

**The prevalence and distribution of dental anomalies in children of Raipur**

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**Abstract**

Dental anomalies are caused by complex interactions between genetic, epigenetic and environmental factors during the process of dental development. This process is multifactorial, multilevel, and multidimensional. (1) The etiology of dental developmental anomalies (or defects) is complex and can involve multiple causative agents such as local factors (e.g., trauma), genetic influences, or environmental insults. (5) Common anomalies included in this study are- Retained deciduous teeth, dental fluorosis, high frenal attachment, cusp of Carabelli, congenitally missing teeth, supernumerary teeth, tongue tie, cleft lip.

The study was conducted among 1100 school going children in Raipur, Chhattisgarh, of age between 3yrs-17yrs divided in two age groups.

The most common anomalies observed were: Dental Fluorosis – 36% & Over-retained deciduous teeth- 20%. (Fig 5&6) (Table-3). Both the anomalies were more in males.

Overall, all the anomalies were more frequent in older age group children between 8-17 years age. (Fig 7) (Table 4)

The study results showed that among the children included in the study, 13.09% had anomaly in which the distribution among the males and females were shown to be 8.64% and 4.45% respectively. Hard tissue anomaly was seen among 73.6% whereas soft tissue anomaly was seen among 26.4% of individuals.

This study was an attempt to describe the various developmental anomalies and morphological variations of teeth and oral soft tissues that can be used in forensic odontology for post-mortem analysis & identification purposes in children.

**Keywords:** Dental anomalies, Oral anomalies, Dental Fluorosis, High frenal attachment, Cleft lip, Fissured lip, Supernumerary teeth, Over-retained deciduous teeth

**Introduction**

Around 7% of children are born with some of the disturbances in the Oro-facial system. These disturbances are referred to as Anomalies. Anomaly (Gk,

anomalos; irregular) is a deviation from what is regarded as normal.

Dental anomalies are caused by complex interactions between genetic, epigenetic and environmental factors during the process of dental development. This process is multifactorial, multilevel, and multidimensional. Developmental dental anomalies may be caused by genetic and environmental factors in particular during the morpho-differentiation or histo-differentiation stages of tooth development.

The incidence and degree of expression of dental anomalies in different population groups can provide important information for phylogenic and genetic studies, allowing us to understand variations within and between the different populations. (1)

Due to their uniqueness, stability and low frequency of the occurrence in different populations, developmental dental anomalies can assist in cases of post-mortem identification also.

The tooth is a specialized part of the human body, understanding the development of which is enigmatic and still challenging. The successful development of tooth depends on a complex reciprocal interaction between the dental epithelium and underlying ectomesenchyme. The interaction involves a complex series of molecular signals, receptors and transcription control systems. Dental development (or odontogenesis) is a highly regulated process that is driven by a cascade of epithelial–mesenchymal interactions involving the oral ectoderm and cranial neural crest derived ectomesenchyme. Beginning in the embryonic and fetal stages of human development, the formation of teeth continues until adulthood. Also, odontogenesis is characterized by several sequential stages such as tooth initiation, morphogenesis, cyto differentiation,

mineralization, and bone remodelling (during tooth eruption). (2,3)

Disturbance of the epithelium and mesenchymal interactions can markedly alter the normal odontogenesis, leading to the developmental anomaly of teeth. Depending on the developmental stage in which the alteration has taken place, different anomalies could take place e.g. anomalies of number, structure, size and/or shape. (4)

Developmental dental anomalies of the primary and permanent dentition occur when specific disturbances in one or more stages of odontogenesis occur during human development. Such anomalies are morphologically diverse and can be characterized as those affecting shape, number, position, and the enamel or dentin structures. The etiology of dental developmental anomalies (or defects) is complex and can involve multiple causative agents such as local factors (e.g., trauma), genetic influences, or environmental insults (e.g., alcohol or drug exposures during the fetal period, febrile illnesses). (5)

From the genetic standpoint, the process of odontogenesis is primarily under the control of the homeobox (HOX) genes (e.g., MSX1, MSX2, SHH, PAX9) which play critical roles in multiple stages of tooth development. Notably, the genetic causation of tooth anomalies can be readily recognized in patients for whom certain systemic conditions or syndromes result in specific abnormalities of the primary or permanent teeth. There are more than 500 anomalies caused by simple genetic factors and perhaps an equal number of others derived from multifactorial causes or chromosome aberrations where there are Oro-facial alterations. Dental anomalies can be evidence of systemic disease and may have more than one cause. (6)

