RESEARCH PAPER

Prevalence and Distribution of Developmental Dental Anomalies in Primary and Permanent Dentition Among School Children in the Foothill Districts of Uttarakhand, India: A Cross- Sectional Study

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ABSTRACT:

Background: Developmental dental anomalies may affect tooth number, size, shape, or structure and can influence oral health, esthetics, and treatment planning. The early identification of such anomalies is important for preventive and interceptive dental care.

Objective: To determine the prevalence and distribution of developmental dental anomalies among school children aged 9–13 years in the foothill districts of Uttarakhand, India.

Methods: A cross-sectional epidemiological study was conducted among 5173 school children from government and private schools using simple random sampling. Clinical examination was carried out under natural light following WHO Type III examination guidelines using a mouth mirror and probe. Data were analyzed using SPSS version 21.

Results: The overall prevalence of developmental dental anomalies was 8.7%. Males showed a higher prevalence (5.2%) compared with females (3.5%). Structural anomalies were the most common type (6%), followed by shape anomalies (1.5%), number anomalies (1.2%), and size anomalies (0.01%). Enamel hypoplasia was the most frequently observed anomaly.

Conclusion: Developmental dental anomalies were present in a considerable proportion of school children, with enamel hypoplasia being the most common. Early screening programs in schools may aid in early diagnosis and appropriate management.

Keywords: Dental anomalies; Enamel hypoplasia; Epidemiology; School children; Uttarakhand; Pediatric dentistry **How to cite this article:** Majreti S, Chauhan A, Pandey A, Tuli A, Singh D, Prasad V. Prevalence and Distribution of Developmental Dental Anomalies in Primary and Permanent Dentition Among School Children in the Foothill Districts of Uttarakhand, India: A Cross-Sectional Study. Int J Drug Deliv Technol. 2026;16(57s): 1442-1445. DOI: 10.25258/ijddt.16.57s.145

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INTRODUCTION:

Tooth development (odontogenesis) is a complex biological process involving interactions between oral epithelium and ectomesenchyme derived from neural crest cells. [1] Any disturbance during these stages may lead to developmental dental anomalies affecting the number, size, shape, or structure of teeth. [2] These anomalies may have significant clinical implications, including esthetic concerns, functional disturbances, and orthodontic complications. [3] Although several epidemiological studies have investigated dental anomalies worldwide, data regarding the prevalence of such anomalies in the foothill districts of Uttarakhand remain limited. Therefore, this study aimed to evaluate the prevalence and distribution of developmental dental anomalies among school children aged 9–13 years in selected districts of Uttarakhand.

1. AIMS AND OBJECTIVES OF THE STUDY:

To determine the prevalence of various dental anomalies in 9-13 years old children studying in various government and private schools situated in foothill districts of Uttarakhand.

2. MATERIAL AND METHOD:

A cross-sectional descriptive epidemiological study was conducted among 5173 school children aged 9 –13 years from government and private schools in the foothill districts of Uttarakhand, including Dehradun, Haridwar, Nainital, and Udham Singh Nagar.

2.1 Ethical Considerations:

Ethical approval was obtained from the Institutional Ethical Committee of Seema Dental College S Hospital, Rishikesh. Permission was also obtained from school authorities, and informed consent was obtained from parents before participation.

2.2 Inclusion criteria-

1. Children aged 9-13 years are included.

2. Children whose parents provided informed consent.
3. Cooperative participants during clinical examination.

2.3 Exclusion criteria-

1. Children younger than 9 years or older than 13 years.
2. Children with systemic diseases, syndromes, cleft lip, or cleft palate.
3. Children who did not provide consent.
4. Uncooperative children during examination.

2.4 Clinical Examination:

Clinical examinations were conducted using a mouth mirror and probe under natural light following WHO Type III examination guidelines. All anomalies affecting tooth number, size, shape, and structure were recorded. Intra-oral photographs were taken when necessary.

2.5 Statistical Analysis:

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics were used to calculate frequencies and percentages. Chi-square tests were applied to determine statistical significance, with $p < 0.05$ considered significant.

3. RESULT:

A total of 5173 children were examined, of whom 2879 (55.7%) were males and 2294 (44.3%) were females. The overall prevalence of developmental dental anomalies was 8.7%. The prevalence was higher in mixed dentition (61.5%) compared with permanent dentition (38.5%). Among the different types of anomalies observed, structural anomalies were the most common (6%), primarily enamel hypoplasia. Shape anomalies accounted for 1.5%, number anomalies for 1.2%, and size anomalies for 0.01%. Anomalies were more commonly observed in the maxilla (55.6%) than in the mandible (44.4%).

Table 1: Distribution of study population on the basis of gender:

VARIABLES	FREQUENCY (n)	PERCENTAGE (%)
Male		
Female		
TOTAL		

The study population consisted of 5173 subjects out of which 2879 (55.7%) were male and 2294 (44.3%) were female.

In present study higher prevalence seen in mixed dentition (61.5%) then permanent dentition (38.5%) and the most common types of anomalies were structure anomalies accounting for 6% of the total sample size; shape anomalies were 1.5%, number anomalies were 1.2% and size anomalies observed were 0.01%. In the present study the prevalence of anomalies was higher in maxilla (55.6%) than mandible (44.4%).

