Journal of Craniomaxillofacial Research

Vol. 12, Issue. 3 Summer 2025

Evaluation of Third Molar Impaction Pattern in Orthodontic Patients with Different Skeletal Malocclusion, Southeast Iran

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ARTICLE INFO

Article Type:
Orginal Article

Received: 11May 2024
Revised: 10 June 2024
Accepted: 15 July 2025

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ABSTRACT

Introduction: This study investigated the third molar impaction pattern in orthodontic patients with different skeletal malocclusions.

Materials and Methods: This cross-sectional study focused on lateral cephalometric images of orthodontic patients with confirmed third molars. Data was collected using a two-part checklist that included patient demographics, clinical examination results, and cephalometric findings. Analysis was performed with SPSS version 27 and the chi-square test at a significance level of 0.05.

Results: Most third molars were found to be mesially impacted ($P < 0.0001$). Tooth impaction levels relative to the lower seventh tooth were classified as class C, with the most common relationship to the ramus being class I. Wisdom tooth impaction toward the ramus was significantly associated with the ANB angle on the left side, the WITS score, and vertical facial height on both sides, but not with the gonial angle. On the left side, a significant relationship existed between the wisdom tooth level and the WITS scale. Additionally, the impaction angle correlated significantly with the ANB angle on the right maxilla, the WITS scale on the left mandible, and vertical facial height on both the left mandible and right maxilla.

Conclusion: Impacted third molars with the mesiangular angle being the most prevalent. Most patients had Class I malocclusion. A significant association was noted between wisdom tooth impaction toward the ramus and the ANB angle on the left side. Additionally, the level of the wisdom tooth relative to the seventh tooth showed a significant relationship with the Wits appraisal on the left side.

Keywords: Third molar impaction; Orthodontic patients; Skeletal malocclusion.

Please cite this Article as:
Azizi M, Ataie A, Azizi M, Hojati NS, Zamaninasab Z. Evaluation of Third Molar Impaction Pattern in Orthodontic Patients with Different Skeletal Malocclusion, Southeast Iran. J Craniomaxillofac Res 2025; 12(3): 168-177. DOI: 10.18502/jcr.v12i3.20624

Introduction

Third molar impaction is a pathological condition where the wisdom teeth (third molars) fail to erupt into the dental arch within the expected time frame or remain completely embedded within the jawbone [1]. In different populations, the prevalence of impacted wisdom teeth is reported to be between 16 and 70% [2]. The prevalence of impacted wisdom teeth has been reported to be 24.3% in Japan [3] and 18.1% in northern Iran [4]. Failure to erupt properly or to impact can cause a variety of problems, including changes in the position of adjacent teeth, malocclusion, periodontal disease, loss of arch length, cysts or tumors, root resorption of adjacent teeth, pericoronitis, and accumulation of food around adjacent teeth [5,6]. The third molar has a wide range of variations in its formation, morphological characteristics of its crown and root, and whether it exists or not. The third molar starts developing between the ages of 3 to 4 years, and it begins to calcify between the ages of 7 to 10 years. Despite this, the eruption's duration varies from 14 to 24 years in different populations [7]. The extraction of impacted third molar is the most common oral and maxillofacial surgery [8] and should be performed as soon as the dentist diagnoses it, as delaying it can cause complications in adulthood [6]. The best time to remove teeth is when two-thirds of their roots have formed. The root of the tooth being less formed will make it harder to extract and the tooth will have a greater tendency to rotate [6].

The classification of wisdom tooth impaction has been accomplished through multiple methods [9]. These classifications are based on factors such as the level of impaction, angulation of the third molar, and the relationship of the third molar with the anterior border of the ramus of the mandible [3,10]. The most widely used classification to date is that of Paul and Gregory (1933) for depth and Ramos relationship [3,10] and the Winter/Acher (1975) classification for angulation [11,12]. Factors such as lack of space, impaired skeletal growth, increased tooth size, and delayed maturation of third molars cause them to become impacted [13]. Skeletal malocclusion or jaw misalignment is a common congenital defect that occurs due to deviation in the development of the upper and/or lower jaw, which will have a great impact on the position, alignment, and health of the teeth, including the impaction of the third molar [14]. Crowding of the dental arch due to a small jaw size can prevent the third molars erupting properly. In contrast, impacted third molars can exert pressure on the surrounding teeth and bone, potentially causing jaw misalignment [15,16]. It has been shown that the likelihood of distoangular impaction in Class II malocclusions is higher due to the greater space at the back of the mouth [17]. Conversely, in Class III malocclusions, mesiangular impaction is more common due to the limited space in the back of the mouth [18]. In general, understanding the configuration of impacted molars in a region is an important clinical issue, as impacted teeth are prone to periodontal diseases and early treatment of this problem is beneficial to reduce related complications. There is limited information on the prevalence and patterns of impacted third molars and their association with skeletal malocclusions in eastern Iran. Therefore, this study determined the impaction pattern of impacted third molars based on the angle of placement, level of impaction relative to the adjacent seventh tooth, and type of relationship to the ramus in eastern Iran and evaluated the relationship of these patterns with skeletal malocclusions. The findings of this study may contribute to the development of improved strategies for the management of impacted third molars in this region.