Early detection of oral & dental anomalies is important to prevent their complications as: malocclusion, cosmetic deformities, periodontal problems, caries, and difficulties during dental treatment, also the knowledge of the prevalence of dental anomalies is very important as it can provide valuable information for genetic studies and also helps in the understanding of differences among population and between various population groups. (7)

Common anomalies included in this study are- Retained deciduous teeth, dental fluorosis, high frenal attachment, cusp of Carabelli, congenitally missing teeth, supernumerary teeth, tongue tie, cleft lip.

### Materials & methods

#### Aim

The aim of this study was to evaluate the prevalence of oral anomalies in school children between the age group of 3 to 17 years residing in Raipur city.

#### Objectives

To record the prevalence and to compare the oral hard and soft tissue developmental anomalies in children of age group of 3-17 yrs residing in Raipur city

The study was conducted among 1100 school going children in Raipur, Chhattisgarh, of age between 3 yrs- 17 yrs.

Groups	Age	Sample size
1	3-7 yrs	550
2	8-17 yrs	550

#### Selection Criteria

##### Inclusion criteria

- Healthy Children with no history of teeth missing as a result of caries, periodontal disturbances, and trauma/extraction were included in the study
- Children with in the age range from 3 yrs – 17 yrs

##### Exclusion criteria

- Children with medical history such as Down's syndrome, ectodermal dysplasia, mentally retarded were excluded from this study.
- Participants with difficulty in opening their mouth
- Participants with severe dental pain

##### Clinical Examination

The study was based on a clinical examination. All the subjects were made to sit on a chair under natural light for examination (Type III). The examination was carried out in a systematic manner using a plane mirror and a straight probe which are kept in a kidney tray containing 2.5 % glutaraldehyde solution. The examination included assessments of the dental anomalies representing variations in tooth size, morphology, and number were recorded on a proforma.

The anomalies taken into consideration in this study were

##### Retained deciduous teeth

Retained deciduous teeth are teeth that do not exfoliate once the permanent tooth erupts. The most common retained deciduous tooth is the upper canine tooth, followed by the lower canine tooth.

##### Dental fluorosis

Dental fluorosis is the appearance of faint white lines or streaks on the teeth that only occurs when younger children consume too much fluoride, from any source, over long periods when teeth are developing under the gums.

##### High frenal attachment

Frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, gingiva, and the underlying periosteum.

##### Cusp of Carabelli

The Carabelli cusp is a tubercle or cuspule, or a groove often seen on the palatal surface of the mesio-palatal cusp

of maxillary permanent molars and maxillary second deciduous molars.

### **Congenitally missing teeth**

Failure of tooth formation due to disturbances during the early stages of development could be the cause of congenital missing teeth.

### **Supernumerary teeth**

A supernumerary tooth (ST) is defined as any tooth or odontogenic structure that is formed from tooth germ in excess of usual number for any given region of the dental arch.

### **Tongue tie**

A congenital oral anomaly that may decrease the mobility of the tongue tip and is caused by an unusually short, thick lingual frenulum, a membrane connecting the underside of the tongue to the floor of the mouth

### **Cleft lip**

A cleft lip happens when the structures that form the upper lip fail to join together when a baby is developing.

### **Geographic tongue**

Benign migratory glossitis is psoriasiform mucositis of the dorsum of the tongue.

### **Statistical Analysis**

Data were entered and analysed using SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used. Significance level is fixed as 5% ( $\alpha = 0.05$ ). P-value  $<0.05$  is considered to be statistically significant. Descriptive statistics was done to analyze by using Pearson's chi-square test.

### **Clinical images of some of the children with dental anomaly.**



Fig 1: A retained deciduous teeth seen in 15yrs female child maxilla (canine of both side)



Fig 2: A retained deciduous teeth seen in mandible of same child



Fig 3: High frenal attachment seen in 4yrs female child



Fig 4: Dental fluorosis seen in 14 yrs male child

**Result**

The study was based on clinical examinations review of 1100 children. Out of 1100 children total no. of children with anomalies was 144, which was distributed into two age groups between 3-7 yrs and between 8-17yrs.

