Avicenna J Dent Res. 2017 March; 9(1):e28250. doi: 10.5812/ajdr.28250.

Published online 2016 July 4. **Research Article**

Epidemiological Status of Third Molars in an Iranian Population

Mahnaz Sheikhi,[1] Mitra Karbasi Kheir,[2,*] and Mohammad Ali Sadeghi[3]

[1]Torabinejad Dental Research Center, Department of Oral and Maxillofacial Radiology, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, IR Iran
[2]Assistant Professor, Department of Oral and Maxillofacial Radiology, School of Dentistry, Islamic Azad University Isfahan (Khorasgan Branch), Isfahan, Iran
[3]Dentist, Isfahan, IR Iran

[*]*Corresponding author*: Mitra Karbasi Kheir, Assistant Professor, Department of Oral and Maxillofacial Radiology, School of Dentistry, Islamic Azad University Isfahan (Khorasgan Branch), Isfahan, Iran. Tel: +98-3112604664, E-mail: mastoor28@yahoo.com

Received 2015 February 24; **Revised** 2015 April 29; **Accepted** 2015 May 31.

Abstract

Background: Impaction of third molars is a common phenomenon. The incidence of impacted third molars varies in different populations.
Objectives: The aim of this study is to assess radiographic status (root development degree, angulation, and eruption level) of the third molar in Iranian population via panoramic radiographs.
Patients and Methods: 647 patients, ranging in age from 17 - 25, were selected from three regions of Iran. Based on their panoramic radiographs, their root development degree, angulation, and eruption levels were analyzed.
Results: The angulation of upper third molars were vertical (44.6%), distoangular (44.1%), mesioangular (10.7%), and horizontal (0.6%). For lower third molars, the angulation was mesioangular (44.5%), vertical (33.8%), distoangular (12.2%), and horizontal (9.5%). The eruption levels of maxillary third molars were C > A> B, and for mandibular third molars they were A > B> C. The order of root development prevalence of the maxillary and mandibular third molars was complete > 2/3 > 1/3.
Conclusions: The most common status of impaction of the third molars in the maxilla was vertical angulation, level C of eruption, and complete root formation. In the mandible it was mesioangular, level A of eruption, and complete root formation. Since the study sample consists of patients from the north, middle, and south of Iran, the sample can represent the whole population of Iran.

Keywords: Impaction, Eruption, Level, Development

1. Background

Impaction may be defined as the failure of a tooth's complete eruption into a normal functional position within a normal time, because of obstruction by bone or adjacent tooth (teeth), overlying soft tissue, and lack of space. It may occur due to tooth-jaw size, unfavorable angulation and aberrant path of eruption, and a late eruption sequence (1-3). Impaction is a frequent phenomenon. However, the prevalence is different in different regions of the jaw. It is now perfectly clear that the third molar is an unusual tooth characterized by considerable variability information timing, and variation in crown and root morphology. The mandibular third molar is the most frequently impacted tooth (1, 4, 5).

Two etiologies of third molar impaction are lack of space and late third molar mineralization, and early physical maturation (1, 6, 7). Other theories which have been suggested to explain the etiology of third molar impaction include hereditary factors, lack of sufficient eruptive force for third molars, and insufficient mesial movement of the dentition of modern men, due to the lack of interproximal attrition and evolutionary elimination of the human need for large jaws followed by a soft diet (8-10).

The incidence of impacted third molars varies in different populations, ranging from 9.5% to 25% (8). The time of eruption has been reported as varying from 16 to 24 years (10, 11). Third molar impaction causes problems like adjacent root resorption, inflammatory processes (pericoronitis), temporomandibular joint dysfunction, and late incisor crowding (7). Assessment of the third molar position and the progress of their eruption can reduce the risk of intra-operative and post-operative complications associated with surgery, and help predict a treatment budget for both patients and insurance companies.

