JOURNAL OF COMPLEMENTARY MEDICINE RESEARCH, 2020
VOL 11, NO. 4
10.5455/jcmr.2020.11.04.28

REVIEW ARTICLE

Open Access

Assessment of Prevalence of Enamel Defects in Permanent Dentition Among Children Visiting A Dental Institution in Chennai: Retrospective Study

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ABSTRACT

Disturbances in the hard tissue matrices during odontogenesis may cause demarcated opacity and diffuse opacity which may lead to hypoplasia. Clinical significance of which predisposes the teeth to dental caries and may cause aesthetic problems such as stained defects or tooth sensitivity. The aim of our study is to assess the prevalence of enamel defects in permanent dentition in patients attending a private dental hospital. This study was done at Saveetha dental college and hospitals. The sample size consisted of 36 patients in the age group 5-20 years who had visited the institution for dental check. It included various parameters such as age, gender, location of enamel defects and type of enamel defects. The cast sheets of patients were obtained from the information archiving system. The data of each patient was obtained and tabulated. Findings of this study show that prevalence of enamel defects in male population (66.7%) was more than the female population (33.3%). Higher prevalence was seen in age group 16-20 years (69.4%) followed by 11-15 years (16.7%) and 5-10 years (13.9%). Fluorosis (94.4%) was seen at a higher prevalence than molar incisor hypoplasia (5.6%). Location of enamel defects had a prevalence occurring in both arch (86.1%) followed by anteriors (8.3%) and posteriors (5.6%). Hence the results of the study show fluorosis is a highly prevalent enamel defect in the age group 16-20 years and males had a higher incidence than females. From the present study we can conclude that fluorosis is a highly prevalent enamel defect in the age group 16-20 years followed by Molar Incisor Hypomineralisation (MIH) and early diagnosis of these defects can help in better treatment and prognosis.

ARTICLE HISTORY

Received October 18, 2020
Accepted November 20, 2020
Published December 09, 2020

KEYWORDS

enamel defects, esthetics, fluorosis, MIH, prevalence

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INTRODUCTION

Development defects of enamel (DDE) consist of mainly dental defects such as hypoplasia and diffuse and demarcated opacities; fluorosis and amelogenesis imperfecta. Enamel hypoplasia, thus, is a surface defect of the tooth crown that is caused by a disturbance of enamel matrix secretion, defective calcification or defective maturation [1].

Enamel hypoplasia or hypo mineralization may be caused by hereditary factors and environmental factors that include systemic factors such as nutritional factors, exanthematous diseases like measles and chickenpox, congenital syphilis, hypocalcemia, birth injury or premature birth, fluoride ingestion or idiopathic causes, and local factors such as infection or trauma from a deciduous tooth. Hereditary enamel hypoplasia/hypomineralization is known as amelogenesis imperfecta. It is transmitted in the family as a mendelian dominant trait which affects enamel of all the teeth, deciduous as well as permanent. Environmental enamel hypoplasia/hypo mineralization of systemic or local origin is also termed as "chronologic hypoplasia". This lesion is found in areas of those teeth where the enamel was being formed during the systemic or local disturbance. Since the formation of enamel extends over a long period and the systemic or local disturbance, in most cases are of short duration, the defect is limited to a circumscribed area of the affected teeth or tooth. Thus knowing the chronological development of deciduous and permanent teeth will make it possible to determine from the location of the defect, the approximate time at which the injury occurred [2].

The basic pathology in DDE is the result of abrupt, short-term or long-term ameloblastic insults during the secretory or maturation phase of the development of tooth; any systemic illness, disturbance, deficiency or prematurity of neonate or local trauma can lead to DDE [3]. Enamel hypoplasia can also be seen in other pediatric conditions in which hypocalcemia is a major sign as in rickets, prematurity and neonatal tetany [4]. Furthermore, disturbances in the development of the enamel of permanent teeth can result from trauma to the primary teeth because of the close proximity of the root of the primary teeth to their permanent successors [5]. Enamel hypoplasia may be inherited or may result from an illness, malnutrition, trauma or due to fluorosis [6] Although it can occur in any permanent tooth, the most commonly involved sites of hypoplasia are the permanent first molars and incisors with specific areas of defect and well-demarcated areas of hypomineralization [7]. The secretory phase for development of the permanent incisors and first molars begins in utero whereas the maturation process begins at birth and thus any trauma of inadequate mineralization can result in DDE [4].

