

Prevalence of congenitally missing second premolar teeth in the Dravidian population


Lakshmi Lakshmanan,
Deepa Gurunathan
*Department of Pediatric and
Preventive Dentistry, Saveetha
Institute of Medical and
Technical Sciences, Saveetha
Dental College and Hospitals,
Saveetha University, Chennai,
Tamil Nadu, India*

Address for correspondence:
*Dr. Deepa Gurunathan,
Department of Pediatric and
Preventive Dentistry, Saveetha
Institute of Medical and Technical
Sciences, Saveetha Dental
College and Hospitals, Saveetha
University, 162, Poonamallee
High Road, Chennai - 600 077,
Tamil Nadu, India.
E-mail: drgdeepa@yahoo.co.in*

Introduction

Congenitally missing teeth (CMT), tooth agenesis and/or hypodontia are the common dental anomaly with different prevalence in each region. Tooth germ that does not develop adequately to allow the differentiation of the dental tissues are referred to as congenitally missing tooth.^[1] A tooth is considered to be congenitally missing when it fails to erupt into the oral cavity and remain invisible in radiographs.^[2,3]

According to various reports, the prevalence of CMT excluding third molars ranges from 0.15% to 16.2%.^[4] Based on gender differences, women are more affected than men.^[4]

Access this article online	
Website: www.jfds.org	Quick Response Code 
DOI: 10.4103/jfo.jfds_32_19	

Abstract

Introduction: In the practice of dentistry, one of the most common dental anomalies encountered is the congenitally missing teeth (CMT) with different prevalence in each region. CMT are those that fail to erupt in the oral cavity and remain invisible in radiographs. The aim of this study was to evaluate the prevalence of congenitally missing second premolar teeth in the Dravidian population that can be used in forensic research. **Materials and Methods:** In this retrospective study, a total of 4600 panoramic radiographs of Dravidian children (2580 girls and 2020 boys) with an age group of 9–17 years were viewed for congenitally missing second premolar teeth. **Results:** The total number of congenitally missing second premolars was 80 (1.73%). The prevalence was seen more in girls (60%) than boys (40%). Mandibular second premolar was the most commonly missing teeth. Bilateral agenesis (66%) was more prevalent than the unilateral agenesis (34%). **Conclusion:** The prevalence of congenitally missing second premolar teeth in the Dravidian population was 1.02%. The study of CMT is important in performing dental treatments and also in the field of forensic research as it can provide knowledge on the diversities among populations.

Key words: Congenitally missing teeth, Dravidian population, forensic, premolar teeth

The most common missing teeth are mandibular second premolar excluding third molars followed by maxillary lateral incisors and maxillary second premolars, and the most common bilaterally missing teeth is the mandibular second premolars in the Japanese, Brazilian, Iran, and Saudi population.^[5-8] The developmental patterns cannot be universally applied owing to ethnic diversity. The standards patterns derived for a Western population cannot be speculated to every other population as there is wide difference racially, culturally, and environmentally.

Submitted: 26-Mar-19
Accepted: 02-Dec-19

Revised: 15-Nov-19
Published: 24-Jan-20

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Lakshmanan L, Gurunathan D. Prevalence of congenitally missing second premolar teeth in the Dravidian population. *J Forensic Dent Sci* 2019;11:103-6.

“Forensic dentistry” deals with the examination and evaluation of dental evidence in the interest of justice.^[9] The comparative human dental identification is based on dental treatment (restorations, extractions, and prosthesis), dental morphology, and pathology.^[10] Currently, the rising trend of preventive dentistry makes the subjects more aware of oral health. Thereby, reduction in the number of identifiers related to dental treatment is expected in the near future.^[11,12] In such situations, CMT plays a major role in forensic identification. When an individual’s identification by other methods such as fingerprints and DNA comparisons are difficult, CMT may be considered as an alternative source of information which narrows the search field. Therefore, the purpose of this study was to determine the prevalence of congenitally missing second premolar teeth in the Dravidian population which can be used in forensic identification.

Materials and Methods

Ethical clearance was obtained from the ethical clearance committee of Saveetha University (SRB/MDS/PEDO/18-19/0012). In this retrospective study, a total of 4600 panoramic radiographs of children (2580 girls and 2020 boys) who had visited Saveetha Dental College, Chennai, were viewed for congenitally missing second premolars with an age group of 9–17 years. The study was conducted over a period of 1 year from January to December 2018.