2. Objectives

Radiographic status of third molars have been accessed in many countries, yet this has not yet been done for the Iranian population. Thus, the aim of this study is to assess the radiographic status (root development degree, angulation, and eruption level) of the third molar in an Iranian population, using panoramic radiographs.

3. Patients and Methods

In this study, panoramic radiographs from a total of 647 patients ranging in age from 17-25 were selected. The

samples were collected from three regions of Iran: 245 from Rasht in the north region, 296 from Isfahan in the middle region, and 106 from Ahvaz in the south region. The number of radiographs was proportional to each city's population. 37.9% of the study population was from Rasht, 45.7% from Isfahan, and 16.4% was from Ahvaz. Panoramic radiographs were gathered from 2008 to 2014. Only those patients that had four third molars and had no history of extraction and orthodontic treatment were included. Poor quality radiographs were excluded. Information about the patient's sex and age were recorded beside each radiograph. The radiographs divided into three age groups: 17 - 19, 19 - 21, and 21 - 25 (age groups 1, 2, and 3). Root development degree, angulation, and eruption level were considered. Root development degree was determined on the panoramic radiographs as complete, 2/3, or 1/3 of root formation. The angulation of third molars was determined on the panoramic radiographs by using Winter's classification with reference to the angle formed between the intersected longitudinal axes of the second and third molars (12). The angulation of impaction was measured using Quek and colleagues' classification system: the inclination for vertical was +10° to - 10°, mesioangular was +11° to +70°, and distoangular was - 11° to - 79°. An inclination above 70° was considered to be horizontally impacted (3, 7, 13). The level of eruption (according to Pell and Gregory's classification) was grouped as level A, where the occlusal plane of the third molar was on the same level or above the occlusal plane of the adjacent second molar. In level B, the occlusal plane was between the occlusal plane and cervical line of the second molar, and in level C the occlusal plane was below the cervical line of the second molar (3). All the measurements were recorded by one author and then reconfirmed by the other authors for reliability of data. The collected data were analyzed by Statistical Package for Social Sciences (SPSS Inc, Chicago, USA) version 20.0. Chi-square tests, Kruskal-Wallis tests and Mann-Whitney tests were used where required. $P < 0.05$ is considered statistically significant.

4. Results

54.3%, 32.1%, and 18.7% of the Rasht samples were from age groups 17 - 19, 19 - 21, and 21 - 25, respectively. In the Isfahan sample 26.6% were 17 - 19 years old while 48.6% and 69.4% were in the 19 - 21 and 21 - 25 age groups, respectively. 19% of the Ahvaz sample was in the 17 - 19 age group, another 19% was in the 19 - 21 group, and 11.9% of the Ahvaz patients were 21 - 25 years old. Frequencies of angulation, root development and eruption level of upper and lower third molars and third molars of each quadrant are shown in Table 1. The relation of each variable (angulation, root development, and eruption level) with age, city and gender were analyzed by chi-square tests, and the P value of each comparison is shown in Table 1. For variables with considerable differences, Kruskal-Wallis or Mann-Whitney tests were done, and the results are shown below.

In maxillary third molars, there was a statistically significant difference between angulation and sex (P = 0.01), angulation and cities (Isfahan-Ahvaz, Rasht-Isfahan P value = 0.00), and angulation and age (17-19 and 21-25, 19-21 and 21-25 P value = 0.01). There was also a statistically significant difference between root development and cities (Rasht-Isfahan, Rasht- Ahvaz, Isfahan-Ahvaz P value = 0.00), and root development and age (17 - 19 and 19 - 21, 17 - 19 and 21 - 25, 19 - 21 and 21 - 25 P value = 0.00). Finally, there was a statistically significant difference between eruption level and cities (Rasht-Isfahan, Rasht- Ahvaz, Isfahan-Ahvaz P value = 0.00), and between eruption level and age (17 - 19 and 19 - 21, 17 - 19 and 21 - 25, 19 - 21 and 21 - 25 P value = 0.00).

