

Third Molar agenesis among children and youths of Central India: A retrospective prevalence study

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ABSTRACT

Background: One of the most prevalent dental abnormalities, third molar agenesis, or the congenital lack of wisdom teeth, may be a reflection of current evolutionary patterns. There is still little information on its prevalence in Central India, despite the fact that there have been several research conducted elsewhere.

Materials and Methods: A retrospective analysis of 1962 OPGs (1004 females, 958 males) from 2019 to 2023 was conducted. The presence or absence of third molars was assessed in OPGs. Data were analysed to assess overall prevalence, gender distribution, jaw involvement, and yearly trends.

Results: Third molar agenesis was observed in 29.45% of the study population, with a higher prevalence in females (30.78%) than males (28.07%). The prevalence showed a consistent increase from 2019 (27.35%) to 2023 (33.52%). The maxilla had a greater frequency of bilateral agenesis than the mandible, and bilateral agenesis was more frequent than unilateral. The most frequent pattern observed was agenesis of all four third molars.

Conclusion: The study indicates a rising trend in third molar agenesis over time, especially among females and in the maxillary arch. The findings suggest that third molars are progressively becoming vestigial, likely influenced by evolutionary, genetic, and environmental factors. Continuous surveillance of third molar development can aid in understanding craniofacial growth patterns and guiding dental treatment planning.

Keywords: Third molar agenesis, wisdom teeth, OPG, Central India, prevalence, congenital absence, dental anomalies.

INTRODUCTION

Agenesis, or congenital tooth loss, refers to the failure of a tooth to develop within its expected period of growth and formation. The third molar, also known as the wisdom tooth, develops entirely after birth and is typically the last tooth to erupt across all ethnic groups, despite variations in eruption sequences due to racial differences.

Environmental factors,¹ systemic diseases,² genetic polymorphisms,³ and teratogens⁴ were shown to

affect tooth development with effects on tooth size, shape, position, and total absence. Therefore, it is understandable that deviations in the typical development of third molars are common, given that they are the final teeth to develop. In prehistoric humans, when the jaw size permitted space for normal dental development and position in the arches, third molar may have been a vital survival tool.⁵ However, human tooth sizes, both mesiodistal and buccolingual dimensions of the

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maxillary and mandibular teeth, have since been gradually decreasing.⁶ According to research on orthodontic patients in Japan, the frequency of maxillary third molar agenesis increased significantly with decreasing maxillary basal bone.⁷ In modern people, third molars have the highest frequency of polymorphisms, malpositioning, impactions, and agenesis. Approximately 65% of the human population has at least one impacted third molar, and those that do erupt are often malpositioned in the dental arches, making them difficult to manage clean.⁵

Third molars, which have the highest rate of impaction, often erupt in the oral cavity between the ages of 18 year and 24 year. On radiography, they first appear as early as age 5 year and as late as age 16 year. Third molars are typically not directly engaged in orthodontic therapy, but in certain instances, their ability to affect or be affected by orthodontic treatment necessitate an active role in treatment planning⁸.

Dental agenesis can be encountered in both deciduous and permanent dentition. Congenitally absence of tooth buds can result in aesthetic and functional difficulties in the affected individuals depending on the type of tooth affected. Hence, it's crucial to recognize the condition and instigate appropriate treatment⁹.

In primary dentition, the tooth agenesis prevalence ranges between 0.1% and 0.2%. However, in the permanent dentition tooth agenesis is prevalent in 6.4% of the overall population, with similar occurrence in the two jaws¹⁰. Tooth agenesis studies generally exclude third molar, due to the high frequency of their absence.

Before determining if a tooth is congenitally absent, a radiographic assessment of the dentition is essential. Orthopantomogram (OPG) is a radiographic modality that is routinely employed in dental practice to detect pathologies of both the dentition and jawbones¹¹. Although there are various studies reporting the prevalence of third molar agenesis in different populations, similar studies among the Central Indian population are sparse. The teeth that are usually congenitally lacking are called third molars, and this may be because of evolutionary changes that have changed the size of the jaw and teeth¹².

In order to ascertain the prevalence and distribution of third molar agenesis among Central Indian children and youths as well as the rise in the frequency of third molar agenesis over time, this retrospective study was conducted utilizing OPGs.

