

Pattern of Impaction in South Chennai Population: A Radiographic Study

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ABSTRACT

Background: To evaluate the prevalence, pattern, angulation and depth of impacted third molar in South Chennai population

Materials & Methods: Data related to 4500 patients and their orthopantomograms (OPG), who had visited the clinic during the period of 2011 to 2013, were evaluated for the gender, prevalence, type of angulation and level of the third molar impaction.

Results: Among 4500 OPGs, 1283 OPGs showed at least one impacted third molar. The impacted third molar was more common in males (752, 58.62%) than in females (531, 41.38%). The mandible (810, 63.1%) was the common site for third molar impaction than maxilla (177, 13.8%) and maxilla and mandible together (296, 23.1%). The horizontal impaction (639, 39.32%) and Level A (670, 41.61%) were common in the mandible and vertical impaction (322, 49.31%) and level C (489, 82.32%) was common in maxilla. Unilateral impaction (900, 56.64%) was common in both the arches.

Conclusion: In this study, we inferred that third molar impaction is less prevalent with male predilection and distribution of third molar impaction is higher in mandible.

Keywords: Impaction, Pattern, Third molar.

INTRODUCTION

The word impaction is from Latin origin – *impactus*. Impaction is the cessation of the eruption of a tooth caused by a physical barrier or ectopic positioning of a tooth¹. Impacted tooth means a tooth which is partially erupted or unerupted when its path of eruption into the occlusal plane is obstructed by another tooth, bone and soft tissue². Third molars are the most common impacted as well as congenitally missing teeth in the jaws. Third molars are the last teeth to erupt in the oral cavity. The reasons for the third molar impactions are prolonged deciduous tooth retention, malposed tooth germs, supernumerary teeth, insufficient

space in the dental arch, unfavourable angulations and wrong path of eruption, density of overlying soft and hard tissues, late eruption sequence, odontogenic tumours, cleft lip & palate, cleidocranial dysplasia, down syndrome, endocrine deficiency and irradiation³⁻⁷. Svendsen and Maertens⁸ have reviewed in detail the aetiology of third molar impactions. Two of the cited causes were

1. Lack of space: Insufficient anteroposterior dimension and transverse distance of the alveolar process in the third molar region. Full alveolar shelves and a greater mandibular width at the

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ramus in relation to the intermolar width are essential for the successful eruption of the third molars.

2. Late third molar mineralization and early physical maturation. These impacted teeth may stay asymptomatic for a long time without creating any disturbances for the patient, or they may present with dental caries, pericoronitis, periodontitis, cystic lesions, neoplasm and root resorption of adjacent tooth⁹. The impacted lower third molar weakens the angle of the mandible and makes it susceptible to fracture and also causes lower arch crowding, TMJ disorders and vague orofacial pain.¹⁰⁻¹² The aim of this study is to evaluate the prevalence, pattern, angulation and depth of impacted third molars radiographically in South Chennai population.

MATERIALS AND METHODS

This study was conducted in Vasan Dental Care, Chennai, and Tamilnadu. Data related to 4500 patients and their OPGs', who had visited the clinic during the period of 2011 to 2013, were selected for the study.

The exclusion criteria of the study were;

1. Patients below 20 years of age
2. Any previous dentoalveolar trauma
3. Incomplete root formation of the third molars.
4. Absence of adjacent second molars
5. Presence of poor quality of OPGs
6. Any craniofacial syndromes like Down syndrome, Cleidocranial dysostosis

OPGs' were reviewed by a single examiner for avoiding inter-examiner bias. In the study sample, prevalence, pattern, depth and angulation of impacted third molars were analysed, and the gender of the patients was also noted.

A third molar was considered impacted if it did not have functional occlusion but, its roots were formed entirely.

