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Comparison and evaluation of the cast index score with dmft and icdas ii of 9-11 year olds residing in East Bangalore

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Abstract

Aim: The aim of the study was to compare and evaluate the CAST scores with DMFT and ICDAS scores in 9-11 year old children residing in Bengaluru(East).

Materials and methods: A cross-sectional survey was conducted, where in one hundred students of the age 9-11 years were selected randomly and examined. Examination was done by a single calibrated examiner according to principles of DMFT, ICDAS II and CAST index. Evaluation of teeth status was performed in dry and wet situations according to codes of the system**.**

Results: When comparing the indices, there was a strong co-relation seen between the three indices and time taken by the CAST Index was less for evaluating a patient when compared to ICDAS II and the DMFT index and this difference was statistically significant(p = 0.001).

Conclusion: CAST index will be more useful for investigators in large epidemiological surveys involving Pediatric population, as it is less time consuming.

Keywords: CAST index, dental caries,

Introduction

Dental caries is a multi-factorial oral disease that manifests clinically as a course from initial white spot lesion in enamel to cavitations. Presentation of early caries does not necessarily transform into cavitations[1]. The non-cavitated stage can be reversed and arrested by the application of required preventive measures[2]. Evaluating the diverse stages of enamel carious lesions makes room for the dental surgeon and the patient to control caries development by the execution of various caries preventive strategies[3].

Initially, the decayed, missing, and filled teeth (DMFT)/ decayed, extracted and filled teeth (def) index was recommended for assessing caries status of a population. However, this index does not demonstrate the severity of decay, so the system known as the International Caries Detection and Assessment System (ICDAS) classification was developed. It classified the histological progression of caries extending into the tooth tissues[4]. Although, this classification is an evidence based and conservative approach, it does not assess the conditions such as application of sealants and restorations present within the tooth. It does not assess caries progression in advanced condition which involves pulp and tooth loss, as this system examines early clinical visible sign of the caries. ICDAS II also has lesser discrimination power in epidemiological surveys because of chances of overestimation of dental caries experience. This system also requires dry tooth surfaces and double checking of tooth which makes surveys more time consuming and costly[7]. For severe caries stages, the PUFA index covers severe decay in teeth with visible pulpal involvement, fistula, ulceration, and abscess. For epidemiological surveys, there is necessity for a simpler index which should assess full process of caries. Frencken introduced the caries assessment spectrum and treatment (CAST) index which assesses dental caries progression, absence of caries, caries protection by sealant and treatment by restoration for carious lesions in enamel and dentine, and pulpal involvement with or without abscess[9]. CAST codes have been developed in such a way that increase in codes corresponds with progress in the consequences of the dental caries process. It also records a restored tooth as sound and functioning tooth. Components of the ICDAS II and PUFA indices are assembled in CAST index. DMF score can be obtained from the CAST score, thus retaining the use of DMF scores. The CAST index has been assessed for the face, content validity, and its reproducibility. Thus, the aim of this study is to compare and evaluate the CAST scores with DMFT/def and ICDAS scores in 9-11 year old children residing in East Bengaluru[11].

Materials and methods

The present cross sectional survey was conducted in children aged 9-11 years residing in East Bengaluru. The study was conducted in schools, through dental health camps after obtaining approval from the administrator of the school and the Institutional Review Board and Ethical Committee Dr. B.R.Ambedkar Medical College Bengeluru [EC no- 645]. The students were selected randomly based on the following

Inclusion Criteria

1. 9-11 year old children[4,5]
2. Subjects who are students of the Institution.
3. Subjects who are willing to participate in the study.

Exclusion criteria

1. Subjects who are not physically and mentally fit.

2. Subjects who are uncooperative/ unwilling for clinical examination during the study.
3. Subjects who are below 9 years and above 11 years of age

Before clinical oral examination, the children were assured that their information will be kept confidential and will be reported in aggregate form. A written assent was then obtained from each participant prior to their clinical oral examination. The sample size for the present study was estimated using the software GPower v. 3.1.9.4. Considering the effective size to be measured (f) at 15%, power of the study at 80% and the margin of the error at 5%, correlation co-efficient among repeated measures at 0.32, the total sample size needed was 100.

Two examiners were trained and calibrated in the DMFT, ICDAS II and CAST Index systems. The study was carried out in schools in East Bengaluru. Examinations were performed by the calibrated examiner under adequate light conditions using clean dental mirror, probes per the DMFT, ICDAS II and CAST index systems.

All the subjects were examined using DMFT, ICDAS II and CAST Index, which was initiated from the right maxillary molar moving anteriorly, passing through left maxillary, left mandibular and finally right mandibular teeth. The number of decayed (D), missing (M), and filled (F) teeth were recorded in DMFT form, then the numbers pertaining to D, M, and F were added to record the DMFT value.

