

Pattern of mandibular third molar impaction: A cross-sectional study in northeast of Iran

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Abstract

Objectives: Impacted teeth, if left untreated, have a potential to induce various complications. The aim of the current study was to determine the prevalence and pattern of impacted mandibular third molar in the Iranian population.

Study Design: This cross-sectional study was performed in patients who were referred to the Department of Oral Radiology between July 2009 and October 2010 to obtain an orthopantomogram (OPG). Data were collected regarding age and gender, prevalence of impacted mandibular third molars, angulation of impacted teeth (Winter's classification), level of impaction (Pell and Gregory classification), and relationship of the mandibular third molar with the ramus (Pell and Gregory classification). The collected data were analyzed using SPSS software version 11.0 with a confidence interval of 95%.

Results: Among the 1433 patients included in the study, 489 (34.12%) patients were male and 944 (65.88%) were female. Of the total OPGs performed, 871 (60.78%) OPGs demonstrated at least one impacted mandibular third molar. In addition, of the 2866 mandibular third molars investigated, 1397 (48.74%) were found to be impacted. A significant association was observed between gender and the number of impacted teeth or the presence of impaction of any mandibular tooth (or teeth) ($P < 0.05$). The most common type of tooth angulation was mesioangular (48.67%). In addition, the most prevalent type of impaction level and ramus relationship was level B (63.85%) and Class II (48.46%), respectively. There were no significant differences between the two sides of the mandible for the prevalence of impacted third molar ($P > 0.05$).

Conclusion: The pattern of mandibular third molars in the Northeast region of Iran revealed a high prevalence of impaction, which was mostly mesioangular, level B, and Class II with a gender predilection for females.

Key words: Impaction, Iran, mandibular third molar, orthopantomogram, pattern

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Introduction

Impaction of permanent teeth occurs when teeth lack the ability to erupt or there is a barrier in the path of eruption. This situation is pathological and can lead to various clinical conditions, including pericoronitis, adjacent root resorption, cystic lesions, or neoplasm.^[1]

The most common tooth involved in impaction in humans is the mandibular third molar.^[2] In addition to the

above-mentioned complications, an impacted mandibular third molar may weaken the angle of the mandible and enhance its susceptibility to fractures.^[3,4] Moreover, complications such as temporomandibular joint disorders and crowding are reported to be related to impacted mandibular third molars.^[5,6]

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Different studies have reported a different prevalence for impaction of the mandibular third molar varying between 16.7% and 68.6%, respectively.^[6-12] Most of the studies have not found a gender predilection; however, some studies have mentioned a higher incidence of impaction in females when compared to males.^[6,7,13]

Mashhad is the second populated city of Iran that is located in the northeast region of the country. There are no reports in the literature regarding prevalence and patterns of third molar impaction in the northeast region of Iran. Hence, the aim of the current study was to evaluate the pattern of mandibular third molar impaction in the Iranian population based on panoramic radiographs. The null hypothesis was that the pattern of impaction and the background factors are not different in this study population from that reported in other similar studies.

Materials and Methods

This study was performed at the Department of Oral Radiology at the Mashhad Dental Clinic. The study protocol was approved by the Ethical Committee of Mashhad University of Medical Sciences. A detailed informed consent was taken from all patients.

Study population

To identify the pattern of mandibular third molar impaction, a cross-sectional study was implemented with patients who were referred to the Department of Oral Radiology between July 2009 and October 2010 to obtain an orthopantomogram (OPG).

The patients were excluded if they were under 19-year-old, had any mandibular pathology, and had any previous

jaw trauma involving the dentition, had craniofacial anomalies (e.g. Down syndrome and cleidocranial dysostosis), had any prior extraction of the mandibular third molar, had mandibular third molars with incomplete root formation, or had any missing mandibular second molars.

