ASSESSMENT & COMPARISION OF DENTAL CARIES STATUS AMONG 12-15 YEAR OLD SCHOOL CHILDREN ACCORDING TO CAST INDEX AND WHO CRITERION IN BANGALORE CITY

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ABSTRACT

AIM: To Assess of dental caries status among 12-15 year old school children according to CAST instrument and WHO criterion in Bangalore city.

Methods: A cross sectional study was carried out among 209 school children aged 12-15 years in Bangalore city. DMFT (Decayed, Missing, Filled Teeth) counts were obtained according to the WHO criterion and the CAST instrument. Total time for examination was recorded. Descriptive statistics, t test and correlation was done using SPSS version 19.

Results: Out of 209 school children examined, majority of them were in the age group of 14 years. Mean DMFT was found to be **1.17±1.89** for CAST index and **0.29±0.78** for WHO criterion and it was statistically significant (p<0.05). However there was significant difference in mean time consumed for applying both criteria. [WHO=35.39±3.77, CAST=66.86±3.15, (p=0.001)]

Conclusion: The CAST instrument provided similar DMF counts as the WHO criterion in all age groups. Time spent on examining children was less for WHO criterion when compared with CAST instrument. Presentation of results from use of the CAST instrument, in comparison to WHO criterion, allowed a more detailed reporting of stages of dental caries, which will be useful for oral health planners.

INTRODUCTION

Dental caries is a complex disease affecting the teeth, which is mainly caused by imbalance between demineralization and remineralization process around the tooth surface.[1] Dental caries is a major oral health problem around the world, affecting 60-90% of school children and the vast majority of adults. In many developing countries, access to oral health services is limited and teeth are often left untreated or are extracted because of pain or discomfort.[2]

Dental caries can be effectively prevented and controlled through a combination of individual, community and professional efforts. In order to prevent and control dental caries, one should know its exact nature of occurrence and distribution in the community. Prevalence studies on dental caries in India have shown results ranging from 31.5% to 89%. According to national oral health survey caries prevalence in India was 51.9, 53.8 and 63.1% at ages 5, 12 and 15 years, respectively.[3] Decayed, Missing, Filled Teeth (DMFT) values ranged from 1.2 to 2.6, which was low, when compared with the other parts of the world. Prevalence of dental caries within India was found to be high i.e., 80-96.5% of the population

according to the national survey conducted by Dental Council of India DCI(2003).[4]

For many years, the World Health Organization (WHO) global goal for year 2000 for dental caries of no more than an average of 3 DMFT (decayed, missing, filled teeth) at 12 years of age has been used as a global yardstick for oral health program success.[5] Dental indices are a powerful tool to quantify the disease, to establish the prevalence of any oral disease in a population, appropriate index must be used and its psychometric properties must be tested for that population.[6]

For several decades dental researchers are following and teaching DMF index developed by Klein, Palmer and Knutson in 1938 for assessing dental caries. World health organization has adopted this index in its oral health assessment form for conducting national oral health surveys.[7]

For the last 70 years, data on prevalence of dental caries have been collected worldwide using the Decayed, Missing, Filled Teeth (DMFT)/decayed extracted filled teeth (deft) index. This classical index provides information on caries as well as its restorative and surgical treatment, but it fails to provide information on the clinical consequences of untreated dental

caries, such as pulpal abscess, which may be more serious condition than the carious lesions themselves. A deep carious lesion with pulpal involvement is usually considered under the code "caries of dentin" and pulpal involvement is not mentioned at all in the caries scoring system in the latest edition of WHO ‑ Oral Health Survey Basic Methods.[2]

WHO criterion include ease in mastering the criterion and its use in practice, the high levels of agreement among examiners and the possibility for comparing results collected from many populations worldwide over long periods. Disadvantage is the absence of codes for recording caries lesions in enamel, difficulty for differentiating caries lesions in dentine that can be treated restoratively from those that require more complicated treatment.[8]

