DOI: 10.7860/JCDR/2014/8725.4639

Original Article

Dentistry Section

Prevalence and Distribution of Developmental Defects of Enamel in the Primary Dentition of IVF Children of West Bengal

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ABSTRACT

Introduction: Developmental defects of the enamel (D.D.E.) are changes in the deciduous dentition may lead to aesthetic problems, dental sensitivity and may be predictors of dental caries. The aim of this study was to estimate the prevalence and distribution of D.D.E. in the deciduous dentition of IVF children of West Bengal.

Materials and Methods: A cross-sectional study was carried out with a sample of 153 IVF children aged three to five enrolled in institute of reproductive medicine Kolkata, West Bengal, India. One hundred fifty three spontaneously conceived matched controlled children also examined as control group. All of the teeth were examined and the enamel defects were assessed according to the Modified D.D.E Index. The differences were tested for statistical significance by using the Chi-Square test & z-test.

Results: The prevalence of D.D.E. was 7.18% in IVF Children and 8.49% in spontaneously conceived children. Diffuse opacities was the common defect found (2.61%) in both group. The most affected teeth were the deciduous maxillary central incisors (12.82% and 13.63% found in IVF and spontaneously conceived group respectively). Defects were observed more frequently in the maxillary arch than in mandibular arch in both groups.

Conclusion: There is no significant difference found in IVF & spontaneously conceived children group.

Keywords: Enamel defect, Dental enamel hypoplasia, Dentition, Developmental defect, IVF children, Prevalence, Primary

INTRODUCTION

The first test tube baby in the world, Louise Brown [1], was born on 25th July 1978 after Invitro-fertilization and Embryo transfer technique (IVF-ET) by R. G. Edwards and P. Steptoe in Oldham, (1978) [1] England. A few days after the delivery of the first test tube baby in U. K., an Indian team from Kolkata led by (Late) Dr. Subhas Mukherjee [2], an excellent cryobiologist and (Late) Dr. Saroj Bhattacharya [2], a well known gynaecologist – announced the birth of 'Durga' [2], following a test tube baby procedure, on 3rd October 1978. Developmental defects in the enamel present important clinical significance since they are responsible for aesthetic problems, dental sensitivity, dentofacial anomalies, as well as for a predisposition to dental caries [3]. In the field of public health, developmental defects in the enamel have taken on a high level of importance for being predictors of dental caries. Populations affected by these changes require as a priority preventive intervention and early treatment. There are very few epidemiological studies done on the prevalence of developmental defects in the enamel of deciduous dentition. The prevalence rates of developmental defects in the enamel showed great variability [4,5]. A literature review carried out on the Medline database, covering the period from 1966 to 2013 and using a combination of the following Mesh terms: enamel, defect, developmental, primary and prevalence has failed to show any population-based studies of developmental defects in the enamel of deciduous dentition carried out in IVF children of West Bengal, India. The objective of this study was to estimate the prevalence of developmental defects in the enamel of deciduous teeth, in IVF children aged three to five enrolled in IRM West Bengal and compare the data with that of Spontaneously Conceived Children. This study was the continuation of the previous study [6] on IVF children of West Bengal done by us.

MATERIALS AND METHODS

This was a descriptive, analytic, cross sectional study approved by the Guru Nanak Institute of Dental Science & Research Ethical Committee. The process of random sampling was used for children sample selection. All the samples were examined in Guru Nanak Institute of Dental Science and Research. Enamel defect status of 153 IVF children of three to five years old was evaluated. The studied group consisted of term (gestational age = 37 to 42 weeks), singleton babies whom were outcomes of IVF in Institute of Reproductive Medicine, West Bengal and 153 spontaneously conceived matched controlled children also examined as control group. The cross sectional studies done at one point of time from June 2009 to June 2011. Case and control groups matched for year of birth, area of residence, parity, gestational age, maternal weight, maternal age and socio-economic status. Neonatal medical records of case and control groups were reviewed and variables such sex, gestational age, birth weight and length, route of delivery, maternal age and parity were recorded. Multiple pregnancies, severe asphyxia, children with major congenital malformations, chromosomal abnormalities genetic syndromes and the children with heavily caries teeth were excluded from the sample. To obviate error due to inter observer variations all measurements were made by a trained single examiner. After informed consents were collected from parents all children were examined for dental attrition using a sterile mouth mirror and probe under adequate illumination. Prior to starting the procedure, the armamentarium was sterilized with the help of autoclaving unit. To diagnose and classify changes in the enamel of the deciduous teeth studied samples modified Developmental Defects of Enamel Index (Modified DDE Index) [4] was used. During the study three surfaces were examined: occlusal/incisal, lingual/palatal and buccal, of all deciduous teeth. Clinical aspects were evaluated in the following manner. Code 0: Normal, Code 1: Demarcated