Panoramic radiographs of nonsyndromic children with age >9 years and only children of Dravidian origin were chosen for the study. Exclusion criteria were as follows: radiographs of children who had cleft lip/palate, history of tooth extraction/tooth loss due to trauma, caries or orthodontic extraction, and radiographs with no enough quality to accurately diagnose the missing teeth.

Digital orthopantomograms (OPGs) were examined by the investigator in a standard manner under good lighting conditions, standard screen brightness, and resolution. A tooth was considered to be congenitally missing when it could not be identified radiographically on the basis of calcification and there was no evidence of extraction. Extracted teeth were differentiated from CMT through evidence of alveolar ridge resorption in radiographs. Data were collected and entered into spreadsheet (Excel 2017: Microsoft office) and analyzed. Descriptive statistics were used to compare the obtained results.

Results

A total of 4600 OPGs of Dravidian children (2580 girls and 2020 boys) were viewed for congenitally missing second premolars with an age group of 9–17 years. Figures 1-3 represents OPGs with congenitally missing second premolars. Forty-seven OPGs (1.02%) of 4600 had congenitally missing second premolars as shown in Figure 4.

Of these, 27 were girls and 18 were boys. The prevalence was seen more in girls (60%) than boys (40%) as shown in Table 1. The total number of congenitally missing premolar was 80 (1.73%) (girls-46 and boys-34). The frequency of most CMT was mandibular second premolar followed by maxillary second premolar in both the gender as shown in Table 2. Figure 5 depicts the occurrence of missing premolars



Figure 1: Unilateral missing lower second premolar



Figure 2: Bilateral missing lower second premolars



Figure 3: Bilateral missing upper and lower second premolars

Table 1: Number of participants with missing second premolars by gender

Gender	Number of participants	Frequency (%)
Girls	28	60
Boys	19	40
Total	47	100

Table 2: Occurrence of missing second premolars by type and gender

Gender	Type of tooth	Number of teeth missing	Total based on gender	Frequency based on teeth type and gender (%)	Frequency based on number of teeth and gender (%)
Girls	Lower second premolar	35	46	76.09	57.50
	Upper second premolar	11		23.91	
Boys	Lower second premolar	28	34	82.35	42.50
	Upper second premolar	6		17.65	
Total		80			100

by type and gender. Of these 47 cases, 31 (66%) were bilateral and 16 (34%) were unilateral as shown in Figure 6.

Discussion

In the field of forensic dentistry, the odontologists utilize the dental evidence collected from the crime scene or mass fatality incidents with the antemortem records available for the identification of the deceased.^[13] These comparisons are achieved by using radiographs and dental records available with the dentists.^[14] Angelakopoulos *et al.* reported that the missing teeth act a simple clinically detectable dental identifier in the field of forensic investigation.^[10] Moreover, the increased awareness of dental health decreased the need for dental treatment and reduced restorative treatment worldwide.^[11,12] Therefore, CMT documented from the radiograph has more forensic scope as it helps in limiting the search field.

CMT are the most common dental anomaly that are frequently observed during routine dental examinations.^[1] It is the result of disturbances during the early stages of development.^[4] The etiology of tooth agenesis is unclear, but the probable factors are genetic (mutations of MSX1 and PAX9 genes), trauma, ectodermal dysplasia, radiation, infections, systemic diseases, drugs, and various syndromes such as Down, Rieger, and Book syndrome.^[15-17] Mutation of the MSX1 gene predominantly affects the second premolars.^[18] Except the hereditary cases, CMT has a greater occurrence when the dental germ is developing after the surrounding tissues have closed the space needed for tooth development.^[4]

By definition, CMT is those that fail to erupt in the oral cavity and remain invisible in radiographs, and therefore, the need for radiographic examination is a must. The visibility of tooth germs on radiographs depends on their mineralization stage.^[5] Tooth buds that show the late onset of mineralization could lead to false-positive diagnosis of agenesis in radiographs.^[19] Goya *et al.*, Endo *et al.*, and Wisth *et al.* reported that the calcification of premolars could be delayed until ages 9–12 years.^[5,20,21] Therefore, this study includes children aged from 9 years old to avoid false-positive results.