Thus an innovative instrument for the epidemiological studies named Caries Assessment Spectrum and Treatment (CAST) was introduced by Frencken *et al* in 2011. A novelty of CAST is the recommendation to include teeth with dental fillings in the category of sound teeth, which is inline with the epidemiological concept of health.[9] It was designed for use in international epidemiological surveys and permits registration of sound teeth, sealants, restorations, enamel and dentine caries lesions, advanced stages of caries lesions into the pulp and tooth-surrounding tissues, and teeth lost due to dental caries. The CAST instrument differs from other caries assessment instruments by the fact that the codes are ordered in increasing level of severity of the effects of the caries process.[10]

In order to further understand the characteristics of CAST for use in population groups, it is important to determine the time needed to perform an examination using the CAST instrument in comparison to that of the WHO criterion. As the results of studies that have used CAST have not been presented yet, an attempt is made to present these in comparison with those obtained according to the WHO criterion.[11] Hence the present study was done with the aim to assess and compare dental caries status among 12-15 year old school children according to CAST instrument and WHO criterion in Bangalore city.

MATERIALS & METHODS

A Cross sectional study was conducted to assess & compare dental caries status among 12-15 year old school children according to CAST instrument and WHO Criteria in Bangalore city. The study proposal was submitted for approval and clearance was obtained from the ethical review board. Prior to study, permission was obtained from the Principal of Hombegowda Boys & Girls High school to conduct the study.

Sample size estimation was done using the formula $E = \dfrac{1.96\sigma}{\sqrt{n}}$

E = margin of error
n = sample size
σ = standard deviation

Data was collected from 12 - 15 year old school children from Hombegowda Boys & Girls High school, Bangalore city who came for dental check up from August 10th to October 10th 2015, for a duration of 3 months. School children who cooperated for oral examination, school children who volunteered to participate in the study, school children who had at least 20 teeth were included in the study. School children who did not give consent, did not wish to participate in the study, school children who had orthodontic fixed brackets, prosthesis, TMJ problems, restricted mouth opening were excluded from the study. Verbal informed consent was obtained from the School children before the start of the study by disclosing that the data collected was for research purpose.

A total of 209 participants were examined by Convenience sampling method. Each class was divided into strata, i.e, 8th and 9th standard school children were examined, among each strata participants were randomly selected for oral examination. One trained and calibrated examiner recorded the dental caries status of each subject using CAST index & WHO criterion in which kappa co-efficient value was 0.83.The summary of the codes and criteria of two indices used are presented in annexure 1.Oral examinations were conducted in school premises. All subjects were examined under adequate light. Before scoring each tooth, it was wiped with a cotton wool roll to dry the surface. Sterilized instruments including mouth mirror for indirect vision and a probe for removing excess plaque were used for examination. A structured and validated proforma was used to collect and record the data. The proforma included the details of demographic characteristics (name, age and gender) and a dental chart to record data.

Examination time was recorded using a stop clock from the moment the examiner picked up the instruments and called out 'start', until the examiner concluded the examination and called out 'finished'. The CAST index was used in the first & WHO criterion was recorded next in the same patient.

Annexure 1 CAST & WHO codes and descriptions

CAST		WHO		
Primary and permanent teeth		Primary teeth	Permanent teeth	Description
Code	Short description	Code		
0	Sound	A	0	Sound
1	Sealant, partial or total	F	6	Fissure sealant
2	Restoration, direct or indirect	D	3	Filled, no decay
		G	7	Bridge abutment, special crown or veneer implant
3	Enamel lesion	A	0	Sound
4	Dentine lesion	A	0	Sound
5	Cavitated dentine lesion	B	1	Decayed
		C	2	Filled, with decay
6	Pulpal involvement	B	1	Decayed
7	Abscess/Fistula	B	1	Decayed
8	Missing due to caries	E	4	Missing, as a result of caries
9	Other	-	9	Not recorded
		-	5	Missing, any other reason
		-	8	Unerupted tooth (crown)
		T	T	Trauma

Statistical Analysis

The data was entered in Microsoft Excel sheet and the data analysis was done using statistical software SPSS version 19. Descriptive statistics, Mean DMF scores for comparison between CAST instrument & WHO criterion was calculated. Paired sample 't' test and Pearson correlation coefficient (r)was used for analysis. p value was set up at 0.05 which was statistically significant.

RESULTS

Distribution of School children according to gender attending 8th & 9th Standard whose oral examination was done. Among 209 school children 109(52.15%) were boys and 100(47.84%) were girls.