opacities: Opacity is defined as the qualitative defect of the enamel identified visually as an abnormality in the translucency of the enamel. It is characterized by a white or discoloured (cream or yellow) area but in all cases enamel surface is smooth and the thickness of enamel is normal, except in some instances when associated with hypoplasia. Patchy, irregular, cloudy areas of opacity lacking well defined margins. Code 2: Diffuse opacities: distinct opacity with well defined margins, Code 3: Hypoplasia of the enamel: Hypoplasia is defined as quantitative defect of enamel visually and morphologically identified as involving the surface of enamel (an external defect) and associated with reduced thickness of enamel. The defective enamel may occur as (a) shallow or deep pits arranged horizontally in a linear fashion across the tooth surface or generally distributed over the whole or part of the enamel surface; (b) the defective enamel may occur as small or large, wide or narrow grooves; (c) in some instances there may be partial or complete absence of enamel over small or considerable areas of dentine. Code 4: Other defects: If any defect does not fall into these categories, they were scored as others. Inclusion criteria of the study was i) any enamel defect present in the erupted deciduous tooth was included in the study ii) when any portion of the deciduous crown had erupted through the mucosa tooth was included in the study iii) a single surface involvement with a single abnormality less than 1mm in diameter was classified as normal iv) in the case of any doubt regarding the presence of any defect, the dental surface was classified as normal. Exclusion criteria of the study was i) tooth with dental caries ii) tooth with extensive restoration iii) enamel surface with marked fracture iv) extracted deciduous tooth v) exfoliated deciduous tooth.

Clinical examinations were done under natural light, by single examiner. Before clinical examination oral prophylaxis was done in every case and cleaned surfaces were dried with sterile gauze piece. Flat mouth mirrors and periodontal probes were used for examination. Enamel defects were assessed according to WHO criteria. Re-examination of the studied samples was done in 2nd visit to minimize procedural error. Obtained data was statistically analysed using chi-square test and z-test.

RESULTS

Total 153 IVF children and 153 spontaneously conceived children were studied. Among 153 IVF children 81(52.94%) were male & 72(47.05%) were female. Among spontaneously conceived children 85(55.55%) were male & 68 (44.44%) were female.

When number and percentage distribution of children with and without enamel defects in deciduous dentition of IVF children and spontaneously conceived children was observed the proportion of DDE in IVF children group was 0.072. The proportion of DDE in spontaneously conceived children group was 0.085. The Z-Score was -0.4253. The p-value was 0.6672. The result was not significant at p <0.05 [Table/Fig-1 and 2].

When comparing percentage of unaffected population, the Z-Score was 0.3845. The p-value was 0.70394. The result was not significant at p <0.05. The proportion of unaffected IVF children was 0.908. The proportion unaffected spontaneously conceived children group was 0.895 [Table/Fig-3 and 4].

In case of demarcated opacities the Z-Score was -0.3824. The p-value was 0.70394. The result is not significant at p <0.05. The proportion of IVF children was 0.02. The proportion spontaneously conceived children group was 0.026 [Table/Fig-3 and 4].

In case of diffuse opacities the Z-Score was 0. The p-value was 1. The result is not significant at p <0.05. The proportion of IVF children was 0.026. The proportion of spontaneously conceived children group was 0.026 [Table/Fig-3 and 4].

In case of hypoplasia the Z-Score was -0.3383. The p-value was 0.72786. The result is not significant at p <0.05. The proportion of IVF children was 0.026. The proportion of spontaneously conceived children group was 0.033. [Table/Fig-3 and 4]. Arch and tooth wise distribution of types of developmental defects of enamel according to tooth type in deciduous dentition of IVF and Spontaneously Conceived Children were depicted in [Table/Fig–5-8].