In this study, girls (60%) had a higher prevalence of congenitally missing second premolar when compared to boys (40%), which correlates with various other studies.^[5,7,8,20]

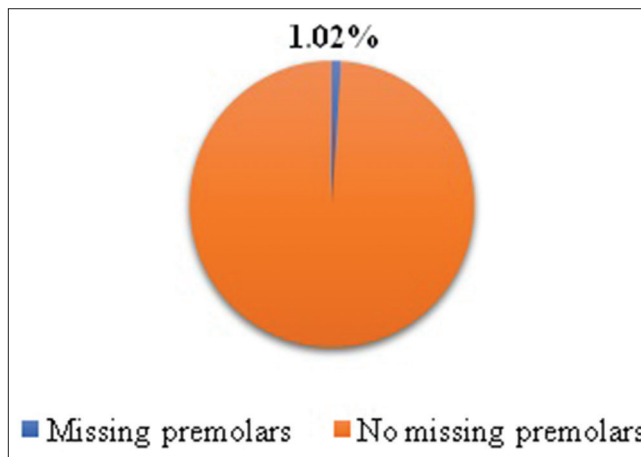


Figure 4: Prevalence of missing second premolars among the participants

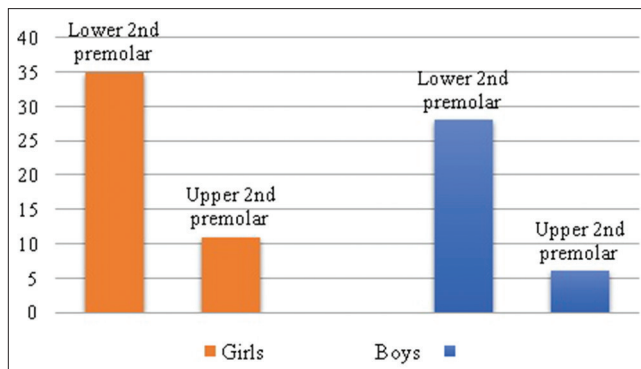


Figure 5: Occurrence of missing second premolars by type and gender

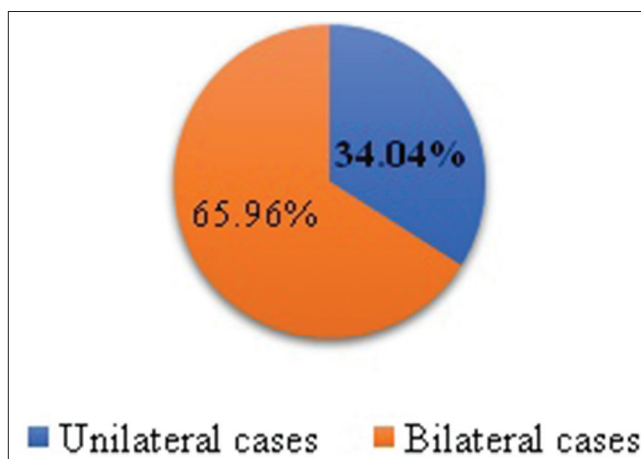


Figure 6: Prevalence of unilateral and bilateral cases

The higher rates observed in females might be associated with biological differences such as smaller jaws, which might trigger environmental factors where the development of dental germs is delayed, and thus, the needed space has been compromised by the surrounding tissues.^[19] It can also be observed that the predominance of bilateral CMT (66%) is almost twice as unilateral missing (34%). Various studies done on the Japanese, Brazilian, Turkish, Iran, Irish, and Saudi population also reported to have more of bilateral missing case.^[15-8,20,22,23] In the current study, mandibular second premolar agenesis (79%) was found to be more than maxillary agenesis (21%). Endo *et al.* found a similar pattern in Japanese children.^[20] The present study was conducted in an ethnically homogeneous community. Even though the prevalence rate is small, this data could act as a reference for the Dravidian population in assessing the ethnicity and proceeding with the forensic investigation. The limitations of the study include small sample size, and the characteristic is difficult to assess in the absence of ante-mortem dental records, or where comparison of the postmortem dental records is not possible.

