Journal of Advanced Medical and Dental Sciences Research
@Society of Scientific Research and Studies
Journal home page: www.jamdsr.com doi: 10.21276/jamdsr ICV 2018= 82.06 UGC approved journal no. 63854
(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

To Evaluate the Prevalence of Clinically Discernable Developmental Dental Anomalies in Hanumangarh District in Rajasthan

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ABSTRACT:
Background: Disturbances during various stages of tooth development can markedly alter the number, size, shape and structure of the teeth. Numerous epidemiological studies on developmental dental anomalies have been carried out in different countries but such studies in India are very few and more often limited either to a single type of anomaly or in the form of case reports. This epidemiological study thus was carried out to determine the prevalence of clinically discernable developmental dental anomalies in Hanumangarh district in Rajasthan. **Material & Methods:** Epidemiological survey was conducted in the government and private schools of Hanumangarh district selected randomly from the 3 Tehsils in the district – Nohar, Bhadra and Rawatsar. A total of 13 schools were included in the survey, 5 from Nohar, 4 from Bhadra and 4 from Rawatsar that included 2 private schools and 11 Government schools. A total of 5046 children were screened for the presence of developmental anomalies of teeth. The obtained data was statistically analyzed using Chi-square test, the Frequencies procedure and Cross tabs procedure. **Results**: For studying primary dentition, an age group must be chosen in which the dentition is fully erupted and an adequate level of cooperation can be gained, but before any anterior teeth are lost by exfoliation. While mesiodens are observed in early stages, most of paramolars and distomolars erupt later. **Conclusion**: The data obtained in this study concerning the prevalence of developmental anomalies provides a better insight of these anomalies. Presence of these anomalies and the associated clinical problems underlies the need for early intervention. The dataa from this study could be utilized for planning treatment modalities.
Key words: Dentl Anomalies, Prevalence, Tooth Development, Disturbances of Tooth Development.

Received: 12 April, 2019 Revised: 2 May 2019 Accepted: 5 May 2019

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This article may be cited as: Godara R, Narain P, Mahala SK. To Evaluate the Prevalence of Clinically Discernable Developmental Dental Anomalies in Hanumangarh District in Rajasthan. J Adv Med Dent Scie Res 2019;7(7): 11-15.

INTRODUCTION:

Tooth development is so unique that the same fundamental developmental process occurring in all the teeth produces anatomically distinct tooth with differing functions.[1]

The first sign of the tooth development is the appearance of the primary epithelial band that forms the dental and vestibular lamina. Dental lamina serves as the primordium for the ectodermal portion of the deciduous teeth. Later, during the development of the jaws, the secondary molars arise directly from a distal extension of the dental lamina.

Mesenchymal cells then differentiate around the bud to form the dental papilla and the dental follicle. With further condensation and differentiation of dental papilla, the enamel organ takes the shape of cap and bell. Hard tissue formation begins in the bell stage with the differentiation of odontoblasts that appear after the enamel depositing ameloblasts are formed. The dentinal matrix then forms at the periphery of the dental papilla during dentinogenesis and subsequently enamel deposition occurs at the dentinoenamel junction after a few micrometers of dentin has been deposited. The continued deposition of enamel and dentin forms the coronal portion of the tooth. Hertwig's epithelial root sheath formed from the cervical portion of the enamel organ initiates radicular dentin formation. It outlines the future root and is responsible for the shape, length, size and number of roots.[1,2]

The shape of the future crown pattern of the tooth is determined in the bell stage that is characterized by both his to differentiation and morpho differentiation. Two hypothetical models have been proposed to explain the crown pattern determination, the Field model and the Clone model. The Field model proposes that the factors responsible for the tooth shape reside within the ectomesenchyme in distinct, but graded fields for each tooth family and the Clone model proposes that each tooth class is derived from a clone of ectomesenchymal cells programmed by the epithelium to produce teeth of a given pattern.

Various genetic and environmental factors and their mutual interactions control the developmental process. Some of the genes, growth factors and signalling pathways that are implicated in tooth development are msx1, -2, pax9, pitx2, left1, Barx1, Lhx 6,-7, Gli 1,-2,-3, Dlx1,-2, chfal, bmp, fgf, shh.[2]

Disturbances during various stages of tooth development can markedly alter the number, size, shape and structure of the teeth. Lack of initiation or physiological obstruction, disruption of dental lamina can result in tooth agenesis/absence of teeth. Hyperactivity of dental lamina may result in supernumerary tooth. Disturbances in morpho differentiation can affect the form or size causing abnormalities such as microdontia, peg teeth, fusion, talons cusp etc. Evolution, hereditary, environmental and genetic factors have been implicated in the development of these anomalies.

