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The Pattern of Mandibular Third Molar Impaction and Its Relationship with the Development of Distal Caries in Adjacent Second Molar: A Digital Radiographic Study

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Key Words:
Impacted teeth, Mandibular 3rd molar, Mandibular second molar, Distal caries, Orthopentomography.

Abstract:

Introduction:- A tooth is supposed to be affected if it is unable to reach the occlusal plane even after 2/3rd of root formation. Distal caries is frequently observed in the mandibular second molar and may result from an impacted tooth if left untreated.
Aim and Objective: - The current research determined (1) the distribution of mandibular 3rd molar impaction (2) the pattern distribution of impaction radiographically (3) the gender distribution of impaction pattern (4) prevalence level of distal caries lesion in mandibular 2nd molar at impaction side.
Materials & method:- A retrospective analysis was done on 989 orthopantomography(OPGs) using Genoray Papaya device and Triana software in the Oral Medicine and Radiology Department at "Goenka Research Institute of Dental Science". The pattern of impacted teeth was assessed and level of eruption was noted according to Pell and Gregory's classification. Additionally, carious lesions that were seen in adjacent mandibular second molars were identified and noted.
Results:- A total 267 patients (26.99%) had impacted 3rd molars; 13% of these patients also had distal cervical caries in their 2nd molars. The most common type was mesioangular impaction. Female gender had greatest prevalence of impacted 3rd molar.
Conclusion:- The present investigation gives valuable data about radiographic status of impacted mandibular 3rd molar among patients.

1. Introduction:

The tooth which fails to erupt or not excepted to erupt into the dental arch based on radiographic and clinical findings is stated to be impacted tooth. The 3rd molars are the most common tooth impacted in human dentition and their values have been on a rise. (1). OPG is commonly utilized during treatment planning for third molar surgery because it permits evaluation of the two-dimensional interaction between the tooth and inferior alveolar canal. There may be unilateral or bilateral impacts. Winter's classification (vertical, horizontal, mesioangular, distoangular, and buccolingual impaction) identifies the pattern of an impacted third molar. [Figure 1] (2)

2. Methodology:

The study included 989 patients, reported to Oral Medicine and Radiology department of "Goenka Research Institute of Dental Science". The information was taken from the Triana programme that the institute used to administer OPGs, decrypted, and placed into an Excel spreadsheet. The data were subjected to descriptive analysis, and the findings were presented as frequency tables and graphs. Orthopantomograms (OPGs) of these patients were screened from

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AUGUST 2022 to MARCH 2023 and were selected.

Inclusion criteria:

- Impacted mandibular 3rd molar with completed root formation
- Distal caries present in adjacent mandibular 2nd molar
- Age above 18 years.

Exclusion criteria:

- Mandibular third molars have under developed roots.
- Age below 18years
- Extraction of mandibular 3rd molar.

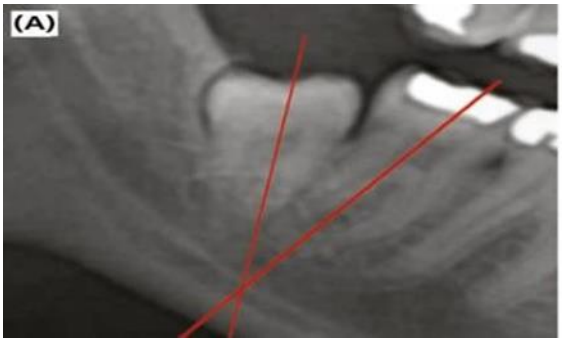
The radiographic evaluation of posterior mandibular teeth with OPGs was examined with a magnifying glass, illuminated X-ray viewer box, and distal surface caries of the 2nd mandibular molar were investigated. Each OPG was evaluated by a single researcher. OPG with 3rd molar teeth impacted was discovered. [3]

The pattern of impaction was identified using Winters classification, which divided it into the following four types based on angle made between the lines intersecting long axes of 2nd and 3rd molars and drawn via the midpoint of occlusal surface and bifurcation: Horizontal impaction (80° - 100°), mesioangular impaction (11° - 79°), vertical impaction (10° to -10°), distoangular impaction (-11° to -79°). In order to understand the mesial or distal inclination in reference to the second molar, an angle was therefore created. In relation to the second molar, third molars were considered to be regularly erupted teeth when they had reached the occlusal plane. [1]

