



## Original Research Article

# Prevalence and patterns of impacted mandibular third molars and their associated pathologies in a Punjab and Haryana population: A retrospective study

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## Abstract

**Aim:** The objective is to analyse the prevalence and patterns of impacted mandibular third molars and their correlation with related pathological conditions. These insights are valuable for general dentists and oral and maxillofacial surgeons as they emphasize the variety of cases observed in a dental hospital setting and enhance patient awareness.

**Materials and Methods:** The data for this study were sourced from the dental department's records from January 2023 to December 2024. Data collection was conducted through OPG assessments and clinical examination records. All collected data were systematically tabulated using Microsoft Excel and analysed using the SPSS 20 software.

**Result:** This study analysed 200 patients with impacted mandibular third molars, comprising 98 males and 102 females. The patients' ages ranged from 18 to 55 years, with the highest prevalence observed in the 21–25 age group. Angulation analysis indicated that mesioangular impaction was the most common type. Regarding classification, a higher incidence of Class II relation and Level C of impaction was the most frequently encountered. The most commonly observed pathology linked to impacted mandibular third molars was root resorption of the second molar, followed by caries in the second molar, periodontal pockets, pericoronitis, caries third molar, and cyst/tumour formation.

**Conclusion:** This study identified 200 cases of impacted mandibular third molars. Comparisons with previous research demonstrated similarities in gender distribution, age range, angulation, and impaction patterns. Genetic and racial factors may influence these differences across global studies.

**Keywords:** Impacted mandibular third molar, Prevalence, Pell and Gregory, Winter's classification, Pathologies associated with impacted mandibular third molar, Angulations, Class, Position.

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## 1. Introduction

Tooth impaction refers to a condition where the eruption of a tooth is obstructed by a physical barrier in its eruption path.<sup>1,2</sup> Tooth impaction is attributed to systemic and local factors, such as dental germ abnormalities, eruption cysts, odontomas, tooth displacement, ankylosis, gingival overgrowth, and insufficient eruption space.<sup>3,4</sup> Specifically, third molar impaction is often linked to the gradual evolutionary reduction in the size of the human mandible and maxilla, resulting in insufficient space to accommodate these teeth.<sup>5,6</sup> Research has also shown that modern diets require less effort in mastication, leading to reduced jaw growth

stimulation. As a result, impacted and unerupted teeth have become more common in humans.<sup>5</sup>

Tooth development progresses steadily throughout the first two decades of life. Since third molar teeth are the last permanent teeth to erupt, they often lack sufficient space for full eruption. When this occurs, these teeth, known as third molars, are classified as "impacted teeth" and remain either fully or partially embedded within the bone or soft tissue of the upper or lower jaw. This impaction can lead to the onset of various pathological conditions. The third molar, known as the wisdom tooth, exhibits significant variability in its morphology, root structure, formation timeline, and eruption

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period. Its development begins around 3 to 4 years, calcifying between 7 and 10 years. The crown typically completes formation between 12 and 16, while the tooth usually erupts between 17 and 21 years.<sup>7</sup>

Third molar teeth, whether impacted or partially erupted, can remain asymptomatic for years but may eventually cause problems such as acute pain, periodontitis, cysts, tumours, dental caries, pericoronitis, and root resorption of adjacent teeth. Additionally, research has highlighted orthodontic relapse and dental crowding linked to retained or impacted third molars.<sup>7</sup>

### *1.1. Pericoronitis and related infections*

Pericoronitis is a localized infection typically affecting mandibular third molars and is the most frequent acute inflammatory condition associated with retained wisdom teeth. It often begins when the crown of a partially erupted lower wisdom tooth is partially covered by adjacent oral soft tissue (operculum). Food debris becomes trapped beneath the operculum, creating a soft tissue pocket that is subsequently invaded by oral bacteria, leading to inflammation.<sup>7</sup>

