

# A radiographic survey of agenesis of the third molar: A panoramic study

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## Introduction

Evolution is problematic with various theories, which are still reevaluated on the basis of new genetic discoveries. Earlier teeth were vital tool used mainly for hunting and eating of raw food, harvesting, and manipulating food. The ability to survive in dependence to teeth was reduced few million years ago when hominids reached an upright position.<sup>[1]</sup>

## Abstract

**Purpose:** It is a well-known fact that nature tries to eliminate what is not in use. Because of this, the number of certain teeth which are no longer necessary for function are either getting increasingly impacted or are not developing at all. This is especially the case where third molars are concerned. Furthermore, the presence or absence of the third molar is significant to all branches of dentistry and in particular, forensic dentistry. **Objectives:** The objectives of this study is to assess (1) The prevalence of third molar agenesis in population of age group 18–25 years. (2) The genderwise difference of third molar agenesis. (3) The difference between maxilla and mandible. **Materials and Methods:** Dental patients, who are advised or referred for orthopantomograph, visited to the Department of Oral Medicine and Radiology were included in the study. The study population comprised 300 patients. **Statistical Analysis:** The data obtained was tabulated and subjected to statistical analysis. SPSS version 17 software was used for the analysis of the data. The Chi-square test was used for the same. **Results:** The incidence of agenesis of the third molar is significantly higher for tooth number 18 ( $P < 0.001$ ). Overall, it is significantly higher among females compared to the males ( $P < 0.001$ ) in our study population. **Conclusion:** (1) The present study reports 46.7% agenesis of the third molar. (2) The frequency of third molar agenesis was found significantly greater in the females. (3) Third molar agenesis showed a greater predilection in maxilla compared to mandible.


**Key words:** Agenesis, forensic dentistry, molar, panoramic, radiography, third

The discovery of fire led to cooking and softening of food and consequently to the survival of individuals with the loss of some or even the loss of all teeth. As the result of these dramatic biological and cultural changes, people lowered their dependency on all kinds of teeth, mainly the third molars.<sup>[1]</sup> Hence, the incidence of the third molars getting impacted or genetically missing is the highest. Hence, third molars may be considered as “vestigial.” Agenesis is the

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congenitally absence of at least one permanent tooth. It is the most frequently encountered dental anomaly.<sup>[2]</sup>

The process of development and eruption of the third molar has been shown to be highly variable. The third molar has the highest incidence of tooth agenesis (20%), and cases with such anomaly were found to have 13 times higher chance of agenesis of remaining teeth. This illustrates how the status of third molar would affect the clinical presentation and the treatment planning process of different dental disciplines.<sup>[3]</sup>

The most often congenitally missing as well as impacted teeth are the third molars, which are present in 90% of the population with 33% having at least one impacted third molar. Impacted teeth are often associated with pericoronitis, periodontitis, cystic lesions, neoplasm, root resorption, and can cause detrimental effects on adjacent tooth.<sup>[4]</sup>

The presence or absence of third molars, the age at which they develop, the time of eruption, and the position and direction of eruption are significant to all branches of dentistry and in particular, forensic dentistry. Several authors have stated that the formation of the third molars is the only quantitative biological variable available for estimating the age of an individual in the early twenties.<sup>[5]</sup>

Thus, ascertaining the rate of third molar agenesis in certain populations can improve reliance on third molars as indicators of age. Knowing that third molar agenesis affects a certain percentage of the population can prevent an analyst from making a hasty assumption about age. This study will advance the utility of human variation research to the fields of forensic anthropology and forensic odontology.<sup>[6]</sup>

There is great variation in the timing of development, calcification, and eruption of third molars or wisdom teeth. Development of wisdom teeth may begin as early as 5 years or as late as 6 years, with the peak formation period at 8 or 9 years. Calcification can start at age 7 years in some children and as late as 16 years in others. Enamel formation is normally completed between 12 and 18 years, and root formation is normally completed between 18 and 25 years.<sup>[6]</sup> Hence, the particular age group is considered in the present study.