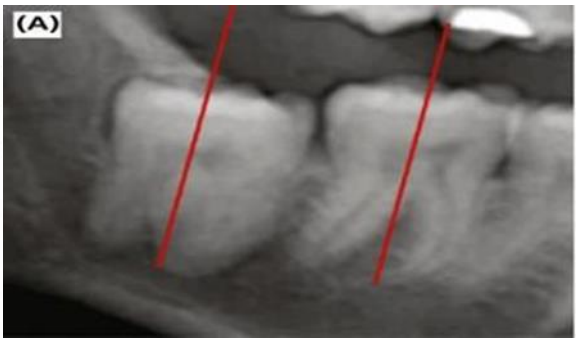
Pell & Gregory categorized the impaction level as A, B, or C based on the relation between occlusal surface of 3rd mandibular molar and neighboring second mandibular molar. [A:- tooth position is parallel to or higher than the occlusal line, B:-The position of tooth is below occlusal plane, whereas above cervical level of 2nd molar, C:- The tooth position is below 2nd molar's cervical level]

Then we differentiate the unilateral and bilateral impactions from the OPGs. The distal caries presence in mandibular 2nd molar was measured when OPG noted distal caries evidence with/without associated periapical and pulpal disorder linked to adjacent impacted mandibular third molar. [4]. The third molars that caused distal caries in mandibular 2nd molars were recognized and noted. [3]

For every patient, the following information was recorded: age, angulation, gender, eruption status of 3rd impacted molar, and presence or absence of distal caries in 2nd molar.



Distoangular Impaction



Vertical Impaction

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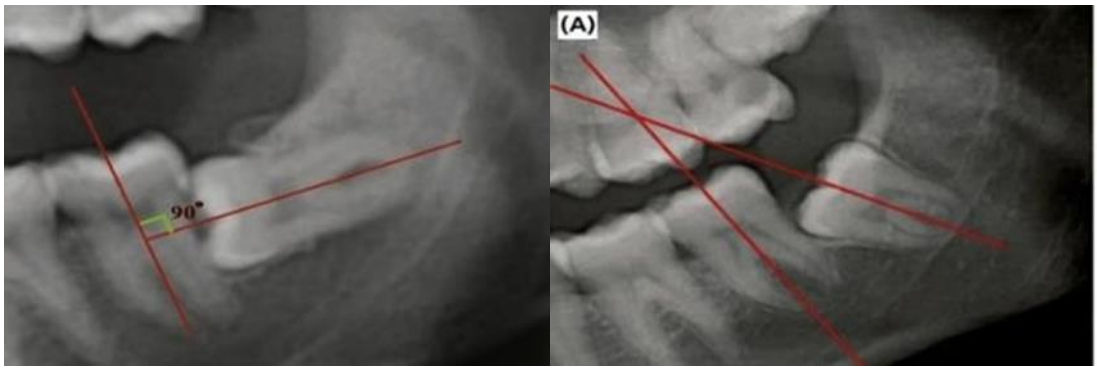

Horizontal Impaction Mesioangular Impaction

Figure: 1 Mandibular third molar impaction pattern

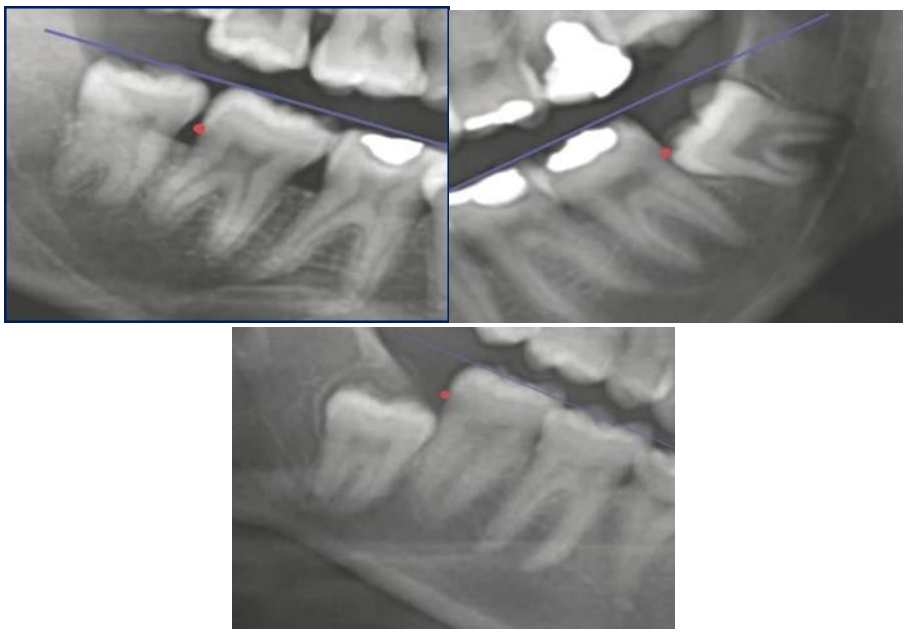

Figure 2: Pell and Gregory classification of mandibular 3rd molars

3. Results:

Patients were evaluated in total of 989 OPGs over 8 months [2022 to 2023]. Table: 1 shows total 267 patients who had impacted 3rd molars (26.99%),438 non-impacted third molars(44.28%), and 286 excluded OPGs(28.91%).