### *1.2. Retained wisdom teeth and mandible fractures*

Studies support the hypothesis that unerupted or impacted mandibular third molar teeth can compromise mandibular strength, making it more susceptible to fractures caused by trauma. Biomechanical model research has shown that retained mandibular wisdom teeth reduce bone mass in the mandibular angle, weakening the area.<sup>7</sup>

### *1.3. Periodontal disease*

Periodontal disease is a specific and well-known localized condition that affects 1 or more of the periodontal tissues, including the alveolar bone, the periodontal ligament, the cementum, or the gingiva. Some investigators propose that to progress toward advanced periodontal disease, gingivitis must first be present. Others disagree and feel that advanced periodontal disease and its sequelae are not based on gingivitis as the presenting problem.<sup>7</sup>

### *1.4. Odontogenic cyst and tumour*

The literature consistently indicates that dentigerous cysts have the highest prevalence among cystic lesions and tumors associated with impacted teeth, accounting for approximately 70% to 100% of cases. In contrast, the occurrence of periodontal pathogens affecting the second molar, as well as conditions such as ameloblastoma, odontoma, odontogenic keratocyst (OKC), paradental cyst, and fibrosarcoma, is significantly lower.<sup>8,9</sup>

### *1.5. Dental caries*

The caries process commonly impacts the distal surface of the second molar, a condition closely linked to mesioangular impactions of mandibular third molars.<sup>10-13</sup> Decay often goes undetected, largely due to the challenges of identifying caries

through visual examination and the limited guidance or detailed recommendations provided to dentists for effective screening.<sup>10,14</sup> Research in cariology has consistently demonstrated that removing third molars is often necessary in such cases and requires extra attention to the second mandibular molar.<sup>10,15,16</sup>

Various classifications are followed for the assessment of impacted mandibular third molars. Winter's classification and the Pell and Gergory classification mainly follow.

G. B. Winter's classification categorized impaction types based on the angulation of an impacted third molar, specifically the angle between the long axes of the second and third lower molars.

1. Vertical impaction: The long axes of the second and impacted third molar run parallel.
2. Mesioangular impaction: The long axes of the second molar and the impacted third molar align coronally.
3. Distal-angular impaction: The long axes of the second and impacted third molars converge at their apical ends.
4. Horizontal impaction: The long axes of the second and impacted third molars form a right angle.
5. Buccolingual impaction: The impacted tooth is positioned in a buccolingual direction.
6. Inverted impaction: The impacted tooth is oriented upside down.<sup>17-19</sup>

### *1.6. Pell and gregory classification*

This system evaluates the degree of third molar impaction based on vertical and horizontal dimensions. It categorizes impaction concerning the occlusal plane (A, B, C) and the mandibular ramus (1, 2, 3).

#### *1.7. Position relative to the occlusal plane*

- A. The occlusal surface of the third molar is at or above the occlusal plane.
- B. The occlusal surface of the third molar lies between the occlusal plane and the neck of the second molar.
- C. The occlusal surface of the third molar is positioned below the neck of the second molar.

#### *1.8. Position relative to the anterior margin of the mandibular ramus*

**Class 1:** The space between the second molar's distal surface and the mandibular ramus's anterior margin exceeds the anteroposterior length of the third molar's crown.

**Class 2:** The available space between the second molar's distal surface and the mandibular ramus's anterior margin is smaller than the anteroposterior dimension of the third molar's crown.

**Class 3:** There is no space between the second molar's distal surface and the mandibular ramus's anterior margin, resulting in complete impaction.<sup>17,20,21</sup>

Based on demographic data, this study analyses the patterns and prevalence of mandibular impacted third molars. It examines the third molars' angulation, position, and depth while exploring associated pathologies linked to impacted mandibular teeth.

## 2. Materials and Methods

The data for this study was obtained from the dental department's records spanning January 2023 to December 2024. A total of 200 patients' OPGs were included in the study, consisting of 98 males and 102 females aged between 18 and 55 years. Data was retrieved using OPG assessments and clinical examination records, which were already present. The study examined various parameters, including age group, gender, its angulation, position, and the level of impaction. Ethical clearance was obtained. Clinical and radiographic records with insufficient information were excluded from the study.