In ICDAS system, the condition of the teeth was recorded with the sequence as formerly mentioned for DMF system in both moist and dried (using cotton rolls or gauzes) states. As suggested for application of CAST, the tooth surface was not air-dried but, when necessary, excess saliva was removed with cotton rolls or gauze.

The data was tabulated and statistical analysis was performed using Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp

Codes and description of ICDAS-II and CAST index are as follows:

ICDAS-II

Code	Description
Code 0	Unfilled and unsealed teeth
Code 1	Sealant applied but all pits and fissures are not covered
Code 2	Sealant applied and all pits and fissures are covered
Code 3	Tooth coloured resin or glass ionomer restoration
Code 4	Amalgam restoration
Code 5	Stainless steel crown
Code 6	Porcelain or veneer crown or PFM
Code 7	Lost or fractured restoration
Code 8	Temporary restoration
Code 9	Tooth is missing or has certain condition
96	The tooth surface is not examinable because of poor accessibility or convenience
97	The tooth is lost due to caries
98	The tooth is lost due to reasons other than caries
99	Unerupted tooth

Caries-Associated with Restorations and Sealants (CARS) Detection Criteria:

Code	Description
0	Sounds
1	First visual change in enamel (seen only after prolonged air drying or restricted to within the confines of a pit or fissure)

2	Distinct visual change in enamel	4	Underlying dark shadow from dentin
3	Localized enamel breakdown (without clinical visual signs of dentin involvement)	5	Distinct cavity with visible dentin
		6	Extensive distinct cavity with visible dentin

CAST

Characteristic	Code	Description
Sound	0	No visible evidence of a distinct carious lesion is present.
Sealed	1	Sealed. Pits and fissures have been at least partially sealed with a sealant material.
Restored	2	A cavity has been restored with an (in)direct restorative material currently without a dentin carious lesion and no fistula/ abscess present
Enamel	3	Distinct visual change in enamel. A clear carious related discoloration (white or brown in color) is visible, including localized enamel breakdown without clinical visual signs of dentin involvement.
Dentine	4	Internal caries related discoloration in dentine. The lesion appears as shadows of discolored dentin visible through enamel which may or may not exhibit a visible localized breakdown.
	5	Distinct cavitation into dentin. No (expected) pulpal involvement is present.
Pulp	6	Involvement of pulp chamber. Distinct cavitation reaching the pulp chamber or only root fragments are present
	7	Abscess / Fistula. A pus containing swelling or a pus releasing sinus tract related to a tooth with pulpal involvement due to dental caries is present
Lost	8	The tooth has been removed because of dental caries
Other	9	Does not match with any other categories

Results

Among the total number of children involved in the study, 22 were males and 78 were females. While evaluating the DMFT, def, ICDAS II and CAST scores, it was found that there was a strong co- relation between the decayed, missing and filled teeth of all the three indices with co-efficient value 1(fig 1).

On comparing the mean decayed, missing, filled teeth scores recorded by different indices, using Wilcoxon Signed Ranged Test, it was statistically significant with p-value of <0.001.(fig 2, fig 3)

While comparing the time taken by all the indices, it was found that the DMFT index took the least time followed by the CAST index and the ICDAS index took the most time. The mean difference of time taken between DMFT and ICDAS was -56.00(p-value 0.006), DMFT and CAST were -12.00(p-value 0.07), ICDAS and CAST were 44.00(p-value 0.004).(fig 4)

Discussion

The detection of dental caries stands very crucial as it helps us in early treatment of the disease. The DMFT index is a most common and widely used method for determining caries status, which gives an independent score of every individual. However, this does not give us any information on the state, stage or depth of penetration of caries, restoration type and their condition.

Hence, ICDAS index was developed. In this study it was seen that the decayed, missing and filled values of ICDAS was much higher than DMFT and CAST index. A study done by Ipshita Potlia et.al compared DMFT, ICDAS and CAST in adults also reported that the ICDAS scores were higher than the DMFT and the CAST scores[9]. This could be because the index evaluates both active and inactive lesions in contrast to DMFT and CAST which only scores active lesions[9].

Similarly, the ICDAS II index evaluates teeth lost for reasons other than caries (e.g orthodontic extractions) which thereby gives a higher percentage for the missing component when compared to the other two index systems (DMFT, CAST). A study done by Aeeza Malik et. al found that the CAST index to evaluate dental caries did not present an overestimated caries prevalence suggesting it's potential for scoring the whole spectrum of dental caries precisely[6].

However, it was difficult to convert the scores obtained on using the ICDAS II index into their corresponding DMFT score and literature also revealed that researchers have encountered problems in reporting the data, necessitating conversion of ICDAS II codes into DMF components. Therefore, even though ICDAS II index evaluates the patient's caries state, dental conditions and treatment planning with a high degree of reliability, presence of compressed air for drying the tooth and the time taken for recording the index made it difficult to record and analyze statistically. Also the ICDAS II does not cover the lesions that involve pulp i.e. peri-apical lesions[10].