MATERIAL AND METHODS

The study comprised dental patients who visited the Department of Oral Medicine and Radiology and were recommended or referred for orthopantomography (OPG). Data during the past five years, from 2019 to 2023, was gathered of individuals aged between 09 to 21years. The lower age limit was set to 09 years because the tooth germ normally becomes visible from age 7 years and crown formation is expected by age 10 years. Since third molars should have erupted into the oral cavity by this age and there is very little chance of extraction before this age, the upper age restriction was set at 21 years. Patients with facial clefts or any other craniofacial syndromes that could affect tooth development and radiographs showing major dental pathologies like tumours or cysts were excluded.

From the Department of Oral Radiology, a total of 1962 OPGs were found throughout this time period, with 958 being male and 1004 being female. This ethical clearance was acquired by the institution's ethics committee. OPGs were examined visually and subsequently reviewed with specialists. Based on the information gathered, the frequency was ascertained.

RESULT

In the current study, there were 958 males and 1004 females among the 1962 study population spanning five years. The prevalence of third molar agenesis was 29.45%, with females experiencing it more frequently (30.78%) than males (28.07%). Between 2019 and 2023, the prevalence of third molar agenesis increased (Table 1). In females, the prevalence of third molar agenesis rose between 2019 and 2023.

Table 1: Total data collected to number of agenesis and the percentage year wise from 2019-2023.

		Total OPGs taken	Agenesis Observed	Percentage %
2019	Male	199	63	31.65

	Female	269	65	24.16
	Total	468	128	27.35
2020	Male	107	26	24.29
	Female	103	27	26.21
	Total	210	53	25.2
2021	Male	193	51	26.42
	Female	167	52	31.13
	Total	360	103	28.61
2022	Male	188	48	25.53
	Female	202	67	33.16
	Total	390	115	29.48
2023	Male	271	81	29.88
	Female	263	98	37.26
	Total	534	179	33.52

Table 2: Incidence of 3rd molar agenesis in males and females unilaterally and bilaterally in each maxilla and mandible.

		Maxilla		Mandible	
		Unilateral	Bilateral	Unilateral	Bilateral
2019	Male	13	28	04	26
	Female	18	28	05	23
2020	Male	10	07	06	12
	Female	07	13	09	12
2021	Male	08	22	10	17
	Female	07	22	13	23
2022	Male	08	20	07	23
	Female	12	38	10	25
2023	Male	11	27	20	29
	Female	12	37	17	39

Table 3: Clinical / Third Molar Impaction Context (Most common if dealing with dental/surgical impactions, e.g., mandibular/maxillary 3rd molars)

		2019	2020	2021	2022	2023
One 3 rd molar agenesis	Male	17	04	08	08	18
	Female	20	04	09	18	23
	Total	37(7.9%)	08(3.8%)	17(4.7%)	26(6.6%)	41(7.6%)
Two 3 rd molar agenesis	Male	33	11	20	14	29
	Female	30	07	18	17	34
	Total	63(13.4%)	18(8.5%)	38(10.5%)	31(7.9%)	63(11.7%)
Three 3 rd molar agenesis	Male	03	03	05	05	10
	Female	00	01	07	08	11
	Total	03(0.6%)	04(1.9%)	12(3.3%)	13(3.3%)	21(3.9%)
Four 3 rd molar agenesis	Male	10	08	18	21	24
	Female	15	15	18	24	30
	Total	25(5.3%)	23(10.5%)	36(10%)	45(11.5%)	54(10.1%)

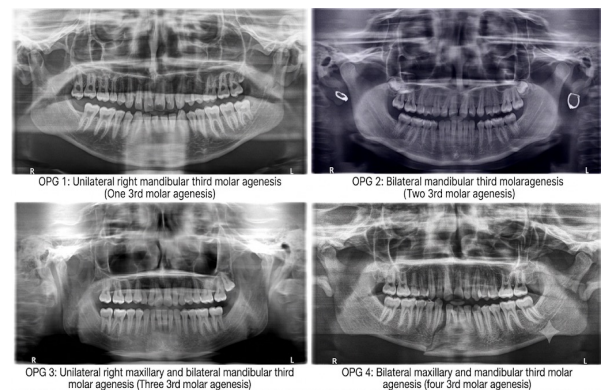


Figure 1: OPG depicting 3rd molar agenesis(One to all four 3rd molar agenesis)

For four third molars, the incidence of agenesis is highest (Table 3). In general, it is higher in females than in males. The incidence of four third molar agenesis was shown to have increased between 2019 and 2023 (Table 3) .