Table 2 shows out of total 486 male patients (49.14%) and 503 female patients (50.85%). There is no gender predilection.

Table 3 shows bilateral impactions with frequency of 190 (71.16%) and unilateral impaction with frequency of 77 (28.83%). Bilateral impactions were more common than unilateral impactions.

Table 4 shows Mesioangular type of impaction was most prevalent in 178 (66.67%) of cases followed by Vertical impactions 42 (15.73%), Horizontal impaction 76 (28.46%),

Distoangular impactions 56 (20.97%) and buccolingual impaction 5 (1.87%).

Table 5 shows According to Pell & Gregory classification, level 1 was seen in 158 (59.17%) of cases, level 2 in 194 (72.65%), and level 3 in 58 (21.72%) of cases. Level 2 pattern of eruption was more common than other levels of eruption.

Table 6 shows out of 267 impactions 31(11.61%) distal caries were present in mandibular second molars.

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	Frequency	Percentage
Impaction	267	26.9%
Non-Impaction	438	44.2%
Exclusion	286	28.9%
Total	989	100%

Table 1: Prevalence of Impacted Teeth

Gender	Frequency	Percentage
Male	486	49.14%
Female	503	50.85%
Total	989	100%

Table 2: Gender Distribution of Impacted Teeth

Impaction	Frequency	Percentage
Unilateral	77	28.83%
Bilateral	190	71.16%
Total	267	100%

Table 3: Bilateral and Unilateral Pattern of Impacted Teeth

Pattern	Frequency	Percentage
Mesioangular	178	66.67%
Distoangular	56	20.97%
Vertical	42	15.73%
Horizontal	76	28.46%
Buccolingual	5	1.87%

Table 4: Pattern of Impaction

Level Of Eruption	Frequency	Percentage
Level1	158	59.94%
Level 2	194	72.65%
Level 3	58	21.72%

Table5: Level of Eruption

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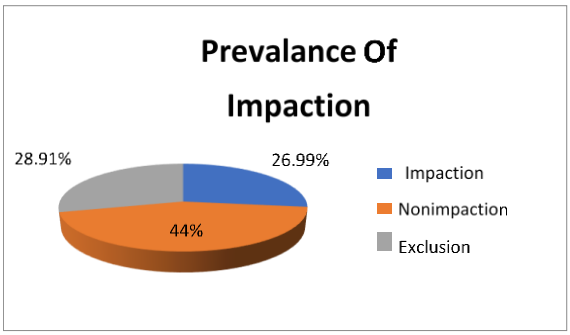
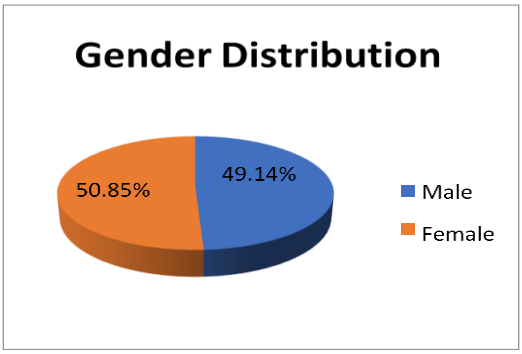
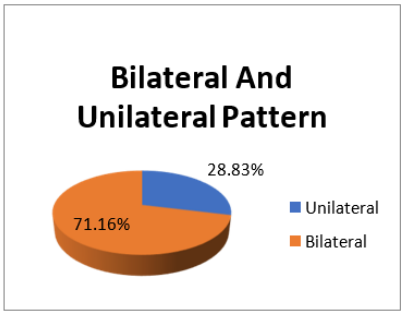
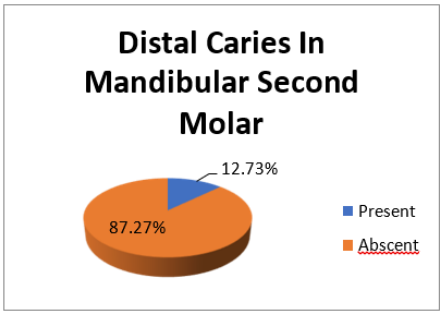
	Present	Absent
Distal caries adjacent to Mandibular Second Molar	31 (12.73%)	236 (87.27%)