Conclusion

Congenitally missing second premolars were seen more in girls than boys, and mandibular second premolar was the most common missing tooth followed by maxillary second premolar. The study of CMT is important in the field of forensic investigation as it provides information on the diversities among populations.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Moyers RE, Riolo ML. Early treatment. In: Moyers RE, editor. Handbook of Orthodontics. 4th ed. Chicago: Year Book Medical Publishers; 1988. p. 348-553.
- Jorgenson RJ. Clinician's view of hypodontia. J Am Dent Assoc 1980;101:283-6.
- Pemberton TJ, Das P, Patel PI. Hypodontia: Genetics and future perspectives. Braz J Oral Sci 2005; 4:695-706.
- Rakhshan V. Meta-analysis and systematic review of factors biasing the observed prevalence of congenitally missing teeth in permanent dentition excluding third molars. Prog Orthod 2013;14:33.
- Goya HA, Tanaka S, Maeda T, Akimoto Y. An orthopantomographic study of hypodontia in permanent teeth of Japanese pediatric patients. J Oral Sci 2008;50:143-50.
- Garib DG, Peck S, Gomes SC. Increased occurrence of dental anomalies associated with second-premolar agenesis. Angle Orthod 2009;79:436-41.
- Sheikhi M, Sadeghi MA, Ghorbanizadeh S. Prevalence of congenitally missing permanent teeth in Iran. Dent Res J (Isfahan) 2012;9:105-11.
- Shafi S, Albeshri AA, Mir S. Prevalence of congenitally missing premolars in college of dentistry, King Khaled University, Abha, Kingdom of Saudi Arabia: Can an early treatment make a difference? Int J Sci Study 2018;6:4-7.
- Dayal PK. Putli bowli. In: Textbook of Forensic Odontology. 1st ed. Hyderabad: Paras Medical Publisher; 1998.
- Angelakopoulos N, Franco A, Willems G, Fieuws S, Thevissen P. Clinically detectable dental identifiers observed in intra-oral photographs and extra-oral radiographs, validated for human identification purposes. J Forensic Sci 2016;62:900-6.
- Petersson GH, Bratthall D. The caries decline: A review of reviews. Eur J Oral Sci 1996;104:436-43.
- Vehkalahti M, Rytömaa I, Helminen S. Decline in dental caries and public oral health care of adolescents. Acta Odontol Scand 1991;49:323-8.
- Pittayapat P, Jacobs R, De Valck E, Vandermeulen D, Willems G. Forensic odontology in the disaster victim identification process. J Forensic Odontostomatol 2012;30:1-2.
- Nuzzolese E, Di Vella G. Digital radiological research in forensic dental investigation: Case studies. Minerva Stomatol 2012;61:165-73.
- Vastardis H, Karimbux N, Guthua SW, Seidman JG, Seidman CE. A human MSX1 homeodomain missense mutation causes selective tooth agenesis. Nat Genet 1996;13:417-21.
- De Coster PJ, Marks LA, Martens LC, Huysseune A. Dental agenesis: Genetic and clinical perspectives. J Oral Pathol Med 2009;38:1-7.
- Stockton DW, Das P, Goldenberg M. Mutation of PAX9 is associated with oligodontia. Nat Genet 2000;24:18-9.
- Mostowska A, Biedziak B, Jagodzinski PP. Novel MSX1 mutation in a family with autosomal-dominant hypodontia of second premolars and third molars. Arch Oral Biol 2012;57:790-5.
- 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;32:217-26.
- Endo T, Ozoe R, Kubota M, Akiyama M, Shimooka S. A survey of hypodontia in Japanese orthodontic patients. Am J Orthod Dentofacial Orthop 2006;129:29-35.
- Wisth PJ, Thunold K, Böe OE. Frequency of hypodontia in relation to tooth size and dental arch width. Acta Odontol Scand 1974;32:201-6.
- Aktan A, Kara I, Sener I, Bereket C, Ay S, Ciftci M. Radiographic study of tooth agenesis in the Turkish population. Oral Radio 2010;26:95-100.
- O'Dowling IB, McNamara TG. Congenital absence of permanent teeth among Irish school-children. J Ir Dent Assoc 1990;36:136-8.