

IMAGING EVALUATION OF THE IMPACTED TEETH BY USING AN ORTHOPANTOMOGRAPHY IN KURDISTAN REGION –IRAQ

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ABSTRACT

Objective: This study aimed to investigate the frequency and etiology of teeth impaction in OPG images, focusing on the third molars and canines.

Methods. This retrospective cross-sectional analytic study was conducted in the Kurdistan Region of Iraq, encompassing the three major cities of Duhok, Erbil, and Sulimanyia. The study included 6374 patients who underwent OPG for impaction assessment, including 2819 (44.23%) males and 3555 (55.77%) females. The angulation of Impacted Mandibular Third Molars (IMTMs) (Winter, 1926) was used to analyze independent variables in this study. **Results.** Molar impaction was the most common type of impaction, affecting 1498 (87.04%) of the 1721 impacted teeth, with a higher proportion of females (909, 60.68%) than males (589, 39.32%). Class 2 level B (32.58%), class 3 level C (32.15%), and class 2 level A (10.50%) were the most prevalent Pell types and levels for left LM (p-value = 0.0001 for all, p value = 0.2946 for class 3 levels B). Class 2 levels B (30.91%), class 3 Level C (26.20%), and Class 2 Level A (11.78%) for right LM showed a statistically significant difference between male and female patients for the left DM.

Conclusion: The most frequent types of impacted LM were the maxillary and canine teeth. These findings contribute to the existing knowledge on the factors that influence impaction and provide insights for the development of effective prevention and treatment strategies.

KEYWORDS: OPG, Canine Impaction, Impacted Teeth, Molar Impaction, Radiographic Study.

1. INTRODUCTION

Tooth impaction is characterized by the tooth's failure to erupt normally into the oral cavity. Lack of arch space or physical obstacles, such as a tooth obstructing the tooth's eruptive pathway or developing in an atypical position, may be to blame for impaction [(Nazir et al., 2014) (Zaman et al., 2021)]. The Royal College of Surgeons of England Faculty of Dental Surgery and the British Association of Oral and Maxillofacial Surgeons jointly published a guideline that defined an immature tooth as one that is lying in the jaws, partially or completely covered by the bone, or interfered with by other teeth in soft tissue (Anwar et al, 2008). The most usually impacted teeth are maxillary and mandibular third molars, maxillary cuspids, and maxillary central incisors (Anwar et al, 2008). Third molars are the most frequently encountered "impacted teeth" due to the close proximity of the teeth and their propensity to emerge later in the sequence of tooth eruption. (Reddy, 2012) Third molars are the teeth that are congenitally missing the most

frequently, however 90% of people have impacted teeth, with 33% having at least one third molar (Haq, 2002). Any tooth may become impacted in the oral cavity, but the third molar accounts for 98% of all impactions (Nazir et al., 2014), (Zaman et al., 2021). They are connected, either directly or indirectly, to a variety of conditions that affect the mouth, jaw, and facial areas, including cystic lesions, periodontitis, caries, and pericoronitis, resorption of the roots [(Nazir et al., 2014), (Mehdizadeh et al., 2014)(Hattab et al., 1995)]. As a result, one of the most frequent surgical procedures performed by oral and maxillofacial surgeons is the extraction of third molars (F.C.S. et al., 2003). If the unerupted tooth does not erupt after complete root creation or the contralateral tooth erupted roughly six months earlier with complete root formation, an impaction should be anticipated (Lindauer et al, 1992). Additionally, it was recommended by (Ericson & Kuroi., 1988) to suspect an impaction if the canine bulge disappears after the age of ten. The impaction of the maxillary canine is one of the toughest issues an orthodontist often faces (Lapin, 1951).

Following the third molar in terms of frequency of impacted teeth, the maxillary canine has a documented incidence of 2.8% of the population (Bishara, 1992); (F.C.S. et al., 2003). More often than not, maxillary canine impaction (MCI) occurs in the mouth as opposed to the mandible (Büyükkurt MC, 2010). Bilateral impactions are present in about 8% of MCI patients. According to research, women (1.17%) experience MCIs more frequently than men (0.51%), with a ratio of 2:1. (Bishara, 1992). A buccal or palatal impact may occur on the maxillary canine. However, palatal impactions happen more frequently (61%) compared to buccal impactions (4.5%). (Stivaros & Mandall, 2000) Regarding side distribution, there are opposing viewpoints. While (Stahl & Grabowski, 2003) as quoted in (Grande, et al 2006) observed an equal frequency, (Grande et al, 2006) discovered a larger incidence on the left side of the oral cavity.