Materials and Methods

Study design and participants:

This descriptive-analytical cross-sectional study included all orthodontic patients aged 14 to 25 years who were referred to the Faculty of Dentistry and private orthodontic offices in Birjand.

Inclusion and exclusion criteria:

All patients aged 14 to 25 years who were referred to the Faculty of Dentistry and private orthodontic offices in Birjand who had a radiographically proven third molar were included in the study. In addition, due to the continuous growth of the ramus and the change in the eruption space for tooth 8, the minimum age for selecting patients was 14 years for girls and 16 years for boys. Patients with a history of orthodontic treatment, congenital deformities such as cleft palate, congenitally missing teeth, or a history of extraction of teeth 1 to 7 in both jaws, pathological bone lesions, oral cancer, and genetic diseases with jaw symptoms and poor-quality images were excluded from the study.

Sample size and sampling method:

The sample size for this study was calculated using the population proportion formula, considering a confidence level of 95%, a margin of error of 5%, a prevalence of third molar impaction of 40.5% based on Hassan's [19] research, d = 0.08, and factoring in a nonresponse rate of 25%. As a result, the sample size determined for the study was 181 patients. Sampling was conducted using convenience sampling until the required sample size was reached.

Data collection

In this study, a two-part checklist was used to collect data, including demographic information of the patients, clinical examination results, and lateral cephalogram images. Demographic information included gender and age and clinical information included third molar impaction patterns, impaction shape in terms of axial angle of the third molar, number of impacted third molars, and skeletal jaw malocclusion patterns. The Wits criteria were used to diagnose skeletal malocclusion in the anterior-posterior dimension. In this criterion, an ANB angle between 0 and 4 degrees is considered class I, an ANB angle > 4 degrees is considered class II, and an ANB angle < 0 degrees is considered class III [20,21]. Skeletal malocclusion in the vertical dimension was assessed based on the SN-GoMe angle and gonial angle. The SN-MP angles of < 27º, 27-37º, and > 37º were considered for convergence (deep bite), normal, and divergence (open bite) conditions [18]. Impacted wisdom teeth were classified based on 1- the angle of tooth placement, 2- the relationship with the anterior edge of the ramus (Pell & Gregory), and 3- the relationship with the occlusal plane (Pell & Gregory) is examined. The most common way to classify mandibular wisdom teeth is by the angle of the tooth's longitudinal axis relative to its adjacent tooth, the second molar. Based on this, mandibular wisdom teeth are classified into four types, which are mesiangular > vertical > disangular > horizontal in order of prevalence. Also, the types of mandibular wisdom tooth impactions in terms of difficulty of extraction are disangular > vertical> horizontal > mesiangular [22]. The second criterion for the classification of the mandible, proposed by Pell & Gregory, is the relationship to the anterior edge of the ramus. The amount of tooth covered by the ramus is the basis of this classification. In fact, this classification determines the position of the wisdom tooth in terms of anteroposterior. Accordingly, the mandibular wisdom teeth are divided into three categories in order of surgical ease:

- "Level A" if the occlusal surface of the impacted tooth is at the same level as the occlusal - "Level B" if the occlusal plane is between the occlusal plane and the cervical line of the adjacent tooth.

- "Level C" is when the occlusal plane of the impacted third molar is below the aforementioned line.

The third criterion for classification is the occlusal plane relationship, which was proposed by Pell & Gregory, and the depth of the mandibular wisdom tooth placement relative to the height of the second molar is the basis of this classification. Accordingly, mandibular wisdom teeth are divided into three categories in order of surgical ease [23]:

- Class I is labeled to a tooth located mesial to the anterior border of the ramus.

- Class II is when the tooth is half covered.

- Class III is when the crown is fully covered by the anterior border of the ramus.

The gonial angle was measured by two different observers, each measuring it three times, and the mean was chosen as the final record.

Study implementation

After obtaining informed consent from the patients and recording demographic information, clinical examinations were performed by a dental student under the supervision of an orthodontist, and the results were recorded in the checklist. In two stages, radiographs were taken from the patients and the image file was loaded into the software. In case of discrepancy between the numbers and points, re-measurement was performed for the third time and two more similar values were selected for analysis.

Data Analysis

Data analysis was performed using SPSS 27 software. Frequency, frequency percentage, tables, mean, and standard deviation (SD) were used to describe the data, and chi-square tests were used at a significance level of 0.05 for analytical analyses.

Ethical Considerations

This study was approved by the Birjand University of Medical Sciences Ethics Committee under the code IR.BUMS.REC.1401.312. In addition, patients completed an informed consent form before participating in the study and were assured that their information would remain confidential and not published individually.

