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Research Article

TO ASSESS THE PREVALENCE OF DENTAL CARIES IN 7-9 YEARS OLD SCHOOL CHILDREN IN LUCKNOW POPULATION USING CAST INDEX

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A B S T R A C T

Introduction: Dental caries remains a serious problem in many populations worldwide, with a marked increase of the prevalence in several countries during the last decade.
Objective: To assess the prevalence of dental caries in 7-9 years old school children using Caries Assessment Spectrum and Treatment (CAST).
Study Designs: This cross-sectional study was carried out in school children using CAST Index in Lucknow population. The dental examination was performed and the teeth were evaluated according to the CAST recommendation. A structured and validated proforma was used to gather and record the data.
Statistical Analysis Used: Statistical analysis was carried out utilizing Chi-square test.
Results: A total of 1598 subjects, (77.8%) examined teeth were found to be sound, whereas, the rest 22.2% represented the previous, present and predicted stages of dental caries. The overall prevalence of dental caries was 12.8% in which the enamel and dentinal carious lesions were 4.2% and 8.6% respectively.
Conclusion: The CAST index is particularly useful for assessing stages of carious lesion progression and rendered care in an epidemiological setting. However, using the CAST index for assessing carious lesion progression as part of a clinical trial is not considered appropriate. The use of the CAST index should be field- tested and there is a need to validate the index and to determine its reliability in different countries and population groups.

INTRODUCTION

Dental caries is a dynamic disease that manifests as lesions of different sizes in enamel and dentin. Eventually, the caries process may decay large parts of the tooth, leading to ulceration, abscess and infection of the alveolar bone and surrounding tissue. It is widely accepted that carious lesions in enamel and dentin can be arrested and their progression can recommence if caries controlling measures are effectively applied.[1] A variety of tools for the assessment of dental caries have been presented in the literature. The most widely known and used is the decayed, missing, filled teeth (DMFT/deft) index, proposed by WHO due to its worldwide acceptance, the easy way of data presentation in the literature and the possibility of making comparisons of results from various populations **[Fisher & Glick (2013)]**.

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However the index does not bear the capacity to weight the early enamel and dentinal lesions and therefore its use is only limited to those populations who have high prevalence of dental caries. To overcome difficulties experienced with (DMFT/deft) index and to combine other caries assessment indices, a new visual and tactile dental caries detection system, viz. International Caries Detection and Assessment system (ICDAS) was developed.[3] It faced the reluctance for its application because it does not assess the very advanced stages of carious lesion progression; those that cause infection of the pulp and destruction of surrounding tissue of untreated dental caries, such as pulpal abscess, which may be more serious than the carious lesions themselves, is the basis for the development of PUFA index. This index records the advanced stages of untreated caries lesions so that caries data collected should have impact on health decision makers, which is not possible with DMF index and ICDAS system. However, PUFA was recommended to be used as an adjunct to the standard caries indices.[4]

In view of the respective advantages and disadvantages of the DMFT/deft, ICDAS and PUFA indices, a new index was proposed by **Frencken *et al.* (2011)**. The proposed new index termed- Caries Assessment Spectrum and Treatment (CAST) covers the total dental caries spectrum from no carious lesion, through caries protection (sealant), caries cure (restoration) to carious lesion in enamel and dentin and the advanced stages of carious lesion progression in pulpal and tooth surrounding tissue.[5] Hence, the objective of the study was to assess the prevalence of dental caries in 7-9 years school children using CAST Index in Lucknow population.

MATERIALS AND METHODOLOGY

A cross-sectional study was conducted in 1598 school children aged 7-9 years of both sexes in Department of Pedodontics and Preventive Dentistry, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow in collaboration with schools of Lucknow city. The general information was gained from the case records including name, age, sex and geographic location. The city was divided into four zones (North, South, East and West) and from each zone two schools were selected. 400 students from each zone were selected for the study. The study design, objectives, potential benefits and methodology was explained to the selected children.

Only those children who had all four permanent molars fully erupted were selected and children with any of the premolars erupted was excluded because of inability to determine whether a primary molar was exfoliated or extracted due to caries. All healthy ambulant children (boys and girls) under the category of American Society of Anesthesiologists (ASA I) and American Society of Anesthesiologists (ASA II) who were willing to participate in the study available during the day of the examination, with no handicapped conditions, no systemic disease, no fixed orthodontic brackets or prosthesis were included. The study subjects were free to discontinue and withdraw at any time without any clarification. Before the commencement of survey, informed consent was taken from the concerned school authorities and parents were informed by the school authority. The study was reviewed by the Institutional Ethical Committee and clearance was obtained.