Agenesis has been reported as the most frequently occurring dental anomaly. The difference in sampling methods, research tools, source population, age, and sex could explain the variations in reporting the prevalence of these anomalies. According to a previous study, 12.7% prevalence of third molar agenesis was reported in British population; Gracia-Hernandez *et al.* found a prevalence of 24.75% in Chile population and Lee *et al.* reported 41% for Korean population. Sujon *et al.* reported 30% and 33% prevalence in Malaysian Malay and Malaysian Chinese, respectively.<sup>[7]</sup>

Due to geographical variations in the prevalence of third molar agenesis, we intend to investigate the prevalence of third molar agenesis. Hence, the objectives of this study were to investigate (1) The prevalence of third molar agenesis in population of age group 18–25 years. (2) The genderwise difference of third molar agenesis. (3) The difference between maxilla and mandible.

## Materials and Methods

Dental patients, who are advised or referred for orthopantomograph, visited the Department of Oral Medicine and Radiology were included in the study. The study population comprised 300 patients with age group between 18 to 25. A detailed clinical history along with the previous history of extraction of the third molar was recorded in the designed pro forma. Patients having a history of the third molar extraction were not included in the study. The ethical clearance was obtained by the ethical committee of the institution. The software used for statistical analysis is SPSS software version 17.(SPSS Inc., Chicago, IL, USA).The obtained data were statistically analyzed using Chi-square test and pie diagram.

## Results

In the present study, out of 300 study population, 173 were females and 127 were males. The obtained data was statistically analyzed using Chi-square test and pie diagram.

The prevalence of third molar agenesis in this study was 46.7%. The agenesis was more commonly seen in females (56.6%) than in males (33.1%) [Graph 1].

The incidence of agenesis of the third molar is significantly higher for maxilla than in mandible.

The incidence of agenesis of the third molar is significantly higher for tooth number 18 ( $P < 0.001$ ) followed by 28, 38 and least in tooth number 48 [Graph 2].

The incidence of agenesis of third molar is significantly higher for tooth number 18 ( $P < 0.001$ ). Overall, it is significantly higher among females compared to the males ( $P < 0.001$ ). The incidence of agenesis is significantly higher among females compared to the males for tooth numbers 28 and 38 ( $P < 0.05$  for both) [Figures 1 and 2]. The incidence of agenesis did not differ significantly between males and females for tooth number 48 ( $P > 0.05$ ) [Table 1 and Graph 3].

Therefore, in the present study, the right maxillary third molars were found to be more missing as compared to third molars of other quadrants.

In the present study group, 20.3% of patients had a missing single third molar, 21.3% had missing two third molars,

3.3% had missing three third molars, and 1.8% had missing all the third molar [Graph 4].

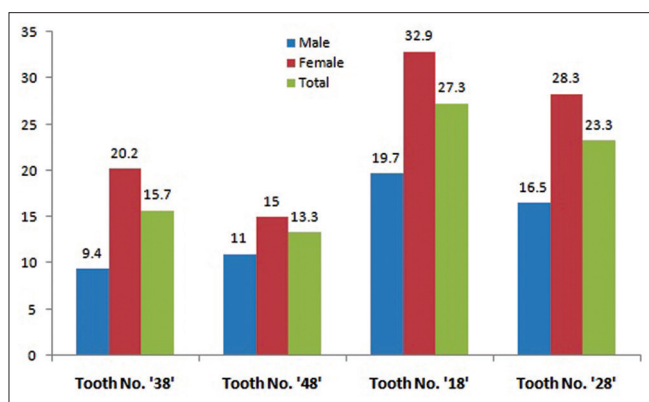
The incidence of agenesis did not differ significantly between males and females for tooth number 48 ( $P > 0.05$ ).

## Discussion

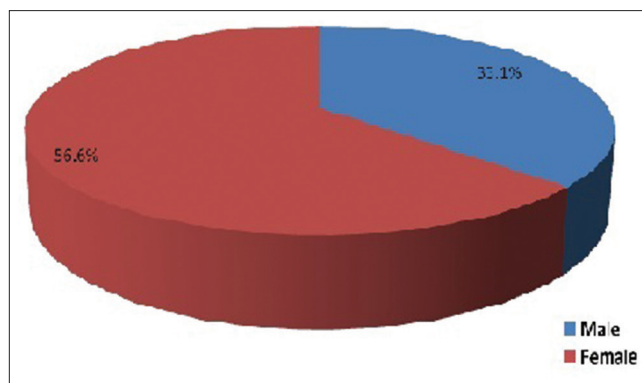
As racial variation, nature of diet, degree of use of masticatory apparatus, and genetic inheritance can affect the jaw size and tooth size, studies of prevalence and incidence

of third molar agenesis and impaction have been carried out on different population groups by various authors<sup>[8]</sup> [Figure 3].

