Original article

Indian Journal of Contemporary Dentistry
Volume 12 No. 1, 2024

Assessment of Impaction Pattern of Mandibular Third Molars in an Iranian Subpopulation: a Retrospective Cross-sectional Study

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How to cite this article: Hossein S, Maleki D, Fard ZM, Mohammaditabaar MS. Assessment of Impaction Pattern of Mandibular Third Molars in an Iranian Subpopulation: a Retrospective Cross-sectional Study. 2024;Indian Journal of Contemporary DentistryVolume 12 No. 1, 2024

ABSTRACT

Background: Impacted teeth are teeth that cannot be indicated in their physiological position in the expected period. Impacted mandibular third molar (IMTM)is the most common tooth to be impacted. Impaction of the tooth may be accompanied by complications such as pain, swelling, caries, bone loss, and inferior alveolar canal pathology. Because of possible complications of the IMTMs,a surgical extraction may be necessary. Moreover, knowing the pattern of IMTMs can lower the possibility of complications after the surgery.This research aims to evaluate the impaction pattern of the IMTMs in the population of patients referring to the Dentistry faculty of the Guilan University of medical sciences clinic.

Methods: In this retrospective analytic cross-sectional study 98 radiographs were gathered and the angulation, depth, and side of impactions, inferior alveolar canal pathology, and decay existence were evaluated. Then each factor was assessed based on age and gender. Analyzing data was done using IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 21 (IBM Corp., Armonk, N.Y., USA).

Conclusion: Mesioangular pattern and level B of impaction depth were the most prevalent position of the IMTMs. Most cases had unilateral impaction and right-sided impaction was more frequent than left-sided.

Keywords: Molar, Third; Radiography, Panoramic; Retrospective Studies; Tooth, Impacted

Introduction

A tooth is impacted when its root is completely formed but hasn't fully erupted into a natural functional location. Soft or hard tissues have totally or partially covered the tooth out of the physiological period for eruption. [1,2] Among impacted teeth,impacted mandibular third molars (IMTM) possess the highest prevalence, and it has been reported that the occurrence of this impaction is between 18 to 32 percent in the studied population[2, 3]. Third molars usually erupt in 17 to 20 years of human life, but this range can also be 14 to 26 years based on different races[4].Besides mandibular third molars, the most commonly impacted teeth are maxillary canines, second molars,mandibular second premolars, and mandibular second molars, respectively[5]. Impaction may possess various reasons like better hygiene, and therefore lower probability of losing a tooth, genetic factors[1], diminished mandible due

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Submission: Dec 23, 2023 Revision: March 18, 2024 Published 2024-04-29

to evolution process caused by behavioral changes and eating patterns,[6] and habits developed in childhood like eating sweet food.[4]

Impacted third molars may cause complications for patients, such aspericoronitis, pain, swelling, cheek ulceration, caries, bone loss and canal pathology of nearby teeth, odontogenic cysts, and benign or malignant tumors [2].Surgical extractions of incompletely erupted MTMs that have been asymptomatic are executed to prevent these complications. This surgical procedure is the most common dentoalveolar surgery.[4] Nevertheless, extraction of the MTM can cause complications at a rate of 2.6% to 30.9% [7],such as neurologic complications that will be existeddue to insufficient diagnosis of the anatomical structures or the specific procedure of the used technique.[8] Therefore,being aware of the pattern of the IMTM is helpful for assessingthe hardness level and deciding the most suitable treatment plan with the lowest complications.[1, 9] Moreover, classifying the impacted third molars can lessen the risk of postoperative complications by presenting an appropriate treatment plan.[1, 10]

Thus, the main target of this research is to evaluate the impaction pattern of the IMTMs in the population of patients referring to the dentistry faculty of the Guilan University of medical sciences (GUMS) clinic.

MATERIALS AND METHODS

Thisretrospective analytical cross-sectional research aimed to determine the impaction pattern of the IMTM among patients referred to the Dental faculty of Guilan university of medical sciences (GUMS), Rasht, Guilan, Iran, in 2022. This study was approved by the Ethics committee of GUMS and all information from patients who participated in this study became confidential.

Ninety-eightradiographs taken from patients for any clinical assessments were evaluated in this research, and graphs were gathered using simple random sampling based onthe following inclusion criteria:

1. Having IMTM
2. Being from patients in the range of 20 to 45 years old
3. Not having impacted maxillary third molar
4. Not having trauma or fraction in the jaw
5. History of having congenital disorders related to the third molar with incomplete development of the root

The exclusion criteria also were as follows:

1. Low quality of radiographs leading to difficulty in evaluation
2. Having a specific syndrome causing dental disorders
3. Radiographs were taken from any other clinical radiographic center
4. Absence of the second molar
5. History of orthodontic treatment

In order to reduce the possible errors,all radiography images were taken by a panoramic radiographic device,SoredexCranex-D Digital Cephalometric, and Panoramic X-ray in the radiology department in the dentistry faculty of GUMS. Then graphs were evaluated on a Flat LG 22' monitor with 990×1440 resolution.

