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Exploring developmental dental Anomalies: Unveiling their prevalence and distribution in the population of Hyderabad

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Abstract
Background: Dental anomalies occur due to hereditary and environmental factors. It can affect both primary and permanent dentition. These anomalies can result in functional, cosmetic, and occlusal problems.
Aim: The aim of the study was to assess the prevalence and distribution of various dental anomalies among the population of Hyderabad.
Materials and Methods: This study was conducted by OroGlee Solutions Private Limited, Hyderabad. A total of 7966 subjects of age 8 to 40 years were examined and grouped based on the presence of various dental anomalies. Oral examination was done using an intraoral camera.
Results: Out of the total 7966 subjects, 220 (2.76%) subjects had dental anomalies. Among the total 220 subjects having dental anomalies, Talon cusp was found to have the highest prevalence. It was seen in 49 (22.27%) subjects, followed by microdontia in 47 (21.36%), peg lateral in 44 (20%), dens evaginatus in 34 (15.45%), mesiodens in 15 (6.81%), dens in dente in 15 (6.81%), gemination in 5 (2.27%), fusion in 4 (1.81%), transposition in 3 (1.36%), paramolar in 2 (0.91%), parapremolar in 1 (0.45%), amelogenesis imperfecta in 1 (0.45%).
Conclusion: The most prevalent dental anomaly found in our study was Talon cusp seen in 49 subjects (22.27% of the subjects with anomalies). Awareness of the prevalence and distribution of developmental dental anomalies would make it easier to identify these abnormalities at early stages and enable prompt correction.

Keywords: Dental anomalies, talon cusp, types of dental anomalies, prevalence of dental anomalies, intraoral camera, Hyderabad

Introduction
Developmental dental anomalies are notable deviations from normal tooth color, contour, size, numbers, and degree of development [1]. Developmental anomalies can be caused by genetic factors such as heredity, metabolic abnormalities, and mutations, or environmental variables such as chemical, physical, biological and environmental factors. Such impacts can occur before or after birth, affecting both deciduous and permanent teeth [1].
Anomalies in tooth number, size, structure, shape, and position develop as a result of disruptions during the morpho differentiation stage of development [2].

1. Developmental disturbances in size of teeth are
a) Microdontia – teeth which are smaller than normal
b) Macrodontia – teeth which are larger than normal

2. Developmental disturbances in number of teeth
a) Hypodontia – is the failure of development of one or more teeth
b) Hyperdontia - additional tooth to the normal set of teeth. Additional teeth termed as supernumerary.

3. Developmental disturbances in shape of teeth

a) Gemination A geminated tooth has two pulp chambers and one pulp canal, making the clinical crown appear bigger.
b) Fusion: A fused tooth has two root canals, one or more pulp chambers, and a large clinical crown.
c) Concrescence – union of two adjacent teeth by cementum only.
d) Dilaceration: This is the term for an angulation, or a severe bend or curve, in the crown or root of a tooth that has formed.
e) Talon cusp: A talon cusp is a well-defined additional cusp that extends at least half the distance from the cementoenamel junction and is located on the surface of an anterior tooth.
f) Dens in dente, also known as dens invaginatus, is an anomaly that develops when the tooth surface invaginates; it appears as a reverse tear that lines the crown and, occasionally, the root.
g) Dens evaginatus (Leong's premolar): an outward extension of the crown's area that is mistakenly identified as an additional cusp due to a horn-like protuberance.
h) Enamel pearl, also known as an enameloma, is the occurrence of enamel in unusual areas, primarily the tooth root.
i) Taurodontism: a developmental abnormality that primarily affects molars, in which the tooth trunk is large and long and the root is short and apically positioned in the bifurcation area.