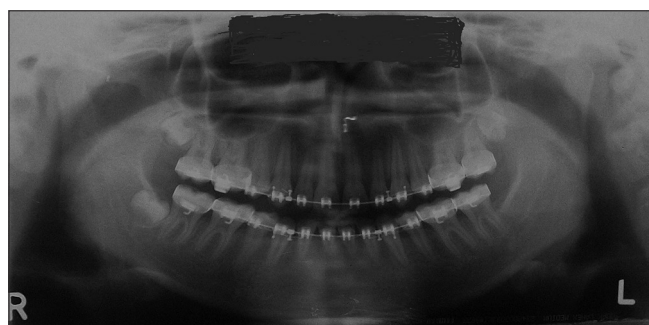
The third molars are the last teeth to erupt in the oral cavity. Since they erupt at about the time when the youth goes off into the world to become wise, they referred to as wisdom teeth. The word wisdom tooth is derived from Latin word dens sapientiae. In many Spanish-speaking countries, it is called as the molar of judgment. This is because when they appear, the person is considered to have better judgement ability than that of a child. Turkish refers the third molar



**Graph 1:** The distribution of agenesis of third molar in different quadrants



**Graph 2:** The distribution of agenesis of third molar according to the gender



**Figure 1:** Agenesis of unilateral left mandibular third molar



**Figure 2:** Agenesis of bilateral maxillary third molars

**Table 1: The distribution of agenesis of third molar in different quadrants**

Gender	Tooth number (quadrant)				Total	$P^a$ ( $P$ Value 1)
	38	48	18	28		
<b>Male (<math>n=127</math>)</b>						
Missing	12 (9.4)	14 (11.0)	25 (19.7)	21 (16.5)	42 (33.1)	0.068 [ $P < 0.05$ ]
Nonmissing	115 (90.6)	113 (89.0)	102 (80.3)	106 (83.5)	85 (66.9)	
<b>Female (<math>n=173</math>)</b>						
Missing	35 (20.2)	26 (15.0)	57 (32.9)	49 (28.3)	98 (56.6)	0.001 [ $P < 0.01$ ]
Nonmissing	138 (79.8)	147 (85.0)	116 (67.1)	124 (71.7)	75 (43.4)	
<b>Total (<math>n=300</math>)</b>						
Missing	47 (15.7)	40 (13.3)	82 (27.3)	70 (23.3)	140 (46.7)	0.001 [ $P < 0.01$ ]
Nonmissing	253 (84.3)	260 (86.7)	218 (72.7)	230 (76.7)	160 (53.3)	
$P^b$ (male vs. female)	0.011	0.313	0.011	0.017	0.352	-0.001 [ $P < 0.01$ ]

$n$ : Number of subjects,  $P^a$ : ( $P$  Value 1),  $P^b$ : ( $P$  Value 2)

directly to the age at which wisdom teeth appear and calls it 20<sup>th</sup> year tooth.<sup>[2]</sup>

In this study, the conventional panoramic radiographic examination of 300 patients of age group ranging from 18 to 25 years old was done. A detailed clinical history along with the previous history of extraction of third molar was recorded in the designed pro forma. Patients having a

history of the third molar extraction were not included in the study.

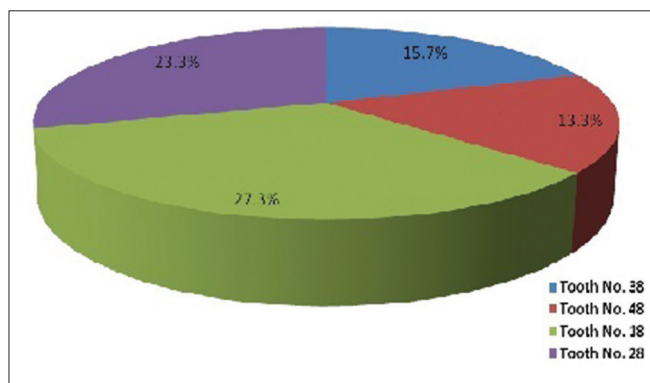
Panoramic radiographic procedure was selected over the intraoral periapical radiographs, due to its advantage of being a fast process and where in the view of the entire maxilla-mandibular region on a single film could be obtained. The procedure is convenient to patient and requires little expertise of the radiologist. The main advantages of this procedure are that the status of developing third molars can be viewed, their relation to inferior alveolar dental canal, type of impaction, and site of the third molar can be easily revealed.<sup>[2]</sup>

Kaur *et al.*<sup>[2]</sup> and Endo *et al.*<sup>[9]</sup> found agenesis of the third molars in 35.4% and 32.3% of the study population and the present study it is (46.7%).

