

Prevalence Of Enamel Hypoplasia In Children Between 3 To 14 Years Of Age In Ahmedabad And Gandhinagar District.

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Abstract:

Background:

The development of enamel defects is a disorder in the enamel formation process and can manifest as enamel hypoplasia or enamel hypocalcification. Amelogenesis imperfecta is a problem in the formation of tooth enamel. Clinically, this is called cavities, pits, or smooth surface enamel defect. Aim: The aim of the cross-sectional study was to investigate the prevalence of enamel hypoplasia in the 3 -14 years of age group and comparison between urban and rural population, local population and migrated population in Ahmedabad and Gandhinagar district.

Materials and Methods: A Total of 2000 children of the age group of 3 -14 years both male and female. They were divided into 2 groups and an oral examination was done to assess the prevalence of the enamel hypoplasia. The modified DDE index that had been reported by Clarkson and O'mullane was used to assess the defect of enamel.

Results: The highest prevalence was found at the age of 10 and 6 years, lowest prevalence was found at age 4. Females showed higher rate of prevalence compared to males.

Conclusion: Based on the study the result showed that 70% of children felt difference in their teeth, 29% of children were not confident about their teeth, 16% of children have sensitivity problem, 87% of children did not avoid food intake, 43% did avoid smiling, 52% of children did not feel left out and 59% of children were not satisfied with color of their teeth. Although the psychological impact of enamel hypoplasia was found to be generally low.

Key Word: Enamel hypoplasia, Prevalence, Enamel defects, Ahmedabad, Gandhinagar

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I. Introduction

The main composition of the teeth tissue is enamel, dentin and cementum. Enamel is unique because it is epithelium-derived calcified tissue. Enamel in the human body is the hardest and highly mineralized substance. It consists of over 98% minerals and less than 2% of water and organic matrix. It is produced by specialized end-differentiated ameloblasts; the enamel-laying cells of the dental organ. Enamel is sequentially laid down over specialized biochemical and cellular pathways. The complex enamel lay-down processes are controlled by genes and influenced by epigenetic and environmental factors.¹

Abnormalities of the developmental pathways histologically manifest as neonatal lines and accentuated striae of Retzius (Wilson bands). These result in quantitative defects of the tissue production and or decreased quality of mineralization. The dental enamel is an essential inert tissue, suited to its role in mastication. The complex enamel specialization process and the life cycle of ameloblasts, which sequentially lay down enamel, explain its high sensitivity to environmental and physiological disorders. The tooth enamel cannot be remodeled after loss due to caries or environmental insults.²

Developmental enamel defects are disturbances during enamel formation and may be manifested as enamel hypoplasia or enamel hypocalcification. Hypoplasia it's the word from Ancient Greek (hypo- "under" plasia- "formation") it is under development or incomplete development of a tissue or organ. Enamel hypoplasia is a deficiency of enamel formation. Clinically this is noted as grooves, pits or generalized deficiency of smooth surface enamel.³

As enamel hypoplasia can cause increased caries susceptibility, increased enamel wear, tooth sensitivity and poor esthetics, early identification is very important. Henceforth this study has been conducted with the

objective of early identification of enamel hypoplastic lesion in children and to assess its functional, psychological impact on children.⁴

II. Material And Methods

The study sample evaluated 2000 public and private school children aged between 3 to 14 years old were randomly picked from various primary schools in Ahmedabad and Gandhinagar district.

Protocol approval was obtained from the Ethical Committee of Ahmedabad Dental College and Hospital. This is a cross-sectional survey that will be conducted in Ahmedabad and Gandhinagar district of Gujarat state. This survey consists of random samples of 2000 children of the age group of 3-14 years both male and female. Before the commencement of study, the parents were clearly explained the purpose of study and the informed consent of parents, patients were obtained for the subjects participating in the study. The consent form was designed as per the guidelines of the Ethical Committee in English and Gujarati.

Children were divided according to the following groups:

Group A: children residing in urban areas of Ahmedabad and Gandhinagar.

Group B: children residing in rural areas of Ahmedabad and Gandhinagar.

They were further divided in the following sub-groups:

Sub-group A: Local population

Sub-group B: Migrated population.

