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Prevalence of Developmental Anomaly in patients visiting the Out Patient Department of a Private Dental College in Kanpur City: a Clinical Cross Sectional Study

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Introduction:

Developmental anomalies of the tooth are routinely encountered by dentists and may present with esthetic and or functional problems. The reported literature has shown a wide variation in the prevalence of these conditions across the globe. Developmental dental disturbances are striking aberrations from the normal size, number, colour, contour and degree of development of teeth. Knowledge of common dental anomalies is essential because these disturbances of teeth contribute to dental problems encountered in regular practice. The aim of this present study is to assess the prevalence of developmental dental anomalies in size, shape, number and structure of the teeth in patients.

Material and Methods: The study was conducted during a period of 4 months on patients who visited the department of oral medicine and radiology. The patients were clinically examined for various developmental dental anomalies.

Results: A descriptive analysis was done on 7,018(100%) patients who visited oral medicine and radiology for various dental problems, of which 196 (2.79%) patients presented with developmental dental anomalies, with 89 (1.26%) had supernumerary teeth, 54(0.76%) presented with microdontia, 39 (0.55%) enamel hypoplasia, 6 (0.08%) with talon's cusp, 2 (0.02%) each of fusion, amelogenesis imperfecta, hypodontia and dens evaginatus were observed. Supernumerary teeth and microdontia were more common.

Conclusion: Developmental dental anomalies are commonly seen during routine dental check-up. These anomalies lead to functional, aesthetic and occlusal problems and thus require appropriate diagnosis and treatment.

Keywords: Amelogenesis Imperfecta, Developmental Anomalies, Microdontia, Prevalence, Supernumerary Teeth

Introduction

Deviations from normal acceptable variation in tooth morphology, color or number is regarded as anomaly, which may be either congenital or acquired during the course of development of

teeth. The development of tooth involves a complete reciprocal interaction between oral epithelium and underlying ectomesenchyme involving a series of molecular signals, receptors and transcription control systems.[1] Abnormalities of morpho differentiation causes abnormalities in the number, size and form of teeth while abnormalities of histo-differentiation result in disturbances in the structure of tooth.[1]

Oral and dental anomalies are frequently encountered by dental practitioners. However, due to the low level of clinical significance associated to anomalies in diagnosis or treatment, reports are not made frequently. Prevalence and the extent of clinical appearance of dental anomalies are varied across geographical areas. In addition, epidemiological studies on dental anomalies can provide information on phylogenic, genetic or environmental characteristics[2].

Dental abnormalities are uncommon when compared to dental caries and/or periodontal diseases. Dental abnormalities may result in malocclusion, functional and esthetic challenges; as well as it can complicate dental treatment[3]. Dental anomalies can result when the genetic pathways and epithelium–mesenchyme interaction are disturbed[4]. The most common anomalies in odontogenesis are related to ameloblasts or odontoblasts differentiation that result in enamel and/or dentine disturbances[5]. Such disturbances affect the size and structure of the affected teeth[6,7]. A total lack of initiation of tooth development can lead to tooth agenesis, whereas hyperactivity of the dental lamina may result in supernumerary teeth[8]. Environment, hereditary and nutrition may play a significant role in the development of such anomalies[9,10]. Dental anomalies can either occur as isolated cases or accompanied by systemic abnormalities constituting syndromic version[11]. Complications associated with dental anomalies may lead to unesthetic appearance of teeth, malocclusion, delayed or incomplete eruption of teeth, risk of developing dental caries, gingivitis, peridontitis, attrition, cusp fracture, speech and mastication difficulty, tempero mandibular joint and atypical facial pain[12].

Studies done across the globe in different populations has shown varying degrees of prevalence of such developmental disturbances. This may be attributed to racial and ethnic differences and local environmental factors. Such influences may affect the deciduous or permanent dentition4 and may be localized or generalized. An early diagnosis of developmental disturbances is important to initiate preventive measures or to minimize complicated multidisciplinary approach for treatment. India has a diverse population comprising of a high number of racial and ethnic groups with widely varying cultural practices.[1] Very few studies have been done to assess the prevalence of dental anomalies in few Indian population especially in Uttar Pradesh. Hence the present cross sectional study was carried out to determine the presence of developmental anomalies in a Kanpur population.