Results

In this study, data from 181 patients were analyzed. The third molar impaction was prevalent in females ($P < 0.0001$). The mesiangular angle of occlusion was the most prevalent and the horizontal angle was the least

DOI: 10.18502/jcr.v12i3.20624

prevalent ($P < 0.0001$). More information is provided in Table 1. According to the chi-square statistical test, there was no difference in the prevalence of impacted wisdom teeth between the two sexes (Table 2). Relationship between ANB angle and WIST criterion with tooth impaction relative to the ramus. On both sides, the ANB angle between 0 and 4 degrees had the highest relation with all three types of occlusion, but this relation was significant on the left side ($p = 0.033$) and not significant on the right side ($p = 0.078$) (Table 3). On the left, the most significant correlations were between class I, class II, and class III occlusions with Wits scores between 0 and less than -1 and greater than 3 ($p < 0.001$). On the right, the most significant correlations were between class I occlusions with Wits scores between 0 and 2, and class II and class III occlusions with Wits scores between less than -1 and greater than 3 ($p < 0.001$) (Table 3). There was a significant relationship between ramus impaction and vertical facial height on both sides ($p < 0.001$ for both sides) (Table 3). Gonial angle had no relationship with wisdom tooth impaction relative to the ramus on either side ($p = 0.873$ and $p = 0.302$ for the left and right sides, respectively). (Table 3). ANB angles of $1-5^{\circ}$, $> 5^{\circ}$, and $< 1^{\circ}$ were considered for Cl I, Cl II, and Cl III malocclusions in the anteroposterior dimension. The ANB angle is not related to the impaction of the wisdom tooth relative to the occlusal surface of the adjacent tooth on either side ($p = 0.174$ and $p = 0.089$ for the left and right sides, respectively) (Table 4). On the left, there is a significant relationship between the level of wisdom tooth placement relative to tooth seven and the WITS scale. ($p = 0.011$). However, on the right, there was no relationship between the WITS scale and the level of wisdom tooth placement relative to tooth seven ($p = 0.176$) (Table 4). There is no significant relationship between the vertical height of the face and the level of wisdom tooth placement relative to the adjacent tooth on either side ($p = 0.06$ for the left side and $p = 1$ for the right side) (Table 4). No relationship was observed between the level of wisdom tooth placement and the gonial angle on either side ($p = 0.367$ and $p = 0.821$ for the left and right sides, respectively) (Table 4). On the right side, there is a significant relationship between the ANB angle and the angle of impaction ($p = 0.02$). In distoangular and vertical impacts, the highest ANB angle observed was between 0 and 4 degrees (Table 5). There is no correlation between the ANB angle and the angle of impaction of the wisdom tooth in the lower jaw on either side ($p = 0.621$ and $p = 0.119$ for the right and left sides, respectively) (Table 5). There is no correlation between the angle of impaction and the Wits scale in the maxilla (left side $p = 0.286$ and right side $p = 0.287$) (Table 5). Only on the left side was there a significant relationship between the Wits scale and the angle of the impacted wisdom tooth ($p = 0.001$). In mesiangular and disangular impacted teeth, the highest WITS size observed was less than -1. In horizontally impacted teeth, the highest Wits size observed was between 0 and 2 mm (Table 5). Only on the right side was there a significant relationship between vertical facial height and wisdom tooth impaction angle in the maxilla ($p = 0.005$) (Table 5). Only on the left side was there a significant relationship between vertical facial height and wisdom tooth impaction angle ($p = 0.031$) (Table 5).

Table 1. Comparison of the distribution of impacted wisdom teeth based on study variables.

Variable			*Impact third molar*		*p-value*
			Number	*Percent*	
Gender		*Female*	*429*	*62.81*	*< 0.0001*
		Male	*254*	*37.18*	
Positioning angle		*Mesi-angular*	*321*	*46.99*	*< 0.0001*
		Distal-angular	*289*	*42.31*	
		Vertical	*52*	*7.61*	
		Horizontal	*21*	*3.07*	
The level of tooth impaction relative to tooth seven of the lower jaw	*right side*	*A*	*7*	*4.00*	*0.676*
		B	*53*	*30.28*	
		C	*115*	*65.71*	
	left side	*A*	*4*	*23.32*	*0.676*
		B	*48*	*27.90*	
		C	*120*	*69.76*	

Variable			Impact third molar		p-value
			Number	Percent	
Type of relationship with Ramos	right side	I	90	51.42	0.739
		II	31	17.71	
		III	54	30.85	
	left side	I	99	57.55	0.494
		II	29	16.27	
		III	45	26.16	

Table 2. Comparison of the distribution of impacted wisdom teeth by gender and jaw.