Table 1: Sex distribution of assessed children

Total no. of children observed	Male	Female
1100	625	475

Table 2: Sex distribution of assessed children with oral or dental anomaly

Total no. Of children with anomalies	Male	Female
144	95	49

Table 3: Sex Distribution of observed Oral & Dental anomalies

Type of Anomaly	Total	Male	Female
Retained deciduous teeth	29	18	11
Dental fluorosis	52	33	19
Cusps of carabelli	11	8	3
Congenitally missing teeth	4	3	1
Supernumerary teeth	10	7	3
Lip pit	3	3	0
High Frenal attachment	13	9	4
Geographic tongue	8	6	2
Fissured tongue	9	6	3
Tongue tie	3	2	1
Cleft lip	2	0	2

The most common anomalies observed were

Dental Fluorosis – 36% & Over-retained deciduous teeth- 20%. (Fig 5&6) (Table-3)

Both the anomalies were more in males. However, over-retained deciduous teeth were seen more often in older children (8-17 yrs.), whereas dental Fluorosis was seen more in younger children. (Table-3)

Other common anomalies included- High frenal attachment (9%), Cusp of Carabelli (7.6%) & Supernumerary teeth (6.9%) (Fig 5&6)

Overall, all the anomalies were more frequent in older age group children between 8-17 years age. (Fig 7) (Table 4)

Type of Anomaly	Age group (3-7 yrs)	Age group (8-17 yrs)
Retained deciduous teeth	0	29
Dental fluorosis	23	29
Cusps of Carabelli	0	11
Congenitally missing teeth	0	4
Supernumerary teeth	0	10
Lip pit	2	1
High frenal attachment	3	10
Geographic tongue	2	6
Fissured tongue	1	8
Tongue tie	3	0
Cleft lip	2	0
Total	36	108