Materials and Methods:

A prospective study was conducted during a period from September 2019 to December 2019. This study comprised of 7,018 subjects, with age ranging from 10-70 years. A comprehensive clinical examination was carried out to identify developmental dental anomalies relating to number, size, structure and shape of the teeth. The inclusion criteria consisted of only those subjects of Indian origin and the exclusion criteria consisted of those subjects with misshaped teeth due to wasting diseases and dental treatment, subjects with teeth missing due to dental caries, periodontal disease and trauma and also those subjects with history of extraction or

orthodontic treatment. A descriptive statistical analysis was done with the help of Microsoft office 2007.

Results

The present study was conducted in Department of Oral Medicine and Radiology with a sample size consisting of 7018 subjects who had reported to the department for regular dental check up. The subject's age ranging from 10-70 years with the mean age was found to be 28.01 years (Table 1). Out of 7,018 (100%) subjects, 3,581 (51.02%) were males and 3,437 (48.97%) were females (Table 2). Out of 7,018 (100%) subjects, 196 (2.79%) presented with various dental anomalies. These dental anomalies were further subdivided into dental anomalies in number, size, structure and shape. Out of 7,018 (100%) subjects, 89 (1.15%) had dental anomalies in number, 54 (0.71%) had dental anomalies in size, 39 (0.59%) had dental anomalies in structure and 14 (0.11%) had dental anomalies in shape (Table 3).

Dental anomalies in number: Mesiodens (0.44%) were the most common dental anomaly in number, followed by Paramolar (0.37), Distomolar (0.28%) and hypodontia (0.17%).

Dental anomalies in size: Peg laterals (0.64%) were the most common dental anomaly in size followed by microdontia (0.12%).

Dental anomalies in structure: Enamel hypoplasia (0.54%) was the most common dental anomaly in structure followed by amelogenesis imperfecta (0.01%).

Dental anomalies in shape: Talon's cusp (0.11%) was the most common dental anomaly in shape followed by fusion (0.02%), germination (0.02%) and dens evaginatus (0.02%)(Table 4).

Gender	**Number**	**Percentage**
Males	3581	51.025%
Females	3437	48.974%
No. of subjects	7018	100%

Table 1: Gender

Total no. of subjects	7018(100%)
Subjects with dental anomalies	196(2.792%)

Table 2: Total Sample Size

Dental anomaly	No. of subjects	Percentage
Number	89	1.26%
Size	54	0.76%
Structure	39	0.55%
Shape	14	0.19%
Total	196	2.79%

Table 3: Distribution of Dental anomalies

Developmental anomalies	Total number of subjects (7018)	Percentage
Mesiodens	31	0.44%
Paramolar	26	0.37%
Distomolar	20	0.28%
Hypodontia	12	0.17%
Pegshaped laterals	45	0.64%
Macrodontia	9	0.12%
Enamel Hypoplasia	38	0.54%
Amelogenesis imperfecta	1	0.01%
Talon cusp	8	0.11%
Fusion	2	0.02%
Gemination	2	0.02%
Dens Evaginatus	2	0.02%
Total	196	2.79%

Table 4: Prevalence of developmental anomalies

Discussion

Dental anomalies develop earlier than the eruption of dentition, and are often hereditarily[13]. Prevalence studies of developmental anomalies are useful to establish frequency rates, to document changes over a period and to identify the changing pattern of anomalies and clues to etiology of disease occurrence. The diagnosis of developmental anomalies also assists in the identification of syndromes and/or any associated systemic diseases. Most dental anomalies attribute to the risk of dental caries and gingival/periodontal disease development. However, due to a lack of subjective symptoms associated with these anomalies, they are usually under reported. Prevalence studies also provide scope for preventive strategies, i.e., hygiene practices and prompt dental visits when a problem such as dental caries and/or periodontal disease are present. Early dental care for developmental anomalies may reduce the severity of dental caries, periodontitis as well as addressing associated esthetic and functional problems.[13]

Developmental anomalies are classified according to:

