

# Prevalence of Dental Anomalies in Maxillary Lateral Incisors: An Institutional Cross-sectional Study from Karnataka

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## ABSTRACT

**Introduction:** The majority of dental abnormalities are found in third molars, followed by permanent maxillary lateral incisors. The occurrence of these dental anomalies varies among different ethnic groups; hence, it is of prime importance for clinicians to know and understand the incidence of dental anomalies among the local population.

**Aim:** To analyse the prevalence of dental anomalies in relation to permanent maxillary lateral incisors in the Karnataka region.

**Materials and Methods:** A cross-sectional study was conducted in the Department of Conservative Dentistry and Endodontics of HKES's S Nijalingappa Institute of Dental Science and Research, Kalaburgi, Karnataka, India from July 2022 to December 2022. A total of 1,116 subjects, aged between 15 and 50 years, were

randomly screened. Each subject was clinically examined, and radiographs were taken for patients with dental anomalies. The five dental anomalies studied were congenitally missing permanent maxillary lateral incisors, peg laterals, dens in dente, talon's cusp, and palato-gingival groove. Statistical analysis was performed using SPSS version 26. Descriptive statistics were estimated in terms of frequency and percentage.

**Results:** A total of 43 subjects were found to have anomalies associated with the maxillary lateral incisor, including peg-shaped laterals (1.25%-14), dens in dente (0.81%-09), congenitally missing (0.45%-05), talon's cusp (0.27%-03), and palato-gingival groove (1.07%-12).

**Conclusion:** Anomalies in permanent maxillary lateral incisors were noted in 3.85% of the Karnataka population.

**Keywords:** Developmental dental anomalies, Maxillary lateral incisors, Peg-shaped laterals

## INTRODUCTION

A deviation from normal is called an anomaly. Disturbance of epithelial and mesenchymal interactions can significantly alter normal odontogenesis, leading to the developmental anomaly of teeth [1]. The existence of dental anomalies, such as changes in shape, size, or number, may depend on the developmental stage in which the alteration occurred [1].

Developmental anomalies can result from genetic variables, including inheritance, metabolism, and mutations, as well as environmental factors like physical, chemical, environmental, and biological factors, either individually or in combination [2]. Morphological alterations are observed in both deciduous and permanent dentition. Permanent teeth are noted to have more anomalies than primary teeth [3,4]. Additionally, the prevalence of dental anomalies demonstrates location and jaw dependence. In the maxilla, dental abnormalities are more common and primarily affect the anterior teeth. Conversely, the mandible shows a higher prevalence of anomalies in the posterior region. The probable reason for the prevalence of these anomalies is the evolutionary change in jaw development [2].

Permanent maxillary lateral incisors exhibit the greatest degree of variation in crown size, shape, and form, after third molars [5,6]. Maxillary lateral incisors can display anomalies such as dens invaginatus, dens evaginatus/talon's cusp, congenitally missing, palatogingival groove, Turner hypoplasia, gemination, fusion, macrodontia, microdontia, or peg laterals [7].

The morphogenic process becomes important to understand and treat conditions with a multidisciplinary approach. Since these anomalies predispose the tooth to caries, periodontal disease, as well as aesthetics and malocclusion [8,9], it is crucial to understand if there are genetic correlations. Identifying and researching these anomalies helps in the timely detection of developmental disorders in individual teeth, which could indicate a potential risk of further positional or eruption abnormalities in other teeth. Therefore, the identification of

these developmental anomalies is significant in establishing a strict follow-up protocol for early diagnosis and appropriate treatment. Additionally, anomalies can occur as part of a syndrome or disease, where they hold diagnostic and medical significance.

Given the impact these factors have on treatment outcomes, there is always room to supplement the available literature by using additional population cohorts. Numerous epidemiological studies have been conducted in various regions of the world to determine the prevalence of different forms of dental defects [6,7,10-13]. The findings indicate that dental abnormalities vary in frequency depending on geography and ethnicity [6,7,10-14]. However, the existing studies on their prevalence show diverse outcomes, necessitating further research to help clarify the frequency and distribution of dental abnormalities. Understanding the pattern of such variation in the Indian sub-continental population is significant for local dental clinicians. Furthermore, there is limited literature on the frequency of dental anomalies in the Karnataka population that are unique to permanent maxillary lateral incisors, and there have been limited attempts to identify changes in current trends.