DISCUSSION

Pregnancy through IVF clearly differs from natural conception. The artificial conception may have its influence on development. Oocyte retrieval may cause mechanical damage to the oocyte. Several review studies done by JJackson RA et al., [7], Helmerhorst FM et al., [8], Olivennes F et al., [9], Ludwig AK, Sutcliffe AG et al., [10] had shown that (singleton) IVF pregnancies have a worse perinatal outcome than naturally conceived singleton pregnancies. IVF children are at increased risk of low birth weight and perinatal death and preterm birth. More over developing foetus may be susceptible to environmentally induced changes. In the present study prevalence of the developmental defects of enamel among IVF children of West Bengal was evaluated.

Ameloblasts are very delicate in nature. They are quite sensitive to various systemic and genetic disturbances. When ameloblasts are damaged they are unable to recover. So the tooth enamel provides information on the systemic insults which are received during the developmental phase. In the present study, the percent prevalence of the developmental defects of enamel among the IVF children was 7.18% and 8.49% in spontaneously conceived children. Yonezu T et al., [11] expressed that the populations with the lowest enamel hypoplasia was from Japan (2%). In Mexico Goodman AH et al., [12] reported enamel hypoplasia was 6%. A higher prevalence of enamel hypoplasia has been reported among malnourished children [3,13]. Olivennes F. et al., [9] studied developmental outcome of IVF children. From the study authors came to conclusion that a high rate of adverse outcome may occur in a large group of IVF pregnancies. They also found prematurity, low birth weight and perinatal mortality were higher than in the general population. The majority of these complications were related to multiple births, but they were also found in singleton pregnancies. But when D.D.E was examined in both IVF & spontaneously conceived group we found no statistically significant difference in both groups. The result may imply that IVF children are as similar as spontaneously

Variable				Without DDE				With DDE			
Gender				No.		(%)		No.		(%)	
		Sex wise distribution									
Age	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
3	51	26	25	24	24	47.05	47.05	2	1	3.92	1.96
4	51	27	24	24	23	47.05	45.09	3	1	5.88	1.96
5	51	28	23	26	21	50.98	41.17	2	2	3.92	3.92
Total	153	81	72	74	68	48.36	44.44	7	4	4.57	2.61
%						92.66				7.18	

[Table/Fig-1]: Number and percentage distribution of children with and without enamel defects in deciduous dentition of IVF children

Variable				Without DDE				With DDE			
Gender				No.		(%)		No.		(%)	
		Sex wise distribution									
Age	Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
3	51	27	24	25	23	49.01	45.09	2	1	3.92	1.96
4	51	31	20	28	18	54.90	35.29	3	2	5.88	3.92
5	51	27	24	24	22	47.05	43.13	3	2	5.88	3.92
Total	153	85	68	77	63	50.32	41.17	8	5	5.22	3.26
%						89.54				8.49	

[Table/Fig-2]: Number and percentage distribution of children with and without enamel defects in deciduous dentition of spontaneously conceived children

Enamel Defects	No. affected Child	
	No.	%
Normal	139	92.66
Affected Population	11	7.18
Demarcated Opacities	3	1.96
Diffuse Opacities	4	2.61
Hypoplasia	4	2.61
Other defects	0	-

[Table/Fig-3]: Enamel defects distribution of IVF children in deciduous dentition

Enamel Defects	No. affected Child	
	No.	%
Normal	137	89.54
Affected Population	13	8.49
Demarcated Opacities	4	2.61
Diffuse opacities	4	2.61
Hypoplasia	5	3.26
Other defects	0	-

[Table/Fig-4]: Enamel defects distribution of spontaneously conceived children in deciduous dentition

Tooth	55		54		53		52		51		61		62		63		64		65	
Type of Defect	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Demarcated opacities	0	-	1	7.69	1	7.69	1	7.69	2	15.38	2	15.38	1	7.69	1	7.69	0	-	0	-
Diffuse opacities	1	5.88	1	5.88	1	5.88	2	11.76	2	11.76	2	11.76	2	11.76	1	5.88	0	-	0	-
Hypoplasia	1	11.11	0	-	0	-	1	11.11	1	11.11	1	11.11	1	11.11	0	-	0	-	0	-
Others	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	2	5.12	2	5.12	2	5.12	4	10.25	5	12.82	5	12.82	4	10.25	2	5.12	0	-	0	-

[Table/Fig-5]: Distribution of types of developmental defects of enamel according to tooth type in deciduous dentition of IVF children