Gender	Impacted third molar				p-value
	Low-right (N (%))	Low-left (N (%))	Up-right (N (%))	Up-left (N (%))	
Female	108 (62.80)	109 (62.30)	107 (62.87)	105 (62.87)	0.99
Male	64 (37.20)	66 (27.70)	62 (36.68)	62 (37.12)	0.98
Total	172 (100)	175 (100)	169 (100)	167 (100)	

Table 3. Relationship between the relationship between ANB angle, WIST criterion, vertical height and Gonial angle with tooth impaction relative to the ramus.

Side	ANB malocclusion	Latent towards Ramos I	II	III	P Value*	WIST (mm)	Latent towards Ramos I	II	III	P Value**	Face vertical height	Latent towards Ramos I	II	III	P Value*	Gonial angle	Latent towards Ramos I	II	III	P Value*
Left	Class III	16 (17.80)	3 (9.70)	1 (1.90)	0.033	≤ -1	22 (24.40)	17 (54.80)	8 (14.80)	< 0.0001	Deep Bite	18 (20.00)	5 (16.10)	3 (5.60)	<0.0001	≤ 112	15 (16.70)	3 (9.70)	7 (13.00)	0.873
	Class I	44 (48.90)	19 (1.30)	30 (55.60)		0-2	41 (45.60)	5 (16.10)	20 (37.00)		Normal	43 (47.80)	25 (80.60)	37 (68.50)		113-127	57 (3.30)	21 (67.70)	34 (63.00)	
	Class II	30 (33.30)	9 (29.00)	23 (42.60)		≥ 3	27 (30.00)	9 (29.00)	26 (48.10)		Open Bite	29 (32.20)	1 (3.20)	14 (25.90)		≥ 128	18 (0.00)	7 (22.60)	13 (24.10)	
Right	Class III	17 (17.20)	2 (7.10)	1 (2.20)	0.078	≤ -1	29 (29.30)	13 (46.40)	6 (13.30)	< 0.0001	Deep Bite	18 (18.20)	4 (14.30)	3 (6.70)	<0.0001	≤ 112	15 (15.20)	2 (7.10)	7 (15.60)	0.302
	Class I	50 (50.50)	17 (60.70)	24 (53.30)		0-2	44 (44.40)	5 (17.90)	14 (31.10)		Normal	47 (47.50)	23 (82.10)	33 (73.30)		113-127	61 (61.60)	18 (64.30)	33 (73.30)	
	Class II	32 (32.30)	9 (32.10)	20 (44.40)		≥ 3	26 (26.30)	10 (35.70)	25 (55.60)		Open Bite	34 (34.30)	1 (3.60)	9 (20.00)		≥ 128	23 (23.20)	8 (28.60)	5 (11.10)	

Table 4. Relationship between the ANB angle, WITS criteria, vertical height and the position of the wisdom tooth relative to the adjacent seventh tooth.

Side	ANB	Wisdom tooth placement level A	B	C	P Value*	WIST	Wisdom tooth placement level A	B	C	P Value**	Face vertical height	Wisdom tooth placement level A	B	C	P Value*	Gonial angle	Wisdom tooth placement level A	B	C	P Value*
Left	Class III	0 (0.0)	18 (34.00)	44 (38.30)	0.174	≤ -1	1 (14.30)	13 (24.50)	48 (41.70)	0.011	Deep Bite	0 (0.0)	14 (26.40)	12 (10.40)	0.06	≤ 112	2 (28.60)	8 (15.10)	15 (13.00)	0.367
	Class I	5 (71.40)	28 (52.80)	60 (52.20)		0-2	1 (14.30)	26 (49.10)	39 (33.90)		Normal	6 (85.70)	26 (49.10)	73 (63.50)		113-127	5 (71.40)	36 (67.90)	71 (61.70)	
	Class II	2 (28.60)	7 (13.20)	11 (9.60)		≥ 3	5 (71.40)	14 (26.40)	28 (24.30)		Open Bite	1 (14.30)	13 (24.50)	30 (26.10)		≥ 128	0 (0.0)	9 (17.00)	29 (25.20)	

DOI: 10.18502/jcr.v12i3.20624

Side	ANB	Wisdom tooth placement level				WIST	Wisdom tooth placement level				Face vertical height	Wisdom tooth placement level				Gonial angle	Wisdom tooth placement level			
		A	B	C	P Value*		A	B	C	P Value**		A	B	C	P Value*		A	B	C	P Value*
Left	Class III	0 (0.0)	14 (29.20)	47 (39.20)	0.089	≤ -1	1 (25.00)	12 (25.00)	48 (40.00)	0.176	Deep Bite	0 (0.0)	7 (14.60)	18 (15.00)	1.00	≤ 112	0 (0.0)	8 (16.70)	16 (13.30)	0.821
	Class I	2 (50.00)	30 (62.50)	59 (49.20)		0-2	1 (25.00)	18 (37.50)	44 (36.70)		Normal	3 (75.00)	29 (60.40)	71 (59.20)		113-127	4 (100.0)	31 (64.60)	77 (64.20)	
	Class II	2 (50.00)	4 (8.30)	14 (11.70)		≥3	2 (50.00)	18 (37.50)	28 (23.30)		Open Bite	1 (25.00)	12 (25.00)	31 (25.80)		≥ 128	0 (0.0)	9 (18.80)	27 (22.50)	

Table 5. Relationship between wisdom tooth impaction angle and ANB angle, WIST criteria, and vertical facial height.

