

Patterns of Mandibular Third Molar Impaction in an Iranian Subpopulation

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Abstract

Objective: To assess the patterns of mandibular third molar impaction in an Iranian subpopulation. **Material and Methods:** This retrospective descriptive study evaluated 1000 panoramic radiographs retrieved from the archives of a private radiology clinic in Kermanshah city, Iran. Depth of impaction, position of impacted mandibular third molar relative to the mandibular ramus according to Pell and Gregory's classification and angle of impacted tooth according to Winter's classification were determined. Data were analyzed using the Chi-square and Wilcoxon tests. **Results:** Of 1000 radiographs, 230 (23%) showed an impaction of at least one mandibular third molar. Mandibular third molar impaction was more common in females (60%). Mesioangular (35.9%) and vertical (34.8%) impactions were the most common angles of impaction in the right and left sides, respectively. Level C (40.3%) and Class I (63.7%) were the most common types of impaction in terms of depth of impaction and position relative to ramus, respectively. No significant difference was observed between the right and left sides of the mandible in terms of patterns of mandibular third molar impaction ($p>0.05$). **Conclusion:** Mandibular third molar impaction was relatively common in the studied population. The mesioangular, level C and Class I impaction patterns were the most frequent.

Keywords: Surgery, Oral; Dentition, Permanent; Molar, Third; Tooth, Impacted.

Introduction

Impaction of permanent teeth occurs as the result of inability of the tooth to erupt or presence of a barrier against the path of eruption [1]. Causes of tooth impaction include systemic and local factors. Systemic factors include certain nutritional habits, genetic impairments and malnutrition, while local factors include the size and position of the adjacent teeth, presence of compact bone covering the tooth, lengthy path of eruption and inadequate length of dental arch [2].

Impaction of mandibular third molars is the most common and has a prevalence of 27% to 68.6% [3]. Mandibular third molars have variable eruption times in different individuals and may erupt as early as 16 years of age or as late as 18 to 20 years of age. As the last teeth to erupt, mandibular third molars may not have adequate space in dental arch to erupt and this leads to their impaction. As a result, mandibular third molars have the highest frequency of impaction [4].

Mandibular third molar impaction often leads to complications such as pericoronitis, swelling, bone loss, resorption of the adjacent root, formation of cystic lesions or neoplasms [5]. It can also decrease the strength of the mandible and increase the risk of fracture of the angle of mandible, crowding of mandibular teeth, temporomandibular joint disorders, orofacial pain and neuralgia [3].

Impacted third molars have different patterns in terms of depth, position relative to the mandible and angle relative to the occlusal plane. Knowledge about these patterns is clinically important because some patterns of impacted third molars are associated with a higher risk of caries in the adjacent tooth [6], pain, pericoronitis [7] and fracture of the angle of mandible [8]. Moreover, it has been shown that type of third molar impaction affects the level of difficulty of its surgical removal [9] and occurrence of postoperative complications [10,11]. Thus, knowledge about the pattern of impaction of mandibular third molars in terms of depth of impaction, position relative to the mandibular ramus and angle can be used to assess the level of difficulty of their surgical extraction, and design the most efficient treatment plan with the lowest risk of complications [9].

Previous studies have shown variability in patterns of mandibular third molar impaction in different populations [12-14]. Considering the clinical significance of knowledge about the patterns of third molar impaction in different populations, this study aimed to assess the patterns of mandibular third molar impaction in patients residing in Kermanshah city, Iran.

Material and Methods

Study Design

This retrospective, descriptive, cross-sectional study evaluated 1000 panoramic radiographs retrieved from the archives of a private radiology clinic in Kermanshah city. The radiographs were selected by census sampling.

The inclusion criteria were good-quality panoramic radiographs of patients and availability of information regarding age and sex of patients. Radiographs of patients with a history of mandibular second molar or third molar extraction, maxillofacial anomalies and history of trauma to the maxillofacial region were excluded.

Data Collection

Demographic information regarding age and sex of patients and clinical information were collected in a checklist. Panoramic radiographs of patients were evaluated by a trained dentist under standard conditions.

Intra-examiner reliability was calculated to be 1, which indicated excellent intra-examiner agreement. Third molars with complete roots but without functional occlusion were considered to be impacted. The pattern of impaction was determined based on the depth of impaction, position relative to the mandibular ramus and angle of impaction relative to the occlusal plane [1].

Depth of Impaction

Depth of impaction was defined as the relationship of cemento-enamel junction (CEJ) of third molar relative to the bone crest according to the Pell and Gregory's classification [15], which was classified as follows: (A) CEJ above the bone crest; (B) Part of CEJ below the bone crest; and (C) Entire CEJ below the bone crest.