From these OPGs', the type of angulation was determined by the angle formed between the

intersected longitudinal axes of second and third molars. The types of angulation of impacted third molar were as follows:

Vertical impactions	-10° to 10°
Mesioangular impactions	11° to 79°
Horizontal impactions	80° to 100°
Distoangular impactions	-11° to -79°
Others	111° to -80°
Buccolingual impactions	Any tooth oriented in the buccolingual direction with crown overlapping the tooth

The level of third molar impactions was determined according to the relationship between the Cemento - Enamel Junction (CEJ) of the third molar and its alveolar bone level. The following classification was used for this study;

Level A -not buried in the bone.

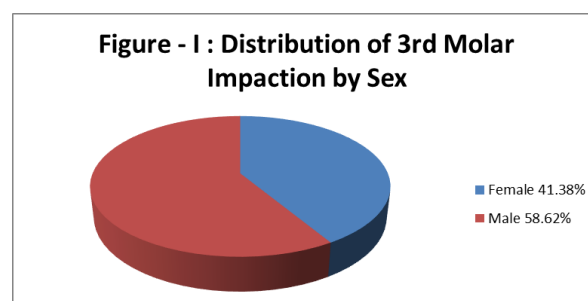
Level B -partially buried in the bone (if any part of CEJ is lower than the bone level)

Level C -completely embedded in bone.

Data were statistically analysed using a Pearson chi-square test. All the assessments were done by a single examiner to avoid inter-examiner bias.

RESULTS

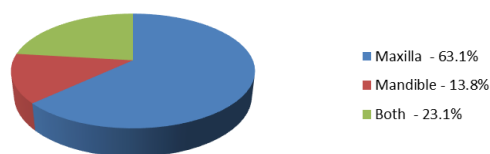
Of the 4500 patients, 2268 (50.4%) were males, and 2232 (49.6%) were females. Among 4500 OPGs, 1283 showed at least one impacted third molar. Among 1283 impactions, 752 (58.62%) were males and 531 (41.38%) were females. The significant difference between males and females was 17.24% (Fig. I).



The distribution of impacted third molars by arch was shown in Figure II. The proportion of mandibular and maxillary third molar impactions was 63.1% and 13.8% respectively and maxillary

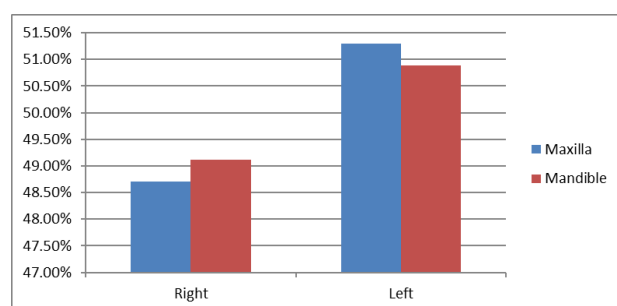
and mandibular third molar impactions together were 23.1%.

Figure - II : Distribution of 3rd Molar Impaction by Arch



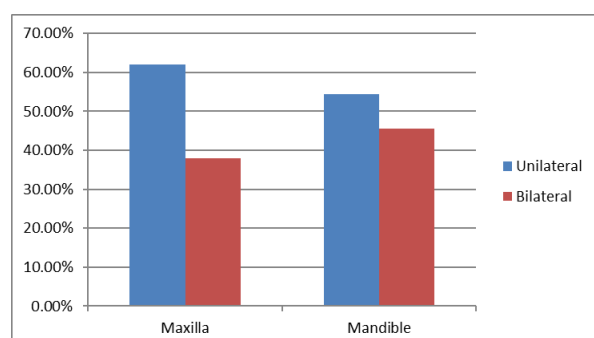
The impacted third molars in the right and left quadrants were 48.99% and 51.01% respectively which was not statistically significant (Table 1 & Figure III).

Fig 3: Distribution of Impacted Third Molar by Side of Impaction.