2. MATERIALS AND METHODS

2.1. Study Design and Data Collection

This retrospective cross-sectional analytic study was conducted in the Kurdistan Region of Iraq, encompassing the three major cities of Duhok, Erbil, and Sulimanyia. The data collection was carefully selected to ensure equal representation from each city's government-run dental centers, with a data collection period spanning from December 2020 to April 2022.

OPGs were routinely obtained for screening and pre-treatment diagnostic purposes in these patients visiting the dental clinic in Kurdistan. None of the OPGs were collected primarily for this study. The research ethics committee of Duhok University gave its approval to the study protocol. All of the OPG pictures in this cross-sectional, retrospective investigation were checked by a single examiner for the presence of impacted teeth. After being reviewed, the OPG photos were subsequently filtered based on inclusion and exclusion standards. The data collection process involved acquiring OPG images from numerous dental centers and clinics throughout the region, amassing a total of 6,374 images. Of these, 3,455 were female and 2,919 were male patients. The rigorous methodology and careful selection of data sources ensure a high degree of scientific accuracy and reliability in the resulting analysis.

2.2. Study Variables

We had many study variables in our research because we used two types of radiographs and many impacted teeth so for molars, we used two methods for sorting data:

The radiographic examination method that is most frequently used in preoperative diagnosis to determine the position of the wisdom teeth is the panoramic radiograph. (Ahmet & Yildiray, 2014) Diagnostics by X-ray enables accurate diagnosis and establishes the clinical management methodology.

We can categorize third molars that are affected in order to assess their level of impaction and choose the most effective surgical technique. It is feasible to lower the risk of complications by planning the surgery based on the subject, physical examination, and other investigations like radiography.

1- The Pell and Gregory classification of the depth of impaction (Figure 1), the Pell and Gregory classification of the relationship with the ramus (Figure 2) (Pell and Gregory, 1942).

2- Winter's classification of the angulation of Impacted mandibular third molars (IMTMs) (Winter, 1926) (Figure 3) were used to analyze independent variables in this study. The line that connects the bifurcation of the tooth and the midway of the occlusal surface was identified as the mandibular molars' longitudinal axis. An orthodontic protractor was used to measure the angle formed by the second and third molars' longitudinal axes (Figure 3).

3- for Canines we used method of Ericson and Kurol (Ericson & Kurol., 1988) for measuring the angle and distance of Maxillary Canine Impaction and for defining sectors of Canine impaction, according to a modified version of Ericson and Kurol's criteria for the palatally displaced canine (PDC), the radiographic parameters that were examined to determine the position were as follows: Sector (S): The extent and severity of maxillary canine impaction can be determined using a variety of classification systems. According to Ericson and Kurol (1988), sector classification is based on where the canine tip lies in reference to the lateral incisor's root.

α Angle: the angle produced between the inter-incisor median line and the long axis of the impacted canine (normal value = 20–53°); Distance (d): the distance between the occlusal plane and the peak of the cuspid that has been struck (typical value = 7–26 mm) (Lindauer et al, 1992). as showed in (Figure 4,5).



Fig. (1): OPG image scaled the depth of the impaction as determined by Pell and Gregory's classification in relation to the occlusal plane. Class A: The highest portion of the mandibular third molar is situated either directly above or at the same level as the occlusal plane of the depth of the impaction as determined by Pell and Gregory's classification in relation to the occlusal plane. Class A: The highest portion of the mandibular third molar is situated either directly above or at the same level as the occlusal plane of the second molar next to it. Class B: The mandibular third molar's highest point lies between the occlusal plane and the second molar's cervical line. Class C: The mandibular third molar's uppermost portion lies below the second molar's cervical line.



Fig. (2): OPG image scaled Ramus related categorization by Pell and Gregory. (a) Class I: There is enough room for the eruption of the third molar between the distal side of the second tooth and the anterior border of the ascending ramus. (b) Class II: The distance between the distance between the distal side of the second molar and the anterior border of the ascending ramus is less than the third molar's crown's mesiodistal breadth. It shows that the distal part of the third molar crown is covered by ascending ramus bone. (c) Class III: The third molar is completely buried in the ascending ramus bone and there is a complete lack of space.