The dental examination was performed and the teeth were evaluated according to the CAST recommendation. All subjects were examined with sterilized instruments including mouth mirror, community periodontal index (CPI) probe. Periodontal probe was used for removing excess plaque. Before scoring, each tooth was wiped with a cotton roll to dry its surface. The tooth surface was not air dried but when necessary, excess saliva was removed with cotton rolls or gauze**.** If two conditions were present on the same surface e.g. a filling in one pit and an enamel lesion 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. A structured and validated proforma (record form) was used to collect and record the data. The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. ANNOVA was used for Comparison of mean age of enrolled children. Chi-Square test was used to found association between caries prevalence.

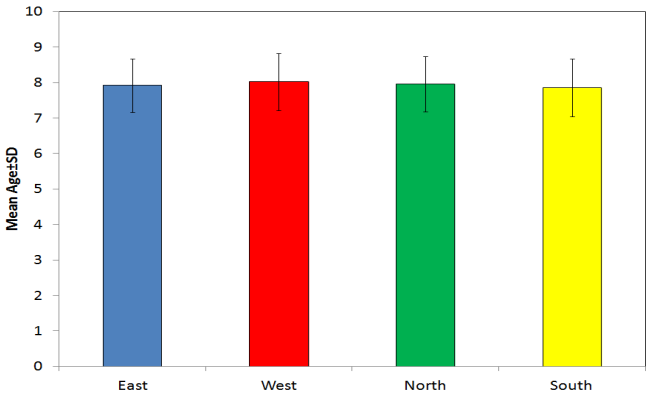
RESULT

Table 1 shows comparison of mean age of enrolled children from different zones of Lucknow. Mean age of children in different zones ranged from 7.86±0.81. Statistically, there was a significant difference in age of children in different groups (p=0.003). Among 1598 children, 752 (47.1%) were male and 846 (52.9%) were female [Table 2]. Male to female ratio was 0.89:1. Table 3 illustrates the overall Prevalence of dental caries using CAST index which was found to be 12.8%. Majority of the teeth examined (77.8%) were recorded as sound (code 0), while fissure sealants (code 1) were found to be 3.8% of the teeth. 3.4% of the total examined teeth as being previously restored (code 2). Initial non cavitated lesions in enamel, cavitated lesions in enamel and distinct cavitations in dentine (code 3, 4 & 5) were identified as 2.3%, 1.9% & 4.8% respectively. However, pulp (code 6) was found to be involved in 3.8% of the cases and 1.6% subjects had (code 7) dental abscesses/fistula, whereas 0.7% (code 8) of the teeth were extracted (lost) because of caries.

Table 1 Comparison of mean age of enrolled children from different zones of Lucknow

SN	Geographic zone	No. of children	Mean Age	SD	Minimum Age	Maximum Age
1.	East	405	7.92	0.75	7	9
2.	West	398	8.02	0.80	7	9
3.	North	389	7.95	0.78	7	9
4.	South	406	7.86	0.81	7	9
	Total	1598	7.94	0.79	7	9

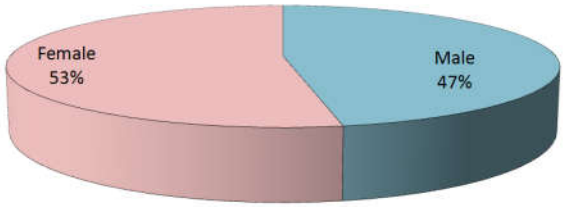
F=2.988; p=0.003 (S) (ANOVA)



Graph 1 Comparison of mean age of enrolled children from different zones of Lucknow.

