

(RESEARCH ARTICLE)



## A study of tooth agenesis in a sample of Malagasy orthodontic patients

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### Abstract

The aim of this study was to describe the specific features of dental agenesis in Malagasy people. A retrospective cross-sectional study was conducted in two private orthodontic clinics in the city of Antananarivo, Madagascar. A total of 72 panoramic radiographs of patients aged more than 7 years old and undergoing orthodontic treatment between January 2008 and September 2022 were examined. Dental agenesis was declared in the absence of crown mineralization on the radiograph. Wisdom teeth agenesis was not considered in this study. Data were collected, coded, processed, and analyzed using SPSS 20.0 software. Statistical significance was set at  $p < 0.05$ .

A significant predominance of females (72.2% vs. 27.8%) was observed among subjects with tooth agenesis ( $p < 0.000$ ). The mandible was the most affected arch (57%). The mandibular lateral incisor (83%) was the most frequently absent tooth, followed by the maxillary lateral incisor (69.3%) and the mandibular second premolar (12.2%). Dental position anomalies associated with agenesis included impacted tooth (41.7%) and tooth transposition (4.2%).

The general characteristics of tooth agenesis in our study population did not show any major differences compared to previous researches in other countries. However, a difference linked to ethnic origin was observed regarding the type of tooth most frequently affected by agenesis.

**Keywords:** Tooth agenesis; Hypodontia; Orthodontic patients; Malagasy

### 1. Introduction

Dental agenesis or hypodontia, is characterized by the absence of development of one or more of the 20 primary teeth and/or the 32 permanent teeth [1]. Worldwide prevalence varies considerably, ranging from 0.3% to 36.5% [2,3]. Wisdom teeth are the most frequently affected, with a prevalence ranging from 20% to 31.9% [4, 5, 6, 7]. Excluding third molars, the prevalence varies between 0.03% and 12.6% [8, 9, 10]. This variation is observed across studies, ethnic diversities and geographical differences [8].

Genetic and environmental factors are often associated with agenesis. It can manifest in isolation or be associated with other congenital anomalies such as cleft lip and palate. Additionally, it may be part of syndromes encompassing multiple dental and/or medical abnormalities [10]. Due to the significant functional, aesthetic and psychological challenges it poses, dental agenesis can have a substantial impact on the patient's quality of life [11].

Management is multidisciplinary, involving various specialties such as orthodontics, prosthodontics, implantology and other related disciplines [12, 13, 14, 15]. To the best of our knowledge, there are limited research on this topic in Madagascar. That is the reason why we undertook the present study.

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The objective was to describe the specific features of dental agenesis in Malagasy people.

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## 2. Material and methods

A retrospective cross-sectional study was conducted within two specialized private orthodontic clinics of Antananarivo, Madagascar.

### 2.1. Study population

Records and orthopantomograms of patients with agenesis of permanent teeth and undergoing orthodontic treatment between January 2008 and September 2022 were selected.

- **Inclusion criteria:** Patients had to be 7 years or older, with or without wisdom teeth, to be included in the study.
- **Exclusion criteria:** Poor-quality panoramic radiographs (blurry and/or discolored) and those of foreign nationals were excluded from the study.

After setting out the selection criteria, 72 panoramic radiographs were eligible for inclusion in the study population.

### 2.2. Data collection

Radiographic films were assessed using a portable viewing box, while digital radiographic images were viewed on a computer screen. The evaluation was conducted meticulously, and in cases of uncertainty regarding image interpretation, the opinion of another practitioner was sought to confirm the presence or absence of dental agenesis.