DISCUSSION

Human evolutionary history reveals that changes in diet patterns, the degree of use of the masticatory apparatus, and genetic inheritance have affected

human facial growth, jaw size, and tooth size¹³. Research indicates that agenesis in tooth is the most frequently observed craniofacial anomaly in the human population¹⁴. Third molar agenesis can occur isolated or become a part of a syndrome¹⁵. The last teeth to erupt in the oral cavity are the third molars. Since they erupt at the time when the youth goes off into the world to become wise, they are referred to as wisdom teeth. In this study, the conventional panoramic radiographic investigation of 1962 patients aged 09 to 21 years was done.

Diet¹⁶ and masticatory function^{17,18} have been identified to affect craniofacial growth. Yamada and Kimmel¹⁹ showed that lateral and inferior periosteal bone growth of the ramus and condylar elongation were slowed in rats consuming soft diets with consequent decreased functional force application. They related the changes to regional decreases in osteoblast function, realignment of bone formation surfaces in the ramus area, and slowed growth of condylar cartilage. It has been demonstrated that the masticatory muscles' activity influences both the width of the dental arch where molars are erupting and the lateral expansion of the skull, especially in areas immediately affected by muscle pressures²⁰. Dietary habits and chewing function are closely linked to craniofacial development—particularly of the mandible—which in turn may impact whether the third molars successfully form, as they are the final teeth to develop.

Kaur *et al.*²¹, found agenesis was more in males. Raloti *et al.*²² found that percentages of missing third molars was higher in female. However, contrary to their findings studies conducted by Endo *et al.*²³, Hattab *et al.*²⁴, Lynham²⁵, showed no sexual predilection for agenesis of the third molars. However, the outcome of the present study revealed that the agenesis of the third molars was more frequently seen in females and the incidence was increasing each year.

The prevalence of bilateral agenesis or congenitally missing third molars was more in the mandibular arch than the maxillary arch which was in concordance to Kaur *et al.*²¹ A similar prevalence rate was found in a Swedish study done by Backman *et al.*²⁶ Nevertheless, other research has indicated that the maxillary arch has a greater prevalence of congenital tooth loss than the mandibular arch^{21,27}.

It was proposed that the existence of distinct innervations was the cause of the increased predominance in the maxilla²⁸. Even if the mandibular arch had a higher prevalence in this study, there are no good reasons to believe that this is the reason for the results.

According to the current study's findings, the incidence of bilateral maxillary and mandibular third molar agenesis in females was higher than that of unilateral maxillary and mandibular agenesis in males. Agenesis is more prevalent in the mandible, according to Tavajohi-Kermani *et al.*²⁹ According to the findings of Rahardjo *et al.*³⁰ and Kaur *et al.*²¹, agenesis is more common in the maxilla than in the mandible. Third molar agenesis was more common in the maxillary arch than in the mandibular arch, which is in line with Rahardjo's findings. 10.4% of the current study group had two missing third molars, 9.5% had all three missing, 6.12% had just one missing, and 2.6% had three missing. The prevalence of losing two third molars was greater. In their study, Nisha Singh *et al.*²⁸ found that 21.3% of patients had two missing third molars, 20.3% had one missing, 3.3% had three missing, and 1.8% had none at all. According to research by Kaur *et al.*²¹, 13.2% of patients had one missing third molar, 12.4% had two missing, 4.8% had three missing, and 5% had none at all. Furthermore, from 2019 to 2023, the incidence of missing two and all third molars is increasing..

In this study agenesis of third molars is found to be increasing from 2019 to 2023 in maxilla as compared to mandible.

CONCLUSION

1. According to this study, the incidence of third molar agenesis is rising annually between 2019 and 2023.
2. Females were more susceptible than males to have third molar agenesis.
3. Females had a higher prevalence of third molar agenesis than males, with a larger preference for the maxilla over the mandible.

An essential component of providing the right oral health care for the target population should be routine monitoring of the incidence of third molar agenesis. Third molar agenesis is increasing over

time, therefore it may eventually be regarded as vestigial.

To Ponder

- Can 3rd molar be considered vestigial on observing the current scenario???

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