

Radiographic Assessment Regarding the Pattern of Third Molar Impaction and its Association with Gender in the Population of Islamabad

Hina Nasim¹, Mawra Hyder¹, Anosha Mujtaba¹, Afsheen Mansoor¹, Bushra Afridi¹, Arsalan Hyder²

¹School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad; ²Department of Dentistry, Federal Government Polyclinic Hospital, Islamabad

ABSTRACT

Objective: The main objective was to determine the prevalence of impacted teeth and classify the types of impaction observed in third molars.

Methodology: This retrospective cross-sectional study spanned three months and involved the analysis of orthopantomograms (OPG) data from 278 patients, encompassing a total of 445 impacted third molars. The data were sourced from patients referred to the Radiology department of the School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, from September to December 2023. Inclusion criteria involved OPGs of individuals aged 25 years or older with fully formed roots in their third molars. Exclusion criteria included OPGs of individuals who were younger than 25 years, exhibited craniofacial anomalies, underwent prior orthodontic treatment, had erupted third molars, or presented with third molars featuring incomplete root formation.

Results: In the present study, both male and female participants were almost equal in number, and the mean age of male participants was 29.8 ± 4.4 while the mean age of female participants was 29.3 ± 4.7 . Among the OPG examined, 73.2% presented with impacted mandibular third molars, while only 26.8% displayed impacted maxillary third molars. To be more precise, the left mandibular third molar was the most frequently impacted at 58.9%, whereas the left maxillary third molar had the lowest occurrence at 20.8%.

Conclusion: In conclusion, our research underscores significant gender variations in the prevalence and types of impactions observed in third molars. Additionally, a higher prevalence of mandibular third molar impaction was identified in comparison to maxillary third molars.

Key words: Radiography, Impaction, Molar

Authors' Contribution:

^{1,2}Conception; Literature research; manuscript design and drafting; ^{3,4}Critical analysis and manuscript review; ^{5,6}Data analysis; Manuscript Editing.

Correspondence:

Hina Nasim
Email: drhinanasim1990@gmail.com

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Introduction

The tooth is said to be impacted when its eruption is hampered and obstructed due to the adjacent tooth, soft tissues, inadequate space, insufficient lower jaw growth, late mineralization, hindered facial growth, and other conditions. Such teeth remain completely

or partly embedded in the bone or the soft tissues, leading to pericoronitis, dental caries, and cystic lesions.^{1,2} As the last tooth to be erupted it faces less accessible space in the oral cavity, making eruption problematic. This is a pathological condition, in which the pathway of eruption of dentitions is

obstructed and the tooth is prevented from erupting into its functional position.³

Third molars are the most impacted teeth, with a global prevalence of 30.3 to 68.6%.^{2,4} Another study conducted in the Gulf region suggests that the occurrence of third molar impaction is 32- 40.5 %.⁵ Third molars are also known as wisdom teeth since this name is associated with the time of their emergence in the oral cavity, which is early adulthood. Impaction in mandibular molars is predominantly more common than in maxillary third molars. Studies have suggested that mesioangular is a more common type of impaction found in mandibular third molars. Third molars erupt in late adolescence between the age of 18 to 20.⁶

According to most of the studies, there is no gender predilection, whereas some of the studies have also proposed that there is a greater incidence of impaction in females as compared to males.⁷ Another study reveals that males have a larger retromolar space than females of Indian heritage. The impacted third molar exhibits distinct patterns in terms of depth, position relative to the jaw, and angle relative to the occlusal plane.⁸ The angle of impaction is determined by using the Winters classification system, referring to the angle obtained by intersecting the longitudinal axis of the second and third molar. It is classified as mesioangular, distoangular, vertical, horizontal, and buccolingual.⁹ An early diagnosis is critical for its early management therefore, a detailed radiographic assessment is required to determine the pattern of the impaction, Orthopantomography (OPG) is used to measure the angulation of the impacted third molar and its relation and proximity to the underlying structures.¹⁰ Retaining the third molar might benefit orthodontic treatment, thus making it a crucial problem to be addressed.¹¹

The objective of this study was to determine the gender-specific pattern of third molar impaction and the prevalence of third molar impaction in both arches.

Methodology

This retrospective cross-sectional study spanned three months and involved the analysis of orthopantomograms (OPG) data from 278 patients, encompassing a total of 445 impacted third molars. The data were sourced from patients referred to the Radiology department of the School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, from September to December 2023. Ethical approval was obtained from the ethical review board of the School of Dentistry, SZABMU. The sample size was determined using the online calculator Rao soft, considering a population size of 1000, a 95% confidence interval (CI), and a z-value of 1.96. Inclusion criteria involved OPGs of individuals aged 25 years or older with fully formed roots in their third molars. Exclusion criteria included OPGs of individuals who were younger than 25 years, exhibited craniofacial anomalies, underwent prior orthodontic treatment, had erupted third molars, or presented with third molars featuring incomplete root formation. Additionally, patients with incomplete records on panoramic radiographs (OPG), poor-quality OPG images, or radiographs lacking the first, second, and third molars were excluded from the study.