The distribution of impacted third molar by unilateral & bilateral (U/L & B/L) occurrences shown in Table 2 & Figure IV, was statistically significant ($p < 0.005$). Of the 900 unilateral third molar impactions, 606(54.35%) were in the mandible and 294(62.03%) were in the maxilla. Of 689 bilateral third molar impactions, 509(45.65%) were in the mandible and 180(37.97%) were in the maxilla.

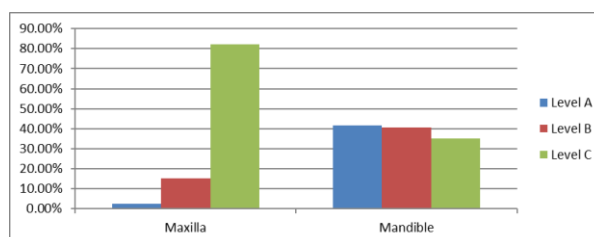
Fig 4: Distribution of third molar impaction by U/L & B/L Occurrences.



The occurrence of the different levels of impaction shown in Table 3 & Figure V was statistically significant ($p < 0.001$). In the mandible, level A (670, 41.61%) was commonly followed by level B (652, 40.50%) and level C (288, 17.89%). In the maxilla, level C (489, 82.32%) was commonly followed by level B (91, 15.32%) and level A (14, 2.36%).

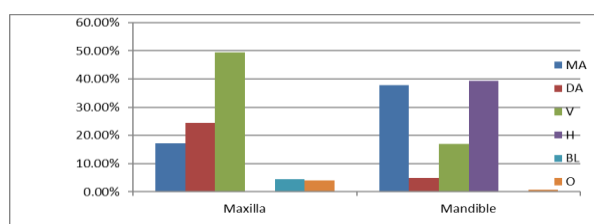
The occurrence of the different angulations of impacted third molars in mandible and maxilla shown in Table 4 & Figure VI, was statistically significant ($p < 0.001$). The horizontal (639, 39.32%) and mesioangular (613, 37.72%) impaction were the most common in the mandible followed by vertical (276, 16.98%), distoangular (80, 4.92%), others (12, 0.74%) and buccolingual (5, 0.31%).

Fig 5: Distribution of Third Molar Impaction by Level of Impaction.



In maxilla, vertical impaction (322, 49.31%) was the most common followed by distoangular (160, 24.50%), mesioangular (112, 17.15%), buccolingual (30, 4.59%), others (27, 4.13%) and horizontal (2, 0.31%).

Fig 6: Distribution of Third Molar Impaction by Angulation.



MA- Mesio Angular; DA- Disto Angular; V- Vertical; H- Horizontal; BL- Bucco Lingual; O- Others

DISCUSSION

According to Mead, an impacted tooth is defined as a tooth that is prevented from erupting into position because of malposition, lack of space or other impediments.¹³

Table 1: Distribution of Impacted Third Molar by Side of Impaction.

JAW	Distribution of Impacted Third Molar by Side of Impaction					Chi square	p
	Right		Left		Total		
	N	%	N	%			
MAXILLA	319	48.70	336	51.30	655	0.031	0.861
MANDIBLE	797	49.11	826	50.89	1623		
TOTAL	1116	48.99	1162	51.01	2278		

Table 2: Distribution of Third Molar Impaction by U/L & B/L Occurrences.

JAW	Distribution of Impacted Third Molar by U/L & B/L Occurrences					Chi square	p
	U/L		B/L		Total		
	N	%	N	%			
MAXILLA	294	62.03	180	37.97	474	7.98	0.005**
MANDIBLE	606	54.35	509	45.65	1115		
TOTAL	900	56.64	689	43.36	1589		

** Significant at 1 % ; U/L – Unilateral; B/L – Bilateral

Table 3: Distribution of Third Molar Impaction by Level of Impaction.