Study variables

Age and gender were recorded as demographic variables. Two calibrated examiners evaluated the OPGs separately in a dark room with an X-ray viewer. Inter-examiner error was calculated and in case of differences between examiners, a final decision was achieved in a session with both examiners and a radiologist. Two hundred OPGs were re-evaluated by examiners to calculate intraexaminer reproducibility. In addition, an oral and maxillofacial surgeon performed the clinical examinations. The following variables were recorded for each patient based on the OPGs and the clinical examinations:

Impaction

To consider a third molar as impacted, the third molar should not have a functional occlusion while the root formation is completed.^[7]

Depth of impaction

According to the Pell and Gregory classification, the relation of the cementoenamel junction (CEJ) of the third molar with the bone level is categorized as follows: Level A: Not buried in bone; level B: Partially buried in bone if any part of CEJ was lower than bone level; level C: Completely buried in bone [Figure 1].^[6,14]

Relationship with the mandibular ramus

According to the Pell and Gregory classification, the position of the distal surface of the third molar crown in

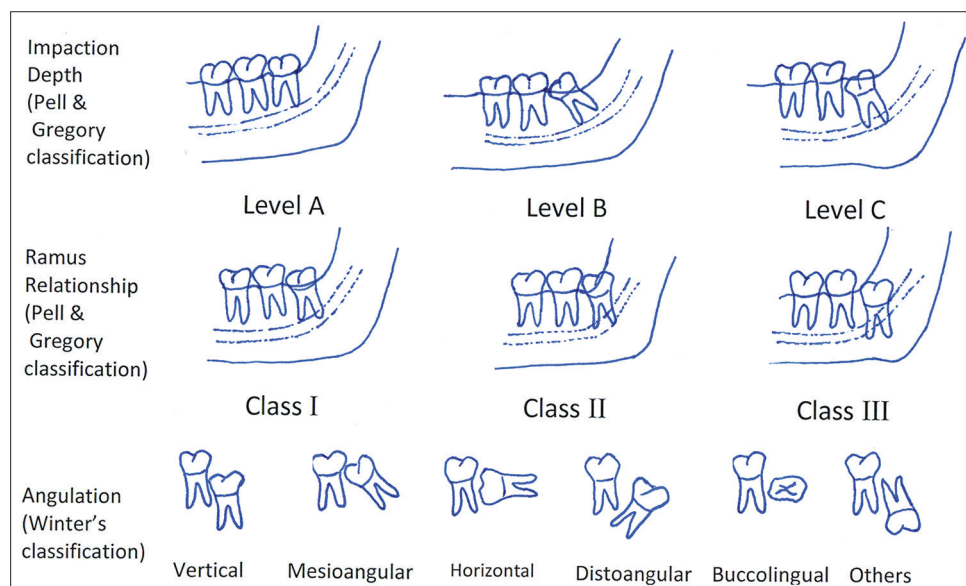


Figure 1: The impaction depth, ramus relationship, and angulation classification of mandibular third molars

relation to the anterior border of the ascending ramus is categorized as follows: Class I: Anterior to the anterior border; Class II: Half of the crown is covered by the anterior border; Class III: The crown is fully covered by the anterior border [Figure 1].^[6,14]

Angulation of impaction

Based on Winter's classification, the angle between the longitudinal axis of the second and third molars (which was measured by an orthodontic protractor) is categorized as follows: Vertical impaction: 10 to -10 ; mesioangular impaction: 11–79; horizontal impaction: 80–100; distoangular impaction: -11 to -79 ; others: 111 to -80 ; and buccolingual impaction when the crown and roots are superimposed [Figure 1].^[7]

Statistical analysis

Appropriate descriptive statistics (including mean, standard deviation, and frequency) were computed. In addition, to analyze the data, a Chi-square test was performed using the Statistical Package for Social Sciences software, version 11.5 (SPSS, Chicago, IL, USA), with a confidence interval of 95%. It should be stated that the interexaminer reproducibility was 92.5% and the intraexaminer reproducibility for the first and second examiner was 88.5% and 93%, respectively.

