PREVALENCE OF IMPACTED THIRD MOLARS AMONG A JORDANIAN COHORT ACCORDING TO PELL-GREGORY AND WINTER CLASSIFICATIONS

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ABSTRACT

Background: Impaction is the failure of a tooth to erupt into the dental arch during an anticipated period without intervention. The frequency of impacted teeth varies between various ethnic populations.
Objectives: To assess the prevalence of impacted third molars of a sample of Jordanian dental patients and to consider the difficulty of elective surgical extraction procedure.

Methods: A retrospective study of 130 adult patients (57 female, 73 male; age 18-58) with at least one impacted third molar, presenting at King Hussein Hospital, King Hussein Medical City, Amman, Jordan, between January 2022 and January 2023. Radiographs of impacted mandibular wisdom teeth were analysed using orthopantomograms (OPGs) taken via a Carestream Dental panoramic unit, model CS 8100 SC, with a magnification ratio of 1.2 (. The following criteria were assessed: axis of second molar; third molar position and inclination; plane of occlusion; tangent line related to anterior border of mandibular ramus; soft tissue and bone volume coverage of impacted third molar. The degree and classification of impaction were identified according to Pell-Gregory (level A, B and C) and Winter (vertical, mesioangular, horizontal, distoangular, buccolingual and inverted) classifications. The impaction was compared to the anterior border of the ramus (Class I, II and III). The cause of extraction was classified as symptomatic or asymptomatic. The type of impaction was evaluated if it was fully or partially impacted and whether the type of overlying tissue was soft tissue or bony impaction.
Chi-square ($\chi 2$) tests with a P-value of less than 0.05 were used to determine statistical significance.

Conclusion: Most participants had elective asymptomatic extraction causes. The identified degree and classification of impaction will help dentists and oral surgeons to decrease procedure time and complications in extractions.

Keywords: Molar: Third, Impaction, Incidence, Extraction, Jordan, Classification, Pell -Gregory, Winter.

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INTRODUCTION

Impaction is the failure of teeth to erupt into the dental arch during an anticipated period without intervention. The frequency of impacted teeth varies between various ethnic populations (Mustafa, 2015), but is a common dental abnormality. Tooth impaction ranges between 0.08 and 3.6% in the general population. The impacted tooth is fully or partially un-erupted and located against another tooth, bone or soft tissue, and it is difficult to erupt at a later stage.

These teeth are commonly described as included or retained. Percentage of use of the masticatory complex and genetics influence the time of third molar eruption. The most frequently impacted teeth are third molars, which usually erupt between the ages of 17 and 21. The teeth frequently affected are the third molars, mandibular canines, premolars and central incisors. When the third molars are impacted, they are commonly correlated with root resorption, dental caries, pain and swelling

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The gradual decrease in the size of the human mandible caused a mandible to be too small to be able to adapt to the corresponding molars. The causes of third molar impaction include insufficient skeletal growth, macrodontia, late maturation of the third molars, and systemic and local factors such as cleidocranial dysplasia (Alfadil & Almajed, 2020). Pericoronitis, cystic lesions and caries are all associated with impacted teeth. Recent diet with insignificant masticatory effort, caused loss of maxillary growth activation and increased impaction of the teeth. Nature of the diet causes attrition, decreased mesio-distoangulated diameter of the crown.

There are two major classification systems for impaction. In the Pell-Gregory classification, third molar impaction is classified based on the vertical depth of the tooth compared to the occlusal surface of the second molar, and on the horizontal impaction to the body of the ramus (Pell, 1933). In the Winter classification, developed in 1926, third molar impaction is based on angulation (Winter, 1926, 41). The mandibular third molars have been radiographically classified by angulation on the maxillo-mandibular bone (horizontal, vertical, mesioangulated or distoangulated, and inverted; vertical relations with the crown of the adjacent second molar (Class A, B, C), and spatial relations with ascendant ramus of the inferior border of the mandible (Class I, II, III). Ortopantomographic (panoramic) imaging is the gold standard for assessing the maxillo-mandibular complex and dento-alveolar region.

The aim of our investigation was to determine the prevalence and pattern of impacted third molars in a sample of Jordanian dental patients, and to assess the difficulty of elective surgical extraction procedure.