4) Developmental disturbances in structure of teeth

a) Amelogenesis imperfecta
b) Dentinogenesis imperfecta
c) Dentin dysplasia type I
d) Dentin dysplasia type II
e) Regional odontodysplasia [3]

5) Developmental disturbances in position of teeth

a) Impaction: The maxillary canine and third molar are the most often impacted teeth.
b) ectopic eruption.
c) tooth transposition [4].

The development of teeth is a complicated, highly controlled biological process that depends on several factors. Clinical alterations or changes will be apparent if there are any disruptions in tooth growth [5].

These anomalies may also develop as a syndrome. In such cases, they will have diagnostic and clinical consequences. Thus, from a therapeutic viewpoint, early diagnosis of dental anomalies is important. These anomalies affect the aesthetic look of teeth and also make dental treatment more challenging [1].

The present study was performed to evaluate the prevalence and distribution of various dental anomalies of size, number, shape, structural, and positional in the general population and their implications in the treatment of such conditions.

Materials and Methods

A cross-sectional survey was conducted by OroGlee Solutions Private Limited among the employees of corporate offices and school-going children in the city of Hyderabad. A total of 7966 people was examined at their respective places of work and schools.

A survey questionnaire was done to gather personal information such as age, gender, lifestyle, relevant dental and medical history. An oral examination was carried out by the dentist using an intraoral camera. The intraoral camera is a useful instrument for capturing the minute details in the oral cavity. Informed oral consent of employees was obtained before the examination. Approval from the respective school administration was taken for their students.

Inclusion Criteria

- Participants from the age group of 8 to 40 years were included in the study.

Exclusion Criteria

- Participants below the age of 8 and above the age of 40 years were excluded from the study.

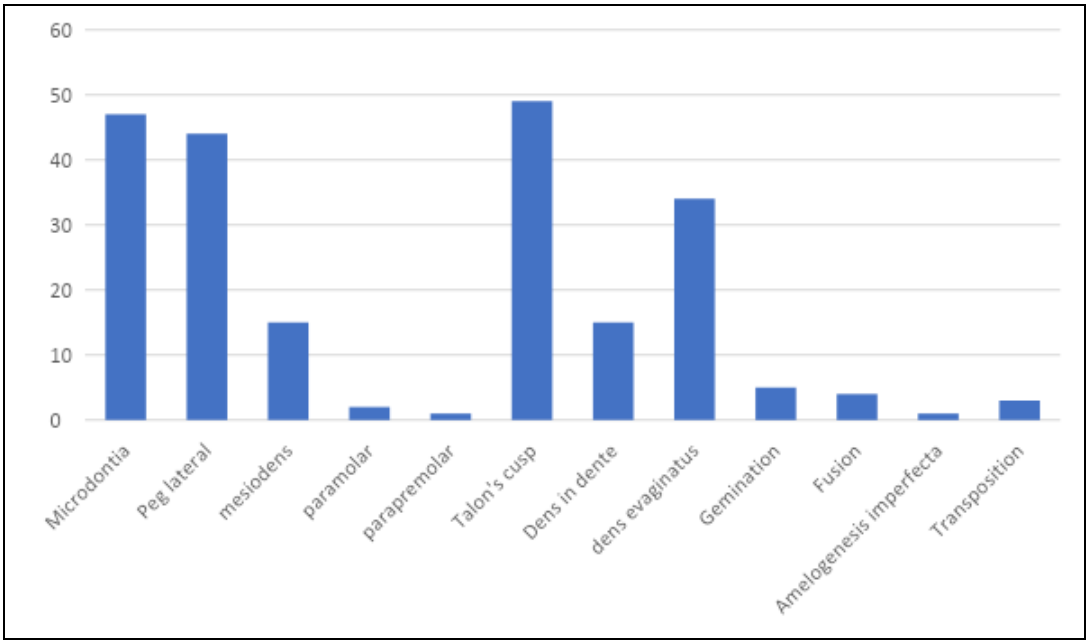
Results

In this study, 7966 people aged between 8-40 years were examined for the presence of various dental anomalies in their teeth. Of these 220 (2.76%) people had various dental anomalies. The distribution and prevalence of dental anomalies are shown in Table 1.