According to number, morophology and size and structure

A) Anomalies of tooth number

1. Hypodontia
2. Hyperdontia

B) Anomalies of tooth size and morphology

1. Microdontia
2. Macrodontia
3. Dens invaginatus
4. Dens evaginatus
5. Talon's cusp
6. Taurodontism
7. Fusion
8. Gemination
9. Conscrescence
10. Dilacertioin
11. Enamel Pearls
12. Supernumerary Cusps and roots

C) Anomalies of tooth structure

1. Amelogenesis imperfecta
2. Enamel Hypopalasia
3. Dentinogenesis imperfecta
4. Dentin Dysplasia
5. Regional Odontodysplasia
6. Cemental hypoplasia
7. Hypercementoses
8. Interglobular dentin

The results of the present study stated that the prevalence of number anomalies was greater than the prevalence rate of the shape, structure and size. Peg lateral demonstrated the highest incidence rate and microdontia was the second most common anomaly among all the groups, while the rarest were gemination and dens evaginatus [Table 3].

Mesiodens

A supernumerary tooth is a developmental anomaly of number characterized by the presence of tooth in addition to the normal series (Figure 1). Supernumerary tooth in the primary dentition is a less common finding, with one-fifth of this seen in the permanent dentition[15]. The supernumerary tooth may be found in any region of the dental arch, the most common site is the palatal midline between the two maxillary central incisors, where it is termed as mesiodens. Mesiodens account for 80% of all supernumerary teeth. On the basis of its morphology, mesiodens can be classified as conical, supplemental and tuberculate type[14,16]. In our study Mesiodens was found to be 0.44% of the total subjects (Table 4) compared to 2.8% in the study performed by Guttal et al.[17] and 1.13% in the study by S Mukhopadhyay[14].

Figure 1: Mesiodens

Paramolars

Paramolar is a supernumerary molar usually small and rudimentary, most commonly situated buccally or palatally to one of the maxillary molars. Paramolar is a developmental anomaly and has been argued to arise from a combination of genetic and environmental factors. In the present study 0.37% of Paramolars were found as compared to 0.81% reported in the study conducted by Nagaveni et al[18].

Distomolars

Distomolars is a supernumerary molar usually situated distal to the third molars. They are often called as fourth molars. Distomolars are either eumorphic or dysmorphic (i.e conoid or tubercular or mixed). Stafne states that most of the distomolars in his study were blunt, multicuspid and are much smaller than the third molars.[11] The prevelance of Distomolars in our study was found to be 0.28% which was much less than the results obtained in the study conducted by S.A Thomas et al, were the prevalence of distomolars was found to be 2.1%[19].

Hypodontia

Hypodontia is the term used to describe the developmental absence of one or more primary or secondary teeth, excluding the third molars (Figure 1). It is the most common developmental dental anomaly and can be challenging to manage clinically. The term oligodontia is used to define developmental absence of multiple teeth, usually associated with systemic manifestations[20]. Total anodontia denotes complete developmental absence of teeth in both dentitions[21]. The prevalence varies from 2.6% to 11.3%[22]. Hypodontia in the primary dentition is less common with reported prevalence rates varying between 0.5% to 2.4%.In our study it was noted to constitute 0.17% of the entire subjects, which was in contrast to the study conducted by Guttal et al[17], who showed a higher prevalence rate of 1.6% and another study conducted by

Anitha et al showed a prevelance rate of 1.1% which was almost similar to our study. This could be attributed due to the differences in the sample size.

Microdontia

Microdontia is used to describe teeth which are smaller than normal i.e. outside the usual limits of variation[23] (Figure 2). The most frequently affected teeth are maxillary lateral incisor and third molars. It has been classified as True generalized microdontia – All the teeth are smaller than normal. Aside from its occurrence in some cases of pituitary dwarfism, this condition is exceedingly rare, Relative generalized microdontia – Normal or slightly smaller than normal teeth are present in jaws that are somewhat larger than normal and there is an illusion of true microdontia[17]. Out of 7018 subjects, 0.64% of subjects had peg lateral and 0.12% had microdontia of the molars. The result of our study was in close approximation with the results obtained from the study conducted by Guttal et al were microdontia was found in 0.81% of the subjects[8]. The results obtained from other studies included the one conducted by Brin et al and Ooshima et al were microdontia showed a prevalence rate of 1.1% and 0.4% respectively[17,20]. The significant difference between the prevalence could be due to the variations in the age group factor, sample size, selected population and local environmental factors.