### 2.1. Inclusion criteria

1. Patients with an impacted mandibular third molar.
2. Individuals aged 18 years and older were included, as this is the age when tooth eruption and root development are typically complete.
3. The pathologies associated with an impacted mandibular third molar mainly involve root resorption of the second molar, followed by caries in the second molar, periodontal pockets, pericoronitis, caries in the third molar, and cyst/tumour formation.

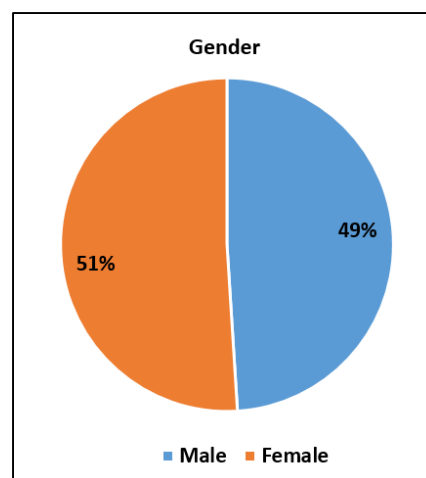
### 2.2. Exclusion criteria

1. Patients with a history of jaw fractures.
2. Individuals with developmental abnormalities such as micrognathia, achondroplasia, or cleidocranial dysplasia.
3. Cases involving supernumerary teeth.

The Pell and Gregory classification system was used to evaluate the position and level of the impacted teeth, and Winter's classification is used to assess the angulation of the impacted teeth. Microsoft Excel was used to tabulate all of the collected data. Data was analysed using a computer software program, SPSS 20.

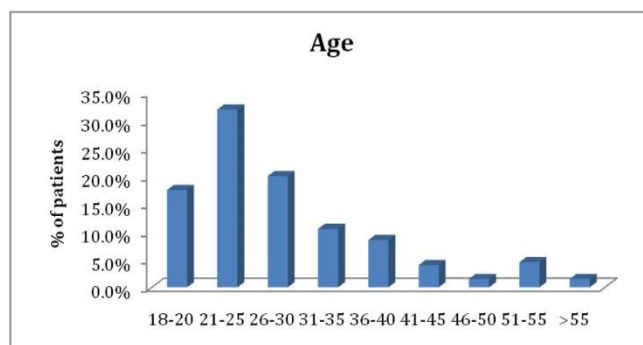
## 3. Results

This study evaluated 200 patients with mandibular impacted third molars between 2023 and 2024. 98 were males, and 102 were females. The patients' ages ranged from 18 to 55, with a mean age of 28.75 and a standard deviation of 9.84 (**Figure 1**).



**Figure 1:** Frequency of impacted mandibular third molars in different genders

In our study, the age group with the highest prevalence of impacted mandibular third molars was 21–25 years, accounting for 32% of cases. The prevalence decreased with increasing age, with the lowest occurrence, at 3%, observed in individuals over 55 years (**Figure 2**).



**Figure 2:** Prevalence of impacted mandibular third molar in different age groups

Our survey indicates that mesioangular impaction is the most common type of mandibular third molar impaction, accounting for 43% of cases. This is followed by horizontal impaction, at 36%, vertical impaction, at 15%, and distoangular impaction, which is the least common, at 6% (**Table 1**).

**Table 1:** Distribution of angulations of impacted mandibular third molar

		Frequency	Percent
Angulation	Distoangular	12	6.0%
	Horizontal	72	36.0%
	Mesioangular	86	43.0%
	Vertical	30	15.0%
	Total	200	100.0%

The survey revealed that Class II was the most common among the three impaction classes categorized by the

mesiodistal diameter of the crown to the anterior border of the mandibular ramus, comprising 49.5% of cases. This was followed by class III, which accounted for 30.5% of cases, and class I, reported in 20% of cases (**Table 2**).