The taken graphs were evaluated in terms ofany accompanying pathologies such as caries, inferior alveolar canal pathology, and radiolucency of pericoronal and periapical tissues of the impacted tooth and the adjacent one.

To evaluate the depth of impaction Pell and Gregory classification was used[11].In this classification, the occlusal surface of the third molar is assessed based on its position according to the cementoenamel junction and the occlusal surface of the second molar. Therefore, the conditions may be as follows:

Level A: The occlusal surface of the third molar is above or at the same level asthe occlusal surface of the second molar.

Level B: The occlusal surface of the third molar is between the occlusal surface and cementoenamel junction of the second molar.

Level C: The occlusal surface of the third molar is below the cementoenamel junction of the second molar.

In this study, cases of levels B and C were considered impacted.

The impaction angulation of MTM was investigated using winter classification[12]. In this classification, the angle between two imaginary lines, the long axis of the second molar and the long axis of the third molar, is the pattern indicator. This angle was measured by the researcher using an orthodontic protractor. The impaction angle of the tooth in winter classification is interpreted as follows: distoangular (-79 to -10), vertical (-10 to 10), mesioangular (11 to 79), horizontal (80 to 100), other (80 to 110) and buccolingual (any tooth that is located buccolingually and the crown has overlapped on the root.). If the second molar did not exist, the term "non-applicable" would be used.

To describe the qualitative data, frequency and percentage were used, and average and standard deviation were considered suitable for the quantitative data. Toillustrate the relation and comparison between groups,Pearson chi-square was used. All tests were done with a p-value =0.05 usingIBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 21 (IBM Corp., Armonk, N.Y., USA).

RESULTS AND DISCUSSION

This study comprised 55 (56.1%) men and 43 (43.9%) women with a mean age of 29.01 ± 7.85, ranging from 20 to 45 (table 1). Patients were divided into two age groups which were younger than 28 (<28, 48%, age group A) and equal to or older than 28 (≥28, 52%, age group B).

36 (36.7%) of impactions were bilateral,and62 (63.3%) were unilateral, of which the frequency of impaction on the rightside(n=25, 25.5%)

Table 1: Data distribution based on gender, age, side, decay existence, inferior alveolar canal pathology, angulation, and depth

Variable	Number	Percentage
Gender		
Female	43	43.9
Male	55	56.1
Age		
<28	47	48
≥28	51	52
Side		
Right	25	25.5
Left	37	37.8
Bilateral	36	36.7
Decay existence		
Absent	6	6.1
Impacted tooth	7	7.1
Adjacent tooth	85	86.7
Inferior alveolar canal pathology		
Absent	2	2
Unilateral	91	92.9
Bilateral	5	5.1
Angulation		
Mesioangular	52	53.1
Horizontal	34	34.7
Vertical	12	12.2
Depth		
Level B	55	56.1
Level C	43	43.9

was more than the left side (n=37, 37.8%). The majority of patients in age group A had impaction on both sides (n=26, 55.3%), while for group B left side impaction was the most common (n=23, 45.1%). Based on genders, it was determined that the left side and bilateral impaction were most frequent between men (n=29, 52.7%) and women (n=18, 41.9%), respectively. According to p=0.001, the relations of the side of impaction with age and gender were statistically significant (Table 2).

Decay was seen in 92 (93.8%) cases,of which 7 (7.1%) were associated with the impacted tooth, and 85 (86.7%) were related to the adjacent one. However, in 6 (6.1%) of the cases, no decay was indicated in the impacted tooth or in the adjacent tooth.

Regarding pathology related to the inferior alveolar canal, 96 (98%) patients were determined to have pathology in this canal. The frequency of cases accompanied by unilateral (n=91, 92.9%) was more than cases with bilateral (n=5, 5.1%) pathology.

According to Winter's classification, mesioangularwas determined to be the most common angulation (n=52, 53.1%), while horizontal and vertical positions follow that with the frequency of 34 (34.7%) and 12 (12.2%) cases respectively (table 1).Mesioangular was the most frequent angle in both age groups and genders. The second most common angulation among both genders and both age groups was horizontal. The association of angulation with gender (p=0.890) and age (p=0.135) were not statistically significant (Table 2).

In the case of depth of impaction based on Pell and Gregory's classification, level B (n=55, 56.1%) was more common than level C (n=43, 43.9%) among cases. Moreover, it was indicated that the most frequent level of impaction in both genders and age groups was level B as well. However, no significant difference was seen in the relation of impaction depth with gender (p=0.642) and age (p=0.509).

Impaction of a tooth occurs when it is not fully erupted in the expected position[2]. Reasons for impaction vary from genetic factors to having better hygiene[1, 4, 6].Impaction of MTM may be accompanied by complications such as pericoronitis, pain, swelling, cheek ulceration, caries, bone loss and canal pathology[2] that may lead to extraction[4]. Moreover,The extraction of the impacted third molar is the most common dentoalveolar surgery[4]. This surgery may be the cause of some complications after the procedure as well[7]. To lower the chance of complications, it is necessary to evaluate the impaction pattern of the impacted tooth[9].