The anomalies of the tooth may be inherited or acquired, may be prenatal or postnatal in origin. They can involve either deciduous or permanent teeth. They may be either localized to single teeth or generalized to involve all the teeth or may be part of systemic disorder or syndrome. Multiple anomalies can occur in a single person and their simultaneous occurrence suggests the need to study them as composites rather than isolates.[3]

Though these anomalies account for a relatively low number compared to the more common oral disorders such as dental caries and periodontal disease, their clinical management is usually complicated as they present with malocclusion, esthetic problem and possible disposition to other oral diseases.[4]

Numerous epidemiological studies on developmental dental anomalies have been carried out in different countries but such studies in India are very few and more often limited either to a single type of anomaly or in the form of case reports. No such epidemiological study has been carried out in Hanumangarh district. This epidemiological study thus was carried out to determine the prevalence of clinically discernable developmental dental anomalies in Hanumangarh district in Rajasthan.

1. To determine the prevalence of developmental anomalies of teeth.
2. To record sexual dimorphism of developmental anomalies of teeth.
3. To record the arch specific prevalence of developmental anomalies of teeth

MATERIALS & METHODS

Epidemiological survey was conducted in the government and private schools of Hanumangarh district selected randomly from the 3 Tehsils in the district – Nohar, Bhadra and Rawatsar. A total of 13 schools were included in the survey, 5 from Nohar, 4 from Bhadra and 4 from Rawatsar that included 2 private schools and 11 Government schools. Each school varied in its class and student strength with few schools having only primary section and others having both primary and high school section.

Before the commencement of the survey, informed consent was taken from the concerned school authority. A total of 5046 children were screened for the presence of developmental anomalies of teeth. The children were examined in their respective schools in a good clinical set up under natural day light with the child sitting on the bench. The clinical findings were recorded in a proforma. The general recording included personal details of the child, dentition status and previous dental treatment records.

Those cases that showed presence of developmental anomaly were further evaluated by a single examiner and the details of the anomaly were recorded. A separate individual consent was taken on child's behalf from the school authority for taking impression and radiographs whenever necessary. Photographs and alginate impression of the anomaly taken and casts prepared using dental stone. Wherever applicable, radiographic recording of the anomaly was done. The obtained data was statistically analyzed using Chi-square test, the Frequencies procedure and Cross tabs procedure.

RESULTS & DISCUSSION

Disturbances during tooth development results in developmental dental anomalies that can affect number, size, shape and structure of teeth. These anomalies are encountered during the routine dental practice. Epidemiological studies have been done to record the prevalence of these anomalies in different geographical areas and such studies have recorded a varying prevalence of these anomalies. Data on the prevalence rate of developmental dental anomalies in India are scant.

The data pertaining to the number and distribution of schools in Hanumangarh district and the number of children studying in these schools were obtained from the Block Educational Officer's (BEO) office, Hanumangarh. 5000 school children formed the sample size for the study which would adequately represent a large population to derive the significant results. With prior permission from the school authorities the survey was planned. A total of 5046 school children of 6-16 years age group were examined and data concerning prevalence rates for developmental anomalies of teeth were obtained.

For studying primary dentition, an age group must be chosen in which the dentition is fully erupted and an adequate level of cooperation can be gained, but before any anterior teeth are lost by exfoliation. There is no ideal age when the complete permanent dentition can easily be studied concerning anomalies. In persons of midteen and

above, the chances of misdiagnosis of hypodontia are high as many will have lost teeth because of caries or trauma or extracted as part of orthodontic treatment.[5]

While mesiodens are observed in early stages, most of paramolars and distomolars erupt later. Many cases of late forming premolars have been reported.[6] An age above 7-8 years has been suggested by few authors, as it is the stage when mineralization of premolars is complete and thus presence or absence of all the teeth excluding 3rd molars can be observed on radiographs (Silverman NE et al 1979[7], Cassia A et al 2004[8] & Polder BJ et al 2004[9]). Brook AH suggests two age groups for the study; one suitably aged 11-14 years for the permanent dentition except 3rd molars and a second, older group for 3rd molars alone.[5]

