ORIGINAL ARTICLE

Agenesis, position, class and angulation of impacted mandibular third molar teeth in 21 – 25 years old subjects visiting dental teaching hospital in Peshawar.

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ABSTRACT… Objective: To document the frequency of agenesis, position, class and angulation of impacted mandibular third molar teeth in patients age ranged between 21-25 years visiting Khyber College of Dentistry using Pell and Gregory and Winter's classification system. **Study Design:** Descriptive Cross-Sectional study. **Setting:** Department of Maxillofacial Surgery and Orthodontics in Khyber College of Dentistry. **Period:** March to September, 2020. **Material & Methods:** A total number 390 patients having impacted mandibular third molar were selected using non-probability consecutive sampling technique. All impacted mandibular third molar teeth on panoramic radiographs were reviewed by a single examiner using X-ray viewer to determine agenesis, position, class and angulation of impaction. **Results:** The mean age of the study participants was 22.89 SD ± 1.41 years and majority of the patients were males (n= 203, 52.1%) and were from the age group 23 years (n= 114, 29.2%). Overall, majority of the impacted third molars both right and left side were Position C (57.5%) followed by Position A (30.75%) and Position B (11.7%). Agenesis were identified in 5.7% of the total sample assessed. Impaction patterns of the third molar was higher among males (52%) compared to females (48%). Most common angulation pattern on both arches was Mesioangular (46.4%) and least common was buccolingual (4.6%). A highly statistical significant difference was identified with chi-square test when angulation pattern was compared with gender. (P < 0.01). **Conclusion:** In conclusion, this research provides useful data regarding the different pattern of third molars impaction. The most common pattern of impaction on both arches was Position C and Class 3. Mesioangular angulation was identified in maximum number of patients. The results of the current study will help the maxillofacial surgeons in the safe removal of the impacted mandibular third molar specially in the healthcare settings where the resources are limited.

Key words: Agenesis, Angulation, Class, Impacted, Mandibular, Position, Third Molar, Teeth.

INTRODUCTION

Third molar also known as wisdom tooth is the most common impacted and the last tooth to erupt. Third molar time of development and morphology are highly variable.[1] Tooth agenesis is one of the most common abnormalities of the dentition. Tooth agenesis is characterized by the developmental absence of one or more teeth in the oral cavity.[2] Many studies have stated that the prevalence of congenital absence of permanent dentition differs from (3% -11%) among European and Asian people.[2] Tooth impaction is a pathological condition where a tooth fails to fully erupt and achieve its normal functional position. The third molars impaction is major problem in modern dentistry and is commonly encountered in routine dental practice by dental surgeons.[3,4] Third molars eruption varies with race and generally erupts between the ages of 17 and 21 years.[5] Finding from a study done on Turkish population reported that the mandibular third molars were most frequently impacted tooth encountered (82%), followed by maxillary third molars (15%) and maxillary canines (1%).[6] Impacted third molar is normally associated with complications like caries, pericoronitis, pain, cysts, tumor, mandible fractures and mal-positioning and root resorption of adjacent teeth. They can also cause root resorption and caries of the adjoining teeth.[7] Angular position and eruption status of the third

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molar also have an impact on these symptoms.[8] Systemic diseases, environmental factors, dietary habits can play an etiological role in the incidence of dental abnormalities like agenesis, macrodontia, macrodontia and ectopic tooth.[4,9] A descriptive cross-sectional study published in local journal carried out on a total number of 89 patients and on 100 mandibular impacted teeth over a period of 12 months reported that mesioangular impaction (38%) was the most common angulation of impacted mandibular third molar and class II level A (45%) was most common impaction pattern according to Winter's and Pell and Gregory classification.[10]

Mandibular third molar impaction and agenesis is associated with overcrowding, delayed development and other morphological changes in different teeth. It also causes adjacent molars root caries, abnormal root development and temporo-mandibular (TMJ) joint pain. Limited local data regarding the agenesis or impaction of mandibular third molar is available. Findings from this research project will help the clinicians in tailoring region specific treatment planning in the field of orthodontics and oral surgery.