METHODS

This study was a retrospective design involving 130 adult patients (57 female, 73 male; age 18-58) with at least one impacted third molar, presenting at King Hussein Hospital, King Hussein Medical City, Amman, Jordan, between January 2022 and January 2023. Written consent was obtained from all participants and ethics approval was granted by the local ethical and research board review committee of the Jordanian Royal Medical Services. Participants with Downs syndrome with craniofacial abnormalities or incomplete root formation of the third molars were excluded.

Radiographs of impacted mandibular wisdom teeth were analysed using orthopantomograms (OPG) taken via a Carestream Dental panoramic unit, model CS 8100 SC, with a magnification ratio of 1.2 (. The following criteria were assessed: axis of second molar; third molar position and inclination; plane of occlusion; tangent line related to anterior border of mandibular ramus; soft tissue and bone volume coverage of impacted third molar. The cause of extraction was classified as symptomatic or asymptomatic. Symptomatic third molars were those causing pain or disturbed mastication and/or with a cyst or tumour lesions.

The degree and classification of impaction were identified according to the Pell-Gregory and Winter classifications. The angle between the long axis of the third molar and the second molar was obtained using an orthodontic protractor and evaluated using the Winter classification (vertical, mesioangular,horizontal,distoangular, buccolingual or inverted). Impaction was classified using the Pell-Gregory classification for the depth of the third molars when compared to the cementoenamel junction (CEJ) level in the alveolar bone and the second molar. The Pell-Gregory classification is based on to the depth of the impacted third molar in relation to the occlusal plane, with three levels:

level A - the occlusal plane of the impacted tooth is at the same level as the adjacent tooth; level B - the occlusal plane of the impacted tooth is between the occlusal plane and the cervical line of the adjacent tooth (if any part of the CEJ was lower than the bone level); level C - the occlusal plane of the impacted tooth is apical to the cervical line of the adjacent tooth.

Level C teeth require further classification of the impaction compared to the anterior border of the ramus (classes I, II and III):class I- situated anterior to the anterior border of the ramus; class II - crown half-covered by the anterior border of the ramus; class III - crown fully covered by the anterior border of the ramus.

The type of impaction was evaluated as to whether it was fully or partially impacted and whether the type of overlying tissue was a soft tissue or bony impaction. Figure 1 shows the position of impacted teeth according to the classification of cases.