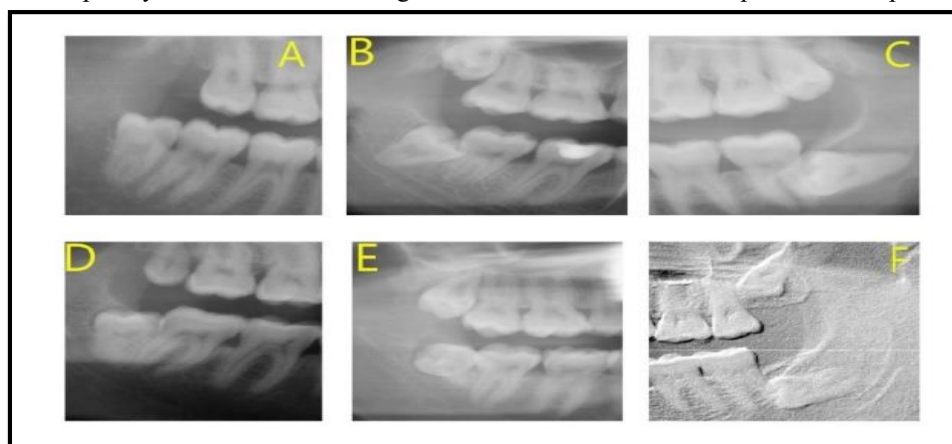


Fig. (3): OPG image scaled Impaction angulation in accordance with Winter's classification. (A) 10° to 10° vertical impaction Mesioangular impaction ranges from 11° to 79° (b). 80° to 100° of horizontal impaction. (d) Distoangular impaction, ranging from 11° to 79° Buccolingual impaction (e) occurs when the crown and roots overlap. (f) Other: 111 to 80 degrees.

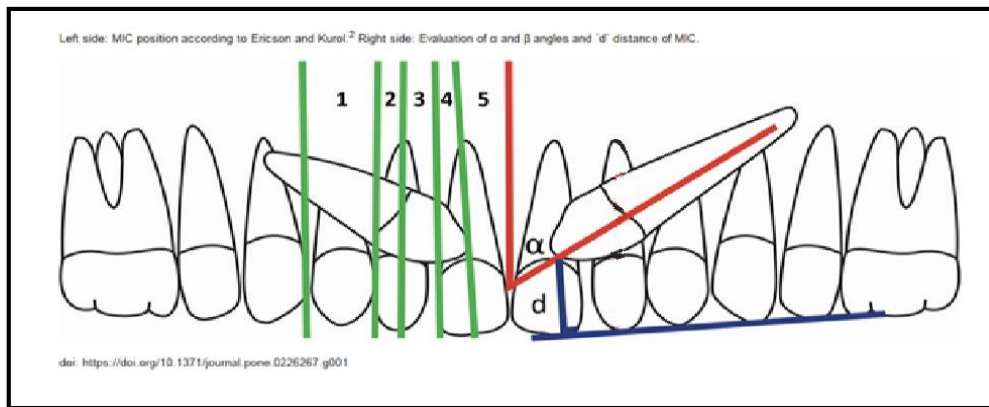


Fig. (4): Way of measuring the distance, Alpha angle and sectors for canine impaction according to Ericson and Kuroi (Ericson & Kuroi., 1988).

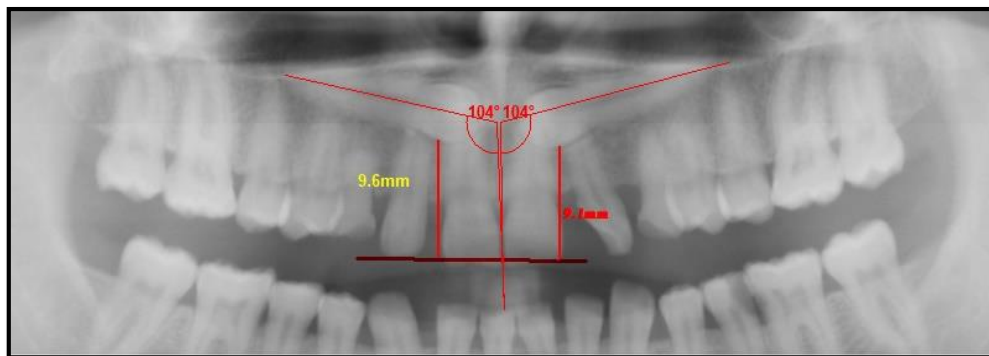


Fig. (5): OPG image scaled measuring the distance, Alpha angle and sectors for canine impaction according to Ericson and Kuroi (Ericson & Kuroi., 1988). in OPG images.

3. STATISTICAL ANALYSIS

According to their frequency and percentage, measurements of the mandibular canal position, impaction type, angulation and location, and bone contact were organized. The association between the kind of impaction, nerve location, bone contact, and angulation were assessed using Pearson's Chi-square test. Results were considered statistically significant if the p value was less than 0.05.

1. Results

Molar impaction was the most common type of impaction, affecting 1498 (87.04%) of 1721 impacted teeth, with a higher proportion of females than males. Canine impaction was less frequent, involving 153 (8.89%) of the impacted teeth. 680 (45.39%) were located in the upper dental arch and 1314 (87.72%) in the lower dental arch.