Table 2: Distribution of study population on the basis of dentition:

AGE	DENTITION		P VALUE
	MIXED	PERMANENT	0.000*
9 YEARS	926(100%)	0(0%)	
10 YEARS	1273(100%)	0(0%)	
11 YEARS	937(100%)	0(0%)	
12 YEARS	44(3.7%)	1147(96.3%)	
12 YEARS	44(3.7%)	1147(96.3%)	

*CHI – SQUARE TEST, STATISTICALLY SIGNIFICANT p- VALUE ≤ 0.05

There were 3189 (61.5%) children with mixed dentition and 1992 (28.5%) with permanent dentition and on applying chi square test significant found (p- VALUE 0.000)

Table 3: Frequency distribution of study population on the basis of dental anomalies:

VARIABLES PRESENT	FREQUENCY (n)	PERCENTAGE (%)
MESIODENS	61	1.1
SUPERNUMERARY TEETH	1	0.01
MICRODONTIA	1	0.01
FUSION	9	0.17
DENS IN DENTE	1	0.01
GEMINATION	3	0.05
PEG LATERAL	67	1.3
ENAMEL HYPOPLASIA	310	6.0
TOTAL	453	8.7

The total study population, enamel hypoplasia was found to be the most common dental anomaly with higher prevalence of 6%, while supernumerary teeth, dens in dente and microdontia were least common dental anomaly with a prevalence rate of 0.01% each. Dens evaginatus, macrodontia, talon's cusp, notched incisor, hypodontia and tooth transposition were not found in any study subjects.

4. DISCUSSION:

Developmental dental anomalies represent deviations from normal tooth development and may involve alterations in tooth number, size, shape, or structure. These anomalies may influence oral health, esthetics,

occlusion, and overall dental management. [4] Epidemiological studies evaluating the prevalence of dental anomalies are essential for understanding their distribution and for planning preventive and therapeutic strategies. [5]

In the present study, the overall prevalence of developmental dental anomalies was 8.7% among school children aged 9–13 years in the foothill districts of Uttarakhand. This prevalence lies within the range reported in previous epidemiological studies conducted in different populations. Studies by **Altug AT et al.** [6] and **Gupta KS et al.** [7] reported prevalence rates ranging from 1.8% to 39.2%, indicating that the occurrence of dental anomalies may vary considerably depending on geographic location, ethnicity, diagnostic criteria, and study design.

The present study showed a higher prevalence in males (5.2%) compared to females (3.5%). Similar findings have been reported in several previous studies, suggesting a slight male predilection for certain dental anomalies. However, other studies have reported no significant gender difference, indicating that gender-related variations may be influenced by genetic or environmental factors.

Another important finding of the present study was that mixed dentition exhibited a higher prevalence of anomalies compared to permanent dentition. This observation may be attributed to the dynamic stage of dental development in children aged 9–13 years, during which both primary and permanent teeth are present. Early identification of anomalies during this stage is particularly important because timely intervention can prevent further complications related to occlusion and esthetics.

Among the different types of anomalies observed in this study, structural anomalies were the most common, accounting for approximately 6% of the total sample population, with enamel hypoplasia being the most frequently detected condition. Enamel hypoplasia is a developmental defect characterized by reduced enamel thickness and may result from systemic disturbances during tooth formation. Factors such as nutritional deficiencies, low birth weight, systemic illnesses, or environmental stress during enamel formation have been associated with its occurrence.

The prevalence of enamel hypoplasia observed in the present study (6%) is comparable with findings reported by **Dummer PM et al.**[8] who reported a prevalence of 7.7%, although higher than the prevalence reported by **Basalamah M et al.**[9] (2.8%). Such differences may be attributed to variations in socioeconomic status, nutritional conditions, environmental exposures, and diagnostic methods used in different populations.

Shape anomalies, including peg-shaped lateral incisors, fusion, gemination, and dens in dente, represented the second most common category of anomalies in the present study. Among these, peg- shaped lateral incisors were the most prevalent, which is consistent with findings reported in several studies conducted in Indian and international populations. Peg-shaped lateral incisors are of clinical significance because they may affect dental esthetics and often require multidisciplinary management involving restorative and orthodontic treatment.

Furthermore, the present study revealed that dental anomalies were more frequently observed in the maxilla compared to the mandible. This finding is in agreement with previous studies that reported a higher occurrence of anomalies in maxillary teeth, particularly in the anterior region.

Although the present study provides valuable epidemiological data on dental anomalies among school children in the foothill districts of Uttarakhand, certain limitations should be considered. The study was based primarily on clinical examination without routine radiographic assessment, which may have resulted in underestimation of certain anomalies such as hypodontia, impacted teeth, or internal dental defects. Future studies incorporating radiographic evaluation and larger multicenter samples would provide a more comprehensive understanding of the prevalence and patterns of dental anomalies.

Overall, the findings of the present study emphasize the importance of early dental screening programs in schools, which can facilitate the early detection and management of developmental dental anomalies. Such initiatives may help reduce future complications related to esthetics, occlusion, and oral health in children.

5. CONCLUSION:

This study revealed that developmental dental anomalies are relatively common among school children in the foothill districts of Uttarakhand. Enamel hypoplasia was the most frequently observed anomaly, followed by shape-related anomalies such as peg lateral incisors. Early screening and preventive dental programs in schools may help in the early diagnosis and management of such anomalies.

Conflict of Interest

The author declares no conflict of interest.

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