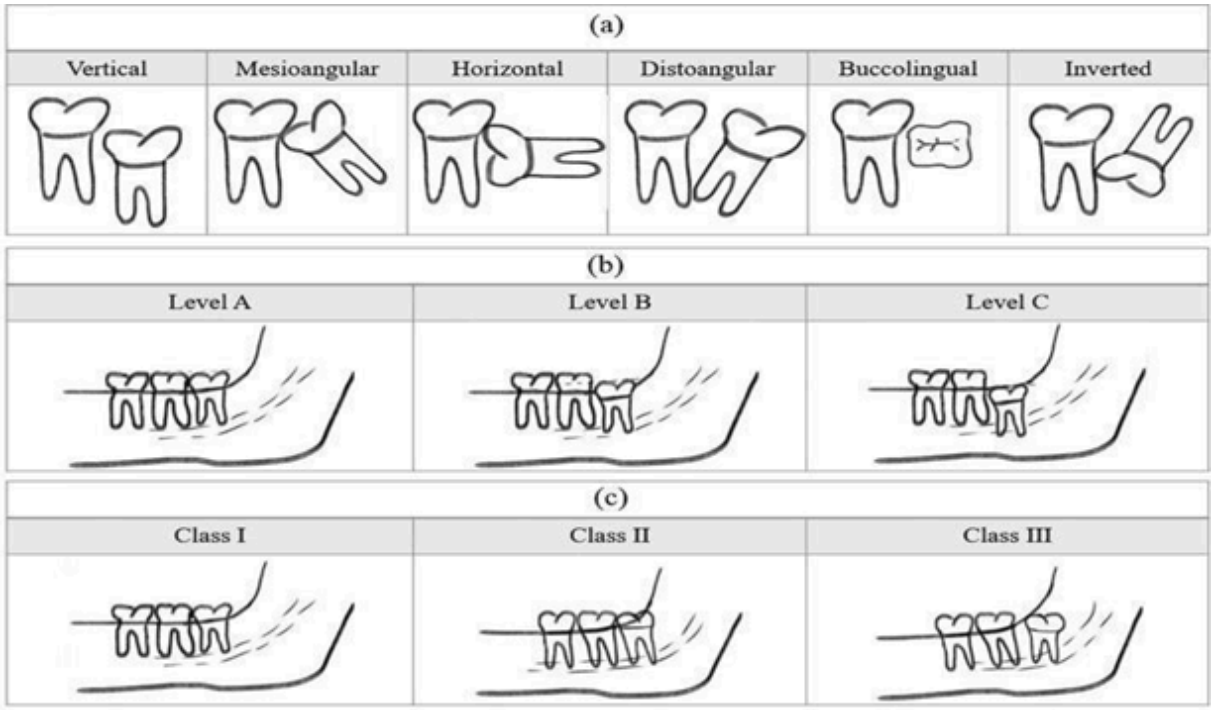

Figure 1. (a) Winter classification: angle of impaction;(b) Pell-Gregory classification: depth of impaction according to CEJ of second molar;(c) Pell- Gregory classification: relationship of impacted wisdom teeth to anterior border of mandibular ramus (Alfadil & Almajed, 2020).

STATISTICAL ANALYSIS

Chi-square ($\chi 2$) tests were used to determine statistical significance. A P-value of less than 0.05 was considered statistically significant.
The chi-square test is used to compare the distribution of a categorical variable in one sample or group with the distribution in another sample or group. If the distribution of the categorical variable does not vary much across groups, we can conclude that the distribution of the categorical field variable is independent of the variable of the group.

RESULTS

A total of 390 participants enrolled in the study, 130 of whom had 370 third molars. The prevalence of impaction was similar regardless of sex, with 56.2% of male patients and 43.8% of female patients. The mean age of participants was 29.8 (+/-7.4) years old; Table (1).
In the angular spread pattern, there are statistically significant differences in the presence of differences in the spread patterns in the mandible and maxilla. In the lower jaw, the linear spread pattern was the most prevalent, with a rate of (23.8%), and in the upper jaw,

Or we can say that categorical variables and groups are independent. Fisher's exact test is really only used when analyzing small samples, but it is valid for virtually all sample sizes. Although the chi-square test is based on approximations.
. Fisher's exact test uses the hypergeometric distribution of the numbers in the table cells to assess the null hypothesis of independence. Many software packages provide Fisher's exact test results for 2 x 2 contingency tables, but not for larger contingency tables with more rows or columns. (kim,2017).

the rectangular spread was the most prevalent, with a rate of (6.9%)و and the value of statistical significance was (p = 0.001) was chi-square (184.585);(table4,5).
According to the Pell-Gregory classification, there were depth differences between the teeth in the mandible, and the A-level impact depth was more common in the mandible and maxilla by 46.9% (10.8%) and the statistically significant value was (p = 0.02) chi-square (0.353); (table 6,7).
Classification showed that class II in both the upper and lower sides was the most common with a ratio of (55.4) & (10%) respectively (p = 0.007) and a chi-square value of (0.923).;(table

Table 1: Patient demographics.

Parameter	No. (%)
Sex M F	73 57
Age (mean, SD)	18-58 (29.8 +/-7.4)
Study group	390
Patients with third molars	130
Number of impactions	283
Total	130(100)

Table 2.Impaction based on gender and mandible ramus

		Gender		Total
		male	Female	
Mandible	Count	60	50	110
	% of Total	46.20%	38.50%	84.60%
	Count	13	7	20
Maxilla	% of Total	10.00%	5.40%	15.40%
	Count	73	57	130
	% of Total	56.20%	43.80%	100.00%

Table 3.Chi-square for Pattern of impaction based on gender

Fisher exact test	0.467
Df	1
p-value	0.269

2*2 computed table
0 cells (0.0%) have expected count less than 5.
The minimum expected count is 8.77.[a]

Table 4.Pattern of impaction based on angulation.