Jaw	Side	ANB	Impaction Angle				p value	WIST (mm)	Impaction Angle				p value	Face vertical height	Impaction Angle				p value*
			Mesioangular	Distangular	Vertical	Horizontal			Mesioangular	Distangular	Vertical	Horizontal			Mesioangular	Distangular	Vertical	Horizontal	
Lower	Left	Class III	57 (37.30)	3 (60.00)	0 (0.00)	2 (12.5)	0.119	≤-1	57 (37.30)	3 (60.00)	0 (0.00)	2 (12.5)	0.001	Deep Bite	20 (13.10)	0 (0.00)	0 (0.00)	6 (37.50)	0.031
		Class I	80 (52.30)	1 (20.00)	1 (100.00)	11 (68.80)		0-2	52 (34.00)	0 (0.00)	1 (100.00)	13 (81.30)		Normal	96 (62.70)	4 (80.00)	1 (100.00)	4 (25.00)	
		Class II	16 (10.50)	1 (20.00)	0 (0.00)	3 (18.80)		≤3	44 (28.80)	2 (40.00)	0 (0.00)	1 (6.30)		Open Bite	37 (24.20)	1 (20.00)	0 (0.00)	6 (37.50)	
	Right	Class III	59 (36.00)	0 (0.00)	0 (0.00)	2 (40.00)	0.621	≤-1	60 (36.60)	0 (0.00)	0 (0.00)	1 (20.00)	0.32	Deep Bite	25 (15.20)	0 (0.00)	0 (0.00)	0 (0.00)	0.614
		Class I	86 (52.40)	1 (50.00)	1 (100.00)	3 (60.00)		0-2	59 (36.00)	0 (0.00)	1 (100.00)	3 (60.00)		Normal	98 (59.80)	2 (10.00)	1 (100.00)	4 (40.00)	
		Class II	19 (11.60)	1 (50.00)	0 (0.00)	0 (0.00)		≥3	45 (27.20)	2 (40.00)	0 (0.00)	1 (20.00)		Open Bite	41 (25.00)	0 (0.00)	0 (0.00)	3 (60.00)	
Upper	Left	Class III	0 (0.00)	51 (37.20)	6 (21.40)	0 (0.00)	0.054	≤-1	0 (0.00)	48 (35.00)	9 (32.10)	0 (0.00)	0.286	Deep Bite	0 (0.00)	14 (10.20)	8 (28.60)	0 (0.00)	0.062
		Class I	1 (50.00)	70 (51.10)	21 (75.00)	0 (0.00)		0-2	0 (0.00)	50 (36.50)	13 (46.40)	0 (0.00)		Normal	1 (50.00)	85 (62.00)	16 (57.10)	0 (0.00)	
		Class II	1 (50.00)	16 (11.70)	1 (3.60)	0 (0.00)		≥ 3	2 (100.00)	39 (28.50)	6 (21.40)	0 (0.00)		Open Bite	1 (50.00) (0.00)	38 (27.70)	4 (14.30)	0 (0.00)	
	Right	Class III	1 (50.00)	53 (36.60)	5 (22.70)	0 (0.00)	0.02	≤ -1	0 (0.00)	52 (35.90)	8 (36.40)	0 (0.00)	0.286	Deep Bite	0 (0.00)	15 (10.30)	7 (31.80)	0 (0.00)	0.005
		Class I	0 (0.00)	74 (51.00)	17 (77.30)	0 (0.00)		0-2	1 (50.00)	56 (38.60)	5 (22.70)	0 (0.00)		Normal	0 (0.00)	91 (62.80)	13 (59.10)	0 (0.00)	
		Class II	1 (50.00)	18 (12.40)	0 (0.00)	0 (0.00)		≥ 3	1 (50.00)	37 (25.50)	9 (40.90)	0 (0.00)		Open Bite	2 (100.00)	39 (26.90)	2 (9.10)	0 (0.00)	

Discussion

In this study, which aimed to determine the pattern of third molar impaction in orthodontic patients with radiographically confirmed impacted third molars and its relationship with types of skeletal malocclusion, lateral cephalogram images were used to assess skeletal malocclusion. The study found that 62.81% of the impacted third molars were in female patients, while 37.18% were in male patients. This finding aligns with the results of most previous studies [24-27]. However, some researchers have reported either no difference in incidence between genders or a higher occurrence in males [28-30]. The variation in reported prevalence may be due to the different types of participants involved in the studies. This difference is also linked to the timing of mandibular growth cessation in men and women. In women, jaw growth stops coinciding with the eruption of the third molars, while in men, it continues until after the third molars erupt. As a result, men generally have more jaw space [31]. In this study, no significant difference was found in the distribution of impacted third molars between the upper and lower jaws in men and women.

