

A comparison of clinical and photographic scoring using the TF and modified DDE indices for recording enamel opacities

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Abstract:

Objective: To compare the results of clinical and photographic scoring of enamel opacities using the TF and modified DDE indices.

Methods: A total of 204 school children between 8-11 years were examined using cluster sampling methodology. The clinical examinations for children were conducted twice. First, enamel opacities on the two maxillary central incisors were recorded using Thylstrup and Fejerskov Index (Fejerskov et al., 1988) and two weeks later it was scored according to Modified Developmental Defects of Enamel Index (Clarkson and O'Mullane.,1989). Following the clinical examinations, an intra-oral colour photograph was taken of the upper central incisors of each subject and was scored on two occasions, first using TF Index and secondly Modified DDE Index. The obtained data was subjected to statistical analysis.

Results: Agreement between clinical and photographic scoring was good for both TF and modified DDE indices, Kendall's rank correlation coefficient being 0.93 and 0.88 respectively. There was fair and moderate agreement between the distributions of scores for the two indices as indicated by

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Kendall's rank correlation coefficient being 0.58 for clinical scores and 0.63 for photographic scores respectively.

Conclusion: The fact that fair/moderate correlations were found between the two scoring systems, using both clinical and photographic recording gives reassurance that either will yield broadly comparable results where fluoride-induced opacities will form a significant proportion of all enamel defects found.

Key-words: Clinical scoring, Photographic scoring, Indices, Enamel opacities.

Introduction:

The enamel opacities are qualitative defect in enamel, abnormality in translucency of enamel and is caused by enamel hypomineralisation.¹ The main difference of opinion, among clinical examiners is in distinguishing between defects caused by excessive intake of fluoride and those caused by other factors.²

The Fluorosis Index of Thylstrup and Fejerskov for dental fluorosis are based upon comparison of the visual appearance of tooth enamel with histological defects. The Index of Developmental Defects of Enamel by Ainamo and Cuttress, 1982 is also used for measuring enamel opacities.²

The occurrence of fluoride in ground water has attracted attention globally, since it has considerable impact on human health. The major health problems caused by fluoride can be dental fluorosis, skeletal fluorosis and deformation of bones.³

Vaniyambadi, a western part of Vellore district is a fluoride endemic area.⁴ A study was done in Vaniyambadi to test the hypothesis that, there exists a moderate to good agreement between clinical and photographic scoring of enamel opacities using TF and modified DDE indices.

Materials and Methods:

The study population consisted of 8-11 years old students studying in the primary schools of Vaniyambadi, Vellore district which is a fluoride endemic area. The subjects were

permanent residents of that area with maxillary central incisors fully erupted, not restored or fractured.

The Ethical clearance was obtained from the Institutional Review Board of Meenakshi Academy of Higher Education and Research. Following the pilot study, using the 'n' master software version 1.0© with the power of the study being set at 80%, alpha error at 5%, the sample size of 202 children was decided for this study.

Following a cluster sampling methodology, a school was selected randomly and all children (8-11 years) were examined which reached a sample size of 204. Informed consent was obtained from the school authorities and parents. Before examination, the teeth were wiped with gauze to remove superficial debris and allowed to dry for 30 seconds. First, enamel opacities on the two maxillary central incisors were recorded using TF index (Table 1). Two weeks later the same examination procedure was followed but on this occasion enamel opacities were scored according to modified DDE index (Table 2). Following the clinical examinations, an intra-oral colour slide photograph was taken of the upper central incisors of each subject.

The agreement between clinical and photographic scoring was statistically analyzed using Kendall's Rank Correlation Coefficient with the help of SPSS version 17 software.

Results:

1) Photographic assessment scored was higher than clinical examination on 5 occasions and lower on 17 occasions on using TF index, an overall disagreement rate of 10.78% was found (table 3). There was a good agreement for clinical and photographic scoring of enamel opacities using TF index (Kendall's Rank Correlation Coefficient being 0.93).