		Vertical	Mesioangular	Horizontal	Distoangular	Horizontal & Mesioangular	Mesioangular & Vertical	Horizontal, Distoangular	Distoangular & Mesioangular	Horizontal & Vertical	Total
Mandible	Count	31	30	12	8	6	14	0	5	4	110
	Percent	23.80%	23.10%	9.20%	6.20%	4.60%	10.80%	0.00%	3.80%	3.10%	84.60%
Maxilla	Count	7	9	0	0	0	1	1	1	1	20
	Percent	5.40%	6.90%	0.00%	0.00%	0.00%	0.80%	0.80%	0.80%	0.80%	15.40%
Total	Count	38	39	12	8	6	15	1	6	5	130
	Percent	29.20%	30.00%	9.20%	6.20%	4.60%	11.50%	0.80%	4.60%	3.80%	100.00%

Table 5.Chi-square for Pattern of impaction based on angulation.

Chi square value	13.234
Df	8
p-value	0.041

Table 6. Impaction based on shape and mandible shape

		Level A	Level B	Level C	Level AB	Level AC	Level BC	Total
Mandible	Count	61	29	10	5	2	3	110
	Percent	46.90%	22.30%	7.70%	3.80%	1.50%	2.30%	84.60%
Maxilla	Count	14	3	0	2	1	0	20
	Percent	10.80%	2.30%	0.00%	1.50%	0.80%	0.00%	15.40%
Total	Count	75	32	10	7	3	3	130
	Percent	57.70%	24.60%	7.70%	5.40%	2.30%	2.30%	100.00%

Table.7 Chi-square Table for Pattern of impaction based on shape

Chi square value	0.353
Df	5
p-value	0.02

Table8.Impaction based on depth and mandible ramus

		Class I	Class II	Class III	Class I & Class II	Total
Mandible	Count	36	72	1	1	110
	% of Total	27.70%	55.40%	0.80%	0.80%	84.60%
Maxilla	Count	7	13	0	0	20
	% of Total	5.40%	10.00%	0.00%	0.00%	15.40%
Total	Count	43	85	1	1	130
	% of total	33.10%	65.40%	0.80%	0.80%	100.00%

Table 9.Chi-square for Pattern of impaction based on depth

Chi square value	0.923
Df	3
p-value	0.007

DISCUSSION

Impaction is the failure of a tooth to completely eruption into a normal functional position. It is caused by lack of space in the dental arch, induced by obstruction by another tooth or development in an abnormal position. The most congenitally missing and impacted teeth are the third molars, found in 90% of people, with 33% having one impacted third molar. Third molars make up 98% of all impacted teeth.

The frequency of impaction of the mandibular third molar (the most common) varies from 9.5% to 68%. It occurs for a variety of reasons, including deficient space in the dental arch, unfavourable angulations and an aberrant path of eruption, the density of overlying soft and hard tissues, and late eruption sequence. Mesiodistal width also influences impactions.

Causes of third molar impactions include lack of space (insufficient anterior-posterior dimension, transverse distance of the alveolar process in the third molar region).

Wide alveolar shelves and a greater mandibular width at the ramus compared to the intermolar width is important for eruption of the third molars, late third molar mineralization and early physical maturation.

Insufficient anterior-posterior space is caused by tooth-jaw size discrepancy and insufficient sagittal growth of the mandible, as continuous elongation of the third molar region between the ages of eight and 20 years old is necessary. This elongation attains forward movement of the first molar, together with ramus resorption to keep third molar space for eruption.

et.al., 2017) Correlation with pathological lesions (cysts or tumours) around the impacted tooth must also be assessed. A normal pericoronal dental follicle is 2–3 mm; radiolucency around the crown of an unerupted tooth of more than 5 mm is an indication of a dentigerous cyst or odontogenic tumour.

Previous work has investigated the incidence and distribution of third molar impactions (Arabion et.al, 2017؛ Yilmaz et.al. ,2016 ؛El-Khateeb et.al., 2015). The incidence of impaction in our investigation was 33.3% which is slightly higher than the 31.9% found by (Pillai et al., 2014). The average age of our study group was 29.8 (± 7.4) years old, which was similar to previous work (23.25 ± 4.17) (Arabion et al., 2017). In our study, frequency of impaction frequency between the two sexes was very similar (43.8% female; 56.2% male). Other studies have found that males had more impacted teeth because of various growth distributions between the two sexes (Syed et al., 2013؛ Šečić et al., 2013) Most jaw growth in females ends by the time the third molar erupts, whereas jaw growth in males is maintained during the eruption of the thirdmolar, giving the necessary spacing (Pillai et al., 2014). A mid-shaped impaction was most common in the mandibular impaction at 30%. Using the Pell-Gregory classification, the most common depth level was mandibular A level (57.7%), while other studies identified B level as more common (Kaomongkolgit & Tantanapornkul, 2017). Class II has been shown to be the most common (Kaomongkolgit & Tantanapornkul, 2017 ؛El-Khateeb et al., 2015). And in our study, only class II (65.4%) was significant