In mandibular third molars, there was a statistically significant difference between angulation and cities (Rasht-Isfahan P value = 0.00, Isfahan-Ahvaz P value = 0.02), angulation and age (17 - 19 and 19 - 21, 17 - 19 and 21 - 25, 19-21 and 21-25 P value = 0.00), root development and cities (Rasht-Isfahan, Rasht- Ahvaz, Isfahan-Ahvaz P value = 0.00), and root development and age (17 - 19 and 19 - 21, 17 - 19 and 21 - 25, 19 - 21 and 21 - 25 P value = 0.00). There was also a statistically significant difference between eruption level and cities (Rasht-Isfahan, Rasht- Ahvaz, Isfahan-Ahvaz P value = 0.00), and between eruption level and age (17 - 19 and 19 - 21, 17 - 19 and 21 - 25, 19 - 21 and 21 - 25 P value = 0.00).

5. Discussion

Impaction of third molars is a common phenomenon. The incidence of impacted third molars varies in different populations, so assessment of third molars status reduces the risk of surgical removal. In this study, the angulation of upper third molars were vertical (44.6%), distoangular (44.1%), mesioangular (10.7%), or horizontal (0.6%). Peterson et al. (2003) stated a similar order, but with different occurrence percentage, especially for vertical and distoangular (4). The order is in agreement with Byahatti and colleagues' findings in the Libyan population, where only the occurrence percentages are different (3). Like Clovis et al. who studied a Brazilian population, here the most common pattern of maxillary third molar impaction is vertical (14). The frequency of mesioangular maxillary third molars is close to what Sandhu et al. reported (15).

The lower third molars were mesioangular (44.5%), vertical (33.8%), distoangular (12.2%), or horizontal (9.5%). The order is similar to what Peterson et al. have shown, but

Table 1. Frequency of Angulation, Root Development, and Eruption Level by Age Group, City, and Sex

Groups	Angulation %					Root Development %				Eruption Level %			
	V.	M.	D.	H.	P Value	3/3	2/3	1/3	P Value	A	B	C	P Value
Upper Third Molars													
Age					0.00				0.00				0.00
17-19	38.7	14.8	45.8	0.7		20.5	56.5	23		8.5	10.5	81	
19-21	43.1	10.1	46.8	0		63.8	32.1	4.1		39.4	19.7	40.8	
21-25	52.8	5.7	40.6	0.9		94	4.5	1.5		71.1	9.6	19.4	
City					0.001				0.00				0.00
Rasht	46.9	9.4	43.7	0		41	37.6	21.4		23.9	10.8	65.3	
Isfahan	40.4	10.8	47.5	1.4		66.7	29.2	4.1		49.2	10.6	40.2	
Ahvaz	51.4	13.2	35.4	0		52.8	34.4	12.7		31.1	16.5	52.4	
Sex					0.02				0.06				0.1
Male	50.2	10.4	39.1	0.2		57	29.2	13.8		38	13.8	48.2	
Female	41.8	10.8	46.6	0.5		53.5	35.3	11.2		35.9	10.6	53.5	
Total	44.6	10.7	44.1	0.6		54.7	33.4	12		36.6	11.7	51.7	
Lower Third Molars													
Age					0.00				0.00				0.00
17-19	23.8	64	4.3	7.8		15.7	52.3	32		15.3	32.7	52	
19-21	33	40.4	15.6	11		63.8	31.7	4.6		35.3	42.2	22.5	
21-25	46.8	21.5	20.6	11.1		93	5.7	1.3		62.1	29.8	8.1	
City					0.00				0.0				0.00
Rasht	51	35.1	7.8	6.1		37.3	36.1	26.5		25.9	29.8	44.3	
Isfahan	37.8	33.3	15.5	13.3		66.7	29.6	6.4		45.6	33.4	20.8	
Ahvaz	48.1	31.6	12.7	7.5		45.3	34.9	19.8		30.7	40.1	29.2	
Sex					0.15				0.045				0.19
Male	35.1	46.6	10.9	7.5		50.9	29.4	19.7		38.5	33.5	28.1	
Female	33	43.4	12.8	10.8		52.7	32.9	14.4		34.4	33	32.6	
Total	33.8	44.5	12.2	9.5		52	31.8	16.1		35.8	33.2	31	