Children were also divided into three age groups- 3 to 6, 7 to10 and 11 to14 years, The study sample evaluates 2000 public and private school children aged between 3 to 14 years old were randomly picked from various primary schools,Orphanages in the Ahmedabad and Gandhinagar city.

An oral examination was done to assess the presence of the enamel hypoplasia. The defects will be assessed by visual and tactile inspection using directed light without the enamel surface being preliminary dried. The modified DDE index that had been reported by Clarkson and O'Mullane was used to assess the defect of enamel. (Table: I)

Table I: Modified developmental defects of enamel index

Modified development defects of enamel index	
Characteristics of defect	Symbol
Standard of normal	0
Demarcated opacities	1
Diffuse opacities	2
Hypoplasia	3
Other defects	4

The teeth were then examined for the enamel hypoplasia lesions on all the surfaces using the modified development defects of the enamel index. The assessment forms were filled separately for each sample. The parents accompanying the children were given an awareness about enamel hypoplasia and its various effects and the children with enamel hypoplasia has to fill the questionnaire form to assess its functional and psychological impact on children.

III. Result

In this study, 2000 children were screened from Ahmedabad and Gandhinagar district. The prevalence of enamel hypoplasia was checked using modified DDE index. The assessment was done to check the overall prevalence and to compare the prevalence between male and female, urban and rural population, local and migrated population, and compare between different age groups. (Table: II)

Table II: Total sample size

Gender	Sample size
Girls	963
Boys	1037
Total sample size	2000

Table 3 shows the prevalence of enamel hypoplasia. It was observed to be 4.5%, while the children's teeth without enamel hypoplasia was 95.5% of the total sample examined. (Table: III)

Table III: Prevalence of enamel hypoplasia

Hypoplasia (P/A)			
		Frequency	Percent
Valid	Absent	1910	95.5
	Present	90	4.5
	Total	2000	100.0

Table 4 shows the age-wise prevalence of enamel hypoplasia. The highest prevalence was found at the age of 10 (12.8%) and 6 (12.2%). The lowest prevalence was found at age 4. (Table: IV)

Table IV: Age-wise prevalence of enamel hypoplasia

Crosstab					
<i>Legend: P value < 0.05 is significant</i>					
		Hypoplasia			
		Absent	Present	Total	
Age	Count	10	0	10	
	% within Hypoplasia (P/A)	0.5%	0.0%	0.5%	
	Count	58	1	59	
	% within Hypoplasia (P/A)	3.0%	1.1%	2.9%	
	Count	235	9	244	
	% within Hypoplasia (P/A)	12.3%	10.0%	12.2%	
	Count	198	6	204	
	% within Hypoplasia (P/A)	10.4%	6.7%	10.2%	
	Count	210	6	216	
	% within Hypoplasia (P/A)	11.0%	6.7%	10.8%	
	Count	201	10	211	
	% within Hypoplasia (P/A)	10.5%	11.1%	10.5%	
	Count	239	18	257	
	% within Hypoplasia (P/A)	12.5%	20.0%	12.8%	
	Count	193	14	207	
	% within Hypoplasia (P/A)	10.1%	15.6%	10.4%	
	Count	189	6	195	
	% within Hypoplasia (P/A)	9.9%	6.7%	9.8%	
	Count	185	13	198	
	% within Hypoplasia (P/A)	9.7%	14.4%	9.9%	
Count	192	7	199		
% within Hypoplasia (P/A)	10.1%	7.8%	10.0%		
Total	Count	1910	90	2000	P value
	% within Hypoplasia (P/A)	100.0%	100.0%	100.0%	0.166

Table 5 shows the prevalence of enamel hypoplasia among male and female. It was 51 (56.7%) in female which was higher than that found in male 39 (43.3%). A comparative evaluation between male and female through Chi-square test shows no statistical significance. (Table: V)