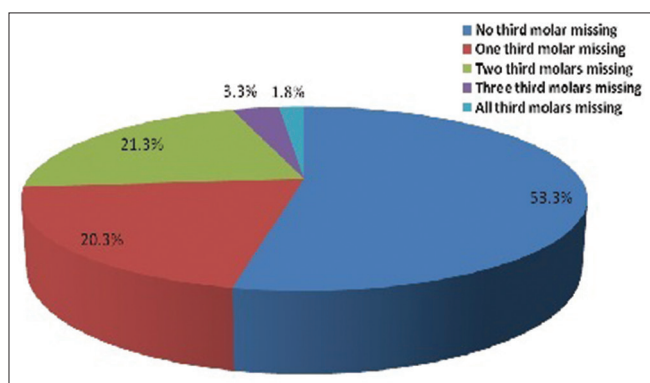
The lowest prevalence of third molar agenesis reported so far was 10.1% for African-Americans and the highest prevalence was 41% for the Koreans. Moreover, Sujon *et al.* reported 28% for New-Zealanders, Malaysian Malays had 30%, and Indian Panjabi people had 11.5% [Figure 3].<sup>[7]</sup>

Kaur *et al.*,<sup>[2]</sup> found agenesis more in males. Raloti *et al.* found that percentages of missing third molars were higher in female.<sup>[10]</sup> However, contrary to their findings studies conducted by Endo *et al.*,<sup>[9]</sup> Hattab *et al.*,<sup>[11]</sup> Lynham,<sup>[12]</sup> showed no sexual predilection for agenesis of the third molars. However, the results of the present study revealed that the agenesis of the third molars was more frequently seen in females.

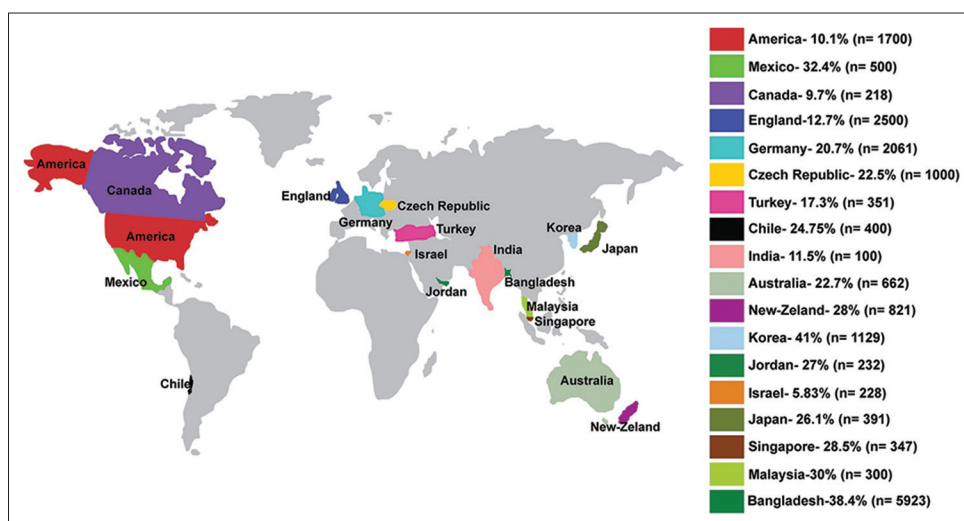
Tavajohi-Kermani *et al.*<sup>[13]</sup> found that agenesis is more common in mandible. Rahardjo<sup>[14]</sup> and Kaur *et al.*,<sup>[2]</sup> concluded that agenesis is more prevalent in maxilla as compared to mandible. In our results, in concordance to



**Graph 3:** The distribution of agenesis of third molar according to the quadrants



**Graph 4:** The overall distribution of agenesis of third molar



**Figure 3:** Global distribution of number of subjects and their prevalence of third molar agenesis

Rahardjo, agenesis of third molars is found to be more in maxilla (50.6%) as compared to mandible (29.0%).

