation based on factors such as eruption status, angulation type, and gender. These variations highlight the complexity and uniqueness of each case when dealing with impacted mandibular third molars. This study was carried out at a single center. The authors recommend a multicentric study to generalize the results of the study.

CONCLUSIONS

Class I vertical level A impaction was the most common impaction in this study. Pain followed by caries in the distal aspect of the second molar and pericoronitis were the common chief complaints presented by the patients with impacted mandibular molars, while pus discharge and food lodgement were the least common chief complaints. Among male vertical impaction was most common while in female mesioangular impaction was predominant.

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AUTHORS' CONTRIBUTION

DCP is the principal investigator of this study. SS, UK, NG contributed to the study design, methods and writing of the manuscript. DCP undertook data collection, led the analysis and writing of the manuscript with major contributions from SS, UK and NG. DCP and NG data cleaning and monitoring aspects of the protocol. All authors read and contributed to the writing of the paper and have read and approved the final manuscript.

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