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Evaluation of the Dental Caries in Primary Molars and First Permanent Molars in 7-8 years old school children using CAST index

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ABSTRACT:

Aim: The aim of this study was to evaluate caries in primary molars and first permanent molars of 7-8 year-old school children by the Caries Assessment Spectrum and Treatment (CAST) Index and to find whether there was any correlation between the caries stages in these teeth.

Materials and method: The study was carried out on 100 children in age group of 7 to 8 years from Government School, Patiala. The prevalence of CAST categories was evaluated with regard to the first and second primary, and first permanent molars. The Spearman's rank correlation coefficient was used to explore the correlation of the distribution of CAST codes among the evaluated teeth.

Results: The overall prevalence of dental caries in this study in primary molars and first permanent molars was found to be 51%, 49% respectively. With regard to the permanent molars, most lesions were scored at the non-cavitation level. Caries in primary molars was most often recorded at the stage of cavitated dentinal lesion. The correlation of the status of first and second primary teeth was stronger for the left than for the right side of the mouth; r was 0.95 and 0.92 in maxilla and 0.89 and 0.86 in mandible ($p < 0.001$), respectively.

Conclusion: With regard to deciduous teeth, dentin cavity and pulpal involvement were more prevalent. For permanent teeth, enamel lesions were most prevalent. The study proved the usefulness of the CAST index in epidemiological studies.

Keywords: Caries pattern, CAST index, Children.

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INTRODUCTION:

The prevalence of dental caries is increasing continuously despite of so many measures were taken to prevent it. Dental caries manifests clinically as initial visual change in enamel to frank cavitations.[1-3] In past, various indices were used to assess dental caries but no one is complete in describing dental caries. The Decayed, Missed and Fill teeth (DMFT) index, recommended by the World Health Organization is the most commonly used tool in the epidemiological surveys for dental caries, but it's not able to detect pre-cavitation stages and later stages (abscess).

The detection of pre-cavitated lesions is important in the populations with a low prevalence of cavities. The application of the International Caries Detection and Assessment System (ICDAS), in which three stages of enamel lesions are distinguished, may be a solution.[4,5] However, this system requires using compressed air to dry tooth surfaces and double checking of teeth. For the populations with a high prevalence and a severe course of caries, tools like Pulpal Involvement-Ulceration-Fistula-Abscess (PUFA) and Pulpal Involvement-Roots- Sepsis (PRS)[6] for the detection of consequences of untreated dental caries index were proposed. Although PUFA and PRS arouse a great interest, but their disadvantage is that they cover only a part of the wide range of caries stages (abscess/fistula) and they only complement the DMFT or ICDAS.[3,7,8]

From the practical point of view, the most advantageous solution is to use a single index

describing the full continuum of a disease. Recently, an innovative instrument for the epidemiological studies named Caries Assessment Spectrum and Treatment (CAST) was introduced by Frencken et al. A novelty of CAST is the recommendation to include teeth with dental fillings in the category of sound teeth, which is in line with the epidemiological concept of health. Most research studies on the caries pattern were based on a dental evaluation according to DMFT. Very few reports on a caries pattern covering the full spectrum of the disease could be found in the literature.[9,10]

The aim of this study was to evaluate caries in primary and permanent molars of 7-8year old school children by the CAST index and to find whether there was any correlation between the caries stages in such teeth.

MATERIALS AND METHOD

Selection of children

For the purpose of this study, 100 children aged between 7 to 8 years were selected from Government School, Patiala. Written consent was obtained from parents or caregivers for child's participation in the study. Only those children who had all four permanent molars fully erupted in oral cavity were included in the study. We excluded children with any of the premolars erupted because in those cases we were not able to determine whether a primary molar was exfoliated or extracted due to caries.

Dental examination

The dental examination was performed and the teeth were evaluated according to the CAST recommendations mentioned in Table 1. The index has a hierarchical structure and covers the full spectrum of caries stages, from a sound surface, pit and fissure sealants, dental fillings, caries lesions in enamel and dentin, a pulpal and periapical inflammation, through to a tooth loss due to caries. During the study, the children's oral cavity was examined under natural light in school. The status of each tooth surface was checked using a plane dental mirror and an explorer. A dental examination was carried out for all selected teeth present in the child's mouth. The status of each tooth was recorded separately on a proforma developed for this study. If two conditions were present on the same surface, e.g. a filling in one pit and an enamel lesion in another, or an enamel lesion in one pit and a cavity in another, the higher score was recorded. If an abscess or a fistula was present, all surfaces with an open cavity were scored with code 7.

Statistical Analysis: Data entry and analysis were performed using Statistical Package of Social Sciences (SPSS) software version 16.0.