Position Relative to the Mandibular Ramus

Position relative to the mandibular ramus was determined as the position of the distal surface of the third molar crown relative to the anterior border of the ascending ramus using Pell and Gregory's classification [15]:

- Class I: Distal surface of molar tooth in front of the anterior border of ramus (ramus not covering the crown).
- Class II: Distal surface of molar tooth posterior to the anterior border of ramus (part of crown covered by the ramus).
- Class III: Distal surface of molar tooth posterior to the anterior border of ramus (complete crown coverage by the ramus).

Angle of Impaction

The angle of impaction was defined as the angle between the longitudinal axes of the second and third molars according to Winter's classification [16]: Vertical: -10 to +10°; Mesioangular: 11 to 79°; Horizontal: 80 to 100°; Distoangular: -11 to -79°; Buccolingual: Superimposition of crown and roots and Others: 111 to -80 (Figure 1).

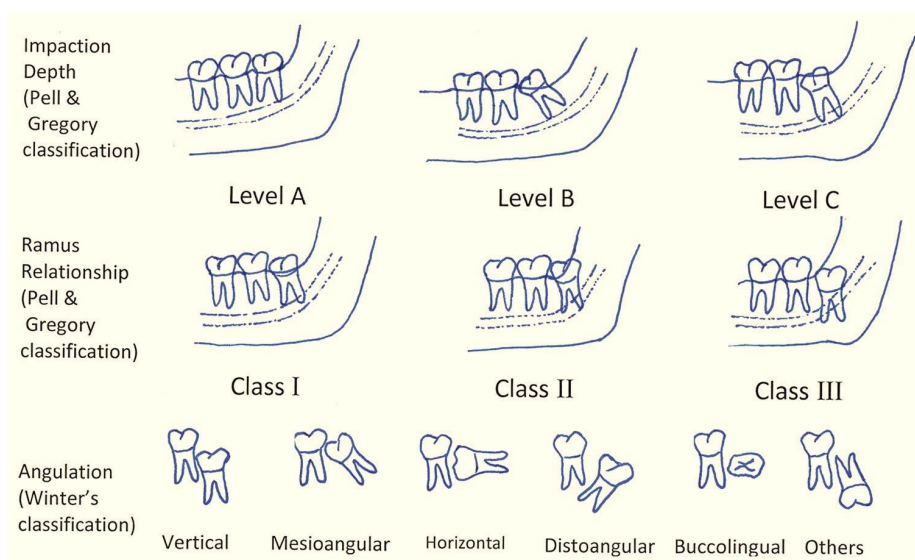


Figure 1. Classification of impacted mandibular third molars in terms of depth of impaction, position relative to the mandible and angle of impaction.

Data Analysis

Data were analyzed using SPSS version 18 (SPSS Inc., IL, USA). The groups were compared using the Chi-square and Wilcoxon tests. $P < 0.05$ was considered statistically significant.

Ethical Considerations

All participants signed informed consent forms. The approval protocol number was IR.KUMS.REC.1396.733.

Results

A total of 1000 panoramic radiographs were evaluated, out of which 230 (23%) showed unilateral or bilateral impaction of mandibular third molars, including 92 males (40%) and 138 females (60%). The mean age of patients was 32.8 ± 8.3 years (minimum 18 and maximum 58 years). The mean age was 33.1 ± 9.1 years (minimum 18 and maximum 58 years) in males and 32.6 ± 7.8 years (minimum 19 and maximum 58 years) in females. The difference in the mean age was not significant between males and females ($p = 0.668$).

Of 230 patients with mandibular third molar impaction, the impaction was in the right side in 72 (31.3%), in the left side in 38 (16.5%) and bilateral in 120 (52.2%). Table 1 presents the frequency distribution of mandibular third molar impaction in males and females and different age groups. The difference between males and females in frequency of bilateral and unilateral impaction was not significant ($p = 0.864$), but a significant difference was observed with different age groups ($p = 0.044$). Only the 50-58-year-olds had significant differences with other age groups in terms of anatomical side of mandibular third molar impaction ($p < 0.05$).

Table 1. Impaction distribution according to side.