In the current study, the mesiangular angle (46.99%) was found to have the highest prevalence, while the horizontal angle (3.07%) had the lowest prevalence, confirming the findings of previous studies [32-34]. It seems that the distribution of third molar impaction angles is similar across most societies and ethnicities; however, vertical impaction is the most common type at older ages [35]. The average age of patients at the time of the initial assessment of impacted third molars has been identified as a significant factor influencing the angle of impaction. As patients age, the retromolar space and the Gregory Ramos Class 1 bridge tend to increase. However, it's important to note that impacted third molars may change their position after the age of 25. Therefore, it is necessary to re-evaluate patients through radiographic imaging to detect any potential changes in the position of third molars as they age [32, 36]. In this study, most patients had class I malocclusion (53.71%), the WITS criteria between 0-2 mm (class I), normal face vertical height, and gonial angle between 113-127 degrees for both right and left lower jaws. The Class I (51.7%) was also reported as prevalent malocclusion in Saudi orthodontic patients [37], and the Malay population, Class II (46.1 %) was most prevalent [38]. This difference refers to the type of ANB angle classification in two mentioned studies. In Aldrees' study, the most common skeletal malocclusion using WITS appraisal was reported Class II [37]. In that study, the skeletal Class I defined difference with our study (WITS -1.8 to 0.8 mm). Notably, the ANB angle and WITS appraisal don't directly cause third molar impaction; instead, they serve as a measurement that indicates underlying skeletal relationships that may predispose individuals to impaction. Specific classifications of the ANB angle, such as Class II or Class III, correlate with distinct jaw sizes and shapes [39]. In addition, skeletal growth patterns influence both the ANB angle and the space available for third molar eruption [40]. WITS appraisal helps identify skeletal discrepancies that can contribute to limited space in the dental arches [41].

In the current study, wisdom tooth impaction toward the ramus was significantly associated with the ANB angle on the left side, WITS score and vertical facial height on both sides; however, this relationship was not significant with the gonial angle. In addition, on both sides, there was no significant relationship between the impaction of the wisdom tooth relative to the adjacent seventh tooth with the ANB angle, vertical facial height, and gonial angle. Only on the left side, a significant relationship was observed between the level of the wisdom tooth relative to the seventh tooth and the WITS scale. Also, the results of the study showed that the impaction angle of the wisdom tooth had a significant relationship with the ANB angle on the right side of the maxilla, the WIST scale on the left side of the mandible, and the vertical facial height on the left side of the mandible and the right side of the maxilla. Briek and Grouber observed that individuals with high vertical facial growth and skeletal class III were less likely to have impacted wisdom teeth [42]. Tassokaret et al. also reported similar results to Briek and Grouber's study [12]. Conversely, Sujit and Karuna did not report a relationship between vertical and horizontal facial growth and impacted wisdom teeth [43]. Generally, the space between the distal second molar and the anterior border of the ramus is essential for the proper eruption of third molars. Any alterations in skeletal patterns can significantly impact the available space for third molar development. For example, a Class II skeletal pattern, which is characterized by a retrognathic mandible, may lead to a lower mandibular ramus [44]. This situation results in decreased space for third molar eruption and an increased risk of impaction. Moreover, skeletal patterns can influence the angle and depth of impaction, with certain skeletal types being more susceptible to specific patterns of impaction, such as mesioangular or distoangular [45].

Conclusion

The impacted third molars were in female patients. The mesiangular angle was found to have the highest prevalence. Most patients had class I malocclusion. Wisdom tooth impaction toward ramus was significantly associated with the ANB angle on the left side. On both sides, there was no significant relationship between the impaction of the wisdom tooth relative to the adjacent seventh tooth with the ANB angle, vertical facial height, and gonial angle. Only on the left side, a significant relationship was observed between the level of the wisdom tooth relative to the seventh tooth and the WITS scale. The impaction angle of the wisdom tooth had a significant relationship with the ANB angle on the right side of the maxilla, the WIST scale on the left side of the mandible, and the vertical facial height on the left side of the mandible and the right side of the maxilla.

Conflict of Interest

There is no conflict of interest to declare.

DOI: 10.18502/jcr.v12i3.20624

References

[1] Hupp JR, Tucker MR, Ellis E. Contemporary Oral and maxillofacial surgery-E-book: Elsevier health sciences; 2013.

[2] Ishwarkumar S, Pillay P, Haffajee M, Satyapal K. Prevalence of impacted third molars in the South African Indian population of the eThekwini Metropolitan Region. South African Dental Journal. 2019; 74.