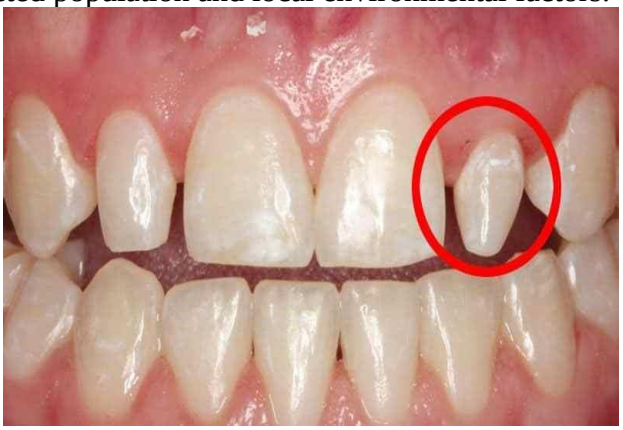

Figure 2: Microdontia

Enamel Hypoplasia

Enamel hypoplasia (Figure 3) is a defect in the matrix of enamel; most commonly reported among malnourished and low birth weight children. The present study showed a prevalence of 0.54% out of 7,018 subjects. The results of the present study was much less as compared to the one conducted by Rebbicca et al were it was 4%,Jindal et al with a prevalence rate of 7.7% and Kanchanakamol et al were it affected 1.2% of the study subjects [24,25,26]. The differing prevalence figures for the developmental defects of enamel could be attributed to the hereditary factor, differences in the population which were studied and the diversity of methodological procedures which were followed.

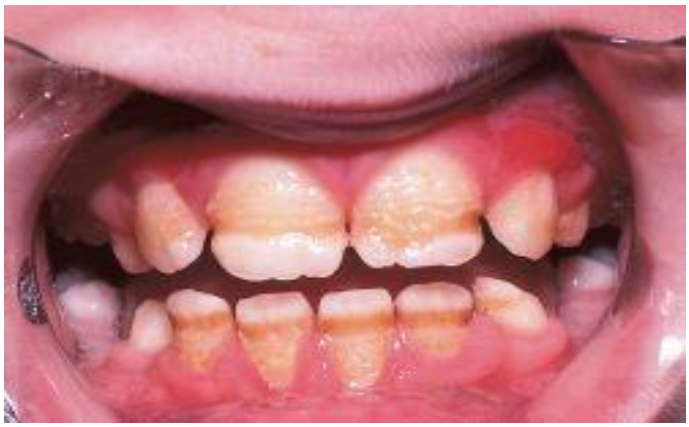

Figure 3: Enamel Hypoplasia

Amelogenesis Imperfecta

Amelogenesis imperfect (Figure 4) is a developmental alteration in the structures of enamel in the absence of systemic disease. In the present study, amelogenesis imperfecta was the rarest in occurrence with the overall prevalence rate of 0.02% of total sample size 7,018. According to the study conducted by various authors such as Thongdomporn (1998), Uslu (2009), Ghaznawi (1999), Ezoddini (2009), Backman (2001) and also by Guttal (2010), zero percent prevalence of structural anomalies was reported in their studies[12,13,14,17,4]. Per contra, in a study conducted by Altug-Atac et al (2005) among Turkish population, amelogenesis imperfecta was the third most common dental anomaly with a prevalence of 0.43%[7]. The disparity in prevalence could have been due to the hereditary factors and clustering of affected patients in certain geographic areas resulting in an increased prevalence of disorder in those areas. Additionally, the stringency of the diagnostic criteria may influence the reported prevalence in any study[6].