JAW LEVEL	Distribution of third molar impaction by level of impaction							Chi square	p
	A		B		C		Total		
	N	%	N	%	N	%			
MAXILLA	14	2.36	91	15.32	489	82.32	594	808.09	< 0.001**
MANDIBLE	670	41.61	652	40.50	288	17.89	1610		
TOTAL	684	31.03	743	33.71	777	35.25	2204		

** Significant at 1 %

Table 4: Distribution of Third Molar Impaction by Angulation.

JAW LEVEL	Distribution of Third Molar Impaction by Angulation													Chi Square	p
	MA		DA		V		H		BL		O		Total		
	N	%	N	%	N	%	N	%	N	%	N	%			
Maxilla	112	17.15	160	24.50	322	49.31	2	0.31	30	4.59	27	4.13	653	755.95	< 0.001**
Mandible	613	37.72	80	4.92	276	16.98	639	39.32	5	0.31	12	0.74	1625		
TOTAL	725	31.83	240	10.54	598	26.25	641	28.14	35	1.54	39	1.71	2278		

** Significant at 1 % ; MA- Mesio Angular; DA- Disto Angular; V- Vertical; H- Horizontal; BL- Bucco Lingual; O- Others

Peterson characterised impacted teeth as those teeth that fail to erupt into the dental arch within the expected time.¹⁴ Farman explained that impacted teeth were those teeth that were prevented from eruption due to physical barriers within the path of eruption.¹⁵ Removal of impacted teeth is the most common surgical procedure performed by Oral and Maxillofacial surgeons.¹⁶ The prevalence of impacted third molar ranges from 16.7%^{3-5,17-19} to 68.6%.²⁰

The selection criteria of this study were;

1. Patients aged above 20 years, due to the completion of growth²¹ and most of the third molar roots by this time.
2. Elimination of patients who are having systemic problems which might be the reason for impaction.

In this study, the prevalence of impacted third molars in South Chennai, which is one of the metropolitan cities in India, was estimated at 28.5%, which is lower than the prevalence estimated by A. Ramamurthy et al. (41.2%)²², Ali. H. Hasan et al. (40.5%)²³, Quek et al. (68.6%)²⁰ and Mariyam-Alsadat et al. (44.3%)²⁴. This result is relatively equal to Eliasson et al. (30.3%)²⁵, Matlab (33%)¹ and Mentaluis (32%)²⁶. The gender and racial differences were the main reasons for this difference.

Third molar impaction was more common in males (58.62%) in this sample. It disagrees with the earlier studies which stated that the jaws of the female stopped growing when third molars just begin to erupt, whereas, in males, the growth of the jaws continued beyond the eruption time of the third molar²⁷, while most of the earlier studies showed no sexual predilection^{26, 28}.

The literature shows the variations in the frequency of occurrence of different angulations of the third molar. In this study, the horizontal impactions were common in the mandible which was in contrast to the studies done by Nasrren et al²⁹, Kanneppady et al³⁰, Obiechina et al³¹, Quek et al²⁰, Kramer et al³² and Mariyam-Alsadat et al²⁴ in which mesioangular impactions were common in the mandible while Hugson et al³³ reported that the vertical impactions were common in the mandible. This could be due to

the fact that a different method of classification of angulation was used.

In this study, vertical impaction was common in the maxilla, which is in similarity with the studies done by A. Ramamurthy et al²², Ali.H.Hasan et al²³, Mariyam-Alsadat et al. ²⁴ and Quek et al²⁰. But Kruger et al³⁴ reported that mesioangular impaction was common in the maxilla. Even though horizontal impaction is common in the mandible and vertical impaction is common in the maxilla, the overall prevalence of mesioangular impaction was much higher than the other types.

The assessment of level impaction is according to the level of CEJ of third molar relative to the alveolar bone height and not according to the relationship to the occlusal surface of the second molar. This is more objective since it excludes any frequently erupting the third molar. In this study, Level C was common in maxilla which agrees with the Ali.H.Hasan et al²³, Quek et al²⁰. Level A was common in mandible, which disagrees with Ali.H.Hasan et al²³, Quek et al. ²⁰ But overall prevalence of level C was higher than the other levels in this study.