[3] Idris AM, Al-Mashraqi AA, Abidi NH, Vani NV, Elamin EI, Khubrani YH, et al. Third molar impaction in the Jazan Region: Evaluation of the prevalence and clinical presentation. The Saudi dental journal. 2021; 33(4):194-200.

[4] Bamdadianf T. Evaluation of impact teeth prevalence and related pathologic lesions in patients in Northern part of Iran (2014-2016). J Contemp Med Sci| Vol. 2018; 4(1):30-2.

[5] Kan KW, Liu JK, Lo EC, Corbet EF, Leung WK. Residual periodontal defects distal to the mandibular second molar 6–36 months after impacted third molar extraction: A retrospective cross-sectional study of young adults. Journal of clinical periodontology. 2002; 29(11):1004-11.

[6] Motonobu A, Hidemichi Y, Eri U, Takashi T, Kenichi K. Cohort study of pain symptoms and management following impacted mandibular third molar extraction. Oral Diseases. 2017; 23(1):78-83.

[7] Celikoglu M, Kamak H. Patterns of third-molar agenesis in an orthodontic patient population with different skeletal malocclusions. The Angle orthodontist. 2012; 82(1):165-9.

[8] Sifuentes-Cervantes JS, Carrillo-Morales F, Castro-Núñez J, Cunningham LL, Van Sickels JE. Third molar surgery: Past, present, and the future. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology. 2021; 132(5):523-31.

[9] Vranckx M, Fieuws S, Jacobs R, Politis C. Prophylactic vs. symptomatic third molar removal: Effects on patient postoperative morbidity. Journal of Evidence Based Dental Practice. 2021; 21(3):101582.

[10] Khouri C, Aoun G, Khouri C, Saade M, Salameh Z, Berberi A, et al. Evaluation of third molar impaction distribution and patterns in a sample of Lebanese population. Journal of Maxillofacial. 2022:1-9.

[11] Riedel RA. A review of the retention problem. The Angle Orthodontist. 1960; 30(4):179-99.

[12] Tassoker M, Kok H, Sener S. Is there a possible association between skeletal face types and third molar impaction? A retrospective radiographic study. Medical Principles and Practice. 2019; 28(1):70-4.

[13] Yilmaz S, Adisen MZ, Misirlioglu M, Yorubulut S. Assessment of third molar impaction pattern and associated clinical symptoms in a central anatolian turkish population. Medical Principles and Practice. 2016; 25(2):169-75.

[14] Joshi N, Hamdan AM, Fakhouri WD. Skeletal malocclusion: a developmental disorder with a life-long morbidity. Journal of clinical medicine research. 2014; 6(6):399-408.

[15] Husain S, Rengalakshmi S. Correlation between mandibular third molar and mandibular incisor crowding: A retrospective CBCT-based study. J Dent Res Dent Clin Dent Prospects. 2021; 15(4):247-50.

[16] Palikaraki G, Mitsea A, Sifakakis I. Effect of mandibular third molars on crowding of mandibular teeth in patients with or without previous orthodontic treatment: a systematic review and meta-analysis. Angle Orthod. 2024; 94(1):122-32.

[17] Gokalp H, Erdem M. Assessing position changes of impacted third molars in treatment of class II malocclusion with premolars extraction. Acta odontologica Scandinavica. 2024; 83:582-7.

[18] Shokri A, Mahmoudzadeh M, Baharvand M, Mortazavi H, Faradmal J, Khajeh S, et al. Position of impacted mandibular third molar in different skeletal facial types: First radiographic evaluation in a group of Iranian patients. Imaging science in dentistry. 2014; 44(1):61-5.

[19] Hassan AH. Pattern of third molar impaction in a Saudi population. Clinical, cosmetic and investigational dentistry. 2010; 2:109-13.

[20] Novianty S, Melynda V, Yusuf M, Putranto R. The Relationship of Facial Soft Tissue A'N'B Angle and Facial Hard Tissue ANB Angle in Determination of Skeletal Relations. Odonto: Dental Journal. 2023; 10:34.

[21] Gasgoos S, Saleem N, Awni K. Cephalometric fea-

tures of skeletal Class I, II and III (A comparative study). Al-Rafidain Dental Journal. 2007; 7:122-30.

[22] Cortell-Ballester I, Almendros-Marqués N, Berini-Aytés L, Gay-Escoda C. Validation of a computer-assisted system on classifying lower third molars. Medicina oral, patologia oral y cirugia bucal. 2011; 16(1):e68-73.

[23] Prajapati VK, Mitra R, Vinayak KM. Pattern of mandibular third molar impaction and its association to caries in mandibular second molar: A clinical variant. Dental research journal. 2017; 14(2):137-42.

[24] Aryan Hesam A, Seyed Morteza S, Reza G. Molar impaction patterns and skeletal malocclusions. Journal of Craniomaxillofacial Research. 2022; 8(4).