Table 1: Distribution and prevalence of dental anomalies in study population

Dental anomalies	Subjects having dental anomalies (n)	Percentage of dental anomalies in the affected population (%)
Number anomalies		
Mesiodens	15	6.81%
Paramolar	2	0.91%
Parapremolar	1	0.45%
Size anomalies		
Microdontia	47	21.36%
Peg lateral	44	20%
Shape anomalies		
Talon cusp	49	22.27%
Dens in dente	15	6.81%
Dens evaginatus	34	15.45%
Gemination	5	2.27%
Fusion	4	1.81%
Structural anomaly		
Amelogenesis imperfecta	1	0.45%
Positional anomaly		
Transposition	3	1.36%
Total	220	2.76%

Talon cusp was found to be the most common dental anomaly in our study followed in descending order by microdontia, peg laterals, amelogenesis imperfecta., dens in dente, gemination, fusion, transposition, paramolar, parapremolar, amelogenesis imperfect.



Graph 1: Showing prevalence of various dental anomalies

In the present study, shape anomalies were seen more frequently followed in descending order by size anomalies, number anomalies, positional anomalies, and structural anomalies

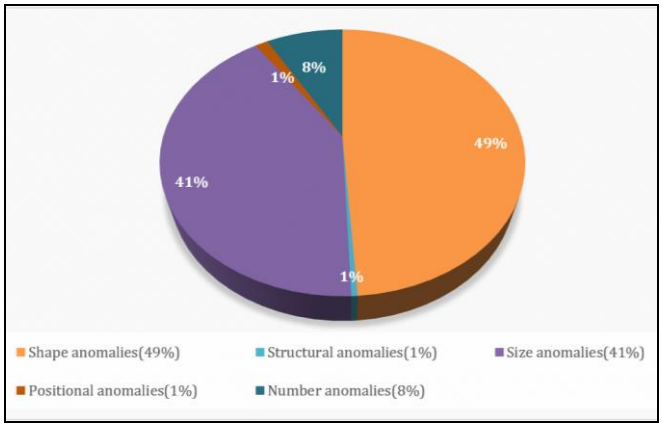


Fig 1: Types of dental anomalies found

Discussion

The dental anomalies are frequently observed during regular dental examinations. Some of these defects appear before the eruption of dentition and are commonly hereditary. The presence of such dental abnormalities causes functional, cosmetic, and occlusal issues [6].

Teeth discrepancies due to size are microdontia and macrodontia. Teeth with microdontia are physically smaller than normal. However, normal-sized teeth may appear smaller when widely separated within larger-than-normal jaws. This is termed as relative microdontia. Usually, the teeth most affected are the third molars and maxillary lateral incisors [7].

A common form of localized microdontia is peg lateral, which affects the maxillary lateral incisor. A peg or cone-shaped crown develops when the sides converge or taper together incisal in place of parallel or diverging mesial and distal surfaces. Such teeth frequently have shorter roots than normal [3]. Environmental, genetic, and maternal factors affect both permanent and deciduous teeth. Most of the time, treatment is not necessary. Porcelain crown is often used for cosmetic purposes [8].

In macrodontia, teeth are larger than normal teeth. This condition can be seen in pituitary gigantism. In certain cases, regular-sized teeth crowded within a small jaw appear larger than normal, a condition known as relative macrodontia [7].

Teeth discrepancies due to a number of teeth are hypodontia and hyperdontia. Hypodontia is uncommon in deciduous dentition, but when it occurs, it usually affects the lateral incisors. Hypodontia is seen mostly in the permanent dentition, with third molars being most commonly afflicted [7]. In place of the missing tooth, prosthodontic treatment or implant, or orthodontic treatment is needed [8].