Though most of the studies consider both genders in their study, few studies have considered only males.[10] The population groups studied have also varied greatly between investigators. The nature of the population is either a particular ethnic group[11-15]or a population within the geographic area studied[16-21] or hospital based population[4,22,23]or non-specific population.[24-26] Many investigators have exclusively studied orthodontic patients,[27,28]who form a convenient group, as radiographs usually are available, but the use of such children can introduce bias.[5] The derivation of the population affects the results also for location of the anomalies at different sites within arches.[5]

Method of examination varies between the studies. Few investigators have relied upon clinical examination with the use of radiographs restricted for the confirmation of the anomalies.[24,29] The FDI technical report suggests that supernumerary and congenitally absent teeth can be studied without the use of radiographs.[5] Radiographic examination has been used by many of the investigators. OPG[13,14]or OPG with full mouth IOPA radiographs[18] or only full mouth IOPA radiographs[11] have also been used. Retrospective studies[11,13,14,16,22] using either only radiographs or radiographs-cast-clinical records of hospital patients or orthodontic patients have been carried out with each of them influencing the final outcomes in the study. Radiographic examination involving OPGs wherever applicable to rule out the presence of other anomalies and syndromes.

In addition to carefully considered sampling techniques and examination methods, defined and reproducible diagnostic criteria needs to be followed which might vary between the examiners resulting in varying findings.[5]

Isolated anomalies are studied by few authors[16,22,24,25]whereas others have studied multiple anomalies in varying combinations.[4,11,12] As there is evidence that the pathogenesis of some of these anomalies are inter-related, the dental anomalies of number, size and form should be studied preferably as a group rather than isolates.

Table 1: Prevalence Of Developmental Dental Anomalies In The Study Population

Type of anomaly	No. Of cases recorded	Prevalence % in population
Supernumerary teeth	19	0.38%
Talons cusp	15	0.29%
Microdontia	45	0.89%
Double teeth	13	0.26%
Dens invaginatus	1	0.02%
Hypodontia	62	1.22%
Multiple anomalies	12	0.24%
Others	31	0.61%

Table 2: Sex Distribution Of The Anomalies

	GENDER				Total	
	Male		Female			
Supernumerary teeth	17	15.9%	2	2.2%	19	9.6%
Talons cusp	5	4.7%	10	11.0%	15	7.6%
Microdontia	17	15.9%	28	30.8%	45	22.7%
Double teeth	7	6.5%	6	6.6%	13	6.6%
Dents invaginatus	0	0%	1	1.1%	1	0.5%
Hypodontia	36	33.6%	26	28.6%	62	31.3%
Multiple anomalies	8	7.5%	4	4.4%	12	6.1%
Other anomalies	17	15.9%	14	15.4%	31	15.7%
Total	107	100.0%	91	100.0%	198	100.0%

Table 3: Arch Distribution of the Anomalies

Type of the anomaly	Arch						Total	
	Maxilla		Mandible		Both			
Supernumerary teeth	18	94.7%	1	5.3%	0	.0%	19	100.0%
Talons cusp	14	93.3%	1	6.7%	0	.0%	15	100.0%
Microdontia	41	91.1%	4	8.9%	0	.0%	45	100.0%
Double teeth	3	23.1%	10	76.9%	0	.0%	13	100.0%
Dens invaginatus	1	100.0%	0	0.0%	0	.0%	1	100.0%
Hypodontia	18	29.0%	42	67.7%	2	3.2%	62	100.0%
Total	95	61.3%	58	37.4%	2	1.3%	155	100.0%

Table 4: Quadrant Distribution of the Anomalies

Type of anomaly	Quadrant						Total	
	Right		Left		Right & Left			
Talons cusp	6	40.0%	5	33.3%	4	26.7%	15	100.0%
Microdontia	6	13.3%	20	44.4%	19	42.2%	45	100.0%
Double teeth	11	84.6%	2	15.4%	0	.0%	13	100.0%
Dens invaginatus	1	100.0%	0	.0%	0	.0%	1	100.0%
Hypodontia	21	33.9%	10	16.1%	31	50.%	62	100.0%
Total	45	33.1%	37	27.2%	54	39.7%	136	100.0%

CONCLUSION

The data obtained in this study concerning the prevalence of developmental anomalies provides a better insight of these anomalies. Detailed records in the form of photographs, radiographs and casts could be beneficial for further studies of these anomalies either as isolates or multiples or for the determination of ethnic, genetic and familial patterns of distribution of these anomalies. Presence of these anomalies and the associated clinical problems underlies the need for early intervention. The data from this study could be utilized for planning treatment modalities.

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