Molar incisor hypomineralization" (MIH), is a more specific form of DDE characterized by hypomineralization due to systemic illness, which can be seen as translucency in the enamel [8]Environmental enamel hypoplasia/hypomineralization due to systemic factors are commonly manifested in the first permanent molars and incisors. Clinical studies indicate that enamel hypoplasia involves those teeth that form within the 1st year of birth. So, most frequently incisors and first permanent molars are affected. Hence, this condition is termed as "molar incisor hypomineralization." When presented clinically these hypomineralized defects frequently break down because of the masticatory pressure and are seen as mixed areas of hypoplasia and hypomineralization. Premolars and 2nd, 3rd molars are seldom affected, since their formation does not begin until the age of 3 years or later [9].

Environmental enamel hypoplasia/hypomineralization due to local factors is also called as "turner's hypoplasia/hypomineralization" seen most commonly in permanent maxillary incisors or upper lower premolars. Turner's hypoplasia usually manifests as a portion of missing or diminished enamel, which affects one or more than one permanent tooth in the oral cavity [10] It commonly affects a single permanent tooth because of infection of the corresponding deciduous tooth. Any degree of defects ranging from mild brownish discoloration of enamel (hypomineralization) to severe pitting and irregularity of tooth crown (hypoplasia) depending on severity of infection. Similarly, when a deciduous tooth has been driven into the alveolus and has disturbed the permanent bud, it can manifest as a yellowish or brownish stain or pigmentation of the enamel usually on the labial surface or a true hypoplastic pitting defect or deformity.

Previously our team had conducted several studies which include, systematic reviews , surveys , clinical trials and in vitro studies Previously we have focused our research on various invitro and invivo studies. [11–30] We have currently shifted our focus to this retrospective analysis. and hence the aim of this study was to assess the prevalence of enamel defects in permanent dentition in patients attending a private dental hospital.

MATERIALS AND METHODS

The present retrospective study was carried out in Saveetha Dental College and Hospital, Chennai, Tamil Nadu. The study was of university setting and carried out using data collected from patient management software. The advantage of using a university setting is that data is readily available and patients are of similar ethnicity. The disadvantage of this type of setting is that it covers a specific geographic area and trends in other locations are not assessed. Ethical approval was obtained from the Institutional Ethical Committee-SDC/SIHEC/2020/DIASDATA/0619-0320. Non probability sampling of the available data was done. The sample size consisted of 36 patients in the age group 5-20 years who had visited the institution for dental check up from June 2019 to April 2020 were reviewed and the dental data regarding the patient's history or chief complaint regarding white spots or discolouration of teeth were retrieved. The data was cross checked and verified by an examiner to avoid any missing records. Inclusion criteria included all patients with enamel defects.

Data collection was carried out using dental archives obtained from the patient management software. It included various parameters such as age, gender, location of enamel defects and type of enamel defects. Location of defects were tabulated as occurring in anteriors, posteriors and in both arch. Type of enamel defects seen were fluorosis and molar incisor hypoplasia. Cross verification of all the diagnosis reports, intra oral pictures and dental case records were done. Data was entered in Microsoft Excel sheets. The data was imported and transferred to the host computer and subjected to statistical analysis using SPSS (Statistical Package for Social Sciences) developed by IBM version 23.0. Frequency, percentage of parameters was employed in the analysis. Chi square test was used to detect the significance between gender, age, region of tooth loss and p value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Findings of this study show that prevalence of enamel defects in male population (66.7%) was more than the female population (33.3%). Higher prevalence was seen in age group 16-20 years (69.4%) followed by 11-15 years (16.7%) and 5-10 years (13.9%). Fluorosis (94.4%) was seen at a higher prevalence than molar incisor hypoplasia (5.6%). Location of enamel defects had a prevalence occurring in both arch (86.1%) followed by anteriors (8.3%) and posteriors (5.6%) as shown in graph 1-4.