the prevalence of distoangular and horizontal mandibular third molars were higher in this study (4). In this study, 44.5% of the mandibular third molars were found to be in the mesioangular position. This number is close to the observations by Sandhu et al. and Byahatti et al. (3, 15). The frequency of distoangular mandibular third molar is close to Byahatti et al. (3).

According to majority of the studies, which were done on Libyan, Nigerian, Singaporean, Chinese, Saudi, Malaysian, Pakistani, Australian, and Omani populations, the most common angulation of impaction of mandibular third molars is mesioangular, which is in accordance with our findings (3, 8, 13, 16-21).

Kaur et al. who did a study on a north Indian population, concluded that vertical impaction was the common state of mandibular and maxillary impacted third molars

(differing from our mandibular results), while in another study in south India mesioangular was the most common pattern of mandibular third molar impaction (10, 18). Kurchid et al. studied a population of Iraqis in Kurdistan, and found that mesioangular impaction of the mandibular third molar was the most common, followed by distoangular, vertical, and horizontal impactions (22). Distoangular impaction was the second most common type of impaction in their study, and is not similar to our results.

A comparison between age groups shows that the frequency of vertical impaction increases with age in both maxillary and mandibular third molars. In Isfahan, distoangular maxillary third molar was the most common angulation, while vertical angulation was most common in Rasht and Ahvaz, perhaps due to genetic differences. For mandibular third molars, vertical impaction was the most common type in all three cities. In addition, all three cities showed a similar angulation sequence (vertical, mesioangular, distoangular, and horizontal), despite the differences in frequencies.

In our study, the eruption levels of mandibular third molars were A > B> C. This sequence is in agreement with Seeic et al. and Al-Anqudi et al., who studied populations in Bosnia and Herzegovina and Oman, respectively (1, 21). Our results were different from the studies in other populations that found level B to be most common (13, 15, 17, 22). The results showed the maxilla has a higher frequency of level C of eruption, followed by A and B respectively, which was different from Byahatti et al. but similar to Sandhu et al. (3, 15). Our results showed that the frequency of eruption level A increased and the frequency of C eruption level decreased with aging in both maxillary and mandibular third molars. This might show that when humans become older, impaction depth decreases. This is in accordance with the results of Pursafar et al. who studied patients in Hamedan city in Iran (23). The most common eruption level in the maxillary third molar in Rasht and Ahvaz was C, and in Isfahan it was A. The most common eruption levels in the mandibular third molars in Rasht, Isfahan, and Ahvaz were C, A, and B, respectively. Ahvaz city shows a similarity in eruption level with the results of Kurchid et al. in a population of Iraqis in Kurdistan. These similar results might be due to racial and genetic similarities between southern parts of Iran and Iraq.

The order of root development prevalence of maxillary and mandibular third molars was complete > 2/3 > 1/3. Comparison between age groups in both jaws shows that root completion progress increases with age. Comparison of root development of third molars between the three cities showed that most third molars had completed the root. Like Kaur et al. we observed no sexual difference in the incidence of different aspects of third molars' impaction (angulation, root development ,and eruption level). However, studies in Bosnia and Herzegovina, Libya, Singapore, Sweden, and Spain reported gender differences in third molar impactions (1, 3, 10, 13, 24-26). An exception in our study was in the upper third molars' angulation: males were mostly vertical and females were distoangular. This might be due to the difference in the number of males and females in the study.