Table (1): Showing Distribution of tooth impacted by gender in OPG.

Cases	OPG			
		Male	Female	Sub-total
Molar	No	589	909	1498
	%	39.32	60.68	23.50
Canine	No	59	94	153
	%	38.56	61.44	2.40
Others	No	29	41	70
	%	41.43	58.57	1.10
Sub-total	No	677	1044	1721
Total	No	2819	3555	6374
	%	44.23	55.77	27.00

Table 2 shows the frequency and percentage of different types of tooth impaction among 6374 patients who underwent OPG. The table indicates that:

Third molar and canine impaction were the most common types of impactions, accounting for 87.04% and 8.89% of the impacted teeth respectively. The sub-total of impacted teeth was 1721 (27%).

Table (2): Frequency of impacted teeth in OPG images

Type of tooth	Frequency	Percentage
Third Molar	1498	23.50
Canine	153	2.40
Super Numerary	22	0.35
First Premolar	18	0.28
Second molar	14	0.22
Central Incisor	8	0.13
First Molar	6	0.09
Lateral Incisor	2	0.03
Sub-total	1721	27.00
total	6374	100

Table 3 The Ericsson and Kurol Method is a classification system for canine impaction based on the position and angulation of the canine relative to the adjacent teeth. The majority of canine impaction cases were type II, Type I,

Type IV, and Type III. There was no significant difference in the distribution of canine impaction types by gender or age group, as indicated by Pearson chi-squared tests.

Table (3): Canine impaction according to Ericsson and Kurol Method from 153 Cases in OPG images

Canine impaction according to Ericsson and Kurol Method in OPG	Total	Gender No (%)		Age No (%)		
		No (%)	Male	Female	15-25	26-35
Right Canine Impaction (n=103)						
I	17	5 (13.89)	12	11(14.67)	4	2 (33.33)
II	(16.51)	27	(17.91)	57(76.00)	(18.18)	4 (66.67)
IV	78	(75.00)	51	7 (9.33)	17	0 (0.00)
	(75.73)	4 (11.11)	(76.12)		(77.27)	
	8 (7.77)		4 (5.97)		1 (4.55)	
p-value (two-sided)		0.5974		0.6826		
		Gender No (%)		Age No (%)		
		Male	Female	15-25	26-35	36-45
Left Canine Impaction (n=116)						
I	17	6 (14.29)	11	9 (10.34)	7	1 (25.00)
II	(14.66)	30	(14.86)	69(79.31)	(28.00)	3 (75.00)
III	89	(71.43)	59	1 (1.15)	17	0 (0.00)
IV	(76.72)	1 (2.38)	(79.73)	8 (9.20)	(68.00)	0 (0.00)
	1 (0.86)	5 (11.90)	0 (0.00)		0 (0.00)	
	9 (7.76)		4 (5.41)		1 (4.00)	
p-value (two-sided)		0.3250		0.4133		

Pearson chi-squared tests were performed for statistical analyses.

In Table 4 Ericsson and Kurol technique shows that there is no statistically significant variation in the distance and alpha angle of impacted canines between genders or age groups. The average distance between affected

canines and their alpha angle is marginally greater on the right side than the left, but this difference is not statistically significant. The mean angle and distance d are slightly higher on the right side than on the left side, but this

difference is not statistically significant. The Ericsson and Kurok method is a radiographic method that assesses various degrees of impaction depending on the placement of the canine on a sector categorization. The results of the study suggest that impacted canines in the

15-25 age group are more likely to be displaced palatally and closer to the occlusal plane than impacted canines in the 26-35 and 36-45 age groups. This may be due to the growth of the maxilla in younger patients.

Table (4): Canine measurement of Distance and Alpha angle according to Ericsson and Kurok Method.

	Total	Gender Mean (SD)		P	Age groups Mean (SD)			P
	Mean (SD)	Male	Female		15-25	26-35	36-45	
Right alpha angle	42.16 (15.36)	42.00 (15.66)	42.26 (15.30)	0.9350	41.38 (15.74)	45.10 (14.48)	42.50 (13.70)	0.6312
Distance (Right alpha angle)	4.015 (1.21)	3.95 (1.17)	4.06 (1.25)	0.6658	4.02 (1.19)	4.00 (1.39)	4.00 (0.90)	0.9962
Left alpha angle	41.15 (14.25)	38.68 (12.12)	42.32 (15.09)	0.2014	40.59 (14.72)	42.48 (12.32)	45.75 (16.40)	0.6902
Distance (Left alpha angle)	3.874 (1.23)	3.74 (1.25)	3.94 (1.22)	0.4153	3.94 (1.23)	3.62 (1.27)	3.93 (0.74)	0.5464

Pearson chi-squared tests were performed for statistical analyses.