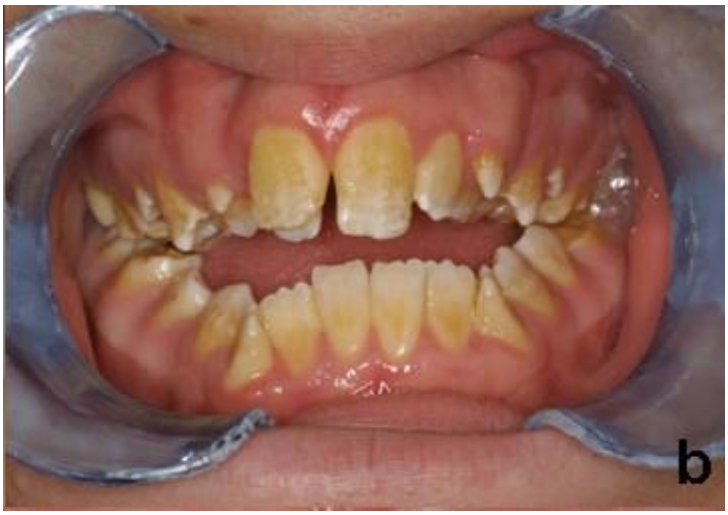

Figure 4: Amelogenesis Imperfecta

Talon cusp

As early as 1892, Mitchell reported a maxillary central incisor with a horn-like protuberance projecting from the lingual surface[27]. In canines and incisors, it originates usually in the palatal cingulum as a tubercle projecting from the palatal surface; however, the anomaly also has affected the labial surface of the tooth. Mellor and Ripa named the accessory cusp talon cusp because of its resemblance in shape to an eagle's talon[28]. In our study, the prevalence of talon's

cusp was 0.11%%. This anomaly had greater predilection for maxilla, where in maxillary central incisors and canines were more commonly affected. A similar study conducted by Gaurav Sharma showed a prevalence of 0.02%[29], which is in par with our study[10]. However, a study conducted by Sedano et al[30] showed a prevalence rate of 0.6 per 1000, and Ardakani et al showed a prevalence of 41.2% with a positive family history in most of these patients.

Fusion, Gemination, Dens Evaginatus

In 1963 Tannenbaum and Alling defined fusion as a union of two separate tooth buds at some stage in their development. Depending on the stage they are united, one tooth may have only one pulp chamber as a gemination, or there may be two pulp chambers, with union only of the dentin[31]. Gemination is an attempt of tooth bud to divide, this partial division is arrested before tooth development is completed, the end result is single tooth with a bifid crown and the total number of teeth is normal. Dens evaginatus is a rare dental anomaly involving an extra cusp or tubercle that protrudes from the occlusal surface of the affected tooth[32]. Also called as Occlusal Tuberculated Premolar, Leong's Premolar, Evaginated Odontome and Occlusal Enamel Pearl Fusion of teeth is relatively frequent, ranging from 0.5 percent to 2.5 percent[33]. Fusion, germination and dens evaginatus accounted for 0.02% respectively of all dental anomalies. Fusion was observed to be unilateral. However, a study conducted by Shashirekha G and Amit Jena showed a prevalence of 0.18% of fusion and 0.28% of germination and 0.18% of Dens Evaginatus in their total subjects[8].

In the present study, the following observations were made:

1. The prevalence of dental anomaly was more in males than in females.
2. The most prevalent dental anomaly was in number. The most common being supernumerary teeth - mesiodens.
3. The second most prevalent dental anomaly was in size. The most common being microdontia - peg laterals.
4. The third most prevalent dental anomaly was in structure, which included enamel hypoplasia followed by amelogenesis imperfecta.
5. The fourth most prevalent dental anomaly was in shape which included talon's cusp followed by fusion, gemination and dens evaginatus. These variations in developmental dental disturbances highlight the need for establishing data from various geographical regions to examine the effect of genetics and environment on dental development.

Conclusion

A series of factors can influence the normal development of the occlusion, interfering in correct alignment of the teeth and harmonic relationship with the adjacent and antagonistic elements. In order to evaluate discrepancies in dentition, it is necessary to be familiar with the normal development of the teeth and the stages involved in it. Early detection and diagnosis of dental anomalies are essential steps in evaluation of the child patient and in treatment planning. In presence of dental anomalies, the dentist should evaluate the moment that they begin to interfere in the normal developmental pattern of occlusion. Then intervention should occur as soon as possible to avoid malocclusion.

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