An extra tooth that may resemble the molars, premolars, or anterior teeth of the group to which it belongs is called a supernumerary tooth. Mesiodens is the most common supernumerary tooth and is situated between the maxillary central incisors. It is followed by distomolar, which is often a little, rudimentary tooth. A paramolar can be observed between the maxillary first and second molars or buccal or lingual to the maxillary molars [3]. The most common complications of supernumerary teeth include diastema, crowding, malocclusion, and ectopic or delayed eruption of adjacent teeth. Extraction of supernumerary teeth is required in most cases [8].

Teeth abnormalities due shape of the teeth are Fusion, Talon cusp, Dens in dente, Gemination, Dens evaginatus, Concrescence, Dilaceration, Enamel pearl, and Taurodontism. Gemination is the process by which one tooth germ divides incompletely, resulting in the formation of two partially or completely separated crowns on a single root. It is most common in the anterior teeth, but molars and bicuspids can also be affected [1]. It is seen in both deciduous and permanent dentition and appears to be inherited in some cases [3].

Two separate tooth germs fuse to form fused teeth. The degree of fusion can vary based on the teeth's developmental

stage at the time of union. It has been suggested that pressure or physical force leads to contact of teeth during development and subsequently fusion. Early contact, before calcification, may allow the two teeth to fuse entirely into one big tooth. Root union may occur if teeth come into contact after a portion of the dental crown has formed [3]. In deciduous teeth, both gemination and fusion result in crowding, irregular spacing, and delayed eruption of permanent teeth [8].

A talon cusp is an extra cusp that extends half of the distance from the cementoenamel junction to the incisal edge on the surface of an anterior tooth. Talon's cusp is most commonly seen in permanent dentition. The cusps are most commonly found on permanent maxillary lateral or central incisors, and are less commonly seen in mandibular incisors and maxillary canines [7]. This anomaly causes problems with esthetics, caries control, and occlusal adaptation. To prevent cavities, the groove should be preventatively restored. If there is an occlusal disturbance, it should be removed. In case of pulpal exposure, endodontic treatment is needed [7].

A developmental variant known as "dens in dente" is an invagination in the surface of the tooth crown before calcification. The permanent maxillary lateral incisors are the teeth that are most frequently affected and, in most cases, "dens in dente" seems to be nothing more than an accentuation in the lingual pit's growth, causes deposits of food particles and increases the tooth's vulnerability to cavities. Early diagnosis and preventative restoration of the tooth are necessary to prevent cavities, pulp infection, and early tooth loss [3].

Unilateral or bilateral premolars may be affected by a developmental condition known as dens evaginatus. Though it has also been shown to develop rarely on molars, cuspids, and incisors, clinically it presents as an extra cusp or globule of enamel on the occlusal surface between the buccal and lingual cusps [3]. Occlusal interference and subsequent loosening or displacement of the affected tooth are possible outcomes, making it clinically relevant. For a considerable length of time, the tooth might remain asymptomatic [1] Deciduous molars are rarely affected. An additional cusp consists of enamel and dentin and in some cases, pulp is also present [7]. Treatment of choice is removal of tubercle and application of fluorides [8].

Teeth anomalies due to structural defects are Amelogenesis imperfecta, Dentinogenesis imperfecta, Dentin dysplasia type I, Dentin dysplasia type II, and Regional odontodysplasia. Amelogenesis imperfecta is a rare genetic condition that affects the normal tooth development. It affects both deciduous and permanent dentition. Amelogenesis imperfecta is a group of genetic diseases affecting enamel matrix proteins due to mutations in the encoding genes resulting in faulty enamel structure affecting both dentitions [8]. Based on the developmental stages of enamel, amelogenesis is primarily divided into four types: hypoplastic, hypomaturative, hypocalcified, and the combination of hypoplastic-hypomaturation and taurodontism. Defects in the enamel matrix deposition, or the initial step of enamel production, are the cause of hypoplastic AI. The matrix protein of hypomaturative AI enamel is normal, but the enamel matrix is immature due to a fault in the crystal structure's maturation process. The enamel matrix is properly led down in the hypocalcified type but causes inadequate calcification processes. The enamel is weak, pitted, and mottled from yellow to brown in hypoplastic-hypomaturation with taurodontism. Some teeth have larger pulp chambers, and molar teeth show signs of taurodontism [3]. Facial veneers and full crowns are the treatment of choice for amelogenesis imperfecta [7].