**Table 2:** Distribution of impacted mandibular third molars based on class of impaction

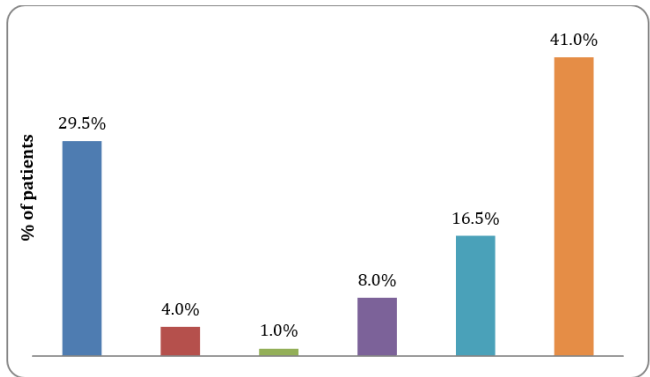
		Frequency	Percent
Class	Class-I	40	20.0%
	Class-II	99	49.5%
	Class-III	61	30.5%
	Total	200	100.0%

According to the survey, the distribution of impacted teeth based on the relative depth of the third molar compared to the second molar revealed that level C was the most common, accounting for 47% of cases. This was followed by level B at 27% and level A at 26% (**Table 3**).

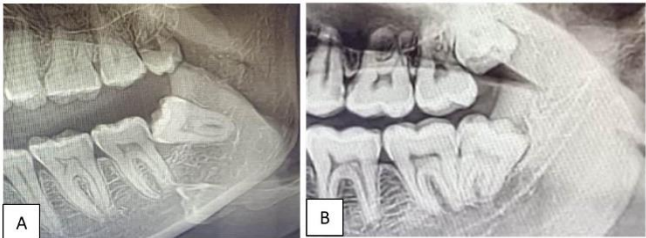
**Table 3:** Distribution of impacted mandibular third molar by the level of impaction

		Frequency	Percent
Level	Level-A	52	26.0%
	Level-B	54	27.0%
	Level-C	94	47.0%
	Total	200	100.0%

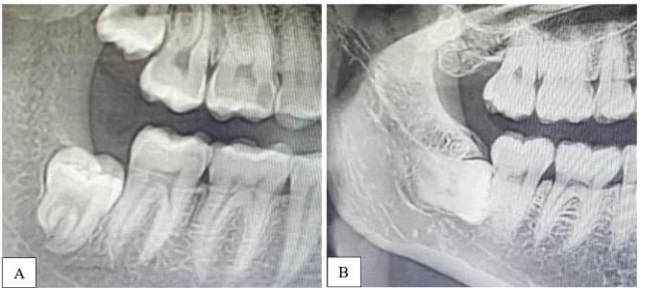
Our study found that root resorption of the second molar, reported in 41% of cases, was the most common pathology associated with impacted mandibular third molars. This was followed by caries in the second molar (29.5%), periodontal pockets (16.5%), pericoronitis (8%), caries in the third molar (4%), and cyst/tumour (1.0%) (**Figure 3**).



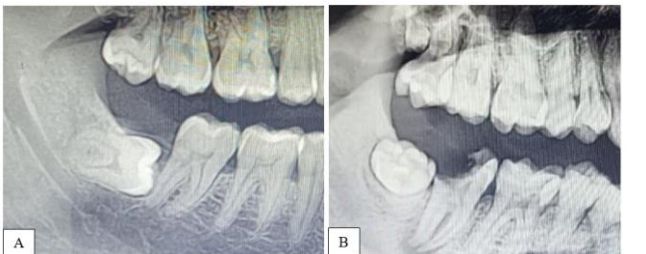
**Figure 3:** Frequency of pathology associated with impacted mandibular third molar



**Figure 4: A):** Mesioangular impaction of mandibular third molar; **B):** Distoangular impaction of mandibular third molar