Distribution of Study participants according to gender
Table 1

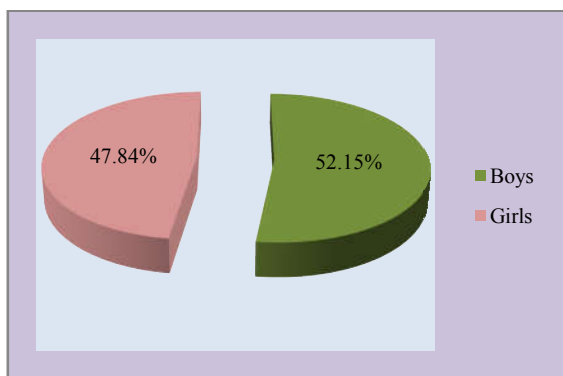| Gender	N(%)
Boys	109(52.15%)
Girls	100(47.84%)

Figure 1 Distribution of Study participants according to gender

Out of 209 school children 6(2.9%) were 12 years old 47(22.5%) were 13 years old 81(38.8%) were 14 years old and 75(35.9%) were 15 years old.

Distribution of Study participants according to age
Table 2

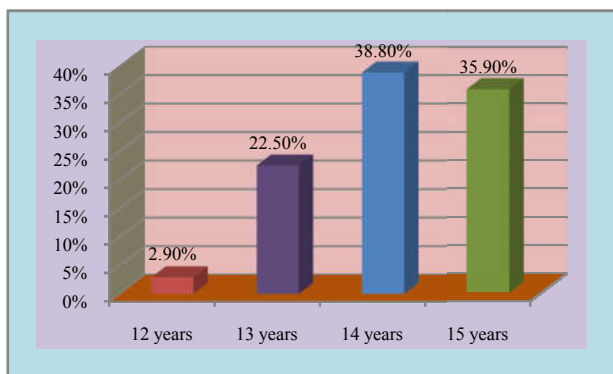| Age	N(%)
12 years	6(2.9%)
13 years	47(22.5%)
14 years	81(38.8%)
15 years	75(35.9%)

Figure 2 Distribution of Study participants according to age

Total time taken for examination by using WHO criterion & CAST index. Mean time taken for WHO criterion was 35.39±3.77seconds and mean time taken for CAST index was 66.86±3.15seconds to perform oral examination.

Mean time taken for examination according to WHO criterion and CAST instrument **Table 3**

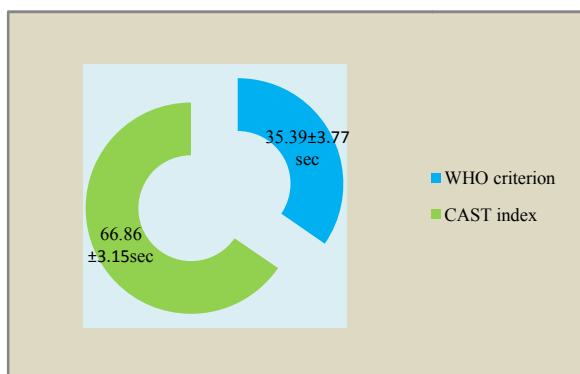| Index	Mean time ± Std deviation
WHO criterion	35.39±3.77 seconds
CAST index	66.86±3.15 seconds

Figure 3 Mean time taken for examination according to WHO criterion and CAST instrument.

Conceptual difference in calculating sound teeth according to CAST instrument and WHO criterion. According to which Code 0(sound) for WHO criterion was 124(59.3%) and CAST instrument was 20(0.9%), Code 1(Sealant, partial or total) for CAST instrument was 10(0.4%), Code 2(Restoration, direct or indirect) for CAST instrument was 42(20%) and Code 3(Enamel lesion) for CAST instrument was 52(24.8%) respectively.

