ORIGINAL ARTICLE

PATTERN OF MANDIBULAR THIRD MOLAR IMPACTION: A RADIOGRAPHIC STUDY

[1]SANA RAUF, [2]WAQAR ALI, [3]QUNOOT TARIQ, [4]RABIA CHAUDHRY[4], [5]SYEDA SADAF KAZMI, [6]MUHAMMAD IMTIAZ

ABSTRACT

Impacted teeth, if left untreated, have potential to induce various complications. The aim of the current study was to determine the prevalence and pattern of impacted mandibular third molar in a Pakistani population. This retrospective study evaluated 601 panoramic radiographs of selected patients. Data were collected regarding age and gender, prevalence of impacted mandibular third molars, angulation of impacted teeth, level of impaction, and relationship of the mandibular third molar with the ramus. The mean age of patients was 32.90 ± 11.24 years (range 16 to 81 years). A significant association was observed between gender and impaction of mandibular thirs molars ($p < 0.05$). The most common kind of impaction in the mandible was mesioangular, followed by vertical, horizontal and distoangular impaction.

Key words: *Pattern, Mandibualar impacted teeth, Mandibular third molar impaction , Pakistan.*

This article may be cited as: Rauf S, Ali W, Chaudhry R, Kazmi SS, Imtiaz M. Pattern of mandibular third molar impaction: a radiographic study. Pak Oral Dent J 2019; 39(3):238-42.

INTRODUCTION

Tooth impaction is a pathological situation in which a tooth cannot or will not erupt into its normal functioning position[1]. In early 1954 Mead[2] defined an impacted tooth as a tooth that is prevented from erupting into position because of malposition, lack of space, or other impediments. Later, Peterson[3] characterized impacted teeth as those teeth that fail to erupt into the dental arch within the expected time. In 2004, Farman[4] wrote that impacted teeth are those that are prevented from eruption due to a physical barrier in the path of eruption.

Any tooth may become impacted, but the most common ones are mandibular third molars. Mandibular third molars may become impacted because of adjacent teeth, dense overlying bone or soft tissue, lack of space in the jaw, aberrant path of eruption, abnormal positioning of tooth bud or pathological lesions.[5] Mandibular third molars erupt between 17 to 21 years of age; and frequency of impaction is higher in mandible than maxilla[6,7]. Several studies have reported impaction of the mandibular third molars varying between 16.7% to 68.6%[6 8-14]. Most of the studies have not found a gender predilection; however, some studies have reported a higher incidence of impaction in females than males[6,8,14]. The third molars are the last teeth to erupt in all races despite racial variations in the eruption sequence[15]. Racial variation in facial growth, jaw and teeth size, nature of diet, extent of generalized tooth attrition, degree of use of masticatory apparatus and genetic inheritance are the crucial factors which determines the eruption pattern, impaction status and the incidence of agenesis of third molars[15]. Impaction of mandibular third molars is often categorized in terms of degree of difficulty in extraction and risk of complications such as iatrogenic trigeminal nerve injury.[6,7,16] Clinically impacted teeth may present with symptoms such as pain, food impaction and cheek bit. To examine impacted third molars, radiographs are still the gold standard for investigation. Radiographs like intra oral periapical (IOPA) and orthopantomograms (OPG) are taken to plan appropriate management and, to evaluate

[1] Sana Rauf, BDS, Demonstrator, Department of Oral and Maxillofacial Surgery, Akhtar Saeed Medical and Dental College, Lahore.

[2] **Corresponding Author:** Waqar Ali. BDS, FCPS, FFDRC S, MSc, Assistant Professor, Department of Oral and Maxillofacial Surgery. Akhtar Saeed Medical and Dental College, Lahore. House: 13, Street: 13, Gardenia block, Sector-C, Bahria Town, Lahore, Pakistan E-mail: doc.waqar.ali@gmail.com,Contact Number: +923231483318

[3] Qunoot Tariq, BDS, Demonstrator, Periodontics

[4] Rabia Chaudhry, BDS, Demonstrator, Oral Medicine Akhtar Saeed Medical and Dental College, Lahore

[5] Syeda Sadaf Kazmi, M Phil, BDS, Oral Pathology, University of Health Sciences, Lahore.