The present study aims to investigate the frequency of agenesis and angular position and class of mandibular impacted third molar teeth in patients visiting dental teaching dental hospital of Peshawar city.

MATERIAL & METHODS

This was a descriptive cross-sectional study conducted at the departments of oral and maxillofacial surgery and orthodontics, Khyber College of Dentistry, Peshawar. Participants of the study was selected using non-probability consecutive sampling technique.

Sample size was calculated using Open-Epi calculator with following parameters input: desired precision: 0.05, estimated true proportion: 0.5, confidence Level: 0.95, population Size: 4.2 million. Total Sample Size calculated was: 390.

Subjects of both gender age ranged between 21-25 years having missing one or both mandibular 3rd molars with no history of either eruption or extraction/loss or clinical signs/symptoms suggestive of their impaction were included in the study. Participants were excluded if they were having congenital deformities e.g cleft lip or cleft palate, any history of extraction of one or both mandibular third molars and poor quality OPG.

Participants consent for volunteering for the study were obtained using the standard pre-structured consent form. Data was collected using a self-structured proforma at the departments of Oral Surgery and Orthodontics, Khyber College of Dentistry after approval of synopsis from IRB Prime Foundation (IRB approval no: Prime/IRB/2019-186). For this research, Pell and Gregory classification was used for Impaction depth and the ramus relationship of the mandibular third molar while Winter's classification was used for angulation.[12-16] The demographic data of the subjects including name, age, gender, address, hospital number and date of data collection were documented in the data collection sheet. Each patient with clinically absent or unerupted or partially erupted mandibular 3rd molars with no history of extraction or loss of mandibular 3rd molar OPG were checked to determine the status of agenesis or impaction. All impacted mandibular third molar teeth on Panoramic Radiographs were reviewed by a single examiner using X-ray viewer to determine agenesis and the position, class and angulation of impaction. In order to control the risk of incorrect assessments due to fatigue, each radiograph was evaluated immediately and at that day.

Data was first entered in Excel sheet from data collection tool and then imported to SPSS version 25.0 for analysis. The descriptive statistics (mean, standard deviation and frequencies) as applicable for various variable like agenesis, impaction, angular position and class of mandibular 3rd molar were computed. Chi Square test was used to compare between categorical variables like angulation pattern and gender. A P-value equal to or less than 0.05 was considered to be statistically significant.

RESULTS

A total number of 390 (Orthopantomogram) OPG of the impacted mandibular third molar were analyzed in this study, of which 203 (52.1%) were male and 187 (47.9%) were female patients. The mean age of the study participants was 22.89 SD $\pm$ 1.41 (median: 23, IQR: 22 – 24). The age range was between 21 to 25 years. Majority of the patients were from the age group 23 years (n= 114, 29.2%) followed by 21 years (n= 94, 24.1%) and 25 years (n= 74, 19%) while only 56 (14.4%) and 52 (13.3%) patients were from the age group 22 and 24 years respectively (Table-I).

Of the total 390 OPGs examined, the prevalence of agenesis of the mandibular third molar was higher on the right side compared the left side. The agenesis was 5.1% (n= 20) for the right side while it was 6.4% (n= 25) for the left side. Impaction depth and the ramus relationship of the right and left side mandibular third molar was classified according to the Pell and Gregory classification. Majority of the right side impacted third molars were Position C (n= 212, 57.3%) followed by Position A (n= 118, 31.9%) and Position B (n= 40, 10.8%). When mandibular ramus relationship was assessed, majority of the right side impacted third molars were Class 3 (n= 206, 55.7%) followed by Class 1 (n= 98, 26.5%) and Class 2 (n= 66, 17.8%) (Table-II).