The table 5 presents the distribution of 3rd molar impaction based on gender and age groups. The total sample size for 3rd molar impaction is 1498, with 538 males and 960 females. Age distribution is 15-25, 25-35, and 36-45 years. Levels of 3rd molar impaction

include 1 impacted molar, 2 impacted molars, 3 impacted molars, and 4 impacted molars. Statistical analysis indicates that there are significant associations between gender and 3rd molar impaction and between age groups and 3rd molar impaction.

Table (5): Distribution of 3rd molar impaction based on gender and age groups. (One 3rd molar impacted, 2 molars impacted, 3 molars impacted and all 4 impacted).

	Total	Gender No (%)		Age No (%)		
		Male (n=538)	Female (n=960)	15-25 (n=1121)	25-35 (n=316)	36-45 (n=61)
3rd Molar impaction (n=1498)						
1 3 rd molar impacted	562 (37.52)	235 (43.68)	327 (34.06)	412 (36.75)	123 (38.92)	27 (44.26)
2 3 rd molars impacted	546 (36.45)	213 (39.59)	333 (34.69)	399 (35.59)	117 (37.03)	30 (49.18)
3 3 rd molars impacted	214 (14.29)	50 (9.29)	164 (17.08)	182 (16.24)	32 (10.13)	0 (0.00)
4 3 rd molars impacted	176 (11.75)	40 (7.43)	136 (14.17)	128 (11.42)	44 (13.92)	4 (6.56)
P-value		<0.0001		0.0010		

Pearson chi-squared tests were performed for statistical analyses.

Table 6 displays the distribution of impacted teeth by gender and age group in the upper molar (UM) and lower molar (LM). Male patients with unilateral impacted teeth outnumbered female

patients with UM, while female patients outnumbered male patients with bilateral impacted teeth. Age and gender differences between the groups for UM were statistically significant. In LM, there were more bilaterally impacted teeth than unilaterally.

Table (6): Distribution of Impacted Teeth by Gender and Age Group in UM (Upper Molar) and LM (lower Molar) Winter classification Datasets."

UM Upper Molar	Total impacted teeth	Gender no (%)		Age no (%)		
LM Lower Molar	No (%)	Male	Female	18-25	26-35	36-45
Impacted teeth UM						
winter (n=680)	355 (52.21)	121	234	278	56	21
Unilateral	325 (47.79)	(62.69)	(48.05)	(53.88)	(40.29)	(84.00)
Bilateral		72	253	238	83	4
		(37.31)	(51.95)	(46.12)	(59.71)	(16.00)
p-value	0.0006				<0.0001	
Impacted teeth LM						
winter (n=1314)	633 (48.17)	236	397	468	141	24
Unilateral	681 (51.83)	(50.11)	(47.09)	(47.23)	(51.46)	(48.98)
Bilateral		235	446	523	133	25
		(49.89)	(52.91)	(52.77)	(48.54)	(51.02)
p-value	0.2946				0.4595	

Pearson chi-squared tests were performed for statistical analyses.

Table 7 shows the distribution of impacted mandibular third molars (LM) based on Pell type, level, angulation, gender, and age group. Class 2 level B, class 3 level C, and class 2 level A were the most prevalent Pell types and levels for left LM, with a statistically significant difference between male and female patients. All Pell classes and levels, except for class 2 level C and class 3 level B, showed a significant

difference in age groups for left LM. Class 2 level B, class 3 level C, and class 2 level A were the most prevalent Pell types and levels for right LM. There were more impacted teeth in the second position than in the first position for both the left and right LM. There was no discernible difference in age categories for patients with first or second position impacted teeth.

Table (7): Prevalence and Distribution of Impacted Mandibular Third Molars by Pell Type, Level, Angulation, Gender, and Age Group."

	Total	Gender No (%)			Age No (%)			
Molar Pell	No (%)	Male	Female	P	15-25	25-35	36-45	P
Impacted LM type Pell (left)								
Class 1 Level A	62 (6.65)	20 (3.26)	42 (13.13)	<0.0001	50 (7.13)	6 (3.11)	6 (15.38)	<0.0001
Class 1 Level B	62 (6.65)	49 (7.99)	13 (4.06)		36 (5.14)	21 (10.88)	5 (12.82)	
Class 1 Level C	18 (1.93)	8 (1.31)	10 (3.13)		14 (2.00)	4 (2.07)	0 (0.00)	
Class 2 Level A	98 (10.50)	69 (11.26)	29 (9.06)		75 (10.70)	23 (11.92)	0 (0.00)	
Class 2 Level B	304 (32.58)	204 (33.28)	100 (31.25)		245 (34.95)	46 (23.83)	13 (33.33)	
Class 2 Level C	71 (7.61)	57 (9.30)	14 (4.38)		67 (9.56)	4 (2.07)	0 (0.00)	
Class 3 Level B	18 (1.93)	12 (1.96)	6 (1.88)		12 (1.71)	6 (3.11)	0 (0.00)	
Class 3 Level C	300 (32.15)	194 (31.65)	106 (33.13)		202 (28.82)	83 (43.01)	15 (38.46)	
Impacted LM type Pell (right)								
Class 1 Level A	68 (6.41)	40 (10.36)	28 (4.15)	<0.0001	40 (4.93)	12 (5.61)	16 (45.71)	<0.0001