Results

A total of 1433 patients were included in this study, of which 489 (34.12%) patients were male and 944 (65.88%) were female. The mean age of participants was 25.44 ± 6.12 . There were no significant differences between the mean age of males (25.83 ± 6.34) and females (25.17 ± 6.02) based on a *t*-test ($P = 0.688$).

Among a total of 1433 OPGs, 871 (60.78%) had at least one impacted mandibular third molar. There was a significant association between the presence of impacted tooth (teeth) and gender [Table 1].

A total of 526 patients had bilateral impacted third molars (154 were male and 372 were female) and 345 patients (109 males and 236 females) had unilateral impacted third molar. Therefore, among the 2866 mandibular third molars investigated, 1397 (48.74%) were impacted. In addition, 197 (6.87%) of the third molars were missing. There were significant differences between males and females for the number of bilaterally impacted teeth [Table 2].

Based on a Chi-square test, it was found the prevalence of mesioangular angulation (48.67%) was significantly higher than other angulations [Table 2]. Among the three impaction levels, level B (63.85%) was significantly more prevalent than others [Table 2]. In addition, the Class II

ramus relationship was significantly more prevalent followed by Class I and Class III, respectively [Table 2]. However, no significant differences were observed for the prevalence of an impacted mandibular third molar between the left and right sides of the mandible [Table 2].

Discussion

The results of the current study revealed that more than half of the participants had impacted mandibular third molar with a gender predilection for females; the most common angulation pattern was mesioangular and the most common impaction depths were level B and Class II.

In the current study, 60.78% of participants had at least one impacted mandibular third molar. In addition, the prevalence of an impacted third molar was 48.74% among all investigated mandibular third molars in the study. Comparable to these findings, Hashemipour *et al.*^[6] found that the prevalence of third molar impaction was

Table 1: Distribution of OPGs with impacted mandibular third molar tooth (teeth) based on gender

Gender	Impacted tooth (teeth)		Total	χ^2	df	Significant
	With	Without				
Male	263	226	489	15.25	1	<0.0005
Female	608	336	944			
Total	871	562	1433			

OPGs=Orthopantomographs, df=Degree of freedom

Table 2: The distribution of impacted mandibular third molars according to study variables

Variable	Number of impacted tooth (%)	χ^2	df	Significant
Gender				
Male	417 (29.84)	226.89	1	<0.0005
Female	980 (70.16)			
Angulation				
Mesioangular	680 (48.67)	1487.98	5	<0.0005
Horizontal	393 (28.13)			
Vertical	218 (15.60)			
Distoangular	84 (6.01)			
Buccolingual	16 (1.14)			
Others	6 (0.45)			
Level of impaction				
A	318 (22.76)	603.91	2	<0.0005
B	892 (63.85)			
C	187 (13.39)			
Ramus relationship				
I	510 (36.51)	240.50	2	<0.0005
II	677 (48.46)			
III	210 (15.03)			
Side				
Right	669 (47.88)	2.49	1	0.114
Left	728 (52.12)			

44.3% in the Southeast region of Iran. However, a lower prevalence has been reported in some studies, including research from Eliasson *et al.* (30.3%),^[15] Montelius (32%),^[16] Hattab *et al.* (33%),^[8] Rajasuo *et al.* (38%),^[17] and Hassan (40.8%).^[18] However, Morris and Jerman^[19] (65.6%) and Quek *et al.*^[7] (68.6%) reported a higher prevalence of impaction in a study population from USA and Singapore, respectively.