The significance of the current study was to assess the prevalence of dens invaginatus, peg laterals, congenitally missing teeth, talon's cusp, and palatogingival groove in permanent maxillary lateral incisors among the population of the Karnataka region and recognise their current pattern. This information can help make appropriate modifications in diagnosis and treatment.

## MATERIALS AND METHODS

A cross-sectional study was conducted in the Department of Conservative Dentistry and Endodontics of HKES's S Nijalingappa Institute of Dental Science and Research, Kalaburgi, Karnataka, India. After obtaining approval from the Institutional Ethical Committee board (HKES/SNIDSR/IEC/05/22) and informed consent from all participants, the study was carried out from July 2022 to December 2022.

**Inclusion criteria:** Individuals with regular and anomalous tooth morphology of permanent maxillary lateral incisors.

**Exclusion criteria:**

- Pregnant women.
- Maxillary permanent lateral incisors that have undergone endodontic treatment.
- Maxillary permanent lateral incisors with dental crowns.
- Maxillary permanent lateral incisors with dental restorations.
- Individuals undergoing radiation therapy.
- Impacted maxillary permanent lateral incisors.
- Ellis fracture.
- Tooth loss due to caries, periodontal disturbances, and extraction.
- Patients with significant systemic medical history.

A total of 1,116 patients of both genders, aged between 15 and 50 years, were randomly selected, resulting in the screening of 2,232 teeth.

A thorough clinical examination was performed under adequate lighting on a dental chair. After collecting demographic data, patients were clinically examined and recorded on a standard proforma. Relevant personal and family histories were also documented. Intra-oral pictures were taken when necessary. Only patients presenting with dental anomalies underwent radiographic examination. A standardised radiographic technique using Radio Visio Graphy (RVG) was employed, with an exposure time of 0.16 seconds and a vertical angulation of 40 degrees. The RVG sensor was placed intraorally using a sensor holder, and a paralleling technique was used for all anomalies except for missing permanent maxillary lateral incisors, for which standardised digital panoramic radiographs were used for evaluation.

Radiographic (2D) and orthopantomographic images were thoroughly observed as part of the radiographic examination, and findings were interpreted and recorded.

Each subject was evaluated to determine the prevalence of peg laterals, dens invaginatus, palatogingival groove, congenitally missing teeth, and dens evaginatus/talon's cusp among the permanent maxillary lateral incisors.

## STATISTICAL ANALYSIS

The findings of the present study were analysed using SPSS version 26. Descriptive statistics were estimated in terms of the frequency and percentage of each dental anomaly.

## RESULTS

Among the 1,116 subjects examined, 602 (53.9%) were male and 514 (46.05%) were female. Anomalies were noted in 43 subjects (3.85%), with 24 being male and a mean age of 28.67±5.07 years, and 19 being female with a mean age of 25.31±3.59 years.

Out of the 1,116 subjects, peg laterals were seen in 14 (1.25%) individuals, with 6 (42.86%) having it unilaterally and 8 (57.14%) having it bilaterally. The prevalence of peg laterals was higher in males (0.72%, 8 subjects) compared to females (0.53%, 6 subjects) [Table/Fig-1,2].

Dental anomaly in maxillary laterals	Male	Female	Total
Peg laterals	8 (0.72%)	6 (0.53%)	14
Dens invaginatus	3 (0.27%)	6 (0.53%)	9
Congenitally missing	3 (0.27%)	2 (0.18%)	5
Talon's cusp	2 (0.18%)	1 (0.09%)	3
Palatogingival groove	8 (0.71%)	4 (0.36%)	12

[Table/Fig-1]: Dental anomaly in study subjects.

S. No.	Types of anomaly	Frequency	Percentage (%) Person prevalence
01	Congenitally missing: a) Unilateral	03	0.27
	b) Bilateral	02	0.18
		Total=5	0.45 (Overall)
02	Peg Lateral: a) Unilateral	06	0.54
	b) Bilateral	08	0.71
		Total=14	1.25 (Overall)
03	Dens in Dente: a) Unilateral	07	0.63
	b) Bilateral	02	0.18
		Total=09	0.81 (Overall)
04	Talon's Cusp (only unilateral)	Total=03	0.27
05	Palato gingival Groove		
	a) Unilateral	11	0.98
	b) Bilateral	01	0.09
		Total=12	1.07 (Overall)

[Table/Fig-2]: Types of anomalies of lateral incisors, their frequency and percentage.