Table V: Gender-wise prevalence of enamel hypoplasia

Crosstab						
<i>Legend: p-value < 0.05 is significant</i>						
		Hypoplasia (P/A)				
		Absent	Present	Total		
Sex	Female	Count	912	51	963	
		% within Hypoplasia (P/A)	47.7%	56.7%	48.2%	
	Male	Count	998	39	1037	
		% within Hypoplasia (P/A)	52.3%	43.3%	51.8%	
Total		Count	1910	90	2000	p-

					value
	% within Hypoplasia (P/A)	100.0%	100.0%	100.0%	0.098

Table 6 shows 44.4% prevalence in both 7 to 10 and 11 to 14 years of age groups. And 11.1% prevalence was found in 3 to 6 years of age group. A comparative evaluation between 3-6, 7-10, 11-14 years of age group through Chi square test shows no statistically significant difference as P value is 0.425. (Table: VI)

Table VI: Prevalence of enamel hypoplasia in three different age groups

Crosstab					
<i>Legend: p-value < 0.05 is significant</i>					
			Hypoplasia (P/A)		Total
			Absent	Present	
Age	3 – 6 years	Count	303	10	313
		% within Hypoplasia (P/A)	15.9%	11.1%	15.6%
	7 – 10 years	Count	848	40	888
		% within Hypoplasia (P/A)	44.4%	44.4%	44.4%
	11 -14 years	Count	759	40	799
		% within Hypoplasia (P/A)	39.7%	44.4%	40.0%
Total		Count	1910	90	2000
		% within Hypoplasia (P/A)	100.0%	100.0%	100.0%
					p-value
					0.425

Table 7 shows 86% prevalence in local population and 13.3% prevalence in migrated population. A comparative evaluation between local and migrated population through Chi square test shows no statistically significant difference as P value is 0.480. (Table: VII)

Table VII: Occurrence of hypoplastic lesion in Local and Migrated population

Crosstab					
<i>Legend: p-value < 0.05 is significant</i>					
			Hypoplasia (P/A)		Total
			Absent	Present	
Local or migrated	Local	Count	1602	78	1680
		% within Hypoplasia (P/A)	83.9%	86.7%	84.0%
	Migrated	Count	308	12	320
		% within Hypoplasia (P/A)	16.1%	13.3%	16.0%
Total		Count	1910	90	2000
		% within Hypoplasia (P/A)	100.0%	100.0%	100.0%
					p-value
					0.480

Table 8 shows the prevalence of urban and rural area. 61.1% prevalence was found in urban population and 38.9% prevalence was found in rural population. A comparative evaluation between urban and rural population through Chi square test shows no statistically significant difference as P value is 0.998. (Table: VIII)

Table VIII: Occurrence of hypoplastic lesion in Urban and Rural population

Crosstab					
<i>Legend: p-value < 0.05 is significant</i>					
			Hypoplasia (P/A)		Total
			Absent	Present	
Rural or Urban	Rural	Count	743	35	778
		% within Hypoplasia (P/A)	38.9%	38.9%	38.9%
	Urban	Count	1167	55	1222
		% within Hypoplasia (P/A)	61.1%	61.1%	61.1%
Total		Count	1910	90	2000
		% within Hypoplasia (P/A)	100.0%	100.0%	100.0%
					p-value
					0.480

A questionnaire survey was filled to check the aesthetic perception and psychological impact of enamel hypoplasia on children. All 90 positive children were asked to fill the questionnaire. It was designed to elicit information on the perception of subjects concerning their overall health, general appearance of their teeth, confidence about their teeth, sensitivity problem, and avoidance of smile or any food, and treatment needs. All 90 children were asked whether they found anything different in their teeth. Out of which 63 (70%) children gave positive response and 27 (30%) children gave negative response.

Second question was about how confident they are about their teeth. Among them 55 (61.1%) gave average response, 26 (28.9%) gave poor response and 9 (10%) gave excellent response. Third question was asked whether they have sensitivity problem. Among them 76 (84.4%) did not have sensitivity problem and 14 (15.6%) had that problem. Fourth question was that whether they avoid any food intake due to their teeth. Among them 78 (86.7%) did not avoid any food intake and 12 (13.3%) avoided food. Fifth question was asked whether they avoid smiling due to their teeth. Among them 51 (56.7%) responded that they do not and 39 (43.3%) responded that they do avoid smiling. Sixth question was that whether they feel left out due to their teeth. Among them 47 (52.2%) children felt they do not and 43 (47.8%) children felt left out and when asking about the most important treatment need, 53 (58.9%) children want to improve the color of their teeth, 25 (27.4%) wants to improve the shape of the teeth, 8 (8.9%) wants the treatment of sensitivity problem and 4 (4.4%) wants to improve their size of teeth.

