

Distribution of Impacted Third Molars based on Gender and Patterns of Angulation in Dental Students of the Hai'l Region, Saudi Arabia: A Panoramic Radiographic (OPG) Study

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ABSTRACT

Introduction: Dental panoramic radiography, also known as orthopantomography (OPG) is a commonly performed investigation for assessment of dental pathologies, including dental impactions. OPG in case of dental impactions can assist in determination of the location and angulation of the 3rd molars and their relation to the adjacent teeth and structures. The aim of the study was to investigate the distribution of impacted third (3rd) molars in dental students of the Hai'l Region of Saudi Arabia.

Material and Methods: The study population of this observational study comprised 170 male and female dental students of the College of Dentistry (CoD), University of Hai'l (UoH). On induction, the study participants underwent clinical examination and OPG. The clinical and OPG assessments assisted in determining the presence of impaction and patterns of angulation of the 3rd molars in maxilla and mandible.

Results: From the 170 OPGs, 95 (55.8%) showed at least one impacted 3rd molar with significant differences between males (30; 31.5%) and females (65; 68.4%). The proportion of impacted mandibular 3rd molars was 2.3 times higher in comparison to the impaction of maxillary 3rd molars. Both in mandible and maxilla, the most common patterns of 3rd molar angulation were vertical. Among females, vertical angulation remained the most common pattern of impaction followed by mesio-angular angulation. Among males, horizontal impaction remained the most common pattern of impaction followed by same numbers for vertical and disto-angular angulation.

Conclusion: The results show a high frequency of 3rd molar impactions among dental students of the Hai'l Region of Saudi Arabia. The proportion of 3rd molar impactions were higher in female students and mandible. Surgical removal of 3rd molars should only be reserved for impactions associated with clinical complexities.

Keywords: Third (3rd) molars; Impactions; Orthopantomography (OPG); Dental students

(DA), vertical (V) and horizontal (H).^{1,2} Dental panoramic radiography, also known as orthopantomography (OPG) is a commonly performed investigation for assessment of dental pathologies, including dental impactions. OPG in case of dental impactions can assist in determination of the location and angulation of the 3rd molars and their relation to the adjacent teeth and structures. OPG also offers benefit in terms of lower radiation dose and cost-effectiveness.²

In order to fill-up the research gap due to a lack of studies on dental impactions from the north-western region of Saudi Arabia, the aim of the present study was to investigate the distribution of impacted 3rd molars based on gender and patterns of angulation in dental students of the Hai'l Region of Saudi Arabia.

MATERIAL AND METHODS

This observational study with a cross-sectional design was conducted at the Dental Clinics of the College of Dentistry (CoD), University of Hai'l (UoH). The study population comprises the 3rd, 4th, 5th and final year dental students of the CoD, UoH. Ethical approval was granted by the Research Ethics Committee of the University of Hai'l. Verbal and written informed consent was obtained from all students before their enlistment. The exclusion criteria were OPGs with evidence of trauma or pathologic process and OPGs that did not meet the quality criteria for diagnostic purposes. In dental clinics at University of Hai'l, OPG assessment is included in basic oral screening. Students were undergoing basic oral screening with their voluntary consent to undergo

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INTRODUCTION

Dental impaction is a term reserved for tooth that remains completely or partially unerupted. Such tooth remains embedded in the jaw bone or under the gum tissue, completely or partially. Third (3rd) molars are the commonest teeth to undergo impaction. Various reasons are attributable to impaction of 3rd molars, such as reduced space for eruption, trauma and pathologies affecting the process of eruption.¹ Different patterns of impactions exist based on the angulation of the impacted 3rd molar to the longitudinal axis of the 2nd molar, categorized as mesio-angular (MA), disto-angular

OPG. And those OPGs were used for this study. OPGs were acquired by digital OPG machine (Orthophos XG5, Sirona Dental Systems, Inc., Long Island, NY, USA). All students on induction into the study also underwent oro-dental clinical examination. The clinical and OPG assessments assisted in determining the presence of third molar impaction and their patterns of angulation in the maxilla and mandible. Two oral radiologists from the CoD, viewed and evaluated the OPGs. For radiographic interpretation, radiologists used OPG viewing box, calibrated scale, magnifying lens (10 cm) and divider. The basic criteria followed for determination of 3rd molar impaction was its non-alignment with the rest of dentition, both clinically and radiographically. The classification for angulation pattern of 3rd molar impactions (mesioangular, distoangular, horizontal and vertical) was derived from Winter’s Classification.³

STATISTICAL ANALYSIS

The data related to the study after collection was coded and tabulated. Statistical analysis was done using Microsoft Excel 2010 and Statistical Package for Social Sciences version 22 (SPSS, Chicago, IL, USA). The number of impacted third molars in terms of angulation, area of jaw and gender were expressed as frequency (number) and percentages. The Pearson’s chi-square test was used to find an association of distribution of impacted 3rd molars with respect to angulations and gender. P-value equal to or less than 0.05 was considered significant.