The occurrence of different pattern of angulation of the impacted right side third molar was assessed using Winter's classification. The most common angulation pattern on the right arch was Mesioangular (n= 160, 43.2%) followed by vertical angulation (n= 148, 40%) and Horizontal angulation (n= 44, 11.9%). The least common angulation pattern was Buccolingual (n= 18, 4.9%). Mesioangular (45.1%), Horizonal (14.5%) and Buccolingual (5.7%) angulation pattern was more common among males compared to females while vertical angulation was greater in females (45.8%) (Table-III) and (Figure-1).

According to Pell and Gregory classification, majority of the left side impacted third molars were Position C (n= 211, 57.8%) followed by Position A (n= 108, 29.6%) and Position B (n= 46, 12.6%).

For the left mandibular ramus relationship, majority of the right side impacted third molars were Class 3 (n= 207, 56.7%) followed by Class 1 (n= 89, 24.4%) and Class 2 (n= 69, 18.9%) (Table-II).

According to Winter's classification for the occurrence of different pattern of angulation of the impacted left side third molar, the most common angulation pattern was Mesioangular (n= 181, 49.6%) followed by vertical angulation (n= 133, 36.4%) and Horizontal angulation (n= 35, 9.6%). The least common angulation pattern was Buccolingual (n= 16, 4.4%) (Table-III). Mesioangular (54.4%), Horizonal (60%) and Buccolingual (68.7%) angulation pattern was more common among males compared to females while vertical angulation was greater in females (55.6%) (Table-III) and (Figure-2). A highly statistical significant difference was identified with chi-square test when angulation pattern of the both arches was compared with gender. ($P < 0.01$) (Table-III).

	n	Mean (SD)	Median (IQR)
Age	390	22.89 ($\pm$ 1.41)	23 (22 – 24)
Variable	Number (n) (%)		
Gender			
Male	203 (52.1%)		
Female	187 (47.9%)		
Age Group			
21 years	94 (24.1%)		
22 years	56 (14.4%)		
23 years	114 (29.2%)		
24 years	52 (13.3%)		
25 years	74 (19.0%)		
Total	390 (9) 100%		

Table-I. Sociodemographic characteristics of the impacted third molar patients

	Right Arch n (%)	Left Arch n (%)	Total n (%)
Position			
Position A	118 (31.9%)	108 (29.6%)	226 (30.75%)
Position B	40 (10.8%)	46 (12.6%)	86 (11.7%)
Position C	212 (57.3%)	211 (57.8%)	423 (57.7%)
Class			
Class 1	98 (26.5%)	89 (24.4%)	187 (25.4%)
Class 2	66 (17.8%)	69 (18.9%)	135 (18.3%)
Class 3	206 (55.7%)	207 (56.7%)	413 (56.1%)
Sub Total	370 (100%)	365 (100%)	735 (100%)
Agenesis			
Yes	20 (5.1%)	25 (6.4%)	45 (5.7%)
No	370 (94.9%)	365 (93.6%)	735 (94.2%)
Total	390 (100%)	390 (100%)	780 (100%)

Table-II. Position and class of impacted mandibular third molar

	Angulation				P-Value
	Vertical	Mesioangular	Horizontal	Buccolingual	
Arch					
Right	148 (52.6%)	160 (46.9%)	44 (55.6%)	18 (52.9%)	> 0.05[a]
Left	133 (47.4%)	181 (53.1%)	35 (44.4%)	16 (47.1%)	
Gender					
Male	126 (44.8%)	185 (54.2%)	49 (62%)	22 (64.7%)	< 0.01[a]**
Female	155 (55.2%)	156 (45.8%)	30 (38%)	12 (35.3%)	
Total	281 (100%)	341 (100%)	79 (100%)	34 (100%)	
a = Chi-Square test ** is sig at 1%, * is sig at 5%					