CONCLUSION

Most participants had elective asymptomatic extraction causes. Impactions are more likely to occur in the mandible with no difference between sex. The identified degree and classification of impaction may help dentists and oral surgeons to decrease procedure time and complications in cases of difficult extraction. Our study may support the collection of more data of factors such as sex, age, co-morbidities, number of areas and angulation, and pathological findings.Funding: The authors received no financial support for the research, authorship and/or publication of this article. Conflict of interest: The authors declare that they have no conflict of interest.Jordanian Royal Medical Services will not be required to provide any extra expenses to fulfil the study requirements

REFERENCES

1. Aldahmeshi R., Alshammri A., Alaenazi M., Alrashdan F., & Alasmari H. (2018). The Prevalence of Mandibular Third Molar Angulation in Patients Who Attended Arar Specialist Dental Centre: Panoramic Survey. Int J Med Res Prof, 4(1), 122-26.

2. Alfadil, L., & Almajed, E. (2020). Prevalence of impacted third molars and the reason for extraction in Saudi Arabia. The Saudi dental journal, 32(5), 262-268.

3. Arabion, H., Gholami, M., Dehghan, H., & Khalife, H. (2017). Prevalence of Impacted Teeth among Young Adults: A Retrospective Radiographic Study. Journal of Dental Materials & Techniques, 6(3), 131-137.

4. Ayrancı, F., Omezli, M. M., Sivrikaya, E. C., & Rastgeldi, Z. (2017). Prevalence of third molar impacted teeth: a cross-sectional study evaluating radiographs of adolescents. JCEI, 8(2), 50-3.

5. El-Khateeb, S. M., Arnout, E. A., & Hifnawy, T. (2015). Radiographic assessment of impacted teeth and associated pathosis prevalence: Pattern of occurrence at different ages in Saudi male in Western Saudi Arabia. Saudi medical journal, 36(8), 973.

6. Kaomongkolgit, R., & Tantanapornkul, W. (2017). Pattern of impacted third molars in Thai population: Retrospective radiographic survey. Journal of International Dental and Medical Research, 10(1), 30-35.

7. Kim, H. Y. (2017). Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. Restorative dentistry & endodontics, 42(2), 152-155.

8. Mustafa, A. B. (2015). Prevalence of impacted pre-molar teeth in college of dentistry, King Khalid University, Abha, Kingdom of Saudi Arabia. Journal of International Oral Health: JIOH, 7(6), 1-3.

9. National Institute for Clinical Excellence (2000). Guidance on the extraction of wisdom teeth. Online article.

10. Pell, G. J. (1933). Impacted mandibular third molars, classification and modified technique for removal. Dental Digest, 39, 330-338.

11. Pillai, A. K., Thomas, S., Paul, G., Singh, S. K., & Moghe, S. (2014). Incidence of impacted third molars: A radiographic study in People's Hospital, Bhopal, India. Journal of oral biology and craniofacial research, 4(2), 76-81.

12. Santosh, P. (2015). Impacted mandibular third molars: Review of literature and a proposal of a combined clinical and radiological classification. Annals of medical and health sciences research, 5(4), 229-234.

13. Syed, K. B., Zaheer, K. B., Ibrahim, M., Bagi, M. A., & Assiri, M. A. (2013). Prevalence of impacted molar teeth among Saudi population in Asir region, Saudi Arabia–a retrospective study of 3 years. Journal of international oral health: JIOH, 5(1), 43-47.

14. Šečić, S., Prohić, S., Komšić, S., & Vuković, A. (2013). Incidence of impacted mandibular third molars in population of Bosnia and Herzegovina: a retrospective radiographic study. Journal of Health Sciences, 3(2), 151-158.

15. Winter G. B. (1926). Impacted mandibular third molar. American Medical Book.

16. Yilmaz, S., Adisen, M. Z., Misirlioglu, M., & Yorubulut, S. (2016). Assessment of third molar impaction pattern and associated clinical symptoms in a central anatolian turkish population. Medical Principles and Practice, 25(2), 169-175.