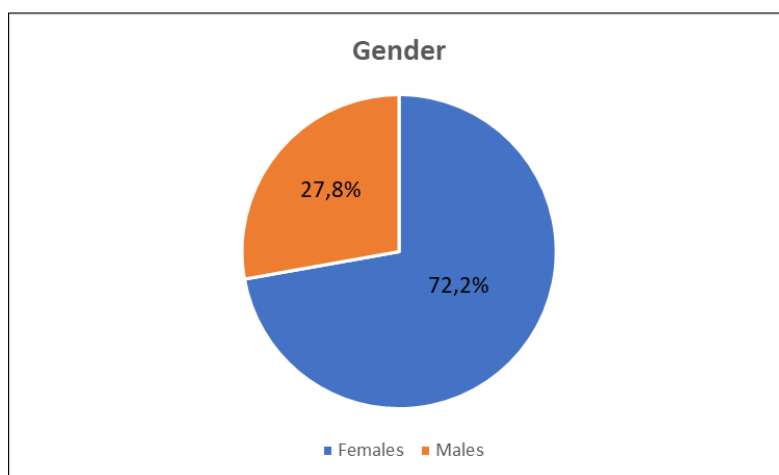
According to our assessment criteria, the visibility of the dental follicle was considered indicative of the tooth's presence. Agenesis of a tooth was declared when the mineralization of its crown was not identified on the radiograph and the clinical record did not mention a history of tooth extraction. Third molar agenesis was not determined in this study.

The independent variables included gender, number of missing teeth, dental arch affected by agenesis, type of missing tooth and associated dental position anomalies.

Anonymity and confidentiality were strictly preserved. Data were collected, coded, processed, and analyzed using SPSS 20.0 software, with statistical significance set at  $p < 0.05$ .

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## 3. Results



**Figure 1** Distribution of patients by gender

**Table 1** Distribution of patients according to the number of missing teeth

Number of missing teeth	Frequency	Percentage
One	35	48.6
Two	30	41.7
Three	5	6.9
Four	2	2.8
Total	72	100.0

**Table 2** Distribution of patients according to the affected arch

Affected arch	Frequency	Percentage
Maxillary	26	36.1
Mandibular	41	57.0
Bimaxillary	5	6.9
Total	72	100.0

**Table 3** Distribution of patients according to the type of missing tooth and affected arch

Tooth type	Affected arch							
	Maxillary		Mandibular		Bimaxillary		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
I1	2	7.7	1	2.4	0	0.0	3	4.2
I2	18	69.3	34	83.0	2	40.0	54	75.0
C	3	11.6	0	0.0	1	20.0	4	5.5
Pm2	1	3.8	5	12.2	2	40.0	8	11.1
I2 & C	0	0,0	1	2.4	0	0.0	1	1.4
I2 & Pm1	1	3.8	0	0.0	0	0.0	1	1.4
Pm1 & Pm2	1	3.8	0	0.0	0	0.0	1	1.4
Total	26	100,0	41	100,0	5	100.0	72	100

**Table 4** Distribution of patients based on the presence of associated dental position anomalies

Dental position anomaly	Frequency	Percentage
Impacted tooth	30	41.7
Tooth transposition	3	4.2
None	39	54.1
Total	72	100,0

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## 4. Discussion

It should be noted that compared to other investigations, our sample size is slightly limited. This consideration should be considered when interpreting the results.

A significant female predominance ( $p < 0.000$ ) was observed among subjects with agenesis. It was found in 52 women (72.2%) versus 20 men (27.8%) (see Figure 1). This female predominance has been reported in previous studies [16–19], and our observations align with these prior findings. Two meta-analyses also revealed sex ratios of 1.22 to 1.37 in favor of females compared to males [17, 20].

Regarding the number of missing teeth, the rate of subjects with one missing tooth was the highest (48.6%), followed by those with two missing teeth, with a percentage of 41.7%. The proportion of subjects with more than two missing teeth was relatively low (9.7%) (see Table 1). This finding is similar with previous results reported by Chung et al. in their study, where the rate of subjects with one missing tooth was 48.9%, while those with two missing teeth stood at 30.7% [21].

The mandible proved to be the most frequently affected dental arch by agenesis, with a percentage of 57%, compared to the maxilla in 36.1% of cases (see Table 2). Simultaneous agenesis affecting both maxillae was observed in 6.9% of cases.