Class 1 Level B	107 (10.08)	34 (8.81)	73 (10.81)		74 (9.11)	33 (15.42)	0 (0.00)	
Class 1 Level C	41 (3.86)	0 (0.00)	41 (6.07)		37 (4.56)	4 (1.87)	0 (0.00)	
Class 2 Level A	125 (11.78)	38 (9.84)	87 (12.89)		108 (13.30)	17 (7.94)	0 (0.00)	
Class 2 Level B	328 (30.91)	122 (31.61)	206 (30.52)		255 (31.40)	69 (32.24)	4 (11.43)	
Class 2 Level C	83 (7.82)	41 (10.62)	42 (6.22)		69 (8.50)	14 (6.54)	0 (0.00)	
Class 3 Level B	25 (2.36)	6 (1.55)	19 (2.81)		25 (3.08)	0 (0.00)	0 (0.00)	
Class 3 Level C	278 (26.20)	99 (25.65)	179 (26.52)		204 (25.12)	65 (30.37)	9 (25.71)	
Mesioangular	6 (0.57)	6 (1.55)	0 (0.00)		0 (0.00)	0 (0.00)	6 (17.14)	
Total left right of LM								
1	634 (48.25)	236 (50.11)	398 (47.21)	0.3141	469 (47.33)	141 (51.46)	24 (48.98)	0.4771
2	680 (51.75)	235 (49.89)	445 (52.79)		522 (52.67)	133 (48.54)	25 (51.02)	

Pearson chi-squared tests were performed for statistical analyses.

Table 8 shows the prevalence and distribution of impacted lower molars (LM) by Winter angulation, gender, and age group. Mesioangular (40.75%) was the most frequent Winter

angulation for left LM, followed by horizontal (30.29%) and vertical (21.63%). For all Winter angulations, there was a significant difference in the left LM between the age groups.

Table (8): Frequency of Molar impaction according to Winter classification in OPG scans.

Impacted winter	Total	Gender No (%)		P-value	Age groups No (%)			P-value
	No (%)	Male	Female		15-25	25-35	36-45	
Impacted LM winter (left) (n=984)								
Buccoangular	19 (1.93)	4	9 (1.40)	0.1106	8	0	5	<0.0001
Distoangular	53 (5.39)	(1.09)	42		(1.03)	(0.00)	(14.29)	
Horizontal	298	10	(6.53)		52	0	0	
Mesioangular	(30.29)	(2.72)	176		(6.70)	(0.00)	(0.00)	
Vertical	401	111	(27.37)		202	79	6	
	(40.75)	(30.16)	258		(26.03)	(39.50)	(17.14)	
	213	152	(40.12)		300	94	16	
	(21.65)	(41.30)	158		(38.66)	(47.00)	(45.71)	
		91	(24.57)		214	27	8	
		(24.73)			(27.58)	(13.50)	(22.86)	
Impacted LM winter (right) (n=1011)								
Buccoangular	13 (1.29)	4	9 (1.40)	0.1106	8	0	5	<0.0001
Distoangular	52 (5.14)	(1.09)	42		(1.03)	(0.00)	(14.29)	
Horizontal	287 (28.39)	10	(6.53)		52	0	0	
Mesioangular	410 (40.55)	(2.72)	176		(6.70)	(0.00)	(0.00)	
Vertical	249 (24.63)	111	(27.37)		202	79	6	
		(30.16)	258		(26.03)	(39.50)	(17.14)	
		152	(40.12)		300	94	16	
		(41.30)	158		(38.66)	(47.00)	(45.71)	
		91	(24.57)		214	27	8	
		(24.73)			(27.58)	(13.50)	(22.86)	

Pearson chi-squared tests were performed for statistical analyses.