[25] Sivaramakrishnan SM, Ramani P. Study on the prevalence of eruption status of third molars in South Indian population. Biology and Medicine. 2015; 7.

[26] Al-Anqudi SM, Al-Sudairy S, Al-Hosni A, Al-Maniri AJSQUMJ. Prevalence and pattern of third molar impaction: a retrospective study of radiographs in Oman. 2014; 14(3):e388.

[27] Al-Madani SO, Jaber M, Prasad P, Maslamani MJMA. The Patterns of Impacted Third Molars and Their Associated Pathologies: A Retrospective Observational Study of 704 Patients. 2024; 13(2):330.

[28] Syed KB, Zaheer KB, Ibrahim M, Bagi MA, Assiri MAJJoiohJ. Prevalence of impacted molar teeth among Saudi population in Asir region, Saudi Arabia–a retrospective study of 3 years. 2013; 5(1):43.

[29] Gupta S, Bhowate RR, Nigam N, Saxena SJISRN. Evaluation of impacted mandibular third molars by panoramic radiography. 2011; 2011(1):406714.

[30] Jung YH, Cho BH. Prevalence of missing and impacted third molars in adults aged 25 years and above. Imaging science in dentistry. 2013; 43(4):219-25.

[31] Singh P, Nath P, Bindra S, Rao SS, Reddy KVR. The predictivity of mandibular third molar position as a risk indicator for pericoronitis: A prospective study. National journal of maxillofacial surgery. 2018; 9(2):215-21.

[32] Ryalat S, AlRyalat SA, Kassob Z, Hassona Y, Al-Shayyab MH, Sawair F. Impaction of lower third molars and their association with age: radiological perspectives. BMC oral health. 2018; 18(1):58.

[33] Passi D, Singh G, Dutta S, Srivastava D, Chandra L, Mishra S, et al. Study of pattern and prevalence of mandibular impacted third molar among Delhi-National Capital Region population with newer proposed classification of mandibular impacted third molar: A retrospective study. National journal of maxillofacial surgery. 2019; 10(1):59-67.

[34] Hashemipour MA, Tahmasbi-Arashlow M, Fahimi-Hanzaei F. Incidence of impacted mandibular and maxillary third molars: a radiographic study in a Southeast Iran population. Medicina oral, patologia oral y cirugia bucal. 2013; 18(1):e140-5.

[35] Alfadil L, Almajed E. Prevalence of impacted third molars and the reason for extraction in Saudi Arabia. The Saudi dental journal. 2020; 32(5):262-8.

[36] Carter K, Worthington S. Predictors of Third Molar Impaction: A Systematic Review and Meta-analysis. Journal of dental research. 2016; 95(3):267-76.

[37] Aldrees AM. Pattern of skeletal and dental malocclusions in Saudi orthodontic patients. Saudi medical journal. 2012; 33(3):315-20.

[38] Ran ALY, Kamaruddin AF, Shafiai NAAJJoH, Medicine T. Investigation of the prevalence of skeletal patterns in the malay population using anb angle and principal component analysis of cephalometric variables. Complementary Therapy, Diagnostic and Advanced Material in Medical and Dentistry 2023 (Special Issue 1):226-34.

[39] Paddenberg E, Proff P, Kirschneck C. Floating norms for individualising the ANB angle and the WITS appraisal in orthodontic cephalometric analysis based on guiding variables. Journal of orofacial orthopedics=Fortschritte der Kieferorthopadie : Organ/official journal Deutsche Gesellschaft fur Kieferorthopadie. 2023; 84(1):10-8.

[40] Satwik A, Naveed N. Third molar impaction-review. Research Journal of Pharmacy and Technology. 2014; 7:1498-500.

 DOI: 10.18502/jcr.v12i3.20624

[41] Bhullar M, Thakur A, Mittal S, Aggarwal I, Palkit T, Goyal M. Evaluation and Correlation of Beta Angle with Wits Appraisal and ANB Angle in Various Skeletal Malocclusion Groups—A Cephalometric Study. Dental Journal of Advance Studies. 2021; 9.

[42] Breik O, Grubor D. The incidence of mandibular third molar impactions in different skeletal face types. Australian dental journal. 2008; 53(4):320-4.

[43] Panda S, Sharma K. Mandibular third molar impaction in different facial growth patterns. Rama Univ J Dent Sci. 2018; 5:8-6.

[44] Abu Alhaija ES, AlBhairan HM, AlKhateeb SN. Mandibular third molar space in different antero-posterior skeletal patterns. European journal of orthodontics. 2011; 33(5):570-6.

[45] Bin Rubaia'an MA, Neyaz A, Talic F, Alkhamis A, Alghabban A, Assari A. The Association Between Skeletal Facial Types and Third Molars Impaction in a Saudi Arabian Subpopulation: A CBCT Study. Clinical, cosmetic and investigational dentistry. 2023; 15:143-56.