Table 1: Codes and Description of CAST index

Codes	Characteristic	Description
0	Sound tooth	No visible evidence of a carious lesion is present.
1	Sealed	Pits and/ or fissures are at least partially sealed with a sealant material.
2	Restored	A cavity has been restored with an (in) direct restorative material.
3	Enamel	Distinct visual change in enamel only. A clear caries discoloration is visible with or without localised enamel breakdown.
4	Dentine	Internal caries related discolouration in dentine. The discoloured dentine is visible through enamel which may or may not exhibit a visible localized breakdown of enamel.
5	Dentine	Distinct cavitation into dentin. The pulp chamber is intact.
6	Pulp	Involvement of pulp chamber. Distinct cavitation reaching the pulp chamber or only root fragments is present.
7	Abscess/Fistula	A pus containing swelling or pus releasing sinus tract related to a tooth with pulpal involvement.
8	Lost	The tooth has been removed because of dental caries.
9	Others	Does not correspond to any of the other categories

RESULTS

Figure 1 shows the percentage of children according to the highest CAST code per mouth, separately for primary and permanent dentition. With regard to deciduous teeth, nineteen percentage of the subjects showed a dentin cavity (code 5) and sixteen percentage showed a pulpal involvement (code 6) as the progressive caries stages. For permanent teeth, enamel lesions (31%) were most prevalent, followed by discolouration in dentin (9.5%). 2.25% of the children scored the categories 7 in permanent teeth. No tooth scored the category 9 either.

Table 3 shows the correlations of CAST codes in evaluated primary and permanent molars. The analysis of distribution of the CAST codes in primary and permanent molars revealed a strong correlation between caries stages in counterpart teeth from the right and left sides of the oral cavity. The correlation of the status of first and second primary molars was stronger for the left than for the right side of the mouth; r was 0.95 and 0.92 in maxilla and 0.89 and 0.86 in mandible ($p < 0.001$), respectively. In the neighbouring teeth correlations, all correlations except 16/55, 26/65 and 36/75 were statistically significant. With regard to the teeth situated in opposite jaws the study revealed that the correlations were strong - r value between 0.63 and 0.96.

Table 2 Distribution of CAST codes in evaluated molar teeth

Tooth	0	1	2	3	4	5	6	7	8	9
16	48	0	2	30	10	6	4	0	0	0
26	46	0	2	30	10	6	4	0	0	0
36	42	0	5	29	11	4	4	5	0	0
46	38	0	7	35	7	5	4	4	0	0
54	24	0	16	5	3	16	19	7	10	0
55	23	0	12	15	10	18	11	5	6	0
64	26	0	10	8	5	17	21	6	7	0
65	31	0	11	9	7	22	12	2	6	0
74	21	0	13	6	9	25	15	3	8	0
75	23	0	10	9	12	20	15	4	7	0
84	20	0	12	7	6	24	18	3	10	0
85	21	0	8	15	8	17	19	5	7	0

Figure 1: shows the percentage of children according to highest CAST category in primary and permanent tooth