Dachi and Howell reported that unilateral and bilateral third molar impaction occurred with almost equal frequency¹⁸. But in this study, unilateral third molar impaction was common both in maxilla and mandible, which disagrees with A. Ramamurthy et al²², Ali.H.Hasan et al²³, Quek et al²⁰, Katayon N Kurchid et al³⁵.

There was no significant difference between Right and a Left side in both jaws, which agrees on the report of Ali H. Hasan et al. ²³ But Nasrren et al²⁹ reported that third molar impactions were common in the right side of the jaws.

CONCLUSION

From this study, we concluded that third molar impaction is less prevalent with male predilection and distribution of third molar impaction is higher in the mandible than that of the maxilla and impacted maxillary and mandibular third molar together. The horizontal impaction is common in the mandible and vertical impaction is common in maxilla but overall mesioangular is in the high prevalence rate. Level C is common in the maxilla. Level A is common in the mandible; overall Level C

is higher than all the levels. Unilateral third molar impaction is common and there was no significant difference between right and left side in both jaws. Further studies are necessary to evaluate the pattern and prevalence of impacted third molar in other parts of India because of its massive population and wide geographic area.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Neelima Anil Malik. Minor oral surgical procedures In: Neelima Anil Malik. Text book of Oral & Maxillofacial Surgery. Third e Ed. Jaypee 2012: 145 – 9.
2. Syed KB, Zaheer KB, Ibrahim, Bagima, Asiri 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
3. Raghoobar GM, Boering G, Vissink A, Stegenga B. Eruption disturbances of permanent molars: a review. J Oral Pathol Med. 1991;20(4):159–166.
4. Jacoby H. The etiology of maxillary canine impaction. Am J Orthod. 1983;84(2):125–132.
5. Moyres RE. Handbook of Orthodontics. 4th ed. Chicago, IL: Year Book Medical Publishers; 1988.
6. Bishara SE, Andreasen G. Third molars: a review. Am J Orthod 1983;83:131-7.
7. Peterson LJ. Principles of management of impacted teeth. In: Peterson LJ, Ellis E, Hupp JR, Tucker MR, editors. Contemporary oral and maxillofacial surgery. 4th ed. New York: Mosby, 2003;184-213.
8. Svendsen H, Maertens JKM. Etiology of third molar impaction. In: Andreasen JO, Petersen JK, Laskin DM, eds: Textbook and Color Atlas of Tooth Impactions. Copenhagen: Munksgaard 1997; 223-7
9. 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;89:143-6
10. Thangavelu A, Yoganandha R, Vaidhyanathan A. Impact of impacted mandibular third molars in mandibular angle and condylar fractures. Int. J. Oral Maxillofac Surg. 2010; Feb 39(2): 136-9
11. Imendros-Marqués N, Alaejos-Algarra E, Quinteros-Borgarello M, Berini-Aytés L, Gay-Escoda C. Factors influencing the pro-phylactic removal of asymptomatic impacted lower third molars. Int. J Oral Maxillofac Surg. 2008;37:29-35.
12. Beeman CS. Third molar management: a case for routine removal in adolescent
13. Archer WH. Oral Surgery: A Step-By-Step Atlas of Operative Techniques, 4th ed. Philadelphia: W.B. Saunders Company; 1966. 507-10.
14. Peterson LJ. Principles of Management of Impacted Teeth. In: Peterson LJ, Ellis E III, Hupp JR, Tucker MR, editors. Contemporary Oral and Maxillofacial Surgery, 3rd ed. St. Louis: Mosby; 1998. p. 215-48.
15. Agarwal KN, Gupta R, Faridi MM, Kalra N. Permanent dentition in Delhi boys of age 5-14 years. Indian Pediatr. 2004 Oct;41(10):1031-5.
16. LJ Peterson, Gregory M Ness. Impacted teeth. In Peterson's Principles of oral and maxillofacial surgery – Vol I: 2nd ed: P 139 - 155
17. Levi O, Regan D. Impaction of maxillary permanent second molars by the third molars. J Paediatr Dent. 1989;5:31–4.
18. Dachi SF, Howell FV. A survey of 3,874 routine full-mouth radiographs. II. A study of impacted teeth. Oral Surg. 1961;14:1165–9.
19. Hattab FN, Rawashdeh MA, Fahmy MS. Impaction status of third molars in Jordanian students. Oral Surg Oral Med Oral Pathol Radiol Endod. 1995; 79:24-9
20. S.L. Quek, C.K. Tay, K.H. Tay, S.L. Toh, K.C. Lim. Pattern of third molar impaction in a Singapore Chinese population: a retrospective radiographic survey. Int. J. Oral Maxillofac. Surg. 2003;32: 548-52.
21. Fielding AF, Douglass AF, Whitley RD. Reasons for early removal of impacted third molars. Clin. Prev Dent. 1981;3(6):19–23.