Table 1 and graph 5 shows association of age & location of defects, in which age group 5-10 years had defect in both arch-10%, age group 11-15 years had defect in both arch- 16% and in age group 16-20 years had in both arch- 74%.

Table 2 and graph 6 shows association of age and type of enamel defect, where in 73% fluorosis was seen in the age group 16-20 years. The comparison of age and type of enamel defect was not statistically significant with a p value- 0.088.

Table 3 and graph 7 shows association of gender & location of defects, the incidence of occurrence in male population is 68% and in female population is 32%.

Table 4 and graph 8 shows association of gender and type of enamel defect, the comparison of gender and type of enamel defect was not statistically significant with a p value- 0.608.

Developmental defects of enamel are not studied enough although they result in esthetic problems, dental sensibility, and are predisposing factors for dental caries. Prematurity has been described as one of the causes for the appearance of enamel defects.

A study on the prevalence of dental fluorosis by Reddy, Kola S., et al in permanent dentition, showed that iit was more in 9–10-year-old children (70%) which is contrary to present study 16-20 years (74%) [31]. The probable reason could be that children who had continuously resided in an area with elevated water fluoride content for the first 5 years of their life. The increasing prevalence and severity of dental fluorosis with increasing fluoride concentration may be explained by the fact that dental fluorosis is a developmental defect which occurs because of exposure to water containing high fluoride concentrations. This relation between water fluoride concentration and severity of dental fluorosis is dose-dependent with increasing concentration leading to higher risk [32] [33]

A study by Padavala, Sisira et al on the prevalence of MIH showed Molars are more affected than the incisors. Mandible was affected more in comparison with maxilla [34]. This was contrary to present study where location of defects involved both arch. These teeth would not have been exposed to the oral environment long enough to develop dental caries. At an older age, there would be a risk of post eruptive breakdown of enamel and caries initiation. Mandibular molars were more affected in this study which could be because they erupt earlier.

Rai, Pooja Mali, et al showed the prevalence of MIH is 13.12% with no gender predilection [35]. This is similar to our results, seen equally in male and female population.

A literature stated by Khan, Soban Qadir, et al on study on fluorosis showed the number of males suffering from fluorosis was more than the females [36]. This has similar results male population (68%) increased incidence.

It is suggested in a study by Kanchan et al, that dental practitioners make a note of these defects in their routine practice so that the information is available for matching dental records during forensic investigations. Enamel defects have been widely used by anthropologists for the investigation of growth disruptions in the past populations [37].

Preterm labor can be a predisposing factor for the presence of the enamel hypoplasia in the primary dentition suggested in a study done by Cruvinel et al [38].

Our study has limitations that must be taken into account for an adequate interpretation of its results such as geographic limitation, cannot be generalized to a larger population and does not represent all the ethnic groups or populations from around the world.

Future Scope of the study includes extensive research to be done in a diverse population which can help in further diagnosis and treatment planning.

CONCLUSION

From the present study we can conclude that fluorosis is a highly prevalent enamel defect in the age group 16-20 years followed by Molar Incisor Hypomineralisation (MIH) and early diagnosis of these defects can help in better treatment and prognosis.