Studies done by both Praveen H Bhoopathi et. Al and Radhey Shyam et. al who used the DMFT and CAST index for evaluation of caries status, proved that the use of CAST index highlighted the caries spectrum in an impressive way and is a simple and promising index for epidemiological studies.[4,11]

The CAST index tells us of various stages of caries progression, abscess/fistula with preventive and restorative care in a single digit coding system. It also has the advantage of deriving the DMFT score out of it and hence makes statistical analysis and comparison with previously done studies using DMFT index much easier. In this study it was found that in children, the decayed, missing and filled values of CAST index were almost

similar to the DMFT/def index, making the results obtained more easily comparable.

The CAST index consumed lesser time as compared to the ICDAS index that is statistically significant. Thus, it can be said that once properly trained with the index, it would take lesser time to evaluate children, making it less time consuming, cost-effective for large epidemiological surveys/study.

Conclusion

From the present study we can conclude that the CAST index covers the whole spectrum of caries process, describes depth of caries involvement and the severity. The index is easy to apply, less time consuming and easily relatable to DMFT scores. Thus the CAST index is a promising tool in epidemiological surveys involving pediatric population as it is less time consuming and cost effective.

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Legends Table and Figure

Table 1: Spearman's correlation test to evaluate Decayed tooth scores as measured by different Indices

Spearman's correlation test to evaluate Decayed tooth scores as measured by different Indices				
Indices	Values	DMFT	ICDAS-II	CAST
DMFT	rho	1	0.20	0.30
	P-Value		0.04*	0.003*
ICDAS-II	rho	0.20	1	0.86
	P-Value	0.04*		<0.001*
CAST	rho	0.30	0.86	1
	P-Value	0.003*	<0.001*	

Spearman's correlation test to evaluate Decayed tooth scores as measured by different Indices				
Indices	Values	deft	ICDAS-II	CAST
deft	rho	1	0.80	0.87
	P-Value		<0.001*	<0.001*
ICDAS-II	rho	0.80	1	0.86
	P-Value	<0.001*		<0.001*
CAST	rho	0.87	0.86	1
	P-Value	<0.001*	<0.001*	

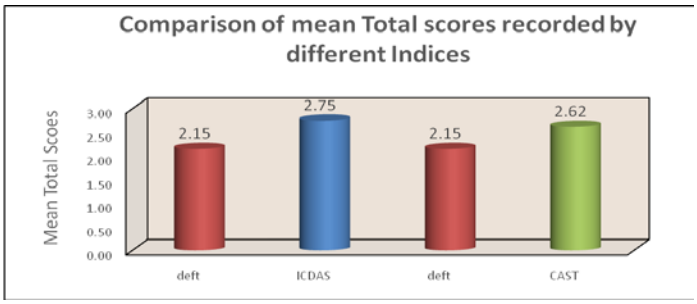

Fig 2: Comparison of mean total scores recorded by different indices

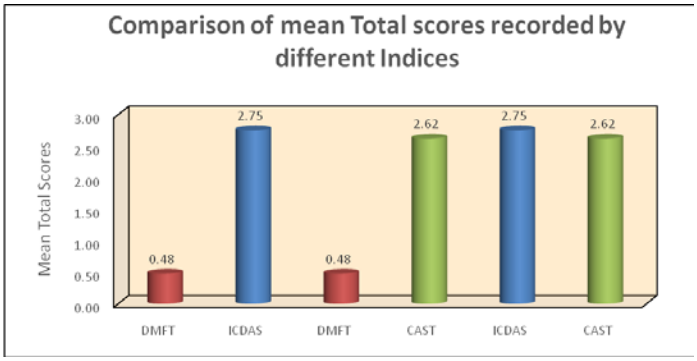

Fig 3: Comparison of mean total scores recorded by different indices

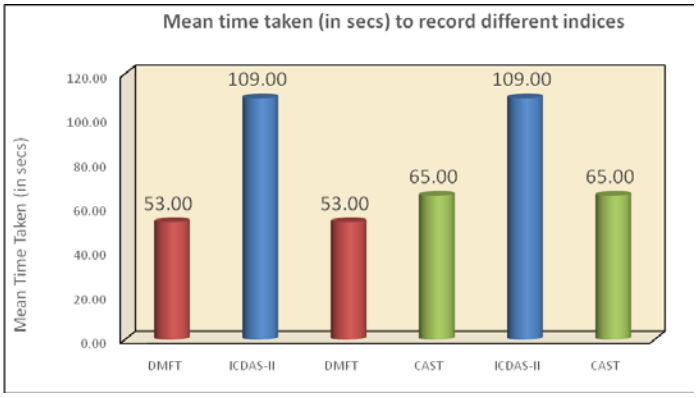

Fig 4: The mean time taken by different indices