**Figure 5: Vertical** impaction of mandibular third molar; **B):** Horizontal impaction of mandibular third molar



**Figure 6: A):** Root resorption of mandibular second molar; **B):** Caries mandibular second molar



**Figure 7:** Caries mandibular third molar





**Figure 8:** Impacted third molar associated with Odontogenic Cyst/Tumour

#### 4. Discussion

Impacted third molars can present considerable difficulties during surgical procedures, such as restricted visibility, limited access, and a heightened risk of nerve injury. Additionally, these teeth may lead to complications like infections, discomfort, cyst formation, and tumours, potentially impairing oral health and function. Routine dental examinations and prompt assessment of impacted molars are essential for effectively preventing or addressing these issues.<sup>22</sup>

Our survey found that mandibular third molar impaction is slightly more common in females (51%) than in males (49%). Likewise, V. Raj Kumar et al. study found a higher incidence in females (53.3%) than in males (46.7%).<sup>23</sup> Research conducted by M. Eshghpour et al. also indicated a significantly greater occurrence in females (65.88%) than in males (34.1%).<sup>24</sup> Md. Rubayet et al research also showed a greater prevalence in females (56.3%) compared to males (43.13%).<sup>25</sup> Similarly, a study by Tsedenina Gebeyahu et al. reported a higher frequency in females (61.2%) than in males (38.2%).<sup>22</sup> The likelihood of third molar impaction in females may be attributed to differences in growth patterns between the sexes. In females, growth spurts typically occur between the ages of 10-12, whereas in males, they take place between 12-14 years. Female skeletal growth is characterized by a rapid yet short duration, while male growth progresses more gradually over a longer period. As a result, males continue to develop their jaws during the eruption of the third molars, whereas females experience jaw growth cessation by the time these molars emerge, potentially limiting space for their eruption.<sup>26,27</sup>

However, contrasting findings were observed in studies by Sajjad Salam and Abu Hussein Muhamad. Sajjad Salam's research et al reported a higher prevalence in males (54.4%) than in females (45.6%),<sup>28</sup> while Abu Hussein Muhamad's et al study showed an even greater male predominance at 62.2% compared to 37.8% in females.<sup>29</sup>

Our findings indicate that the highest incidence of impacted mandibular teeth occurs in the 21-25 age group, likely due to the common eruption period of the third molar. A similar study by Narayan Sharma Lamichhane et al. reported a prevalence among individuals aged 20-30 years.<sup>26</sup>

Likewise, research conducted by Indra Hadikrishna et al found a higher occurrence in the 17-29 age group.<sup>30</sup> Dr. Lukman Fawzi Omar et al study also highlighted a greater tendency for impacted teeth within the 21-25 age range.<sup>31</sup> Additionally, Asif Nazir's et al survey showed a higher prevalence among individuals aged 20-25 years.<sup>32</sup> Furthermore, Sadeta Secic et al research revealed that impacted mandibular third molars were most frequently observed in the third decade of life, with a prevalence of 61.2%.<sup>33</sup>

The distribution of impacted third molar angulation indicates that mesioangular impaction is the most common, occurring in 43% of cases. Likewise, a study by Marwa Hatem et al. identified mesioangular impaction as the most frequent type, with a prevalence of 34.6%.<sup>34</sup> Similarly, research conducted by Sanjit Singh et al. reported a 33.3% occurrence of mesioangular mandibular third molars.<sup>35</sup> Otasowie Osunde et al findings showed a higher prevalence of mesioangular impaction at 44.9%,<sup>36</sup> while Eman Zafar et al recorded an incidence of 51.6%.<sup>37</sup> A related study by Dena Ali reported an even greater occurrence, with mesioangular impaction observed in 64.4% of cases.<sup>38</sup> The high frequency of mesioangular impactions is believed to be associated with variations in the growth of the mesial and distal roots of third molars. Insufficient development of the mesial root may lead to mesioangular impaction, whereas excessive growth of this root could result in distoangular impaction.<sup>38</sup>

However, some studies have reported different findings. Anwar B. Bataineh et al. survey indicated a higher occurrence of vertical impaction at 61.4%,<sup>39</sup> while research by SGM Falci et al. observed a greater prevalence of distoangular impaction in mandibular third molars.<sup>40</sup>