Tooth	55		54		53		52		51		61		62		63		64		65	
Type of Defect	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Demarcated opacities	0	-	0	-	1	7.14	2	14.28	2	14.28	2	14.28	1	7.14	0	-	0	-	0	-
Diffuse opacities	0	-	0	-	1	6.25	2	12.50	2	12.50	2	12.50	1	6.25	0	-	0	-	0	-
Hypoplasia	0	-	1	7.14	1	7.14	2	14.28	2	14.28	2	14.28	1	7.14	2	14.28	0	-	0	-
Others	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	0	-	1	2.27	3	6.81	6	13.63	6	13.63	6	13.63	3	6.81	2	4.54	0	-	0	-

[Table/Fig-6]: Distribution of types of developmental defects of enamel according to tooth type in deciduous dentition of spontaneously conceived children

Tooth	85		84		83		82		81		71		72		73		74		75	
Type of Defect	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Demarcated opacities	0	-	0	-	0	-	1	7.69	1	7.69	1	7.69	1	7.69	0	-	0	-	0	-
Diffuse opacities	0	-	0	-	0	-	1	5.88	1	5.88	2	11.76	1	5.88	0	-	0	-	0	-
Hypoplasia	0	-	1	11.11	1	11.11	1	11.11	0	-	1	11.11	0	-	0	-	0	-	0	-
Others	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	0	-	1	2.36	1	2.56	3	7.69	2	5.12	4	10.25	2	5.120	0	-	0	-	0	-

[Table/Fig-7]: Distribution of types of developmental defects of enamel according to tooth type in deciduous dentition of IVF children

Tooth	85		84		83		82		81		71		72		73		74		75	
Type of Defect	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Demarcated opacities	0	-	1	7.14	0	-	1	7.14	1	7.14	1	7.14	1	7.14	1	7.14	0	-	0	-
Diffuse opacities	0	-	0	-	1	6.25	2	12.50	2	12.50	2	12.50	1	6.25	0	-	0	-	0	-
Hypoplasia	0	-	0	-	0	-	0	-	1	7.14	1	7.14	1	7.14	0	-	0	-	0	-
Others	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	0	-	1	2.27	1	2.27	3	6.81	4	9.09	4	9.09	3	6.81	1	2.27	0	-	0	-

[Table/Fig-8]: Distribution of types of developmental defects of enamel according to tooth type in deciduous dentition of spontaneously conceived children

conceived children when DDE is concerned. Seow WK [14] observed that the rapid development of caries in the teeth which were affected by the enamel defects made the diagnosis of a pre-existing defect more difficult. Warnakulasuriya KAAS [15] and Li Y et a., [16], found the prevalence of the localized hypoplasia was higher than that of the opacities i.e. 11.9% and 7.3% and 22.2% and 1.6% in the respective studies. Our study partially supports this finding. In our study it was higher in spontaneously conceived children (3.26%) than IVF children (2.61%) in case of IVF children percentage of hypoplasia diffuse opacities remain same (2.61%). Demarcated opacities were found lowest (1.96%).

The higher prevalence of hypoplastic teeth may be due to artificial conception procedure. Till date no reviews on DDE of IVF children are available in national and international journal. So no comparison was possible with the previous study.

In our study, the developmental defects in the enamel in IVF Children were found to be highest in the maxillary central incisors, (12.82%) followed by maxillary lateral incisors (10.25%) and left mandibular incisor (10.25%) followed by right mandibular incisor (7.69%). The developmental defects in the enamel of spontaneously conceived children.

D.D.E in spontaneously conceived children were found to be highest in the maxillary central incisors, (13.63%) followed by right maxillary lateral incisors (13.63%) followed by mandibular central incisors (9.09%). A higher incidence of the enamel defects in the upper incisors than in the lower incisor in both groups was observed in our study. Li Y et al., [16], Rugg-Gunn AJ et al., [17] found relatively similar result. The deviation in the results may be due to the diversity of the methodological procedures and racial differences.

CONCLUSION

The present study is a cross-sectional study on IVF children. It provides an insight into patterns of D.D.E in three to five years aged IVF children. Hopefully this kind of study will bring assurance to numerous parents of IVF children. This information can initiate & inspire further studies in this unexplored field.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jan 30, 2014**
Date of Peer Review: **Apr 15, 2014**
Date of Acceptance: **May 12, 2014**
Date of Publishing: **Jul 20, 2014**