22. A. Ramamurthy, Jeya Pradha, Sathiya Jeeva, Nadeem Reddy, J. Sunitha, Selvakumar. Prevalence of mandibular third molar impaction and agenesis: A radiographic south Indian study. J. Ind. Acad. Oral Med and Radiology 2012;24(3);1736
23. Ali.H.Hasan, Pattern of third molar impaction in a Saudi Population. Clinical, Cosmetic and Investigational Dentistry 2010;2 109-13
24. Maryam-Alsadat Hashemipour, Mehrnaz Tahmasbi-Arashlow, Farnaz Fahimi-Hanzaei. Incidence of impacted mandibular and maxillary third molars: a radiographic study in a
25. Eliasson S, Heimdahl A, Nordenram A. Pathological changes re-lated to long-term impaction of third molars. A radiographic study. Int J Oral Maxillofac Surg. 1989;18: 210-12.
26. Montelius GA. Impacted teeth: a comparative study of Chinese and Caucasian dentitions. J Dent Res. 1932;12(6):931-8.
27. Hellman M. Our third molar teeth: their eruption, presence and absence. Dental Cosmos. 1936;78:750-62.
28. Brown LH, Berkman S, Cohen D, Kaplan AI, Rosenberg M.A radiological study of the frequency and distribution of impacted teeth. J Dent Assoc S Afr. 1982;37(9):627-30.
29. Nasreen Amanat, Daud Mirza, Kulsoom Fatima Rizvi. Pattern of third molar impaction: frequency and types among patients attending urban teaching hospital of Karachi. Pak Oral & Dental Jour. 34(1):34-7
30. Kanneppady SK, Balamanikanda srinivasan, Kumaresan R, Sakri SB. A comparative study on radiographic analysis of impacted third molar among three ethnic groups of patients attending AIMST Dental Institute, Malaysia Dent Res J (Isfahan).2013May;10(30):353-8.
31. Obiechina AE, Arotiba JT, Fasola AO. Third molar impaction: evaluation of the symptoms and pattern of impaction of mandibular third molar teeth in Nigerians. South-east Asian J Oral Maxillofac Surg. 2001;93:22-5. .
32. Kramer RM,William AC.The incidence of impacted teeth. Oral Surg Oral Med Oral Pathol 1970;29:237-41.
33. Hugson A, Kugelberg CF. The prevalence of third molars in a Swedish population. An epidemiological study. Community Dental Health 1988: 5: 121-38.
34. Kruger E, Thomson WM, Konthasinghe P. Third molar outcomes from age 18 to 26 findings from a population-based New Zealand longitudinal study. Oral Surg Oral Med Oral PatholOral RadiolEndod.2001;92(2):150-55.
35. Katayon N. Hurchid, Omed I. Shihab. 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.