In the majority of examined impacted mandibular third molars, half of the crown was covered by the anterior border of the mandibular ramus, classifying them as Class II. Our survey on mandibular third molar impaction, based on Pell and Gregory's classification, found that Class II impactions were the most common at 49.5%, followed by Class III at 30% and Class I at 20%. Similarly, a study by Karina Kendelhy Santos et al reported a higher prevalence of Class II relationships at 55.1%.<sup>41</sup> Research conducted by Sars M. El Khateeb et al. also indicated a predominance of Class II impactions, with a prevalence of 77.6%.<sup>42</sup> A comparable study by Ruchadaporn Kaomongkolgit et al. reported the same high occurrence of Class II relationships at 77.6%.<sup>43</sup> Additionally, a study by M. Eshghpour et al. found that 48.46% of cases had a Class II mandibular ramus relationship.<sup>24</sup> Another survey by Ahmad et al. reinforced this trend, reporting a Class II incidence of 49.02%.<sup>44</sup>

However, in contrast to these findings, studies by Giuseppe Monaco et al.<sup>45</sup> and A.E. Obiechina et al. indicated a higher prevalence of Class I relationships, where the anterior border of the mandibular ramus was aligned with the impacted mandibular third molar.<sup>46</sup>

Our survey results reveal that 47% of impacted third molars were classified as Level C, indicating the deepest level of impaction. At this level, the highest part of the tooth is positioned below the cervical line of the second molar relative to the long axis of the impacted second molar. This was followed by Level B, with Level A being the least common. A comparable study by Lina Aifadil reported an even higher prevalence of Level C impaction at 53.9%,<sup>47</sup> while Mahvash Zeb et al.'s research also found a higher incidence, at 57.7%.<sup>48</sup> However, studies by Hassan A. H<sup>49</sup> and Yahya Alhadi et al. present differing results, suggesting that Level B is the most frequent type of mandibular third molar impaction.<sup>50</sup> Additionally, findings from Siddharth Gupta et al.<sup>51</sup> and Mahmoud Al Dajani et al. indicate that Level A is more prevalent.<sup>52</sup>

Our study conducted on the local North Indian population found that the most common pathology associated with impacted third molars is root resorption of the second molar, occurring in 41% of cases. This is followed by caries in the second molar (29.5%), periodontal pockets (16.5%), pericoronitis (8%), and cysts or tumours (1%). These findings differ from other surveys conducted across India, where pericoronitis is reported as the most prevalent pathology.

For instance, a survey by Mukherjee et al. conducted in Udaipur, Rajasthan, in India, identified pericoronitis as the leading cause of third molar extraction, accounting for 42% of cases.<sup>53</sup> Similarly, research by Santosh Patil et al. on the Western Indian population reported pericoronitis as the most common pathology at 38.9%.<sup>54</sup> Another study by Shital Patel<sup>55</sup> in Western Gujarat found that recurrent pericoronitis was the primary reason for mandibular third molar extraction, with a prevalence of 33.81%.<sup>55</sup> Additionally, a survey by R. Anitha et al. on the South Indian population reported that pericoronitis was responsible for 74% of third molar extractions.<sup>56</sup>

## 5. Conclusion

Within the scope of this study, it can be concluded that among the 200 patients with impacted mandibular third molars, females were more prevalent, and the most affected age group was 21-25 years. The survey indicates that mesioangular impaction is the most common type. Additionally, the predominant patterns of impaction observed were Class II and Level C. The most frequently associated pathology with impacted mandibular third molars was root resorption of the second molar.

Comparison with other studies revealed similarities in gender, age, angulation, and impaction patterns; however, variations were noted in the pathological outcomes associated with impacted teeth. Differences across studies worldwide may be attributed to genetic and racial factors. A thorough understanding of prevalence, impaction patterns, and associated pathological conditions can improve patient care and treatment planning. These insights are essential for

general dentists and oral and maxillofacial surgeons as they highlight the diverse cases encountered in a dental hospital setting and contribute to patient awareness.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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