Dens invaginatus was found in nine subjects (0.81%). It showed a predilection towards females with a prevalence of 0.53% (6 subjects), compared to males with a prevalence of 0.268% (3 subjects). Two subjects had bilateral cases of dens invaginatus, while seven had unilateral cases. According to Oehler's classification, which is based on radiographic interpretation of the degree of invagination, seven subjects presented with Type-I invagination (5 female, 2 male), one subject (female) presented with Type-II, and one subject (male) had Type-III invagination [15].

Congenitally missing permanent maxillary lateral incisors were found in 5 (0.45%) subjects (2 females-0.18% and 3 males-0.27%). Among the 5 subjects, 3 (0.27%) had unilateral absence of maxillary lateral incisors, while 2 (0.18%) had bilateral absence. Talon's cusp was found in 3 (0.27%) subjects (2 males and 1 female), unilaterally.

The prevalence of palatogingival groove was found to be 1.07% (12 subjects-4 females and 8 males). One subject had a bilateral palatogingival groove, while the remaining 11 subjects had unilateral cases palatogingival groove [Table/Fig-1,2].

## DISCUSSION

Prevalence refers to the number of individuals with a particular condition in a population and can be considered as an indicator of disease status [16]. In the current study, 3.85% of the 1,116 participants had abnormalities in the development of their permanent maxillary lateral incisors, including peg laterals, talon's cusp, dens invaginatus, congenitally missing teeth, and palatogingival groove.

Comparing the findings of the current study with previous studies is important, as there may be significant variation in prevalence among different socio-ethnic groups, depending on factors such as regional variation, ethnicity, and sample size presents a comparative evaluation of the present study with previous similar studies [Table/Fig-3] [6,7,10-13,17-21].

The peg-shaped tooth, defined by Grahén as the mesio-distal width at the incisal third of the tooth crown being shorter than the cervical width, usually affects the permanent upper lateral incisor [22]. This shape leads to anterior diastemas, which pose functional and aesthetic concerns for the affected patients. In the present investigation, peg laterals were present in 14 patients, with a prevalence of 1.25%, which closely aligns with earlier studies [23,24]. Regarding the prevalence of unilateral and bilateral occurrences of peg laterals, the current study found a slightly higher prevalence of bilateral occurrence (0.71%; n=8) than unilateral (0.54%; n=6). These findings correlate with the study conducted by Hua F et al., and contrast with a study carried out by Lupinette GM et al., where a higher prevalence of unilateral peg laterals was observed in cases with the right lateral incisor compared to the left [24,25].

S. No.	Authors name and year	Place of study	No. of subjects	Population studied	Parameters assessed				
					Peg lateral	Dens invaginatus	Congenitally missing	Talons cusp	Palatogingival groove
1.	Shashirekha G and Jena A 2013 [7]	Bhuvaneshwar, Odisha, India	1062	Dental patients of Odisha population	2.82%	0.81%	1.6%		
2.	Bäckman B et al., 2001 [10]	City of Umea, North Sweden	739	Healthy caucasians	0.8%				
3.	Batool F et al., 2016 [11]	Islamabad in Pakistan	364	Dental out patients in Islamabad			1.6%		
4.	Arandi NZ et al., 2018 [12]	City of Nablus in Palestine	2662	Dental patients in Palestine			1.91%		
5.	Ucheonye I et al., 2010 [13]	South Western region, Nigeria	1070	General population and dental out patients	1% and 2.3% in field and clinic samples, respectively				
6.	Hamasha AA and Alomari QD, 2004 [17]	Jordan	1660	Jordanian adults		2.95% (90% cases out of these were in maxillary laterals.)			
7.	Cakici F et al., 2010 [18]	Turkey	1012	Turkish Anatolian population		1.28% (13)			
8.	Fekonja A 2022 [6]	Helsinki Finland	372	Caucasian orthodontic patients in Helsinki	2.3%	0.84%		1.3%	2.4%
10	Sharma G et al., 2014 [19]	Haryana, India	5200	Dental out patients of Indian population				0.06%	
11	Zhang R et al., 2022 [20]	China	1715	Chinese population					4.5%
12	Prabhu RV et al., 2012 [21]	Mangalore, Karnataka	2740	Indian dental patients				0.36%	
13	Present study 2022	Kalaburgi district, Karnataka	1116	Dental out patients, Karnataka population	1.25%	0.81%	0.45%	0.27%	1.07%