Table 2: Comparison of angulations, depths, and sides of the IMTM based on age and gender

Variable	Age		p-value	Gender		p-value
	<28 n(%)	≥28 n(%)		Male Cn(%)	Female n(%)	
Angulation						
Mesioangular	29 (55.8)	23 (44.2)	0.135	28(53.8)	24 (46.2)	0.890
Horizontal	15 (44.1)	19 (55.9)		20 (58.8)	14 (41.2)	
Vertical	3 (25)	9 (75)		7 (58.3)	5 (41.7)	
Depth						
Level B	28 (50.9)	27 (49.1)	0.509	32 (58.2)	23 (41.8)	0.642
Level C	19 (44.2)	24 (55.8)		23 (53.5)	20 (46.5)	
Side						
Right	7 (28)	18 (72)	0.001	8 (32)	17 (68)	0.001
Left	14 (37.8)	23 (62.2)		29 (78.4)	8 (21.6)	
Bilateral	26 (72.2)	10 (27.8)		18 (50)	18 (50)	
Pearson Chi-Square						

In this study, patients lower than 20 were not included,and the purpose of this selection is because of the fact that the formation of the root is not completed under this age [13]. Moreover, as reported, the best range for studying the impaction of MTM is 20 to 25[14].

It was determined that most of the population had unilateral impaction, consistent with the other authors' findings[15-17]. In contrast, there were studies in which the IMTMs were mostly positioned bilaterally [9, 18, 19]. Based on gender,unilateral impaction was characterized to be the most common among male and female patients. Based on age groups, it was found that most of the patients younger than 28 had bilateral impaction, and patients at 28 or older showed unilateral impaction more often. According to the results,the differences in sides based on age and gender were statistically significant. In line with this study, Rezaei et al.[9] found a considerable difference between side and age.

According to the findings of this study, the most frequent angulation was mesioangular. This result ties well with previous studies in Iran[9, 20], Malaysia[10, 21], Poland[1], Jordan[22], Bangladesh[23], and Lebanon[24]. However, contrary to the current findings, in other studies, vertical angulation had the highest frequency in the Turkish[25], Arab[26], and Indian[27]populations. The importance of this finding appears to be increased based on previous investigations in which IMTMs with mesioangular position had the highest prevalence in providing dental and periodontal lesions in mandibular second molars [28]. The most common angulation in both genders was mesioangular, corroborating other studies [9, 29, 30]. However, in other studies, IMTM with vertical angulation was the most prevalent position seen in women [9] and men [29], and this differs from the results presented here. No significant difference was found between angulation and gender in accordance with the findings obtained byRezaei et al.[9], but Safril et al.[30] noted a significant difference.

Based on the gathered findings, level B of impaction depth was more common than level C in the study population. The researchers of this study did not consider teeth with level A of depth, based on Pell and Gregory's classification,to be impacted. In agreement with this outcome, other researchers stated that the frequency of Level B was higher than level C [1, 19, 24, 31, 32]. This finding is notable,as reported in other studies; teeth with level B of impaction were significantly more prone to cause decay [33]. In conflict with the present study, level C was more common than level B in other researches [23, 25, 34]. Although not significant, based on gender, level B was more prevalent in both males and females,consonant with other studies[30]. In contrast, level C was the most common level in both genders in other findings[9].

As discussed, impacted teeth can cause complications, and treatment for that issue can be extraction[2, 7]. This surgical procedure may be accompanied by complications, such as neurological disorders that can result from insufficient knowledge about anatomical structures[8]. This study can be useful to clinicians to have a brighter aspect of the pattern of the IMTM to select the suitable approach and lower the chance of postoperative complications as possible[9]. Besides, this research can be beneficial to other researchers to compare and investigate the pattern of IMTM in different populations to reach comprehensive knowledge about this issue.

This study was done on a small population and did not gather data from different ethnicities. Besides authors did not investigate the prevalence of IMTM in the specific population. According to these statements, it is recommended to study the prevalence and impaction pattern of the IMTM in a much larger group and compare the findings in each race or ethnicity.

CONCLUSION & ACKNOWLEDGEMENT

Based on the results of this study, mesioangular position and level B of impaction depth were the most frequent pattern accompanied by the IMTMs. Mesioangular position and level B of impaction depth were the dominant impaction pattern in both genders and age groups. Bilateral impaction had the most prevalence among male and female patients. Bilateral impaction was dominant in cases equal to or older than 28, and among patients younger than 28 cases with unilateral impaction were most frequent.

Conflict of Interests

The authors declare that they have no conflict of interests.

Ethical Clearance - This study was approved by the Ethics Committee of GUMS (NO.1398/445) and informed consent was taken from each patient. Moreover, all information from patients who participated in this study became confidential.

Source of Funding

Authors declare that there was no source of funding in this study.

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