Table-III. Angulation pattern of impacted mandibular third molar

Figure-1. Right arch angulation
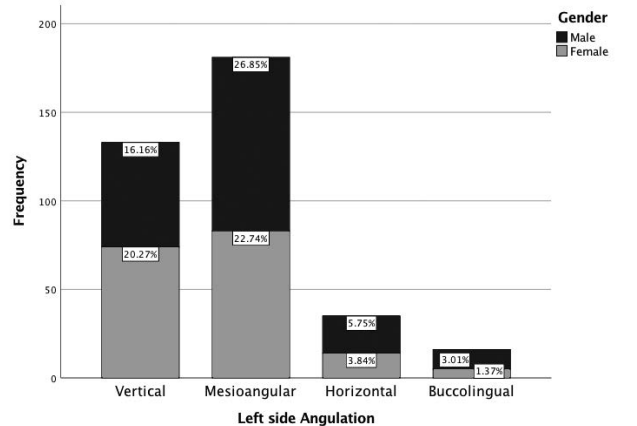
Figure-2. Left arch angulation

For this research, Pell and Gregory classification was used for Impaction depth and the ramus relationship of the mandibular third molar while Winter's classification was used for angulation. Majority of the studies used the same classification methods.[12-16]

Overall, majority of the impacted third molars (both right and left) in this research were Position C (57.5%) followed by Position A (30.75%) and Position B (11.7%). Most common pattern of impaction was Class 3 Position C (98%) while most common angulation pattern was Mesioangular (46.4%). Agenesis were identified in 5.7% of the total sample assessed. Impaction patterns of the third molar was higher among males (52%) compared to females (48%).

Out of the total 390 participants OPGs assessed, 203 (52.1%) were male and 187 (47.9%) were

DISCUSSION

The mandibular third molar impactions are the most frequent impactions globally.[11] Normally the third molars erupt between the ages of 17 and 21 years and many impacted third molars can change their positions and erupt late.[11] Our study collected sample from patients aged range between 21 years to 25 years to achieve the more accurate results.
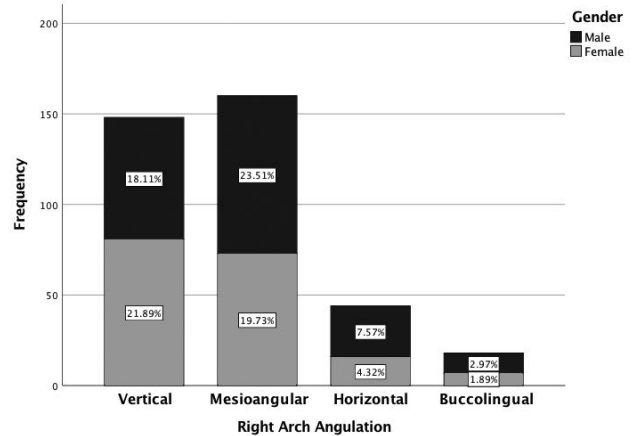
female patients. For gender distribution this study is in accordance with study of Hazza's et al[12], Padhye et al[13], However, studies of Yamaoka et al[14], Hattab et al[15] and Linden et al[16] showed female predominance.

The level or position of impaction with respect to the jaw bone gives a direct indication of the depth to which the tooth is impacted. According to Pell and Gregory classification, our study has shown that for both right and left arches, the most frequent impaction depth was Position C followed by Position A and B. A Turkish study by on the assessment of third molar impaction pattern by Yilmaz et al reported the same results of Position C, the commonest in the mandible.[6] While many studies like Fareedi et al[17], Sandhu et al[18] and Susrala et al[19] that reported majority of the third molar are at Position A followed by Position B and then C. While another study conducted in Saudi Arabia by Al-Dajani et al concluded that the most frequent type of impaction is Position A followed by C then B in both left and right arches.[20] One study in Thailand population by Kaomongkolgit et al conducted on third molar impaction patten reported Position B, C, A sequence, respectively, from most frequent to less frequent.[21] These variations for diverse population suggest ethnic and racial differences.