DISCUSSIONS

The aim of this study was to investigate the prevalence and etiology of tooth impaction in adult patients in Kurdistan Region -Iraq. Tooth impaction is a common problem that can affect the alignment and appearance of teeth, as well as cause complications such as resorption, infection, cysts, and tumors (Karolina et al, 2016). Several factors have been reported as possible causes for impaction, such as lack of space, early physical maturation, delayed mineralization, genetic factors, and environmental factors (Mushtaq Bhat ; et al, 2019).

The study analyzed 6374 orthopantomograms (OPGs) of patients aged 18 years or older and found that 27% of them had at least one impacted tooth. The most common type of impacted tooth was the molar (23.5%), followed by the canine (2.4%), and other types of teeth (1.1%). The maxilla was the most frequent location for impacted teeth (67.3%), especially for canines (97.1%). The mandible was more common for impacted molars (63.9%). Females had more impacted teeth than males (55.77% vs 44.23%), especially for canines (61.44% vs 38.56%). The most common angulation for impacted molars was vertical (53%), followed by horizontal (20%), mesioangular (15%), oblique (7%), and distoangular (5%). The study covered the three main cities of Duhok, Erbil, and Sulimanyia. The angulation of Impacted Mandibular Third Molars (IMTMs) was measured according to Winter's classification (1926). The results showed that molar impaction was the most frequent type of impaction, accounting for 1498 (87.04%) of the 1721 impacted teeth. There was a higher prevalence of molar impaction among females (909, 60.68%) than males (589, 39.32%). The most common Pell types and levels for left LM were class 2 level B (32.58%), class 3 level C (32.15%), and class 2 level A (10.50%), with a significant difference between genders for all types and levels except for class 3 level B (p-value = 0.0001 for all, p value = 0.2946 for class 3 level B). For right LM, the most common Pell types and levels were class 2 level B (30.91%), class 3 level C (26.20%), and class 2 level A (11.78%), with a significant difference between genders for all types and levels. The study concluded that OPG is a useful tool for assessing impacted teeth and their angulation in the Kurdistan Region of Iraq.

The prevalence of impacted teeth in this study was similar to some studies conducted in other regions of the world. The findings of this study suggest that tooth impaction is a prevalent condition in adult patients in Kurdistan Region -Iraq. The etiology of tooth impaction may be multifactorial and influenced by genetic and environmental factors. Early diagnosis and intervention are recommended to prevent or minimize the adverse effects of tooth impaction on oral health and quality of life.

Similar to the prevalence of impacted teeth in Saudi patients was found to be **13.2%** (Alamri et al, 2020) and this prevalence rate is similar to rates found in other regions of the world, such as **13.7%** among the Greek population, (Gisakis, et al , 2011) **14.1%** among Finnish patients (AITASALO, et al, 1972), 16.8% in northern India (Patil & Maheshwari , 2014), 44.1% in the central part of Iran (Arabion, et al , 2017.), and **28.3%** among Chinese patients in Hong Kong (Chu et al, 2003). The alignment and appearance of teeth can be affected when canine teeth are impacted. A variety of studies have been done to examine the prevalence of this condition in Saudi Arabia and other countries. AlZahrani (Zahrani, 1993) discovered in 1993 that 3.6% of 4898 Saudi patients had at least one impacted canine. Afify and Zawawi (Afify & Zawawi, 2012) found a comparable rate of 3.3% in Jeddah in 2014. Mustafa (Mustafa, 2015) and Alrwuili (Alrwuili, et al, 2016) reported lower rates of 1.44% and 4.33%, respectively, in Abha and Al-Jouf. Melha et al. (Melha, et al, 2017) and Alhammadi et al. (Alhammadi, et al , 2018) noted similarly low rates of 3.65% and 1.9%, respectively, in their retrospective analyses of radiographs. (Alyami, et al, 2020) observed a higher rate of 5.35% in Najran. Turkey and Nigeria had rates of 3.58% (Aydin, et al, 2004) and 9.8% (Yemitan, 2018), respectively. These findings correlate with those of (Fardi et al, 2011), who found that 170 (13.7%) of Greek patients had at least one impacted tooth. Our research revealed that the impacted and for molars we found that 23.50 % from the total of impacted teeth, canines were 2.40 %, Othman (Othman, 2009) discovered a similar distribution among Malaysians. The maxillary third molar (13.4%) was the second-most common impacted tooth, followed by the maxillary canines (1.7%) and mandibular canines (0.6%). This was in agreement with Al-Faleh (Al-Faleh, 2009), who said that among Pakistani patients, the mandibular and maxillary third molar, the

maxillary canines, the mandibular and maxillary second premolar, and the maxillary central incisors were the most often implicated teeth, in that order.