The study evaluated the following parameters:

1. The number and frequency of impacted third molars.
2. The classification of third molars is based on Winters' criteria.

The categorization of impacted mandibular third molars was accomplished using Winter's classification, which is based on the alignment of the long axis of the impacted third molar with that of the second molar. Specifically, the classification included: Mesio-angular: When the impacted third molar is inclined in a mesial direction toward the second molar, Disto-angular: When the long axis of the impacted third molar is directed distally or posteriorly away from the second molar, Horizontal: When the long axis of the impacted third molar is

parallel to the ground, Vertical: When the long axis of the impacted third molar aligns parallel to the long axis of the second molar, Buccolingual: When a tooth is oriented in a buccolingual direction.¹²

The analysis of the data was carried out using SPSS software (version 20). The frequency of impaction was presented as percentages. Gender predisposition towards various impaction patterns was assessed through the chi-square test, with a significance level set at $p < 0.05$.

Results

In the present study, both male and female participants were almost equal in number, and the mean age of male participants was 29.8 ± 4.4 while the mean age of female participants was 29.3 ± 4.7 (table- 1).

Table1: Demographic data of study participants

Gender	Frequency (f)	Percentage %	Age Mean \pm SD
Male	138	49.6	29.8 ± 4.4
Female	140	50.4	29.3 ± 4.7

SD= Standard deviation

Among the OPG examined, 73.2% presented with impacted mandibular third molars, while only 26.8% displayed impacted maxillary third molars. To be more precise, the left mandibular third molar was the most frequently impacted at 58.9%, whereas the left maxillary third molar had the lowest occurrence at 20.8% (Figure 1). Concerning the maxillary arch, the majority 48.7% showed the distoangular type of impaction, specifically in the left maxillary quadrant, the predominant pattern of third molar impaction among patients was distoangular impaction (8.6%), with only 1.4% experiencing buccolingual impaction. Likewise, in the right maxillary quadrant, the majority (9.7%) of third molars exhibited distoangular impaction, while only 1.1% displayed buccolingual impaction. Within the mandibular arch, mesioangular impaction was prevalent at 41.7%, notably in the left quadrant at 23.0%, while

buccolingual impaction was the least frequent at 1.1%. Similarly, within the mandibular right quadrant, mesioangular impaction was the most common (26.3%), while buccolingual impaction had the lowest reported incidence at 0.7% Table 2.

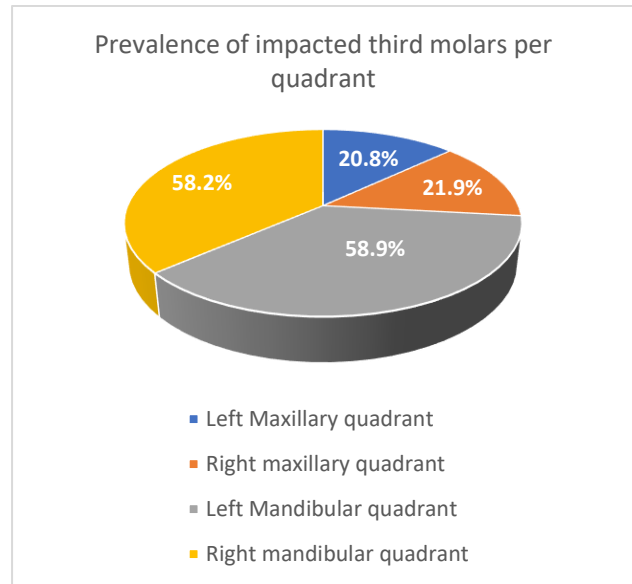


Fig 1: Prevalence of impacted third molars per quadrant among study participants

Table 2: The pattern of third molar impaction per quadrant

Quadrant	Pattern of impaction	Frequency (f)	Percentage %
Left maxillary quadrant	Mesioangular	12	4.3
	Distoangular	24	8.6
	Horizontal	-	-
	Vertical	18	6.5
	Buccolingual	4	1.4
Right maxillary quadrant	Mesioangular	9	3.2
	Distoangular	27	9.7
	Horizontal	-	-
	Vertical	22	7.9
	Buccolingual	3	1.1
Left mandibular quadrant	Mesioangular	64	23.0
	Distoangular	28	10.1
	Horizontal	34	12.2
	Vertical	35	12.6
	Buccolingual	3	1.1
Right mandibular quadrant	Mesioangular	73	26.3
	Distoangular	22	7.9
	Horizontal	26	9.4
	Vertical	39	14.0
	Buccolingual	2	0.7

Concerning the maxillary arch, a statistically significant correlation was observed between gender and the type of impaction ($p=0.006$). A distinct impaction pattern was more prevalent among females compared to males. Notably, no horizontal impaction pattern was observed in either gender. Conversely, in the mandibular arch, no statistically significant association was identified between gender and type of impaction ($p=0.23$) (refer to Table 3). Additionally, a slightly higher incidence of mesioangular (47.2%) was noted in males, while females exhibited a higher prevalence of distoangular impactions (37.1%).