[6] Muhammad Imtiaz, BDS, FCPS, Assistant Professor, Oral and Maxillofacial Surgery. Fatima Memorial College of Medicine and Dentistry, Lahore,

Received for Publication: June 6, 2019
First Revised: July 27, 2019
Second Revised: Aug 24, 2019
Approved: Aug 26, 2019

the type of impaction, any anatomical impediments that are preventing its eruption; whether it is completely or partially embedded in bone, marginal bone height, condition of adjacent second molars and relation of third molars to inferior alveolar canal.[17]

Impaction of mandibular third molars is a common condition that may lead to a diverse group of pathologies including pericoronitis dental caries of third molar or adjacent second molar[18]. The extraction of impacted third molar carries risk of serious complications including iatrogenic trigeminal nerve injury. The information about pattern and prevalence of impacted molars is scarce in Pakistan. Previous studies in Pakistani populations have examined the impacted third molars which had clinical symptoms only[19]. The purpose of the present study however was to evaluate the pattern of mandibular third molar impaction, their angulation, level of eruption and third molar space available in the based on panoramic radiographs solely

MATERIALS AND METHOD

This was a cross-sectional descriptive study using retrospective radiographic data at Akhtar Saeed Medical and Dental College, Lahore. A total of 2040 OPGs taken from January 2016 to December 2018 were examined, out of which 601 met the inclusion criteria. The age and gender of the patient, and number of impacted third molar were recorded on a form specifically designed for the study. Patients younger than 19 years, those with history of extraction of permanent tooth, mandibular fracture, or orthodontic treatment were excluded from the study. In addition, patients with a developmental anomaly, congenital or systemic disease, major pathology in the mandible that has/had caused severe bone resorption/destruction, bone expansion, root resorption, and tooth migration were also excluded from the study. Patients with incomplete records or those with poor quality OPGs were excluded.

All the dental OPGs have been taken using Carestream Kodak OPG Dental Machine with a tube voltage of 60-90 kv and 2-15 mA current at a frequency of 140 kHz in the neutral head position with an exposure time of 18 seconds. Appropriate entries were made in the structured study form by the researchers.

OPGs were reviewed by two individual examiners separately in a dark room using the same X-ray viewer to determine the levels of eruption of third molars and their angulations if impacted. Level (depth) of eruption was recorded in relevance to the occlusal plane; level A when there was crown to crown position between impacted third molar and second molar, level B when there was crown to cervical position between impacted third molar and second molar, and level C when there was crown to root position between third molar and second molar[2,19,20]. The inclination of third molars was determined by measuring the angle formed between the line intersecting the long axis of the second and third molars, drawn through the midpoint of the occlusal surface and midpoint of the bifurcation.[19,21]

The available third molar space and ramus relationship was determined as the distance between the intersection of the occlusal plane with the anterior border of the ramus and the intersection of the vertical line with the occlusal plane according to the classification of Pell and Gregory[22] (Fig. 1). Also, the mesiodistal width of the third molar crown was recorded. If the available space was more or equal to mesiodistal diameter i.e. situated anterior to the anterior border of the ramus of third molar, it was considered as Class I (adequate room for eruption of a third molar if eruption could occur), if the available space was less than mesiodistal diameter of third molar i.e. crown half covered by the anterior border of the ramus, it was considered as Class II (partial space between posterior of the second molar and the ascending ramus of the mandible), and if the tooth was located completely within the mandibular ramus it was considered as Class III (the retro molar space is obliterated because the ascending ramus of the mandible was located immediately posterior to the second molar).[3,20,23]

The angulation of impacted third molar was documented based on Winter's classification[24] (Fig. 1) with reference to the angle formed between the intersected longitudinal axes of the second and third molars. The vertical impaction (10° to -10°), mesioangular impaction (11° to 79°), horizontal impaction (80° to 100°), distoangular impaction (11° to -79°), Others (111° to -80°) and buccolingual impaction (Any tooth oriented in a buccolingual direction with crown overlapping the roots)[19]

Data was analyzed using Statistical Package for Social Sciences (version #25). The qualitative variables like gender and patterns of impaction were presented as proportions and percentages while quantitative variables like age were presented as means and standard deviations. The association between angulation, ramus relation and depth of impaction with age and gender were tested by using Chi Square test. The level of significance was set at $p<0.05$.

RESULTS

The age of patients ranged from 16 to 81 years. Out of 601 impacted mandibular third molars; 43.4 % were in male patients while 56.6% were in females.

TABLE 1: NUMBER OF IMPACTED MANDIBULAR THIRD MOLARS BASED ON GENDER

Gender	Number of Patients	Mean Impaction	SD	P-value
Male	209	1.54	0.500	0.002*
Female	392	1.58	0.494	

Test utilized: T-test *significant

TABLE 2: NUMBER OF IMPACTIONS BASED ON AGE CATEGORIES

Age Categories (Years)	Mean Impaction	SD	P-value
1 (16-24)	1.76	0.430	0.008*
2 (25-45)	1.70	0.460	
3 (46-60)	1.59	0.493	
4 (61-91)	1.56	0.499	

Test utilized: One Way ANNOVA *Significant

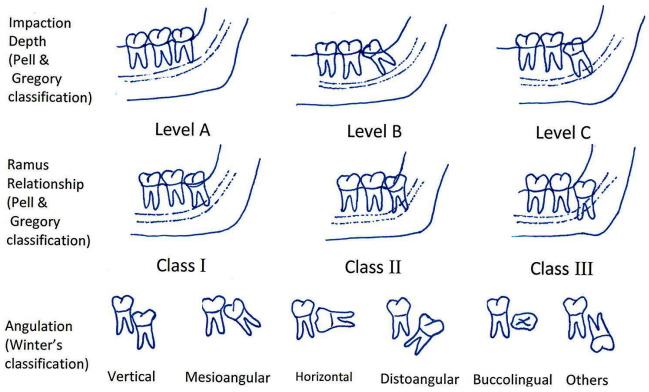

Fig 1: The impaction depth, ramus relationship, and angulation classification of mandibular third molar

The gender difference was statistically significant (p=.000). Highest number of impactions was seen in the age range of between 25 to 45 years.