The conclusions of previous studies vary regarding which dental arch is more affected by agenesis. Some studies, such as those conducted by Amini et al. in Iran, Ifesanya et al. in Nigeria and Schonberger et al. in Israel, reported a higher prevalence of dental absence in the maxilla compared to the mandible [8, 18, 19]. In contrast, similar results to those of our study, reporting an increased frequency of agenesis in the mandible compared to the maxilla, were found by Soni et al. in India [22]. Other studies did not find any consistent finding as to which jaw had more missing teeth regarding orthodontic population [16, 23]. Some studies also observed the simultaneous presence of agenesis in the maxilla and mandible, with a considerable frequency, as evidenced by the study by Chung et al. in South Korea [21].

The mandibular lateral incisor was identified as the most frequently absent tooth in our study, with a rate of 83%, followed by the maxillary lateral incisor (69.3%) and the mandibular second premolar (12.2%) (see Table 3). This order of teeth most frequently affected by agenesis varies from country to country. In Malaysia, Mani et al. found that after third molars, the upper lateral incisors, followed by upper- and lower-second premolars were the most common missing tooth [6]. In Japan, Endo et al. observed that the most commonly missing teeth were the mandibular second premolars, followed by the mandibular and maxillary lateral incisors [16]; while Gracco et al. found that the most common congenitally missing teeth were the mandibular second premolars, followed by the upper lateral incisors and the maxillary second premolars in Italian orthodontic patients [24].

A feature frequently correlated with hypodontia is the ectopic position of permanent teeth. This atypical arrangement is caused by the absence of neighboring teeth available to provide guidance during eruption or by insufficient space allowing their emergence. Furthermore, dental transposition, a phenomenon characterized by the abnormal displacement of teeth, is also observed more frequently in individuals with agenesis [25]. In our study, dental position anomalies associated with tooth agenesis were mainly tooth inclusion (41.7%) and tooth transposition, observed in 4.2% of cases (see Table 4).

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## 5. Conclusion

A significant female predominance was observed among subjects with missing teeth in our study population. Moreover, the mandibular arch was more commonly affected by tooth agenesis than the maxilla. The special features of hypodontia in our population was the order of the more frequently involved teeth. The mandibular lateral incisor was found to be the most frequently absent tooth. The associated anomalies were impaction and tooth transposition.

The general characteristics of tooth agenesis in our study population showed no major differences compared to previous research. However, a difference due to ethnic origin was clearly observed regarding the first three most frequently missing teeth.

Expanding the sample size in future investigations could lead to more definitive conclusions in general population. The exploration of genes specific to our population related to this type of anomaly could also be relevant, as part of a global trend in the field of dental genetics.

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## Compliance with ethical standards

### *Acknowledgement*

We would like to thank the managers of the private orthodontic clinics who made this study possible.

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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## References