We found that the incidence of mandibular third molar impaction was significantly higher in females in comparison to males. In agreement with the current study, Hashemipour *et al.*,^[6] Quek *et al.*,^[7] Hugoson and Kugelberg,^[13] Ma'aita and Alwrikat,^[1] and Kim *et al.*^[20] also reported a gender predilection for females. The higher incidence in women could be attributed to the fact that the physical growth in women usually stops earlier than men leading to a smaller jaw size.^[7] Moreover, the initiation of third molar eruption in women normally happens after the growth of the jaw is completed. In men, however, the jaw growth continues during the third molar eruption and thus provides more space for the tooth.^[7] In contrast with the results of this study, other researchers indicated no gender differences in the pattern of third molar impaction.^[8,11,12,16,21-23]

In the present study, the most common angulation type of impacted mandibular third molar was mesioangular, followed by horizontal and vertical angulations, respectively. In agreement with these findings, Kramer and Williams,^[23] Quek *et al.*,^[7] Moris and Jerman,^[19] Hassan,^[18] and Hashemipour *et al.*^[6] found that mesioangular impaction was the most prevalent type of impaction in the mandibular third molars of African American, Singaporean, American, Arabian, and Iranian populations, respectively.

In the study sample of the current research, the most common impaction level was Class B, which means that the CEJ of mandibular third molar was lower than the bone level and the tooth was partially impacted in the bone. In agreement with these findings, Blondeau and Daniel,^[24] Almendros-Marques *et al.*,^[5] Quek *et al.*,^[7] and Hassan^[18] also found that Class B was the most common impaction level. In contrast, Monaco *et al.*,^[25] Obiechina *et al.*,^[26] Hugoson and Kugelberg,^[13] and Hashemipour *et al.*^[6] reported Class A as the predominant impaction level. The contrast between findings of different studies can be explained by the difference in classification methods. In the current study, the impaction level was evaluated according to the position of CEJ in relation to the alveolar bone level; however, in the studies, which indicated level A as the most common type, the classification had been performed according to the relationship of occlusal surfaces of the third molar and the adjacent second molar. As the former classification excludes the erupted third molars, it may be a more objective method to categorize the level of impaction.

In most of the investigated impacted mandibular third molars, half the crown was covered with the anterior border of the mandibular ramus, and thus, was classified as Class II. This was in compliance with the findings of Monaco *et al.*,^[25] Obiechina *et al.*,^[26] Blondeau *et al.*,^[24] Almendros-Marques *et al.*,^[5] and Hashemipour *et al.*^[6]

In the current study, patients less than 19 years of age were excluded because human growth continues beyond this age.^[27] In addition, at the age of 19, the root formation of the third molar would be complete. As the eruption of the tooth continues till the end of root formation process, we excluded patients with incomplete root formation of the mandibular third molar.^[7] Patients who had any conditions interfering with normal tooth eruption were also excluded to ensure that the study evaluated the pattern of mandibular third molar impaction in healthy subjects. Moreover, we excluded maxillary wisdom teeth from the study design due to a higher incidence of complications related to impacted mandibular third molars in comparison to maxillary wisdom teeth.^[28]

It should be noted that changes in human lifestyle have resulted in smaller jaws. Hence, the space available for the third molars, which are the last teeth to erupt-has decreased.^[29,30] In addition, delayed third molar mineralization and early physical maturation is a possible etiology of high impaction rate of third molars.^[6] Furthermore, racial differences can affect the maturation and eruption timing and also the size of the jaw; this would explain the different rates of incidence reported for different countries.^[5-7,18,19,23-26]

This study was implemented prospectively as patients in need of OPG were included, while most previous studies on third molar impaction pattern had been performed retrospectively based on the OPG records. One of the advantages of this study design was that patients who had previously had extraction of their mandibular third molars could be excluded; which means the incidence and pattern of impaction was calculated more precisely and the drawback of underestimation of incidence of impaction was overcome (which can happen in retrospective studies). In addition, with this design, the only other reason to explain the loss of a mandibular third molar was a congenital missing tooth. Hence, the incidence of congenital loss of third molar could also be estimated that the other reports lacked.

The limitation of this study was that it was cross-sectional without randomization. In addition, it covered only a limited region of Iran. It is recommended to implement further studies to evaluate the etiology of third molar impaction in the Iranian population and also to perform randomized studies in populations from different regions of Iran to evaluate the pattern of third molar impaction more comprehensively.

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