Space between the distal part of the mandibular second molar and the ramus of was classified according to Pell and Gregory classification. In this research majority of the impacted third molars (both right and left arches) were Class 3 (All or most of the impacted third molar is in the ramus of the mandible) followed by Class 1 (sufficient space between the ramus and the distal part of the 2nd molar to accommodate 3rd molar) and then Class 2 (space less than the mesiodistal diameter of the 3rd molar). A study conducted on the position of impacted mandibular third molar in different skeletal facial types by Sapkota et al in 2017 identified the same results.[22] In this study Class 3 impaction was more common in mesofacial type while Class 1 impaction was highest in dolichofacial types.[22] Studies across the diverse regions reported different results. Kaomongkolgit et al[21] and Wazir

et al[23] have shown Class 2 as the most frequent one followed by Class 1 and Class 3 for both left and right third molars. A study conducted in India on the mandibular third molar impaction audit in the city of Gujrat dental hospital by Fareedi et al.[17] contradicts both of these results by showing class 1 as the most frequent followed by Class 2 then Class 3.

Angulation of the third molars to the long axis of the second molar was categorized according to the Winter's classification. Ours study identified mesioangular the most frequent one followed by vertical and horizontal. The Buccolingual angulation was the lest common for both arches. Majority of the studies in the literature have reported the same sequence results. Nine studies[10,14,17,18,20,21,23,24,25] were analyzed to compare the results of angulation with our research, of these, all studies reported the mesioangular angulation the most frequent one. Moreover, the buccolingual angulation was lest common in all of the above literature studied. All of these results are in accordance with our study results.

Of the total 390 OPGs examined, the prevalence of agenesis of the mandibular third molar was 5.1% for the right side and 6.4% for the left side. The prevalence of at-least one arch agenesis was 5.75%. A systematic review and meta-analysis on third molar agenesis by Carter et al reported agenesis ranging from 5.32% to 56% in different population.[5] The systematic review also revealed that women are 14% more likely to have agenesis compared to men. Contrary to the results of the systematic review, our study identified agenesis more common in male patients. The low prevalence in our study might be due to exclusion of the patients who had third molar extraction history due to some pathology.

One of the major strengths of this research was the exclusion of patients from sample who had previous extraction history of their mandibular third molars. The patients were excluded to achieve more precise results of the natural agenesis or congenitally missing. Secondly, the sample age range was between 21 to 25 years. Normally the third molars erupt between the ages of 17 and

21 years and many impacted third molars can change their positions and erupt late. Our study kept the age range 21 - 25 years to achieve the more accurate results. Third, widely used more accurate classification tool "Pell & Gregory" and "Winter's classification method was used.

The limitation of this research study is that it was a cross-sectional study. In addition to that, participants selection was limited to single hospital due to COVID-19 pandemic restrictions and these results can't be generalised.

CONCLUSION
In conclusion, this research provides useful data regarding the different pattern of third molars impaction. Impaction was more common in 23 years age group with males affected slightly more than female population. In this research, the most common pattern of impaction on both arches was Position C and Class 3. Mesioangular angulation was identified in maximum number of patients. The results of the current study will help the maxillofacial surgeons in the safe removal of the impacted mandibular third molar specially in the healthcare settings where the resources are limited. A comparison of our study results with other researches has shown similarities in certain pattern like angulation and relation to ramus, but most results varied like Position and Class of the impacted third molar. Different studies across the globe have shown mixed results and this may be due to genetic and racial variation hence no clear criteria can be taken as general rule.

RECOMMENDATIONS
The current research can be taken as a baseline for future researches. Further longitudinal research studies with etiological factors assessment are warranted to achieve more accurate results.
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2	Muhammad Ishfaq	Discussion, Conclusion.	
3	Sana Arbab	Introduction, Discussion.	
4	Asma Ali Khattak	Introduction.	
5	Imran Khattak	References.	
6	Asif Rehman	Data analysis, Results, Methodology.	