AUTHOR CONTRIBUTIONS

First author (Pavithra H Dave) performed the analysis, interpretation and wrote the manuscript. Second author (Dr.Samuel Raj Srinivasan) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Third author (Dr.Mahesh) participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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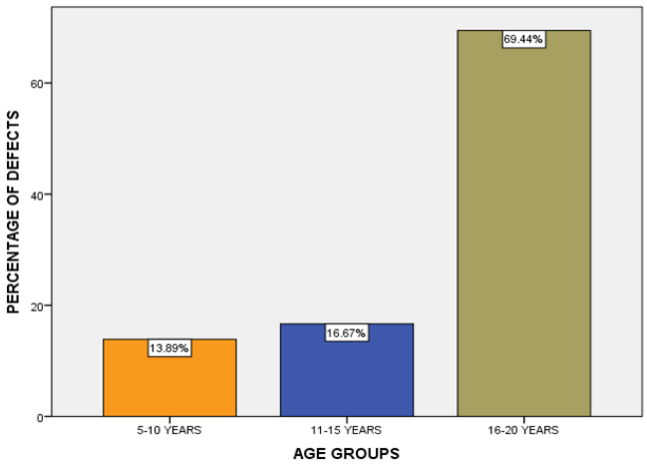
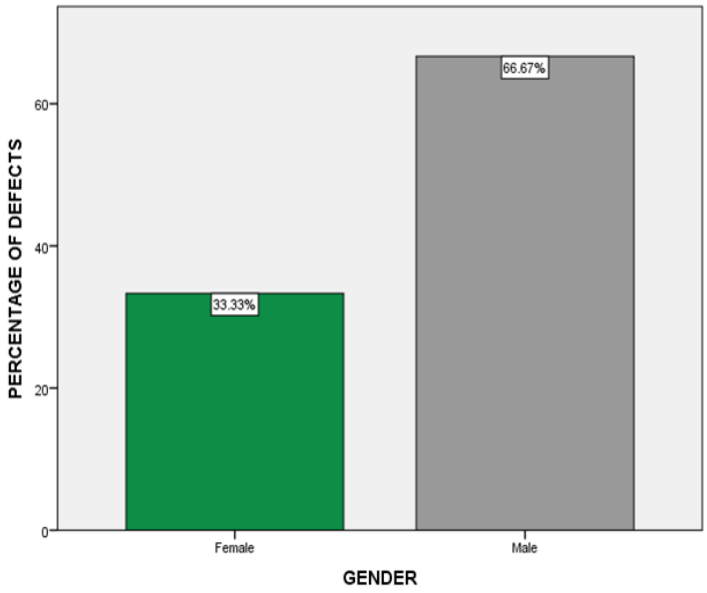
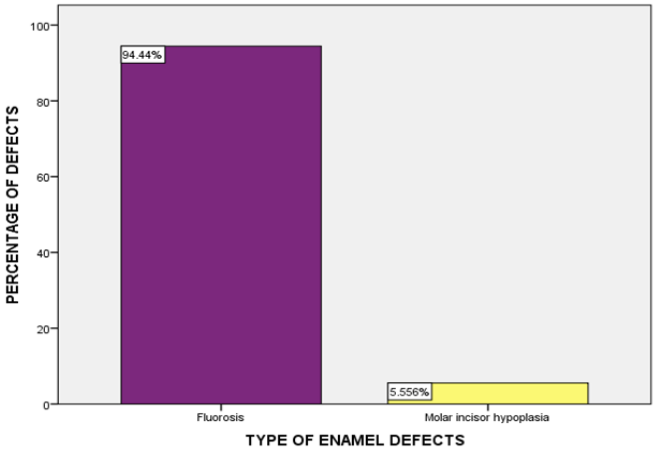


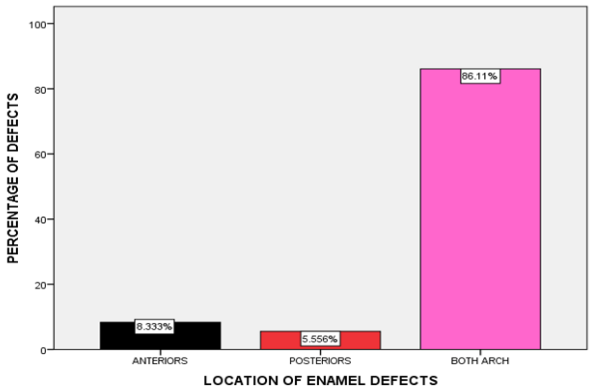
Graph 1 represents frequency distribution of age groups, where orange denotes age group 5-10 years, blue denotes age group 11-15 years and brown denotes age group 16-20 years. X axis represents the age groups and Y axis represents the percentage of enamel defects. Thus it is shown that higher prevalence was seen in age group 16-20 years (69.44%) when compared to other age groups.



Graph 2 represents frequency distribution of gender, where green denotes female population and grey denotes male population. X axis represents the gender and Y axis represents the percentage of enamel defects.Thus it is shown that higher prevalence was seen in male population (66.67%) when compared to the female population (33.33%).