RESULTS

Among 170 dental students of 3rd, 4th, 5th and final years, 85 (50%) were male and 85 (50%) were female. The age of students ranged from 20 to 24 years (mean age 21 years). The response rate of participants was 100%. None of the

participants’ OPG were with evidence of pathology or trauma. From the 170 OPGs, 95 (55.8%) showed at least one impacted 3rd molar with significant differences between males (30; 31.5%) and females (65; 68.4%) (P= 0.0001). The proportion of impacted mandibular 3rd molars (no of impactions=139) was 2.3 times higher in comparison to the impaction of maxillary 3rd molars (no of impactions=60) (P= 0.002). Vertical (30.6%), mesio-angular (19.6%) and horizontal (14.1%) patterns of 3rd molar angulation in mandible were statistically significant (P= 0.002), compared to the same patterns of 3rd molar angulation in maxilla. While disto-angular (7.5%) pattern of 3rd molar angulation was higher in frequency in maxilla, compared to the same pattern of 3rd molar angulation in mandible (5.5%) [Table 1].

Both in mandible and maxilla, the most common patterns of 3rd molar angulation were vertical (no. of impactions in mandible=61; 30.6%); (no. of impactions in maxilla=28; 14.1%) [Fig. 1].

Overall in terms of incidence of 3rd molar impactions, females had a higher frequency (no. of impactions=129; 64.9%) (P=0.0001) compared to males (no. of impactions=70; 35.1%). Among females, vertical angulation remained the most common pattern of impaction (no. of impactions=71; 55.1%) followed by mesio-angular angulation (no. of impactions=39; 30.2%). Vertical and mesio-angular patterns of angulation in females remained statistically significant compared to the same patterns of angulation in males. Among males, horizontal impaction remained the most common pattern of impaction (no. of impactions=22; 31.5%) followed by same numbers for vertical and disto-angular angulation (no. of impactions=18; 25.7%). Horizontal and disto-angular patterns of angulation in males remained statistically significant compared to the same patterns of angulation in females [Table 2].

On an overall basis, the vertical pattern of angulation dominated the other patterns of angulation (no. of impactions=89; 44.7%) (P=0.0001) [Tables 1 and 2].

DISCUSSION

Hai’l is the capital of Hai’l Region which is a province in north-western Saudi Arabia. University of Hai’l is a major university of Saudi Arabia. The College of Dentistry of this university is the only dental school of the Hai’l Region. The current study, to the best of our knowledge is the first and the only study that investigated the distribution of impacted 3rd molars among adolescents in the Hai’l Region of Saudi Arabia. Third (3rd) molars are the most commonly impacted teeth.⁴ Globally, the prevalence of impaction for 3rd molars ranges from 16.7% to 68.6%.⁵ The overall frequency of impactions (55.8%) in this study was matching with the

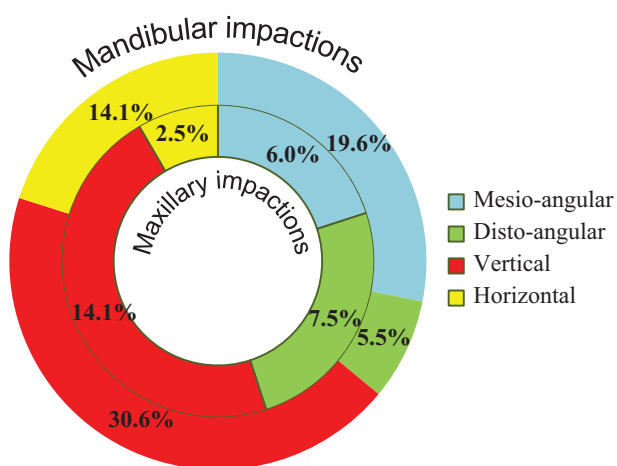


Figure-1: Percentage distribution of mandibular and maxillary 3rd molar impactions

	Mesio-angular	Disto-angular	Vertical	Horizontal	Total
Mandibular impactions	39 (19.6)**	11 (5.5)	61 (30.6)**	28 (14.1)**	139 (69.8)**
Maxillary impactions	12 (6.0)	15 (7.5)	28 (14.1)	5 (2.5)	60 (30.2)
Total	51 (25.6)	26 (13.0)	89 (44.7) **	33 (16.6)	199 (100)

**Significant at 0.01

Table-1: Distribution of mandibular and maxillary 3rd molar impaction in terms of patterns of angulation: number of impactions (%)

Angulation	Females	Males	Total
Mesio-angular	39 (30.2) ***	12 (17.1)	51 (25.6)
Disto-angular	8 (6.2)	18 (25.7) ***	26 (13.1)
Vertical	71 (55.1) ***	18 (25.7)	89 (44.7) ***
Horizontal	11 (8.5)	22 (31.5)***	33 (16.6)
Total	129 (64.9)***	70 (35.1)	199 (100)
***Significant at 0.0001			
Table-2: Distribution of 3rd molar impaction in terms of patterns of angulation with respect to gender: number of impactions (%)			

global trends of prevalence for 3rd molar impactions. In the current study, the frequency of maxillary 3rd molar impactions remained 30.2%. The frequency of mandibular 3rd molar impactions (69.8%) in this study was consistent with few of the earlier studies.^{6,7} In general, 3rd molar impactions in maxilla is related to the available space for eruption.⁴ On the contrary, the higher frequency of impactions in mandible can be ascribed to various factors such as, decrease in the overall length of the mandible, larger ascending ramus and the greater mesial inclination of crowns.^{8,9}