Overall, our results showed that most patients in the 21 - 25 age group had vertical, level A, and completed root mandibular and maxillary third molars, and the prevalence of third molar tooth impaction decreased with increasing age, as is consistent with Bokhari Syed et al. (27). As discussed above, there are differences between populations in third molars status, which might be due to differences in genetic background, race, and socioeconomic status.

5.1. Conclusion

The most common status of impaction of third molars in the maxilla was vertical angulation, level C of eruption, and complete root formation; in the mandible it was mesioangular, level A of eruption, and complete root formation. Since the study sample consists of patients from the north, middle, and south of Iran, the study sample may represent the whole population of Iran. This study can thus be the basis for future studies.

Acknowledgments

The authors would like to thank the Research Center of the Faculty of Dentistry of Isfahan University of Medical Science for supporting this study.

Footnotes

Authors' Contribution: Study concept and design: Mahnaz Sheikhi, Mitra Karbasi Kheir, Mohammad Ali Sadeghi; acquisition of data: Mitra Karbasi Kheir, Mohammad Ali Sadeghi; analysis and interpretation of data: Mitra Karbasi Kheir; drafting of the manuscript: Mitra Karbasi Kheir; critical revision of the manuscript for important intellectual content: Mahnaz Sheikhi, Mitra Karbasi Kheir; statistical analysis: Mahnaz Sheikhi, Mitra Karbasi Kheir; administrative, technical, and material support: Mahnaz Sheikhi, Mitra Karbasi Kheir; study supervision: Mahnaz Sheikhi.

Funding/Support: This study was part of a research project (Grant No: 293070) supported and funded by Isfahan University of Medical Sciences.