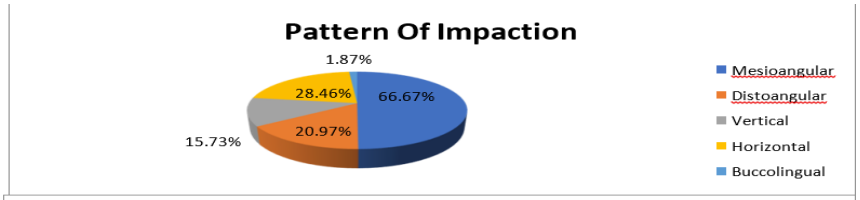
Table 6: Distal Caries in Mandibular Second Molar

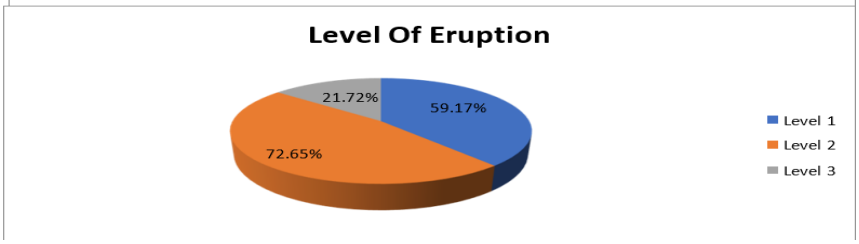












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4. Discussion:

Numerous studies were done on impacted 3rd mandibular molars in developed nations, where third molar management costs millions of dollars each year. The most frequent type of oral surgery is the extraction of an impacted mandibular 3rd molar. To prevent unanticipated issues brought on by third molars, preventive extraction has been advised. Other small correlation studies involving the eruption status of the mandibular 3rd molars and distal caries on the mandibular 2nd molars have been conducted. [7] **Punwutikorn et al.** stated that caries of the mandibular second molar was most common pathological problem related to partially erupted mandibular 3rd molars.[11]

OPG radiographs helped study the pattern, angulation, root morphology, pathologies, and difficulty level associated with the impacted tooth removal. [8]

Out of 989 OPGs, 267 OPGs were assessed with impacted MTMs. **Mohammed AmjedAlsaegh et al (2022[5]** demonstrated that 686 MTMs impactions out of 2000 OPGs. **KamranBokhari Syed et al (2017[2]** demonstrated that 979 MTMs impactions out of 6000 OPGs. These were correlated with our study.

In the present analysis, 503(50.85%) were females, and 486(49.14%) males showed androcentric outcomes. Regarding the study's gender distribution, it is per work of **Bansal et al. (2012[12**] and **shivaramakrishnan SM et al. (2015) [13]** showed female predominance which is correlated with the present analysis.

Pattern of Impaction assessed based on winter's classification showed that mesioangular was the most prevalent pattern with 66.67% of cases followed by Horizontal (28.46%), Distoangular (20.97%), vertical (15.73%) and Buccolingulal as the least pattern with 1.87% of cases. This was correlated with the **Kamran Bokhari Syed et al. (2017) [2]** mesioangular impaction (60.4%) and **Hemamalini Balaji et al (2015) [4]** mesioangular impaction (49.4%) studies. According to above studies, mesioangular impactions were more common than others.

Eruption Level estimated on the basis of Pell and Gregory's classification observed that Level 2 was the most prevalent with 72.65% of cases followed by Level 1 with 59.17% and Level 3 with 21.72%. According to **Mohammed Amjed Alsaegh et al (2022) [5],** Level 2 wasmost common with 74.05%.

Third molars that are partially erupted and closely approximate the CEJ of the M2M are morelikely to develop occult caries, which can quickly lead to pulp destruction. The result of this problem is frequently the removal of both teeth. This study examined the relationship betweenaffected M3M and distal M2M caries in light of the above issue. The oral prevalence of distal caries adjacent to M2M is related with impacted M3M (12.73%). This was similar to observed by **Kalyna Chakrvarthy Pentapati et al (2019) -** 38.9% [9] and Amitlal **Goswami et al (2020) 30.1**% [3] but much higher than that reported in our study.

5. Conclusion:

Panoramic radiographs may be utilized as a valuable predictor of the result of the position of the impacted mandibular 3rd molars due to their high cost-to-information ratio. In conclusion, mesioangular is the most typical impaction pattern. Bilateral impactions are more common thanunilateral. Prevalence of impaction was more common in females than males. Mesioangular impaction of impacted mandibular 3rd molars may be associated with distal caries developmentin mandibular 2nd molars. It is essential to diagnose caries at an early stage with periodic monitoring and radiographic evaluation.

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