**[Table/Fig-3]:** Comparative evaluation of present study with similar studies [6,7,10-13,17-21].

The invagination of the enamel organ into the dental papilla during the developmental stage leads to a developmental malformation called Dens invaginatus. In the current study, the prevalence of Dens invaginatus was 0.81% (9 subjects), which is in agreement with the study by Shashirekha G and Jena A (1062 population) [7]. Dens invaginatus may coexist alongside various dental anomalies, primarily dens evaginatus. There have been reports of peg-shaped laterals complicated by the presence of dens invagination [26]. This variation predisposes the tooth to the development of dental caries, leading to pulpal necrosis and the development of a periradicular lesion, which becomes challenging for the clinician to treat. In the current study, Type-1 Dens invaginatus (based on Oehler's classification) was the most prevalent morphology (7/9), which is in accordance with findings from prior studies by Alves Dos Santos GN et al., and Alkadi M et al., [27,28]. Regarding laterality, unilateral DI showed a higher prevalence, similar to the study by Alves Dos Santos GN et al., [27]. A deep-grooved maxillary lateral incisor must be carefully examined, even in the absence of clinical symptoms, for the presence of dens invaginatus [29].

The most common congenitally missing permanent tooth in the aesthetic zone is the maxillary lateral incisors [30]. The prevalence accounted for 0.45% (n=5) of subjects in this study, with 0.27% (n=3) unilateral and 0.18% (n=2) bilateral cases. The overall prevalence of congenitally missing lateral incisors in this study was lower than that reported in the Odisha population (G S Jen) with a prevalence of 1.6% of subjects. A similar study conducted by Arandi NZ on a sample of 2662 subjects found a prevalence of 1.91% of missing permanent maxillary lateral incisors in the studied population [12].

The presence of dens evaginatus in the anterior teeth is known as Talon's cusp or eagle's talon. In most instances, it is associated with clinical problems such as poor aesthetics and caries susceptibility. The present study found a prevalence of 0.27% for Talon's cusp, while Sharma G et al., and Prabhu RV et al., found a personal prevalence of 0.06% and 0.36%, respectively, in permanent maxillary lateral incisors [19,21].

The origin of the palatogingival groove is usually at the cingulum and extends on the root surface apically toward the Cementoenamel Junction (CEJ) and may terminate at the coronal/middle/apical third of the root surface. The infolding of the inner enamel epithelium, disturbance in the epithelial sheath of Hertwig, or an attempt to form a supernumerary root can be probable causes for the development of the palatogingival groove; however, the aetiology is not definitive. The highest predilection is seen with maxillary lateral incisors [31,32]. It can be seen as an independent entity or coexist with other developmental anomalies like dens invaginatus or dens evaginatus. The diagnosis and treatment are often dilemmatic and clinically challenging when the clinical presentation increases in severity and turns complex [33]. The complicated root canal anatomy and the severe localised periodontitis may require a combined endodontic-periodontic treatment approach [34]. In the present study, palatogingival grooves were present in 1.07% (n=12) of the subjects. The prevalence of palatogingival grooves (n=12) in this study was lower than that reported in studies by Fekonja A (2022) and Radhakrishnan R et al., (2012) [6,35]. Out of 200 dental outpatients evaluated in Benghazi, Libya,

Radhakrishnan R et al., identified a 1.68% prevalence of palatogingival grooves on their permanent maxillary lateral incisors [35], whereas Fekonja A found a 2.4% prevalence [6].

### Limitation(s)

Although, 3D examinations of individuals would have allowed for more accurate data regarding other dental anomalies and morphologies, such as gemination, root dilacerations, concrescence, tooth fusion, and canal anomalies, this was not feasible in the current study.

### CONCLUSION(S)

Within the limitations of this study, it can be concluded that a total of 3.85% of the population were found to have maxillary lateral incisor anomalies. Early and accurate diagnosis plays a significant role in enabling the efficient management of consequences arising from these defects.

A deeper understanding of morphological variables in the local population provides reliable guidance for successful management.

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