While 34.4% of the patients had impacted mandibular third molar on one side, 65.6% had impacted mandibular third molars on both sides. In total; 49.4% had right sided mandibular third molar impactions while 50.6% had left sided.

The most common level of eruption of impacted mandibular third molar on the right side was Level II (40.3%) followed by Level I (28.0%) and level III (13.1%). The most common position of impaction on this side was at level B 41.9% followed by level A which was 21.6%; whereas level C were only 18.1%.

On the left side, most common level of impaction was level II at 44.6% followed by level I at 24.3% and level III at 16.0%. Whereas the most common position of impaction on the same side was at level B with 42.6%; followed by level A which were 20.8%, and only 20.6% were level C.

The frequency of mesioangular position (40.1%) was highest followed by vertical (25.6%), horizontal (11.6), Distoangular (2.7%) and other positions (buccolingual/ inverted mesioangular 1.3%). On the left side, the most frequent impacted position was mesioangular angulation (38.4%) followed by vertical (28.8%), horizontal (9.7%), distoangular (5.7%) and others (1.5%).

DISCUSSION

The results of the current study revealed that impacted mandibular third molars had a gender predilection towards females; the most common angulation pattern was mesioangular and the most common impaction depths were level A and Class II. It was 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* [8] Hugoson and Kugelberg, [14] Ma'aita and Alwrikat, [25] and Kim *et al*. [26] also reported a gender predilection for females. The higher incidence in females could be attributed to the fact that the physical growth in females usually stops earlier than males leading to a smaller jaw size. [8] Moreover, the initiation of third molar eruption in females normally occurs after the growth of the jaw is completed. In males, however, the jaw growth continues during the third molar eruption and thus provides more space for the tooth.[8] In contrast with the results of this study, other researchers indicated no gender differences in the pattern of third molar impaction. [9, 12, 13, 27-29]

The predominant age group in this study was the later stages of the second decade as well as the entire third decade, which is in accordance with local and international studies.[25, 30] However, in contrast to the results reported by Khan[31] very few patients were above the age of 40 years. This may be due to the increasing

awareness about oral health and early removal of impacted third molars.

In the present study, the most common angulation type of impacted mandibular third molar was mesioangular, followed by vertical angulations and horizontal, respectively. In agreement with these findings, Kramer and Williams[29] Quek et al[8] ,Moris and Jerman[32], , Hassan[1], 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 present study, the most common impaction level was Class A, that was similar to studies by Monaco et al[33], Obiechina et al[34], Hugoson and Kugelberg[14] and Hashemipour et al [6]. In contrast, several studies[8, 31, 32] reported Class B as the most common impaction level. The contrast between findings of different studies can be explained by the difference in classification methods utilized. In the current study, the impaction level was evaluated according to the relationship of occlusal surfaces of the third molar and the adjacent second molar. While the studies which reported Class B level as predominant used the position of cementoenamel junction (CEJ) in relation to the alveolar bone level for the evaluation.

In most of the impacted mandibular third molars in present study, half of the crown was covered with anterior border of mandibular ramus, and thus was classified as Class II. This was in agreement with the findings of several previous studies.[6, 29-33]

Larger studies in other areas of Pakistan are needed to evaluate the pattern of third molar impaction more comprehensively. Nevertheless, the results of the present will help in better treatment planning as well as identifying the degree of extraction difficulty based on radiologic findings.

CONCLUSION

The Pakistani population has a distinct predilection for third molar impactions in the mandible. The most common kind of impaction in the mandible is mesioangular, followed by vertical, horizontal and distoangular. Most impacted mandibular third molars were noticed in level A, followed by level B and level C. While the most common level of mandibular third molar impaction was level II followed by level I and then level III.

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CONTRIBUTIONS BY AUTHORS

1 Sana Rauf:	Designing of the research, literature search, data collection, data analysis, drafting of article and abstract writing.
2 Waqar Ali:	Designing of the research, literature search, data collection, data analysis, drafting of article and abstract writing.
3 Qunoot Tariq:	Conception and design of research, drafting of article and final review of article.
4 Rabia Chaudhry:	Conception and design of research, drafting of article and final review of article.
5 Syeda Sadaf Kazmi:	Conception and design of research, drafting of article and final review of article.
6 Muhammad Imtiaz:	Conception and design of research, drafting of article and final review of article.