Variables	Side			p-value
	Right N (%)	Left N (%)	Bilateral N (%)	
Gender				
Male	27 (29.3)	16 (17.4)	49 (53.3)	0.864
Female	45 (32.6)	22 (15.9)	71 (51.4)	
Age Group				
18-30 Years	29 (28.2)	15 (14.6)	59 (57.3)	0.044
31-40 Years	27 (31.0)	14 (16.1)	46 (52.9)	
41-50 Years	13 (43.3)	4 (13.3)	13 (43.3)	
50-58 Years	3 (30.0)	5 (50.0)	2 (20.0)	

Table 2 presents the frequency distribution of level of mandibular third molar impaction in the right and left sides. Level C was the most common depth of impaction in both the right (40.1%) and left (40.5%) sides. There was no association between the side and the impaction depth ($p = 0.651$).

Table 2. Frequency distribution of the level of impaction according to the side.

Side	Impaction Deep			Total N (%)	p-value
	Level A N (%)	Level B N (%)	Level C N (%)		
Right	55 (28.6)	60 (31.3)	77 (40.1)	192 (100.0)	0.651
Left	36 (22.8)	58 (36.7)	64 (40.5)	158 (100.0)	

Table 3 shows the frequency distribution of position of impacted mandibular third molars relative to the mandibular ramus in the right and left sides. Class I was the most common position in both the right (60.4%) and left (67.7%) sides. No association was observed between side and position ($p=0.683$).

Table 3. Frequency distribution of position according to the side.

Side	Position			Total N (%)	p-value
	Class I N (%)	Class II N (%)	Class III N (%)		
Right	116 (60.4)	56 (29.2)	20 (10.4)	192 (100.0)	0.683
Left	107 (67.7)	36 (22.8)	15 (9.5)	158 (100.0)	

Table 4 presents the frequency distribution of mandibular third molar angle of impaction in the right and left sides. The most common angle of impaction was mesioangular (35.9%) and vertical (32.8%) in the right side and vertical (34.8%) and mesioangular (32.9%) in the left side. No significant difference were observed between the side and angles of impaction ($p=0.581$).

Table 4. Frequency distribution of impaction in the right and left sides.

Side	Angle of Impaction						Total N (%)	p-value
	Vertical N (%)	Mesioangular N (%)	Horizontal N (%)	Distoangular N (%)	Buccolingual N (%)	Other N (%)		
Right	63 (32.8)	69 (35.9)	46 (24)	3 (1.6)	10 (5.2)	1 (0.5)	192 (100.0)	0.581
Left	55 (34.8)	52 (32.9)	41 (25.9)	3 (1.9)	7 (4.4)	0 (0.0)	158 (100.0)	

Table 5 shows the frequency distribution of depth of impaction of mandibular third molars in the right and left sides in males and females. In terms of frequency of depth of impaction of mandibular third molars, no association was noted between males and females in the right ($p=0.141$) or left ($p=0.401$) sides.

Table 5. Frequency distribution of depth of impaction according to gender.

Side	Gender	Impaction Deep			Total N (%)	p-value
		Level A N (%)	Level B N (%)	Level C N (%)		
Right	Male	16 (21.1)	28 (36.8)	32 (42.1)	76 (100.0)	0.141
	Female	39 (33.6)	32 (27.6)	45 (38.8)	116 (100.0)	
Left	Male	12 (18.5)	23 (35.4)	30 (46.2)	65 (100.0)	0.401
	Female	24 (25.8)	35 (37.6)	34 (36.6)	93 (100.0)	

Table 6 presents the frequency distribution of position of impacted mandibular third molars relative to the ramus in the right and left sides in males and females. No significant difference was noted between males and females in the right side ($p=0.301$), but the difference in the left side was statistically significant ($p=0.002$).

Table 6. Impaction distribution according to gender and side.

Side	Gender	Position			Total N (%)	p-value
		Class I N (%)	Class II N (%)	Class III N (%)		
Right	Male	51 (67.1)	18 (23.7)	7 (9.2)	76 (100.0)	0.301
	Female	65 (56.0)	38 (32.8)	13 (11.2)	116 (100.0)	
Left	Male	54 (83.1)	7 (10.8)	4 (6.2)	65 (100.0)	0.002
	Female	53 (57.0)	29 (31.2)	11 (11.8)	93 (100.0)	

Table 7 shows the frequency distribution of angle of impaction of mandibular third molars in the right and left sides in males and females. No significant difference was noted between males and females in the right ($p=0.644$) or left ($p=0.280$) side.

Table 7. Frequency distribution of angle of impaction according to side and gender.