IV. Discussion

The principal expressions of pathologic amelogenesis are hypoplasia, hypocalcification or hypomineralization. Enamel hypoplasia occurs if matrix formation is affected and may manifest as pitting, grooving or even total absence of enamel. Thus, disturbance either in matrix formation or in calcification can occur depending chiefly on the stage of tooth formation at the time of injury.⁵

The present study was carried out to determine the prevalence of enamel hypoplasia in 3 – 14 years of age group and comparison between urban and rural population, local population and migrated population in Ahmedabad and Gandhinagar district. The objective was to evaluate the prevalence of enamel hypoplasia in the age group of 3-6 years, 7-10 years and 11-14 years. And to compare the prevalence of enamel hypoplasia in both male and female, local and migrated population and urban and rural population. A pilot study consisting of 100 patients was carried out. After obtaining the results and discussing it with the statistician, a total of 2000 patients were selected for the present study.⁶ Children of age group of 3-14 years from Day care/Anganwadi/schools were selected for present study and the area of study was Ahmedabad and Gandhinagar district was selected. Children with no consent and not willing to participate in the study were excluded and enamel defect due to caries were also excluded from the study.

Oral examination was done to assess the presence of the enamel hypoplasia. The defects will be assessed by visual and tactile inspection using directed light without the enamel surface being preliminary dried. The modified DDE index that had been reported by Clarkson and O'Mullane was used to assess defect of enamel.⁷ The modified DDE index is a descriptive index. It is more practical and comparable index for epidemiological studies and it allows efficient recording of prevalence of enamel defects. A study was conducted by Osman KM, El-Masry E, El-Malt M (2016)⁸ to determine the prevalence of enamel hypoplasia and enamel hypocalcification in Egyptian children they also use modified DDE index. The enamel hypoplasia was recorded when there was lack of continuity of the surface enamel. Brown, yellow, or opaque white discoloration with an intact surface was also recorded as enamel hypoplasia. Only obvious, not borderline cases were recorded. The assessment form for each sample filled separately.⁹

In the present study, the overall prevalence of enamel hypoplasia was founded to be 4.5% of the 2000 children studied. Which was consistent with a finding of Osman KM, El-Masry E, El-Malt M (2016)⁸ that was 3%. Also, a study by Azhar H, Jamal KM, Anas H (2017)³ found the 6.2% prevalence. Another study by Murray JJ, Shaw L (1979)¹⁰ found the 4% prevalence of Enamel hypoplasia in Great Britain. A lowest prevalence was found in a study conducted by Yonezu T, Hayashi Y, Sasaki J, Machida YJ (1997)¹¹ in Japan and that was 2%. Meanwhile, the studies who reported higher prevalence was 15% conducted by Rugg-Gunn AJ, Al-Mohammadi SM, Butler TJ (1998)¹² in Saudi Arabia. And 21% prevalence was found in California, a study done by Nation WA, Matsson L, Peterson JE.¹³ Cultural and behavioral diversity may describe this difference between the countries and even in the same country.

V. Conclusion

Enamel formation happens in three steps: matrix formations, in which proteins included in amelogenesis are produced; calcification, through this stage mineral content is gained and the proteins are eliminated; maturation, the enamel is calcified any proteins remaining are eliminated. enamel hypoplasia has been identified such as pit type, plane type, and linear enamel type. Yellow-brown defects are deeper, extending from the dento-enamel junction to the enamel surface, whereas white-creamy defects are usually less porous and vary in depth

and are typically limited to the inner enamel. Enamel hypoplasia is valuable clinically because it could cause increase caries susceptibility, tooth sensitivity, teeth wear, and needy aesthetic. The result showed that 70% of children felt difference in their teeth, 29% of children were not confident about their teeth, 16% of children have sensitivity problem, 87% of children did not avoid food intake, 43% did avoid smiling, 52% of children did not feel left out and 59% of children were not satisfied with color of their teeth. Although the psychological impact of enamel hypoplasia was found to be generally low. More studies should be undertaken to look at the general population's cosmetic or aesthetic perceptions relating to enamel hypoplasia.

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