2) Photographic assessment for upper right central incisors, scored was higher than clinical examination on 3 occasions and lower on 15 occasions on using Modified DDE index, an overall disagreement rate of 8.82% was found (table 4). There was a good

Table 1: TF INDEX (Fejerskov et al-1988)

0	Normal enamel translucency remains after wiping and drying.
1	Thin, white opaque lines run across the tooth. Slight snow capping of cusps or incisal edges may be seen.
2	More pronounced white lines merge to form cloudy areas. Snow capping common.
3	White lines merge and there are cloudy areas over many parts of the surface.
4	Entire surface opaque or chalky white.
5	Entire surface opaque with pits less than 2mm across.
6	Pits merge to form bands 2 mm high.
7	Loss of outer enamel over less than half the surface.
8	Loss of outer enamel over more than half the surface.
9	Enamel loss is so severe that tooth surface is altered.

Table 2: MODIFIED DDE INDEX (Clarkson and O'Mullane (1989))

0	Normal
1	Demarcated opacities
2	Diffused opacities
3	Hypoplasia
4	Other defects
5	Demarcated and Diffused opacities combined
6	Demarcated opacities plus hypoplasia
7	Diffuse opacities plus hypoplasia
8	Demarcated and diffuse opacities plus hypoplasia

Table 3: Comparison of clinical and photographic recording of enamel opacities using TF index

Clinical Scores	Photographic scores								Total
	0	1	2	3	4	5	6	7	
0	22	2	0	0	0	0	0	0	24
1	5	62	2	0	0	0	1	0	70
2	0	6	31	0	0	0	0	0	37
3	0	0	5	4	0	0	0	0	9
4	0	0	0	0	16	0	0	0	16
5	0	0	0	0	1	29	0	0	30
6	0	0	0	0	1	0	14	0	15
7	0	0	0	0	0	0	1	2	3
Total	27	70	38	4	18	29	16	2	204

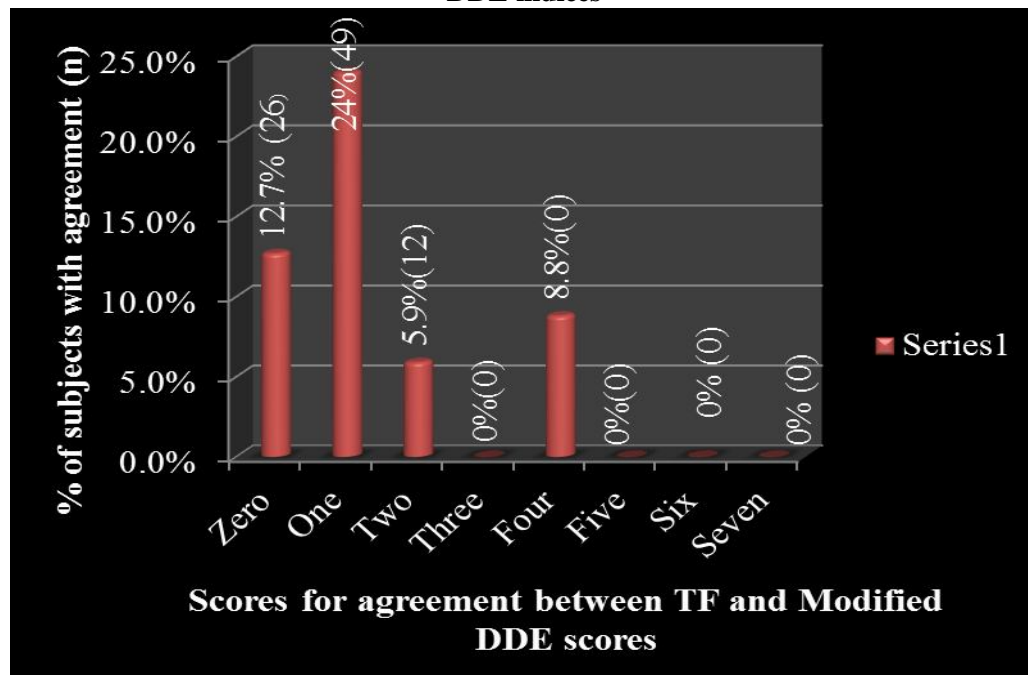
Table 4: Comparison of clinical and photographic recording of enamel opacities using Modified DDE index (for upper right central incisors)