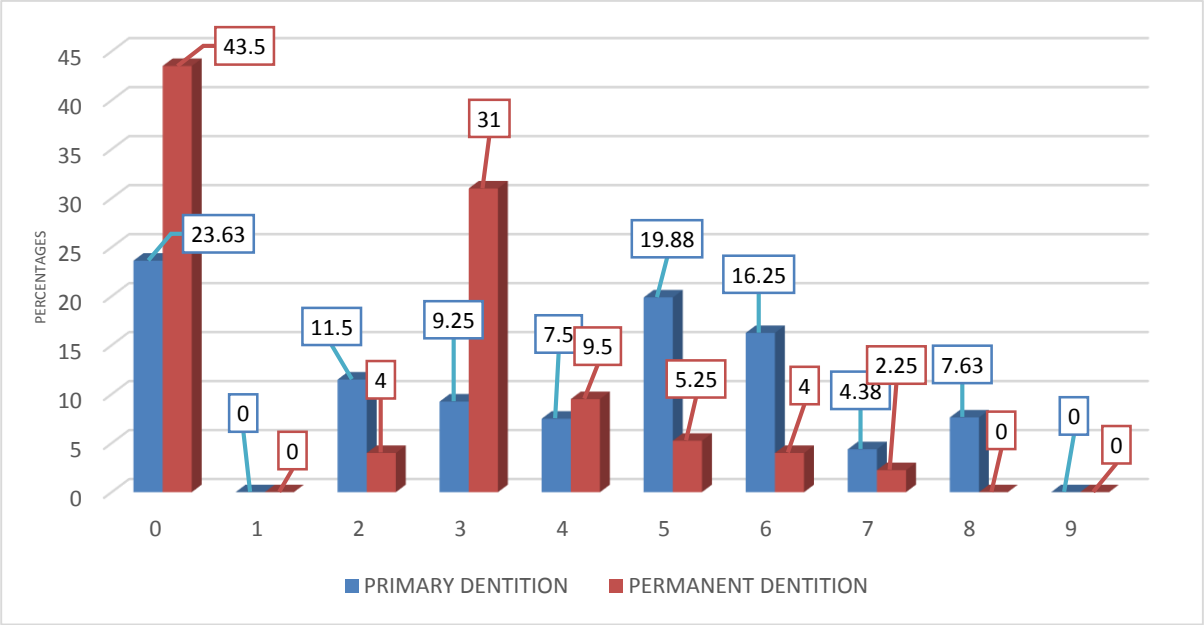

Table 3: The correlations of CAST codes in evaluated molar teeth (Spearman's correlation coefficient)

TOOTH NUMBER	r	P
Left-right correlations		
16/26	0.85	<0.001
46/36	0.90	<0.000
55/65	0.95	<0.000
85/75	0.95	<0.000
54/64	0.90	<0.000
84/74	0.84	<0.001
Neighbouring teeth correlations		
16/55	0.60	0.065
26/65	0.78	>0.005
36/75	0.59	0.074
46/85	0.73	<0.003
55/54	0.92	<0.000
65/64	0.95	<0.000
75/74	0.89	<0.001
85/84	0.86	<0.001
Upper-lower jaw correlations		
16/46	0.63	<0.018
26/36	0.73	<0.003
55/85	0.90	<0.000
54/84	0.90	<0.000
65/75	0.96	<0.000
64/74	0.88	<0.001

P value < 0.005(significant)

DISCUSSION:

The main concept of caries indices are based on the idea of incorporation of all caries stages into one tool. Among various systems, the CAST index stands out with its simple hierarchical structure including the full spectrum of the disease, the categorization of the caries process according to its progression. This index covers the full spectrum of caries stages, from a sound surface(code 0), pit and fissure sealants(code 1), dental fillings(code 2), caries lesions in enamel and dentin (code 3,4,5,6), a pulpal (code 6) and periapical inflammation, to a tooth loss due to caries (Code 8).[8-10]

In our study, the percentage of children found to be caries-free with regard to primary and permanent teeth was 23%, 43.5% respectively. The overall prevalence of dental caries in this study in primary molars and permanent molars was found to be 51% and 49% respectively. Prevalence of dental caries in primary and permanent molars were calculated by combining both the enamel (code 3 & 4) and dentinal carious lesions (code 5 & 6), which were 16.75%, 36.13%, and 40.5%, 9.25% respectively. Pulpal involvement, (the category involving a cavity reaching the pulp or the presence of root fragments), was found to be the most serious stage in 16.25% (primary molars) and 4% (permanent molars) of the children. The presented results are in accordance with the study conducted by Malik A et al (2014) who studied the prevalence of dental caries using CAST index.[3]

We decided to primarily concentrate on the correlations between the statuses of molars because of the considerable dynamics of front teeth exchange in children at the age of 7–8 years. The exclusion of incisors and canines from the analysis allowed us to keep the homogeneity of the study group. In our study, the correlations between CAST categories found in neighbouring primary molars were stronger for the left side of the mouth, both in maxilla and mandible, which might prove the theory about the accumulative caries pattern. The correlations between caries stages found in first permanent and second primary molars

were weak. These results are in accordance with the findings of Honcala et al and Baginska J et al (2014)[8] who found that the correlation status of first and second primary molars was stronger for the left than for right side of the mouth.

In the present study it was well appreciated that the prevalence of sealants and restorations were just 0.0% (no tooth) & 7.5% respectively. This strongly suggests that lack of awareness for prevention of oral diseases which is actually leading to the deteriorating oral health status of developing populations. Reporting the progressive nature of dental caries using CAST, will facilitate the health care providers to present the real picture of preventable carious lesions to the policy makers, which up till now was just accounted as cavities in epidemiological studies.

CONCLUSION

CAST has introduced a new paradigm by reassessing the pathogenesis of dental caries. The strongest correlation in the evaluated children was found for the distribution of caries stages in primary molars on the left side of the mouth. On the basis of these results, CAST is a promising index for epidemiological research studies because the instrument allows obtaining more detailed data on caries prevalence and experience than DMFT, ICDAS. This was a pilot study yet, more data are required to authenticate this index for detecting caries progression.

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