As evident in previous studies^{10,11}, the current study also determines a significant difference between females and males in terms of incidence of 3rd molar impactions. The higher frequency of impacted teeth in females can be attributed to differences in growth pattern between males and females. The females had less incremental growth and a shortened duration for growth of mandible compared to the males. Moreover, growth in females usually ceases when the 3rd molars just begin to erupt. All these factors presumably leads to hindrances in mandibular 3rd molar eruption.^{12,13} However in an investigation on prevalence of impacted teeth in North Indian population, no statistically significant difference became evident among the sexes.¹⁴

In the current study the vertical pattern of angulation was commonest in both mandible (30.6%) and maxilla (14.1%). The finding of this study related to the vertical angulation being the most common pattern of angulation in the maxilla was in accordance with the findings of an Iranian study (vertical angulation=45.3%).¹¹ However in Nigerian¹⁵ and Singaporean¹⁰ investigations on evaluation of symptoms and pattern of mandibular 3rd molar impactions, mesio-angular impactions (48.2% and 59.5%, respectively) dominated over other patterns of angulation.

Impacted tooth if allowed to retain carries the risk of pericoronitis, infection and cyst formation. Moreover it compromises the integrity of the adjacent teeth due to caries and root resorption. Removal of impacted tooth may help to prevent pathologic complications associated with their retention.¹⁶ Contrarily, removal of maxillary and mandibular third molar carries a possible risk of damage to the temporomandibular joint (TMJ) resulting in temporomandibular disorders (TMD). Moreover females were more likely to contract TMD after extraction of the 3rd molars. Apart from TMD other complications can also be associated with the removal of 3rd molars, such as, postsurgical infection, dysesthesia, permanent paresthesia and dry socket. Sometimes the clinical decision making gets too intricate for removal of 3rd molars. The intricate factors

linked with the removal of 3rd molars are risks/complications and benefits, personal preferences and considerable costs associated with the extraction procedure. Consequently, prophylactic extraction of asymptomatic third molars has attracted substantial controversy. As a matter of fact, National Health Service (NHS) of United Kingdom and American Public Health Association has advocated against the extraction of symptomless 3rd molars.^{17,18} Considering the various types of morbidity associated with the extraction of 3rd molars, simply relying on the radiographic evidence of impaction in absence of clinical indications of infection, non-restorable caries and recurrent pericoronitis for their prophylactic extraction is not at all justified. Most importantly, with the exception of horizontal impactions, a considerable proportion of various types of impactions do emerges completely. In late adolescents, presenting with radiographic evidence of impacted tooth, an appropriate strategy would be to monitor the impaction regularly for any clinical indications of development of pathosis.¹⁹

Orthopantomography (OPG) is a preferred radiographic technique for evaluation of impacted 3rd molars in terms of depth of impaction and type of angulation. Prior to removal of these teeth, panoramic radiography may also assist in visualization of any impediments in their extraction. Pre-surgical OPG assessment is for determination of ease of surgical access and relation of the apex of 3rd molar with inferior alveolar nerve canal and maxillary antrum.²⁰

The results of this study are limited, as this has been a simple study that focused on the prevalence of 3rd molar impaction among dental students. In order to address the limitations of current study, there should have been the determination of pathologies associated with the impaction of 3rd molars. Although this study doesn't represent the total population of the Hai'l Region, its results may be utilized as an extension to a study encompassing a representative sample. Such a study would give a better and comprehensive understanding of various trends of 3rd molar impaction in the population of Hai'l Region of Saudi Arabia. Against all odds, the present study focused on an insufficiently researched and crucial aspect of 3rd molar impactions among adolescents in the North-western Region of Saudi Arabia. The data from this study can serve as a baseline for future studies on 3rd molar impactions among the populace of the region.

There is no research based evidence to substantiate the claims of benefit of such extractions to the patients.²¹ On clinical and radiographic detection of an impaction, the best strategy would be to monitor them for any evidence of associated pathologies or complications. The monitoring should be

based on a clinical and radiographic examination, conducted at periodic intervals. This monitoring may then help to track down specific indications of pathosis that justifies the extraction of an impacted 3rd molar.^{22,23} OPGs apart from detection of an impaction, can also prove indispensable in visualization of any impediments in extraction.²⁰

CONCLUSION

This study has been characterized by a high frequency of 3rd molar impactions in dental students of the Hai'l Region of Saudi Arabia, particularly in mandible and in females. This high frequency signifies that an increasing number of individuals are retaining the impacted 3rd molars. The retention of such teeth may lead to pathologies and complications, such as unrestorable caries, endodontic lesions, recurrent pericoritis, abscess, cellulitis, osteomyelitis, cyst formation and its transformation into carcinoma. Considering the costs, discomfort and disabilities associated with the extraction of 3rd molars, prophylactic removal of asymptomatic 3rd molars is completely uncalled for.

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