Conceptual difference in calculating sound teeth according to CAST instrument and WHO criterion
Table 4

Codes for sound teeth	WHO criterion(N%)	CAST instrument(N%)
0	124(59.3%)	20(0.9%)
1	0	10(0.4%)
2	0	42(20%)
3	0	52(24.8%)

Conceptual difference in calculating decayed teeth according to CAST instrument and WHO criterion. According to which Code 1& 2(caries & filled with caries) for WHO criterion was 48(22.9%) and CAST instrument was 0, Code 4(Dentine lesion) for CAST instrument was 10(0.4%), Code 5(Cavitated dentine lesion) for CAST instrument was 8(0.3%), Code 6(Pulpal involvement) for CAST instrument was 25(11.9%), Code 7(Abscess/Fistula) for CAST instrument was 5(0.23%) respectively.

Conceptual difference in calculating decayed teeth according to CAST instrument and WHO criterion
Table 5

Codes for decayed teeth	WHO criterion	CAST instrument
1&2	48(22.9%)	0
4	0	10(0.4%)
5	0	8(0.3%)
6	0	25(11.9%)
7	0	5(0.23%)

Mean decayed teeth according to WHO criterion and CAST index **Table 6**

CAST index	WHO criterion	P value	t value
1.17±1.89	0.29±0.78	0.005*	6.195

*Statistically significant p value <0.05

DISCUSSION

Based on the mean DMF scores and on the prevalence of dental caries, the present study showed a significant difference between the CAST instrument and the WHO criterion results. This implies that for the age group of 12-15 years, caries experience obtained through use of the CAST instrument can be compared with those obtained through using the WHO criterion. A very recently published caries epidemiological survey on occlusal surfaces of permanent first molars of 6-8-year-old children appear to confirm this finding.[12] Whether the high level of similarity between CAST and WHO criterion is also present in other age groups and in populations with different treatment patterns is unknown and needs to be investigated.[13]

For example, in populations with a high prevalence of restored teeth that also contain enamel caries lesions, a single tooth is categorised as restored according to the WHO criterion, while such a tooth is categorised as an enamel caries lesion when CAST is used. This difference is due to the hierarchical order

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within CAST that considers a tooth containing an enamel caries lesion as in a more severe condition than a restored tooth. This novelty in CAST might affect the level of agreement in DMF counts between the two caries assessment instruments and is dependent upon the frequency of occurrence of combinations of caries codes in a tooth.[14]

The time taken to perform the examinations did differ between the two caries assessment instruments. The time taken for CAST index was 66.86 ±3.15sec and for WHO criterion it was 35.39±3.77 sec. In an attempt to achieve greater accuracy, CAST was developed. In this assessment instrument, only teeth that have a cavitated dentine caries lesion and those that show its consequences (CAST codes 5-7) are considered diseased and included in the calculation of the prevalence of dental caries. A restored tooth and an extracted tooth are not included, because the first one has been treated and the second one is not considered diseased anymore.[15]

Caries status according to CAST allows for the presentation of a pre-morbidity stage that calls for preventive actions. Furthermore, CAST also distinguishes dentine caries lesions that can be restored from those that are beyond treatment with a restoration alone. These caries conditions are not included in the WHO criterion, which is a disadvantage. For example, the last epidemiological survey conducted in Brazil, which used the WHO criterion, concluded that about 80% of decayed primary teeth in 5-year-olds remained untreated. Having these results as a reference, health planners are unable to provide a realistic overview of the kind of treatments needed and consequently, cannot accurately calculate the amount of (restorative) dental materials, instruments, equipment and budget required to improve the situation adequately.

The present study reported a low proportion of children having teeth affected with a caries lesion reaching the pulp, which in most cases would require an extraction. It further showed a high prevalence of children with teeth having an enamel caries lesion requiring preventive measures, dental health education and regular surveillance. Even though both CAST instrument and WHO criterion gives similar results, CAST instrument provides detailed stages of caries and allows health authorities to plan oral health care programs, health policy and dental care planning for the general public.

- Both WHO criterion and CAST index during survey is feasible and time friendly, so both indices can be used.
- The awareness and understanding of the regularities in the caries pattern will make clinical practitioners more accurate during a dental examination.

CONCLUSION

Time spent on examining children was less for WHO criterion when compared with CAST index. Presentation of results from use of the CAST index, in comparison to WHO criterion, allowed a more detailed reporting of stages of dental caries, which will be useful for oral health planners. The CAST instrument provides a realistic reproduction of the prevalence of dental caries in populations and it facilitates development of an adequate health policy and dental care planning for the population.

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