References

1. Secic S, Prohic S, Komsic S, Vukovic A. Incidence of impacted mandibular third molars in population of Bosnia and Herzegovina: a retrospective radiographic study. *J Health Sci.* 2013;**3**(2):151. doi: 10.17532/jhsci.2013.80.
2. Khawaja NA. Third molar impaction: A review. *J Pak Dent Assoc.* 2006;**15**(2):97–101.
3. Byahatti S, Ingafou MS. Prevalence of eruption status of third molars in Libyan students. *Dent Res J (Isfahan).* 2012;**9**(2):152–7. [PubMed: 22623930].
4. Naseer N, Aronow WS, McClung JA, Sanal S, Peterson SJ, Weiss MB, et al. Circumflex coronary artery occlusion after blunt chest trauma. *Heart Dis.* 2003;**5**(3):184–6. doi: 10.1097/01.HDX.0000074513.94316.d8. [PubMed: 12783632].
5. Shetty DC, Ahuja P, Urs AB, Bablani D, Paul M. Epidemiological status of 3rd molars-their clinical implications. *J Oral Health Comm Dent.* 2010;**4**(1):12–5.
6. Svendsen H, Maertens JKM. Etiology of third molar impaction. In: Andreasen JO, Petersen JK, Laskin DM, editors. Textbook and color atlas of tooth impactions. Copenhagen: Munskgaard; 1997. .
7. Qamruddin I, Qayyum W, Haider SM, Siddiqui SW, Rehan F. Differences in various measurements on panoramic radiograph among erupted and impacted lower third molar groups. *J Pak Med Assoc.* 2012;**62**(9):883–7. [PubMed: 23139968].
8. Olasoji H, Odusanya S. Comparative study of third molar impaction in rural and urban areas of southwestern nigeria. *Tropical Dental J.* 2000:25–8.
9. Kaur B, Sheikh S, Pallagatti S. Radiographic assessment of agenesis of third molars and para-radicular third molar radiolucencies in population of age group 18-25 years old–a radiographic survey. *Archives Oral Rese.* 2012;**8**(1):13–8.
10. Kaur B, Sheikh S. Status of Third Molars in North Indian Population - A Radiographic Survey. *J Dental Peers.* 2012;**1**(1):10–9.
11. Yamaoka M, Furusawa K, Fujimoto K, Uematsu T. Completely impacted teeth in dentate and edentulous jaws. *Aust Dent J.* 1996;**41**(3):169–72. [PubMed: 8768639].
12. Winter LB. Insulin Convulsions and Recovery. *Biochem J.* 1926;**20**(4):668–75. [PubMed: 16743707].
13. Quek SL, Tay CK, Tay KH, Toh SL, Lim KC. Pattern of third molar impaction in a Singapore Chinese population: a retrospective radiographic survey. *Int J Oral Maxillofac Surg.* 2003;**32**(5):548–52. [PubMed: 14759117].
14. Clovis M, Comparin E, Toledo JLF. Third molars classifications prevalence in the cities of cunha porã, maravilha and palmitos in the nortwest of santa catarina state in brazil. *Rev odonto cienc.* 2006;**21**(51):55–66.
15. Sandhu S, Kaur T. Radiographic evaluation of the status of third molars in the Asian-Indian students. *J Oral Maxillofac Surg.* 2005;**63**(5):640–5. doi: 10.1016/j.joms.2004.12.014. [PubMed: 15883938].
16. Lynham A. Panoramic radiographic survey of hypodontia in Australian Defence Force recruits. *Aust Dent J.* 1990;**35**(1):19–22. [PubMed: 2322168].
17. Hassan AH. Pattern of third molar impaction in a Saudi population. *Clin Cosmet Investig Dent.* 2010;**2**:109–13. doi: 10.2147/CCIDEN.S12394. [PubMed: 23662088].
18. Ramamurthy A, Pradha J, Jeeva S, Jeddy N, Sunitha J, Kumar S, et al. Prevalence of mandibular third molar impaction and agenesis: A radiographic south indian study. *J Indian Academy Oral Med Radiol.* 2012;**24**:173–6. doi: 10.5005/jp-journals-10011-1289.
19. Othman R, Tin MO. Impacted mandibular third molars among patients attending hospital university sains malaysia. *Archives Orofacial Sci.* 2009;**4**(1):7–12.
20. Wahid A, Mian FI, Bokhari SAH, Moazzam A, Kramat A, Khan F. Prevalence of impacted mandibular and maxillary third molars: A radiographic study in patients reporting madina teaching hospital, faisalabad. *Jumdc.* 2013;**4**(2):22–31.
21. Al-Anqudi SM, Al-Sudairy S, Al-Hosni A, Al-Maniri A. Prevalence and Pattern of Third Molar Impaction: A retrospective study of radiographs in Oman. *Sultan Qaboos Univ Med J.* 2014;**14**(3):e388–92. [PubMed: 25097776].
22. Kurchid K, Shihab O. Pattern of mandibular third molar impaction in patients attended the Hawler College of Dentistry: a retrospective radiographic study. *Zanco J Med Sci.* 2010;**14**(1):1–4.
23. Pursafar F, Salemi F, Dalband M, Khamverdi Z. Prevalence of impacted teeth and their radiographic signs in panoramic radiographs of patients referred to hamadan dental school in 2009. *Avicenna J Dental Res.* 2011;**3**(1):21–7.
24. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. *Community Dent Health.* 1988;**5**(2):121–38. [PubMed: 3165039].
25. Ma'aita J, Alwrikat A. Is the mandibular third molar a risk factor for mandibular angle fracture?. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2000;**89**(2):143–6. doi: 10.1067/moe.2000.103527. [PubMed: 10673648].
26. Almendros-Marques N, Berini-Aytes L, Gay-Escoda C. Influence of lower third molar position on the incidence of preoperative complications. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006;**102**(6):725–32. doi: 10.1016/j.tripleo.2006.01.006. [PubMed: 17138172].
27. Syed KB, Zaheer KB, Ibrahim M, Bagi MA, Assiri MA. Prevalence of Impacted Molar Teeth among Saudi Population in Asir Region, Saudi Arabia - A Retrospective Study of 3 Years. *J Int Oral Health.* 2013;**5**(1):43–7. [PubMed: 24155577].