Clinical scores	Photographic scores								Total
	0	1	2	3	4	5	6	7	
0	25	3	0	0	0	0	0	0	28
1	4	52	0	0	0	0	0	0	56
2	1	2	18	0	0	0	0	0	21
3	0	0	1	2	0	0	0	0	3
4	0	0	0	0	61	0	0	0	61
5	0	1	0	0	0	10	0	0	11
6	0	4	0	0	0	0	4	0	8
7	0	0	1	1	0	1	1	11	15
8	0	0	0	0	0	0	1	0	1
Total	30	62	20	3	61	11	6	11	204

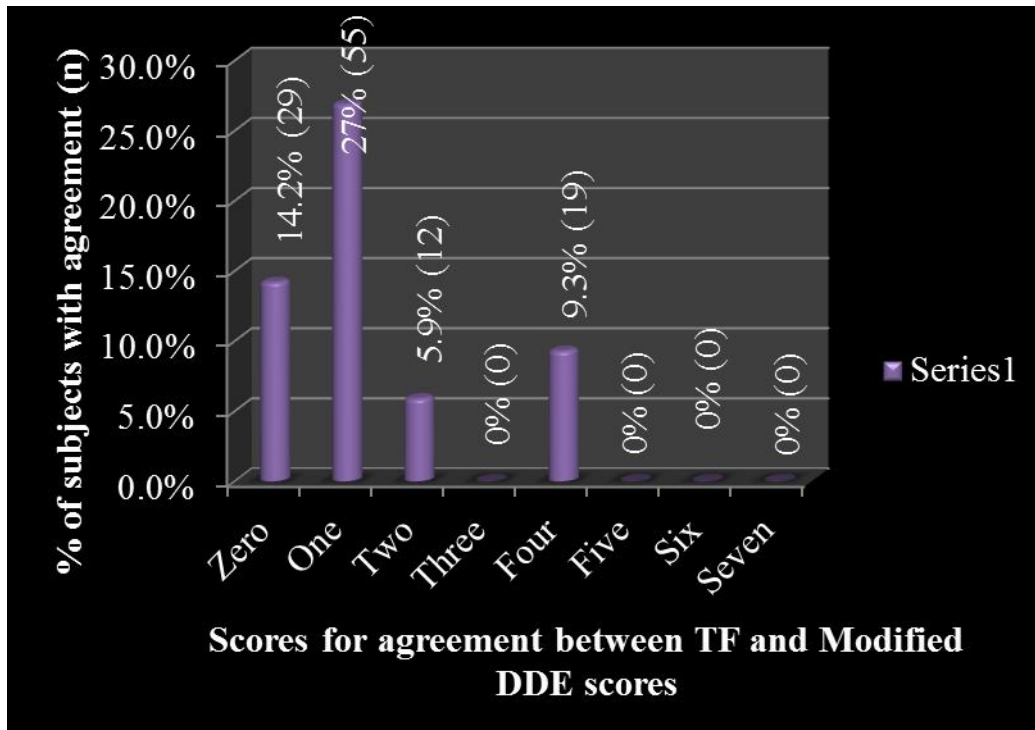
Table 5: Comparison of clinical and photographic recording of enamel opacities using Modified DDE index (for upper left central incisors)

Clinical scores	Photographic scores								Total
	0	1	2	3	4	5	6	7	
0	28	1	0	0	0	0	0	0	29
1	7	47	0	0	0	0	0	0	54
2	0	2	22	0	0	0	0	1	25
3	1	0	0	1	0	0	0	0	2
4	0	0	0	0	55	1	0	0	56
5	0	1	0	0	0	11	0	0	12
6	0	5	0	0	0	0	5	0	10
7	0	0	1	1	0	1	1	11	15
8	0	0	0	0	0	0	1	0	1
Total	36	56	23	2	55	13	7	12	204

Graph 1: Comparison of clinical scores for upper right central incisors according to the TF and Modified DDE indices



Graph 2: Comparison of photographic scores for upper right central incisors according to the TF and Modified DDE indices



agreement for clinical and photographic scoring of enamel opacities on upper right central incisors using Modified DDE index (Kendall's Rank Correlation Coefficient being 0.88).

3) Photographic assessment for upper left central incisors, scored was higher than clinical examination on 3 occasions and lower on 17 occasions on using Modified DDE index, an overall disagreement rate of 8.34% was found (table 5). There was a good agreement for clinical and photographic scoring of enamel opacities on upper left central incisors using Modified DDE index (Kendall's Rank Correlation Coefficient being 0.86).