A Brazilian subpopulation and Tanzanian individuals both had a comparable distribution of tooth impaction. (Pedro et al. , 2014) (Msagati, et al , 2013). According to studies about canine impaction, the prevalence ranges from 0.8 to 2.8% in the population of Europe (Grover & Lorton, 1985) and (Kramer and Williams, , 1970) from 5.1% to 5.2% in the population of Turkey (Celikoglu, et al, 2010). Maxillary canine impaction was estimated to occur 1.7% of the time (Ericson & Kuroi, 1986) and 0.92% of the time (Dachi & Howell, 1961). Chinese and Japanese populations have been reported to have the lowest prevalence of maxillary canine impaction (Takahama & Aiyama, 1982). According to studies conducted, (Al-Zoubi et al, 2017), and (Al Fawzan, et al, 2017), the population of Saudi Arabia is 3.41 %, 10.1%, and respectively. In agreement with (Chu et al, 2003), who conducted a retrospective analysis among a Hong Kong Chinese community and reported a 28.3% prevalence of impacted third molars, our investigation indicated that 23.50% of 6374 patients had impacted third molars. A comparable prevalence percentage of 27.8% among a Hong Kong population was also observed by (Tang, 2006). According to a prior study by (Aydin, et al, 2004), the incidence of affected canines was 3.58%. Furthermore, 3.6% of 4,898 Saudi patients with an age range of 13 or older in (Zahrani, 1993) study had at least one impacted cuspid. 101 cases of impacted cuspids were found after (Rózsa et al , 2003) analysis of 1,858 cases. Our study with 70 out of 6374 total. Racial differences and different study methodologies may be the cause of the varying findings of these studies. It was verified that impacted canines in the mandible were uncommon. In fact, the maxilla, which had already been identified by others as the primary location, housed the majority of the damaged canines.

In contrast, (Fardi et al, 2011) showed that among 225 impacted teeth, canines (59.6%), premolars (19.1%), and extra teeth (15.1%) were the most frequently afflicted teeth, whereas the frequency of impacted molars was significantly lower (6.2%).

Vertical angulation was seen in 53% of impacted mandibular third molars, followed by

horizontal, mesioangular, and oblique, with distoangular being the least common. This was in contrast to the findings of Bokhari et al., who reported that among the impacted mandibular third molars, the majority of patients (50.75%) had mesio-angular impaction and just 1.4% had distoangular impaction. Our study investigated the frequency of molar impaction in OPG images using the Winter classification. Gender and age categories were taken into account when analyzing the study's 984 cases of impacted left molar teeth and 1,011 cases of impacted right molar teeth. Based on the direction and depth of impaction, the Winter categorization system divides molar impaction into different categories. In the study, the following categories were taken into account:

The findings revealed that horizontal impaction and mesioangular impaction were the two types of molar impaction that occurred more frequently in both the left and right molar teeth. The least frequent type of impaction in both the left and right molar teeth was distoangular.

The frequency of molar impaction varied by gender, with females having a slightly larger percentage of impacted teeth than males. However, there was no statistically significant change. The 25–35 age group had the highest frequency of molar impaction, according to an examination of age groups. To determine the results' statistical significance, Pearson chi-squared tests were conducted. The studies revealed that, with the exception of Buccoangular impaction, there were statistically significant differences in the frequency of molar impaction between the various Winter classes. In conclusion, the study revealed that horizontal impaction is the second most frequent type of molar impaction, after mesioangular impaction. The age range of 25 to 35 has the highest frequency of molar impaction, and females are somewhat more likely than males to have impacted teeth. Except for Buccoangular impaction, there were statistically significant differences in the incidence of molar impaction among the other Winter classes.

According to the study, there are differences in the frequency and distribution of impacted teeth among various ethnicities, which can be attributed to a variety of genetic, environmental, nutritional, and cultural factors. The study found that OPG is a trustworthy and practical technique for identifying impacted teeth and choosing the best treatment options.

The study presents its goals, strategies, findings, and discussion in a very clear manner. It offers significant background data on the subject of impacted teeth and OPG in addition to pertinent citations to back up its claims. To present its data and comparisons with other studies, it makes use of tables and figures. It uses suitable scientific language and vocabulary and has a logical framework. It also points out its shortcomings and recommends topics for further study.

CONCLUSION

This study investigated the frequency and etiology of teeth impaction in OPG images, focusing on the third molars and canines. The results showed that 23.5% of them had at least one impacted tooth, with the most common types being the third molars and canines. Females had more impacted teeth than males, especially for canine teeth. The study also found that horizontal and mesioangular impactions are the most common types of molar impaction, and distoangular impaction is the least common. These findings provide insights for future research on the factors that influence teeth impaction and the development of effective prevention and treatment strategies. Further studies are needed to explore the etiology, pathogenesis, complications, and management of teeth impaction in different populations and settings.

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