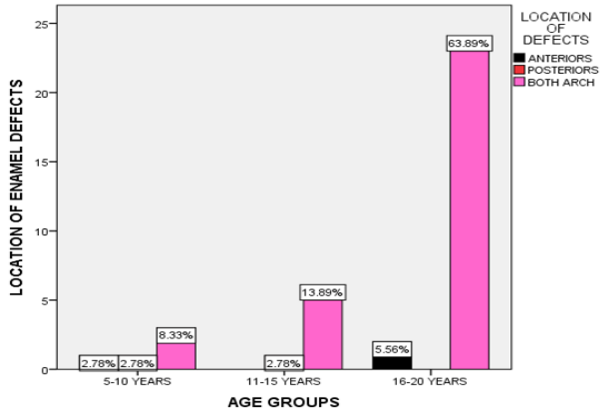
Graph 3: represents frequency distribution of type of enamel defects in which purple denotes fluorosis and yellow denotes molar incisor hypoplasia. X axis represents the type of enamel defects and Y axis represents the percentage of enamel defects. Thus it is shown that higher prevalence was seen in fluorosis (94.44 %) when compared to the other defects.



Graph 4: represents frequency distribution of location of enamel defects in which black denotes anteriors, red denotes posteriors and pink denotes both arch. X axis represents the location of defects and Y axis represents the percentage of enamel defects. Thus it is shown that a higher prevalence was seen occurring in both arch (86.11 %) when compared to the other locations.

Table 1: represents association of age and location of enamel defects. Chi square test was used, p value > 0.05 and hence statistically not significant.

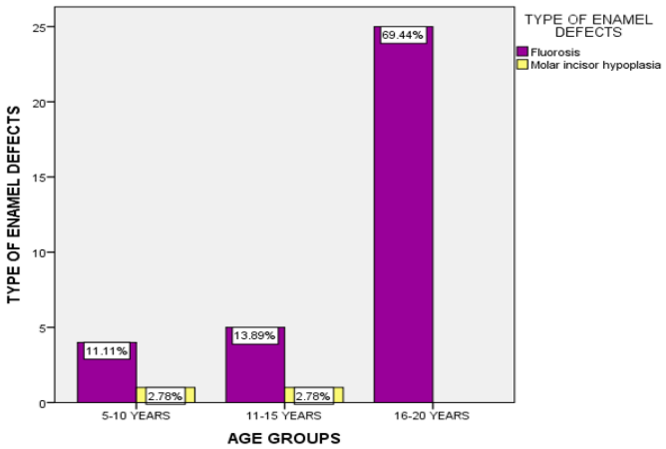
LOCATION OF DEFECTS							
		ANTERIORS	**POSTERIORS**	**BOTH ARCH**	**TOTAL**	**CHI SQUARE VALUE**	**P VALUE**
AGES	**5-10 YEARS**	1	1	3	5	6.422	0.170
	11-15 YEARS	0	1	5	6		
	16-20 YEARS	2	0	23	25		
TOTAL		3	2	31	36		



Graph 5: represents association of age and location of enamel defects in which black denotes anteriors, red denotes posteriors and pink denotes both arch. X axis represents the age groups and Y axis represents the location of enamel defects. Thus it is shown that prevalence was more in the age group 16-20 years seen occurring in both arches (63.89 %) when compared to the other age groups and this difference was not statistically significant. Pearson Chi Square Value- 6.422, p value- 0.170

Table 2: represents association of age and type of enamel defects Chi square test was used, p value > 0.05 and hence statistically not significant.