4) Comparison of clinical scores of enamel opacities for upper right central incisors according to TF and Modified DDE indices indicated fair agreement (Kendall's Rank Correlation Coefficient being 0.58) (graph 1).

5) Comparison of photographic scores of enamel opacities for upper right central incisors according to TF and Modified DDE indices indicated

moderate agreement (Kendall's Rank Correlation Coefficient being 0.63) (graph 2).

Discussion:

The TF index (Fejerskov et al., 1988) was selected as it designed in a comprehensive way the scale of increasing severe fluorosis, it is less cumbersome to use compared to other indices (examined only labial surfaces) and has biological validity.

The modified DDE index (Clarkson and O'Mullane 1989) was selected as it was simple to use, provided effective system for recording enamel defects based on clinical criteria and this index was proposed in WHO- Basic Oral Health Survey Manual 1997 for recording enamel opacities.

The results in this study, showed good agreement for clinical and photographic scoring of enamel opacities using TF index. This was similar to the study results done by A.M.Sabieha *et al.*,² where the agreement between clinical and photographic scoring using TF index was good

(spearman's rank correlation – 0.78). This is also similar to the study conducted by E.D.Tabari *et al.*,⁵ where the clinical and photographic results agreed closely and had high reproducibility for TF index.

Good agreement for clinical and photographic scoring of enamel opacities using modified DDE index was found. This was similar to the study done by A.M.Sabieha *et al.*,² where the agreement between clinical and photographic scoring using Modifying DDE index was good (spearman's rank correlation – 0.69).

Agreement between clinical scoring for both TF and modified DDE was fair being 0.58. In a study done by A.M.Sabieha *et al.*,² the agreement for clinical scoring for both TF and modified DDE was good (spearman's rank correlation – 0.77).

The agreement between photographic scoring for both TF and modified DDE was moderate being 0.63. This was similar to the study results done by A.M.Sabieha *et al.*,² where the photographic scoring was moderate for both TF and modified DDE indices (spearman's rank correlation – 0.69). In a study conducted by R.S.Levine *et al.*,⁶ the results showed that the photographic method was highly reproducible.

According to TF index, 88.2% of the subjects in the present study had evidence of fluorosis on the upper central incisors. In a study conducted by F.Manji *et al.*,⁷ the evidence of dental fluorosis was 100% (according to TF index-1978). In a study conducted by Cleaton-Jones & Hargreaves (1990), 51% (according to TF index-1978) of the study subjects had evidence of fluorosis.⁸ In a study conducted by M.J.Larsen *et al.*,⁹ the study subjects (14-16 years) had 20% evidence of fluorosis (according to TF index-1978). In a study conducted by B.A.Burt *et al.*,¹⁰ 44% (according to TF index-1978) of the study subjects (8-9 years) had evidence of dental fluorosis. In a study conducted by Ana Karoline Adelario *et al.*,¹¹ the fluorosis was evident in 75.5% (according to TF index). According to Modified DDE index, 87.7% of the subjects in the present study had evidence of fluorosis on the upper right central incisors. In a study conducted by J. Clarkson and D.O'Mullane,¹² the percentage of

children affected by fluorosis on examination of one or more index teeth ranged from 30 to 42% for 8-year-olds.

The present study has shown a good agreement between clinical and photographic scoring for both TF and modified DDE indices. Hence, it is possible in future to carry out photographic scoring for recording enamel opacities, where it may not be feasible to do clinical recording. Photographic examination has scope in future, as it provides a less elaborate and less costly way to overcome bias on part of examiner to record the appearance of teeth. Photographic examination can be done at leisure and by arranging them in a random order any possibility of bias can be reduced. As this study has tested only TF and modified DDE indices, it is necessary to carry out further research in future on the most frequently used indices – Dean's fluorosis index and TSIF along with modified DDE indices.

To conclude, there was a fair and moderate agreement between TF and modified DDE indices for clinical and photographic scoring, respectively. This gives reassurance that either will yield broadly comparable results where it may be expected that fluoride-induced opacities will form a significant proportion of all enamel defects found.

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