- [1] Parkin N, Elcock C, Smith RN, Griffin RC, Brook AH. The aetiology of hypodontia: the prevalence, severity and location of hypodontia within families. *Arch Oral Biol* 2009, 54(1):52-6.
- [2] Rosenzweig KA, Garbaski D. Numerical aberrations in the permanent teeth of grade school children in Jerusalem. *Am J Phys Anthropol* 1965, 23(3):277-83.
- [3] Mahaney MC, Fujiwara TM, Morgan K. Dental agenesis in the Dariusleut Hutterite Brethren: comparisons to selected Caucasoid population surveys. *Am J Phys Anthropol* 1990, 82(2):165-77.
- [4] Celikoglu M, Kamak H. Patterns of third-molar agenesis in an orthodontic patient population with different skeletal malocclusions. *Angle Orthod.* 2012 Jan, 82(1):165-9.
- [5] Bhutta N and Sadozai SRK. Association of missing third molars with various skeletal patterns. *Pakistan Oral Dent J.* 2013, 33(2):307-11.
- [6] Mani SA, Salmah W, Mohsin Y, John J. Prevalence and patterns of tooth agenesis among Malay children. *Southeast Asian J Trop Med Public Heal.* 2014, 45(2):490-498.
- [7] Suja AG, Jose J, Prasanth SP and Manoj W. Prevalence of third molar agenesis in population with skeletal class II pattern. *Int J Bioassays.* 2015, 4(7):4165-4170.
- [8] Amini F, Rakhshan V, Babaei P. Prevalence and pattern of hypodontia in the permanent dentition of 3374 Iranian orthodontic patients. *Dent Res J.* 2012, 9(3):245-250.
- [9] Coelho ASEC, Macho VMP, Andrade DJC, Augusto APC, Areias CMF. Prevalence and distribution of tooth agenesis in a pediatric population: a radiographic study. *Rev Gauch Odontol.* 2012, 60(4):503-508.
- [10] Majeed MM, Ahmed I, Uzair M, Atif M. Prevalence of missing, impacted and supernumerary teeth in patients under orthodontic treatment in a teaching hospital of Karrachi, Pakistan. *Int J Dent Heal Sci.* 2014, 1(1):39-46.
- [11] Kotecha S, Turner PJ, Dietrich T, Dhopatkar A. The impact of tooth agenesis on oral health-related quality of life in children. *J Orthod.* 2013 Jun, 40(2):122-9.
- [12] Jepson NJ, Nohl FS, Carter NE, Gillgrass TJ, Meechan JG, Hobson RS, Nunn JH. The interdisciplinary management of hypodontia: restorative dentistry. *Br Dent J* 2003, 194(6):299-304.
- [13] Gill DS, Barker CS. The multidisciplinary management of hypodontia: a team approach. *Br Dent J* 2015, 218(3):143-9.
- [14] Johal A, Huang Y, Toledano S. Hypodontia and its impact on a young person's quality of life, esthetics, and self-esteem. *Am J Orthod Dentofac Orthop.* 2022, 161(2):220-7.
- [15] Laing E, Cunningham SJ, Jones S, Moles D, Gill D. Psychosocial impact of hypodontia in children. *Am J Orthod Dentofac Orthop.* 2010, 137(1):35-41.
- [16] Endo T, Ozoe R, Kubota M, Akiyama M, Shimooka S. A survey of hypodontia in Japanese orthodontic patients. *Am J Orthod Dentofacial Orthop.* 2006 Jan, 129(1):29-35.
- [17] Polder BJ, Van't Hof MA, Van der Linden FP, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol.* 2004 Jun, 32(3):217-26.

- [18] Ifesanya JU, Temisanren OT, Jaiyeoba OO. A radiographic assessment of the prevalence and pattern of dental agenesis in a Nigerian population. *African J Oral Health*. 2018, 8(1): 10-5.
- [19] Schonberger S, Shapira Y, Pavlidi AM, Finkelstein T. Prevalence and Patterns of Permanent Tooth Agenesis among Orthodontic Patients—Treatment Options and Outcome. *Applied Sciences*. 2022, 12(23):12252.
- [20] Khalaf K, Miskelly J, Voge E, Macfarlane TV. Prevalence of hypodontia and associated factors: a systematic review and meta-analysis. *J Orthod*. 2014, 41(4):299-316.
- [21] Chung CJ, Han JH, Kim KH. The pattern and prevalence of hypodontia in Koreans. *Oral Dis*. 2008 Oct, 14(7):620-5.
- [22] Soni HK, Joshi M, Desai H, Vasavada M. An orthopantomographic study of prevalence of hypodontia and hyperdontia in permanent dentition in Vadodara, Gujarat. *Indian J Dent Res*. 2018 Jul-Aug, 29(4):529-33.
- [23] Zhang J, Liu HC, Lyu X, Shen GH, Deng XX, Li WR et al. Prevalence of tooth agenesis in adolescent Chinese population with or without orthodontics. *Chin J Dent Res*. 2015, 18(1): 59-65.
- [24] Gracco ALT, Zanatta S, Valvecchi FF, Bignotti D, Perri A, Baciliero F. Prevalence of dental agenesis in a sample of Italian orthodontic patients. *Prog Orthod*. 2017, 18(1):33
- [25] Peck S, Peck L, Kataja M. Concomitant occurrence of canine malposition and tooth agenesis: evidence of orofacial genetic fields. *Am J Orthod Dentofacial Orthop*. 2002 Dec, 122(6):657-60.