Table 3: Gender and arch-wise comparison of the pattern of third molar impaction among participants

Gender	Pattern of impaction in maxillary arch					p-value
	Mesioangular	Distoangular	Horizontal	Vertical	Buccolingual	
Male	6	20	-	13	1	0.006*
Female	15	31	-	27	6	
Gender	Pattern of impaction in mandibular arch					p-value
	Mesioangular	Distoangular	Horizontal	Vertical	Buccolingual	
Male	76	15	30	36	4	0.23
Female	62	36	30	38	1	

Discussion

The present study aimed to determine the prevalence of impacted teeth and classify the types of impaction observed in third molars. Among the examined cases 73.2% exhibited impaction in the mandibular third molar, with the remaining 26.8% demonstrating impaction in the maxillary third molars. Similarly, a study conducted in Malaysia revealed a higher prevalence of impaction in mandibular third molars (52.2%) compared to maxillary third molars (47.7%).³ Likewise, a study carried out in India indicated a higher prevalence of impacted mandibular third molars (57.9%) in

comparison to impacted maxillary third molars (42%).¹³ Also, a study conducted in Oman revealed a higher incidence of impacted third mandibular molars, with 56%, compared to impacted third maxillary molars, which accounted for 44%.¹⁴

The current investigation indicated that the prevailing impaction pattern for third molars in the maxillary arch was distoangular, while in the mandibular arch, it was mesioangular. Likewise, a study conducted in Saudi Arabia also found that the distoangular impaction pattern was the most prevalent type in the maxillary arch, accounting for 96.6%.¹⁵ Another study conducted in India revealed that vertical impaction (62.5%) and distoangular impaction (33.1%) are the most frequently observed types of third molar impaction in the maxillary arch.¹⁶ Similarly, a study undertaken in Kuwait found that the majority of impactions of third molars in the maxillary arch were of the distoangular type, comprising 68.5%.¹⁷ A study carried out in Iran documented that the prevalent form of impaction for mandibular third molars was mesioangular, accounting for 35.9%.¹¹ In another study conducted in Lebanon, it was reported that the majority (46.5%) of mandibular third molars exhibited a mesioangular pattern of impaction.¹⁸ Likewise, in a study conducted in Estonia, it was observed that the mesioangular pattern of impaction was the most commonly encountered type among mandibular third molar impactions 52.5%.¹⁹

This study found a significant correlation between gender and the impaction pattern of maxillary third molars, but no such association for mandibular third molars. Among females in the maxillary arch, various impaction types were prevalent, including mesioangular, distoangular, vertical, and buccolingual, while males predominantly exhibited mesioangular impaction for mandibular third molars compared to females. Similarly, a study conducted in India reported the majority of males (59.3%) presented with mesioangular type of mandibular third molar impaction as compared to females (40.6%).²⁰ Likewise, a study conducted in India

indicated that males (25.08%) exhibit a higher tendency for the mesioangular pattern of impaction in mandibular third molars as compared to females (17.08%).²¹ In contrast to our findings, a study conducted in Nigeria revealed that females exhibited a higher prevalence of mesioangular mandibular third molar impaction (68%) compared to males (44.4%).¹ Unlike our study, a previous study conducted in Saudi Arabia showed no sex predilection for maxillary third molar impaction, which shows females are more prone to have maxillary impactions as compared to males.²² The evaluation of OPGs was carried out within a limited timeframe; therefore, a more comprehensive sample size might provide more conclusive insights into our observations. Due to the study's single-centre design, it is essential to approach generalizations of the data with caution. Consequently, conducting multi-centred research studies with larger sample sizes becomes imperative to support and confirm our findings.

Conclusion

In conclusion, our research underscores significant gender variations in the prevalence and types of impactions observed in third molars. Additionally, a higher prevalence of mandibular third molar impaction was identified in comparison to maxillary third molars. The predominant impaction pattern in the mandibular arch was mesioangular, contrasting with the distoangular impaction predominance in the maxillary arch. These insights offer valuable information for clinicians, emphasizing the importance of considering gender-specific factors when assessing and managing third molar impactions in both arches.

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