In the present study group, 21.3% had missing two third molars, 20.3% of patients had a missing single third molar, 3.3% had missing three third molars and 1.8% had missing all the third molars. There was a higher incidence of two third molars missing. Kaur *et al.*<sup>[2]</sup> found that 13.2% of patients had a missing single third molar, 12.4% had missing two third molars, 4.8% had missing three third molars, and 5% had missing all the third molars.

Nanda in his study mentions that differences in the incidence of absent third molars are associated with underlying genetic differences which make the individuals differ morphologically from each other. Nanda and Chawla state that the speculation that third molars are decadent vestigial teeth.

In humans, a missense mutation in the MSX1 gene at chromosome 4p16.1 appears to be responsible for the agenesis of third molars. Bone morphogenetic protein-4, produced early in dental epithelial development, regulates mesenchymal tooth-specific gene expression, including that of the MSX1 gene. The collective influence of these genes and their corresponding growth factors is probably associated with the clinical findings of tooth agenesis.<sup>[15,16]</sup> Decreased maxillary jaw size and maxillary tooth agenesis were generally associated.<sup>[15]</sup>

## Conclusion

1. The present study reports 46.7% agenesis of the third molar
2. The frequency of third molar agenesis was found significantly greater in the females
3. Third molar agenesis showed a greater predilection to maxilla in comparison to mandible.

Data, concerning the incidence of third molars agenesis, belong to the essential characteristics of the dentition's status of the given population. Dental developmental anomalies can indicate the degree of genetic load of individuals and relatives.

Regular monitoring of the third molars agenesis incidence should become an integral part of the appropriate oral health care in the given group of population. As time goes

by, agenesis of the third molars is increasing, so they can be considered as vestigial.

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## Conflicts of interest

There are no conflicts of interest.

## References

1. Pitekova L, Satko I. Controversy of third molars. Bratisl Lek Listy 2009;110:110-1.
2. 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. Arch Oral Res 2012;8:13-8.
3. Bindayel NA. The role of third molar in orthodontic treatment. Pak Oral Dent J 2011;31:374-8.
4. 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;3:151-8.
5. Priyadharshini KI, Idiculla JJ, Sivapathasundaram B, Mohanbabu V, Augustine D, Patil S. Age estimation using development of third molars in South Indian population: A radiological study. J Int Soc Prev Community Dent 2015;5 Suppl 1:S32-8.
6. Hentisz AY. A Radiographic Study of Third Molar Agenesis in a Sample from the American Midsouth. Master's Thesis, University of Tennessee; 2003.
7. Sujon MK, Alam MK, Rahman SA. Prevalence of third molar agenesis: Associated dental anomalies in non-syndromic 5923 patients. PLoS One 2016;11:e0162070.
8. Byahatti S, Ingafou MS. Prevalence of eruption status of third molars in Libyan students. Dent Res J (Isfahan) 2012;9:152-7.
9. Endo S, Sanpei S, Ishida R, Sanpei S, Abe R, Endo T. Association between third molar agenesis patterns and agenesis of other teeth in a Japanese orthodontic population. Odontology 2015;103:89-96.
10. Raloti S, Mori R, Makwana S, Patel V, Menat A, Chaudhari N. Study of a relationship between agenesis and impacted third molar (wisdom) teeth. Int J Res Med 2013;2:38-41.
11. Hattab FN, Rawashdeh MA, Fahmy MS. Impaction status of third molars in Jordanian students. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;79:24-9.
12. Lynham A. Panoramic radiographic survey of hypodontia in Australian defence force recruits. Aust Dent J 1990;35:19-22.
13. Tavajohi-Kermani H, Kapur R, Sciote JJ. Tooth agenesis and craniofacial morphology in an orthodontic population. Am J Orthod Dentofacial Orthop 2002;122:39-47.
14. Rahardjo P. Prevalence of hypodontia in Chinese orthodontic population. Dent J Majalah Kedokt Gig 2006;39:147-50.
15. Nanda RS, Chawla TN. Status of third molar teeth. J Dent Assoc 1959;31:19-29.
16. Kapadia H, Mues G, D'Souza R. Genes affecting tooth morphogenesis. Orthod Craniofac Res 2007;10:105-13.