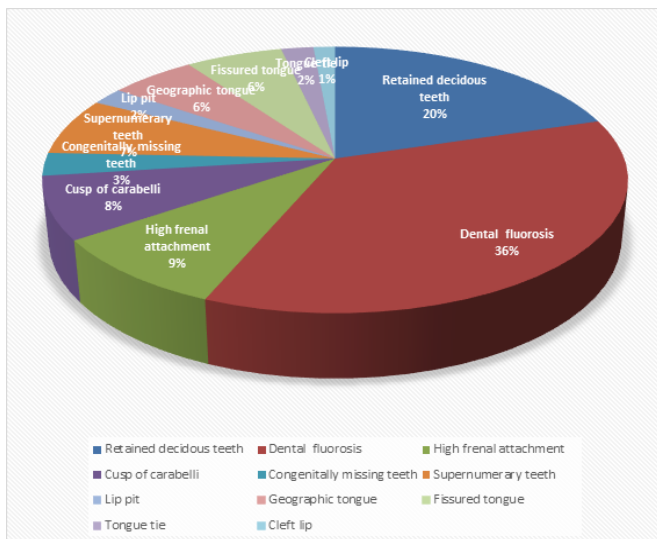


Fig 5: Pie chart of relative percentage of anomalies

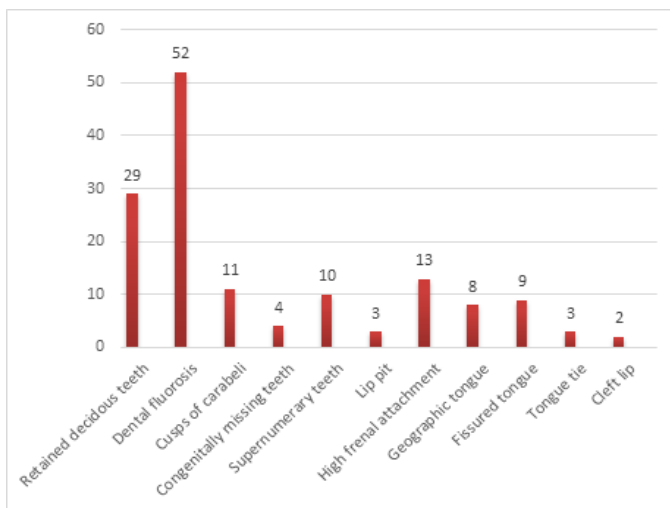


Fig 6: Graph of relative percentage of anomalies

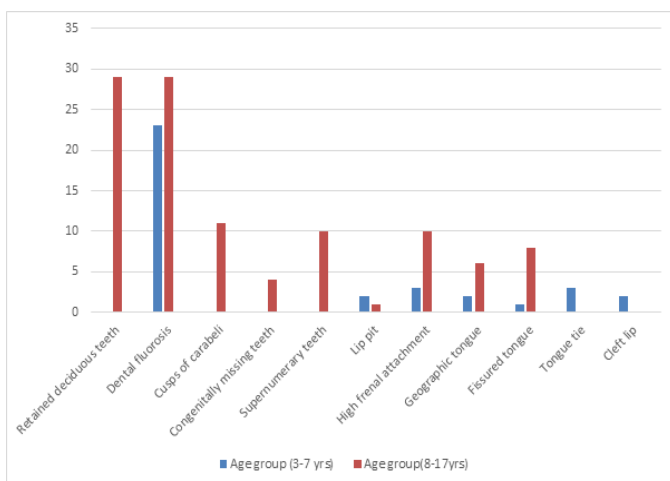


Fig 7: Graph of comparative anomaly distribution among two age groups

Table 4: Age Distribution of observed Oral & Dental anomalies

### Discussion

In day-to-day dental practice, the main reason for dental problems emerges due to the development defects and disturbances. During the tooth formation, dental anomalies occur commonly which usually affects the size, colour, shape and number of teeth. The anomalies can usually be confined to single tooth or multiple teeth which may be due to developmental, acquired or congenital. (8)

The teeth commonly affected due to anomalies are asymptomatic which can be accurately diagnosed by proper clinical examination and in rare case radiographic examination is also necessary. Although the prevalence of dental caries and periodontal disease was found to be in higher one, the management of dental anomalies is found to be complicated, since aesthetics and occlusion problems occur among the individuals. (9)

The formation of dental arches and abnormal malocclusion can occur due to the pattern of tooth eruption. (10) The study results showed that among the children included in the study, 13.09% had anomaly in which the distribution among the males and females were shown to be 8.64% and 4.45% respectively. While assessing the statistically significant difference, highly statistically significant difference was seen among the study individuals. According to Mohan et al(11), the study among the Ranchi population showed that 5.83% of the population had dental anomalies which had a male dominant prevalence which was found in accordance with our study. In Saudi population the study done by Bakhurji et al (12), has shown the prevalence of dental anomalies were predominant in males along with the hard tissue examination, dental fluorosis was

predominant finding which was in accordance with our study.

Assessment of anomalies among the hard tissue and soft tissue comparison was done in our study, which showed that hard tissue anomaly was seen among 73.6% whereas soft tissue anomaly was seen among 26.4% of individuals. While assessing the statistically significant difference, highly statistically significant difference was seen in incidence among the hard and soft tissue anomaly. Among the hard tissue anomaly, it was seen that dental fluorosis was seen among 36.1% and least seen was congenitally missing tooth in 2.78%. Jain et al (13), had shown a prevalence of hard tissue anomaly 4.7% among the Indian population.

Among the soft tissue anomaly, high frenal attachment was seen among 9.03% and least was seen among 1.39% on cleft lip, in our study. According to Hussain et al (14), the double lip was common anomaly seen in the patients undergoing orthodontic treatment which was not in accordance with our study results. Nayak et al, had done in study among the Indian population which showed a prevalence of dental anomalies to be 5.46%.

The strength of our study is that, according to the previous literature search, the data based on hard and soft tissue comparison was not reported by any author which is highlighted in our study.

### **Conclusion**

The use of developmental anomalies and morphological variations of the teeth & oral soft tissues in post-mortem identification is well accepted in forensic examinations and in courts of law. Even if the ante-mortem dental records are not available for comparison, the forensic odontologist can help in post-mortem dental profiling as well as giving clues regarding the age, race and sex of the deceased from the dental evidence recovered from the scene. This study was an attempt to describe the

various developmental anomalies and morphological variations of teeth and oral soft tissues that can be used in forensic odontology for post-mortem analysis & identification purposes in children. Significant differences in the prevalence of different dental anomalies were found between males and females.

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