Side	Gender	Angle of Impaction						p-value
		Vertical N (%)	Mesioangular N (%)	Horizontal N (%)	Distoangular N (%)	Buccolingual N (%)	Others N (%)	
Right	Males	23(30.3)	30 (39.5)	19 (25.0)	0 (0.0)	4 (5.3)	0 (0.0)	0.644
	Females	40 (34.5)	39 (33.6)	27 (23.3)	3 (2.6)	6 (5.2)	1 (0.9)	
Left	Males	19 (29.2)	23 (35.4)	21 (32.3)	1 (1.5)	1 (1.5)	0 (0.0)	0.280
	Females	36 (38.7)	29 (31.2)	20 (21.5)	2 (2.2)	6 (6.5)	0 (0.0)	

Discussion

Third molar impaction is a common anomaly and the pattern of impaction may be related to the occurrence of disorders, pathologies [6-8] and surgical outcomes [9-11]. Different populations have different patterns of impaction. Thus, this study assessed the patterns of impaction of mandibular third molars in an Iranian subpopulation residing in Kermanshah city.

The frequency of mandibular third molar impaction was 23% (230 cases out of 1000 radiographs), which was lower than the reported rates in other cities of Iran, including Mashhad (60.78%) [1] and Kerman (55%) [3]. The frequency of mandibular third molar impaction was 84% in Tanzania [17], 54.3% in Oman [12], 50.7% in Turkey [18], 27.3% in Saudi Arabia [19] and 15.2% in Eritrea [20].

In the present study, the incidence of mandibular third molar impaction in females was higher than that in males (3:2), which was in agreement with the results of previous studies [1,3,20,21]. Higher frequency in females can be due to differences in growth patterns of males and females. By the time of mandibular third molar eruption, the growth has often ended in females while in males, the growth and development of the jaws continue during eruption of mandibular third molars, and greater space is therefore available for their eruption [3]. However, studies conducted in Turkey [18], Tanzania [17] and Saudi Arabia [14] found no difference between males and females in this respect.

In the present study, bilateral impaction was the most common, followed by the right side impaction. No significant difference was noted in the frequency of impaction between males and females or between different age groups. Similar to our study, previous authors noticed that mandibular third molar impaction was bilateral in most cases [22]. However, in contrast to our study, the highest frequency of impaction was noted in the left side [21] and in the right side [17]. Another authors found no significant difference in the frequency of mandibular third molar impaction in the right and left sides [1,12]. It seems that the frequency of bilateral, right-side and left-side impaction is affected by factors such as genetics and race.

This study showed that level C was the most common depth of impaction in both the right (40.1%) and left (40.5%) sides, which was in agreement with the results observed in Turkish population who also showed that level C was the most common depth of impaction (61%) [7]. In contrast to our results, level A was the most common depth of impaction in many previous studies [12,13,20,23]. Previous authors in Iran found that type A was the most common depth of impaction [3], while in Saudi Arabia level B was the most common depth of impaction [1,14]. Differences in level of impaction among different populations can be due to variability in race, patient selection criteria and study population.

Our results showed that the most common position of impacted third molars relative to the mandibular ramus was Class I in both sides, corroborating previous findings [20], while other studies reported that Class II was the most common position [1,19,23]. Previous study showed that the position of impacted mandibular third molar relative to the mandibular ramus was affected by age [22]. They found that the prevalence of Class I position was zero at 18 years of age, but it increased to 54.9% in 26-year-olds.

In our study, the most common angle of impaction was mesioangular and vertical in the right and vertical and mesioangular in the left side. The literature shows that the most common angle was vertical and mesioangular in a study developed in India [13] and vertical in a study conducted in Turkey [7]. In most previous studies, mesioangular impaction was the most common type of impaction [1,3,12,14,17,18,20-22,24,25]. Previous studies have demonstrated that mesioangular position is associated with the highest risk of caries in the distal surface of mandibular second molars [26-28]. Thus, surgical extraction of impacted mandibular third molars in such cases should be performed to prevent caries in the distal surface of an adjacent second molar tooth.





Our study failed to show any significant association between level or angle of impaction with gender, confirming previous findings [20]. In terms of frequency, no significant difference existed between males and females in terms of position of impacted mandibular third molars relative to the ramus in the right side but this difference was significant in the left side.

One limitation of this study was its retrospective design. Since only radiographs of patients were evaluated, patient complaints regarding impacted third molars could not be evaluated. Second, there was no sample calculation, despite the extensive sample analyzed.

Conclusion

Mandibular third molar impaction was relatively common in the studied population. The mesioangular, level C and Class I impaction patterns were the most frequent.

Authors' Contributions

FR	 0000-0002-9314-7903	Conceptualization, Validation.
MMI	 0000-0002-3982-5216	Investigation, Formal Analysis, Software.
AK	 0000-0001-5505-7571	Methodology, Writing – Original Draft Preparation and Writing – Review and Editing.
AN	 0000-0003-3974-8385	Data Curation and Resources.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

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