Teeth discrepancies due to the position of teeth are Transposition, Impactions, and Ectopic eruption. Normal teeth can occasionally erupt into an improper position. This aberrant eruption pattern is known as dental transposition. Maxillary first premolars and canines are the teeth that are most commonly involved in transposition. These normal teeth may need to be extracted, reshaped, or undergo orthodontic treatment due to crowding or malocclusion [7].

Our study was conducted on 7966 people and the results showed that 220 (2.76%) people had dental anomalies of different types. Talon cusp was the most prevalent dental anomaly found in our study of the total 220 subjects, 49 (22.27%) subjects had dental anomalies followed in descending order by microdontia in 47 (21.36%), peg laterals in 44 (20%), dens evaginatus in 34 (15.45%), mesiodens in 15 (6.81%), dens in dente in 15 (6.81%), gemination in 5 (2.27%), fusion in 4 (1.81%), transposition in 3 (1.36%), paramolar in 2 (0.91%), parapremolar in 1 (0.45%), amelogenesis imperfecta in 1 (0.45%).

In the study conducted by Arvind Jain *et al*. in the Government College of Dentistry, Indore, Madhya Pradesh, India, total of 4000 cases including both males and females were taken between 10-40 years of age based on intraoral examination, study casts, radiographs. In this study, a total of 331 cases of number and size developmental dental anomalies were recorded. This included 173 (8.6%) males and 158 (7.9%) females. Hypodontia was the most frequently found dental anomaly in both males (4.9%) and females (4.4%) followed by hyperdontia and supernumerary roots. Microdontia was the most frequently found size anomaly in both males (1.6%) and females (1.9%) [2]

In the study conducted by Santosh Patil *et al*., the panoramic radiographs of 4133 patients attending the Department of Oral Medicine and Radiology, Jodhpur Dental College and General Hospital between September 2008 to December 2012 were examined for the presence of various dental anomalies. The study comprised of 2145 males (51.9%) and 1988 females (48.1%) with an age range of 13 to 38 years with a mean age of 21.8 years. Number anomaly hypodontia is most frequently found in this population with 673 (16.3%) subjects, followed by impacted teeth in 641 (15.5%), supernumerary teeth in 51 (1.2%), and microdontia in 41 (1.0%) subjects. Other anomalies were found at lower prevalence like transposition in 7 (0.1%) and ectopic eruption in 30 (0.7%) subjects [10].

In the study conducted by Eman A. Bakhurji *et al.*, in Eastern Saudi Arabia, a total of 2226 paediatric patients were identified and reviewed over a period of 5 years. Teeth rotation (24.5%) is the most common anomaly seen in this study followed by ectopically erupted teeth (6%), congenitally missing permanent teeth (5.4%), peg lateral (1.1%), supernumerary (0.5%), gemination (0.3%), and fusion (0.1%) [11].

The differences observed in the prevalence of various dental anomalies between our study and other studies can be attributed to the sample selection, patient selection area, and study method.

Limitations

The present study shows only those anomalies that were clinically evident. Some anomalies that are only visible on radiographs or orthopantomograms were not included.

Conclusion

The present study was done to evaluate the prevalence and distribution of various dental anomalies in the population of Hyderabad. Talon's cusp, Microdontia, Peg laterals, Dens evaginatus, Mesiodens, and Dens in dente were more frequently found as compared to other anomalies. Because of the high frequency of these anomalies, it is recommended to identify the aetiological reasons and treat the dental aberration earlier.

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