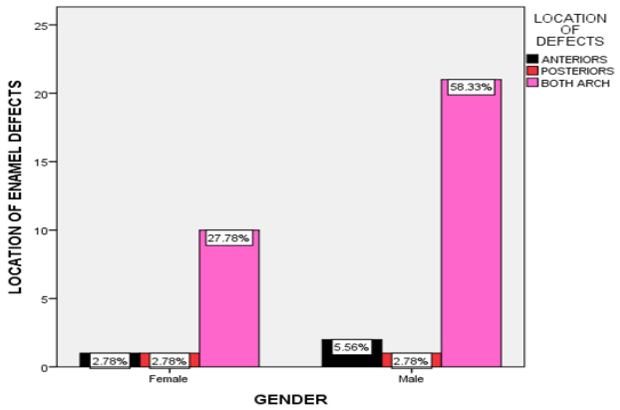
TYPE OF ENAMEL DEFECTS						
		FLUOROSIS	**MOLAR INCISOR HYPOPLASIA**	**TOTAL**	**CHI SQUARE VALUE**	**P VALUE**
AGE GROUPS	5-10 YEARS	4	1	5	4.871	0.088
	11-15 YEARS	5	1	6		
	16-20 YEARS	25	0	25		
TOTAL		34	2	36		



Graph 6 represents association of age and type of enamel defects in which purple denotes fluorosis and yellow denotes molar incisor hypoplasia. X axis represents the age groups and Y axis represents the type of enamel defects. Thus it is shown that prevalence was more in the age group 16-20 years with fluorosis having a higher prevalence (69.44 %) when compared to the other defects and this difference was not statistically significant. Pearson Chi Square Value- 4.871, p value- 0.088

Table 3 represents association of gender and location of enamel defects Chi square test was used, p value > 0.05 and hence statistically not significant.

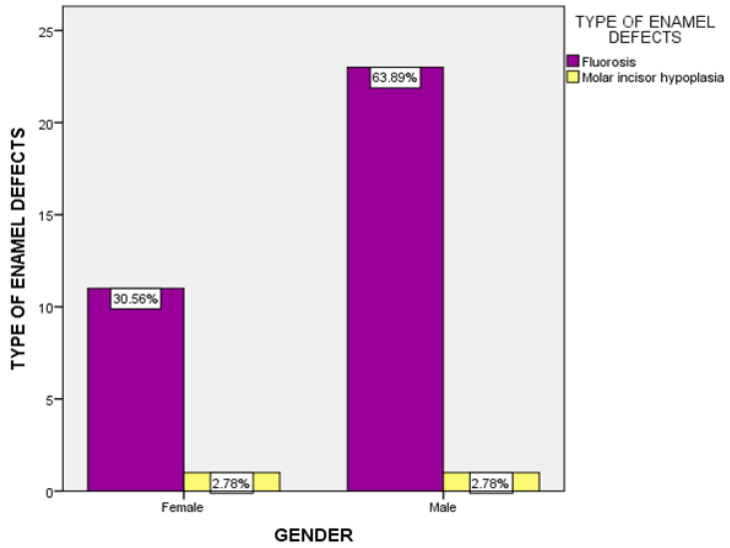
LOCATION OF DEFECTS							
		ANTERIORS	**POSTERIORS**	**BOTH ARCH**	**TOTAL**	**CHI SQUARE VALUE**	**P VALUE**
GENDER	FEMALE	1	1	10	12	0.266	0.875
	MALE	2	1	21	24		
TOTAL		3	2	31	36		



Graph 7 represents association of gender and location of enamel defects in which black denotes anteriors, red denotes posteriors and pink denotes both arch. X axis represents the age groups and Y axis represents the location of enamel defects. Thus it is shown that prevalence was more in the male population seen occurring in both arches (58.33 %) when compared to the female population and this difference was not statistically significant. Pearson Chi Square Value- 0.266, p value- 0.875

Table 4: represents association of gender and type of enamel defects Chi square test was used, p value > 0.05 and hence statistically not significant.

TYPE OF ENAMEL DEFECTS						
		FLUOROSIS	**MOLAR INCISOR HYPOPLASIA**	**TOTAL**	**CHI SQUARE VALUE**	**P VALUE**
GENDER	FEMALE	11	1	12	0.265	0.607
	MALE	23	1	24		
TOTAL		34	2	36		



Graph 8: represents association of gender and type of enamel defects in which purple denotes fluorosis and yellow denotes molar incisor hypoplasia. X axis represents the age groups and Y axis represents the type of enamel defects. Thus it is shown that prevalence was more in the male population with fluorosis having a higher prevalence (63.89 %) when compared to the other defects and this difference was not statistically significant. Pearson Chi Square Value- 0.265, p value- 0.607