Table 2 Distribution of cases according to gender

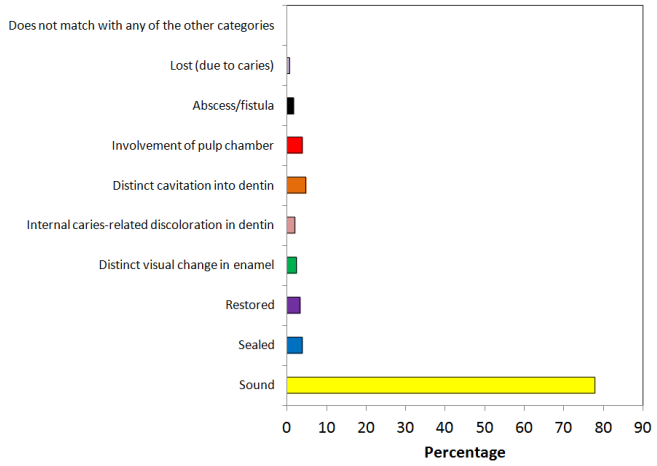
SN	Gender	No. of children	%
1.	Male	752	47.1
2.	Female	846	52.9
	Total	1598	100



Pie diagram 2 Distribution of cases according to gender

Table 3 Prevalence of Total Spectrum of Dental Caries

Code	Characteristic	Total No. of children (n=1598)	
		No.	%
0.	Sound	1244	77.8
1.	Sealed	61	3.8
2.	Restored	53	3.3
3.	Distinct visual change in enamel	36	2.3
4.	Internal caries-related discoloration in dentin	31	1.9
5.	Distinct cavitation into dentin	76	4.8
6.	Involvement of pulp chamber	61	3.8
7.	Abscess/fistula	25	1.6
8.	Lost (due to caries)	11	0.7
9.	Does not match with any of the other categories	0	0.0



Graph 2 Prevalence of Total Spectrum of Dental Caries

DISCUSSION

Dental caries is a complex disease affecting the teeth, which is mainly caused by imbalance between demineralization and remineralization process around the tooth surface. It is a major cause of tooth loss and pain worldwide.[6] Thus, they have become an important public health problem because of their high prevalence, impact on individuals and in society, as well as the high cost of their treatment.[5]

According to **Braga *et al.* 2009** epidemiological surveys are important for monitoring trends in dental caries and for assessing dental needs.[7] Although the prevalence of dental caries has declined in developed countries during the last 30 years, it remains a significant dental disease and a major public health challenge in children and adults in these countries.[8] 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.[9,10] No reports on a caries pattern covering the full spectrum of the disease could be found in Lucknow population. Hence, the aim of this study was to assess the prevalence of dental caries in 7-9 years old school children in Lucknow city using the CAST index.

We decided to primarily concentrate on the correlations between the status 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 **[Honcala *et al.* (2011), Stephenson J, (2012)]**. **Masood *et al.* (2012)** suggested that obligatory screenings should be started at the age of 6 years and followed for a certain period of time in order to select individuals with the highest caries risk so the age group 7-9 years was taken for the study.[4,10,11,12]

According to the results of the present study, the overall prevalence of caries was found to be 12.8%. In the present study around 77.8% of the examined teeth were found to be sound whereas the rest (22.2%) represented the previous, present and predicted stages of dental caries.

Results of our study showed that the percentage of sealed teeth was 3.8%. It may indicate that Lucknow dentists are more focussed on caries prevention than on the operative treatment.. In Poland, the application of fissure sealants in first permanent molars is refunded by the NHS up to the age of 8 years and **Baginska *et al.* (2014)** expected a greater percentage of sealed teeth. It may indicate that Polish dentists are more focused on the operative treatment than on caries prevention. It also has been proved that not all dentist act upon recommendations towards the sealant use **[Courson *et al.* (2011)]**. The prevalence of fissure sealants in 7-8 years old from Eastern European countries varies from 2.4% to 41.9% **[Saldunaite *et al.* (2009); Runnel *et al.* (2012)]**.[2,13,14,15] In the study conducted by **Khokhar *et al.* (2011),** it was well appreciated that the prevalence of sealants was 0.0% which is in contrast to our study.[16] In the study conducted by **Malik *et al.* (2014)** in Karachi, the prevalence of sealants and restorations was just 0.07 & 1.04% respectively. This strongly suggested that lack of awareness for prevention of oral diseases is actually leading to the deteriorating oral health status of developing populations including Pakistan which was in contrast to our study.[3]

The prevalence of restored teeth in the present study was found to be 3.3%. It is a logical approach considering that restored teeth may remain even for the whole life. There are also surveys showing that dentists apply different criteria for the restorative treatment and in every population some healthy teeth are restored **[Domejean- Orliaguet*et al.* (2004); Traebert*et al.* (2005)]**. For CAST however, the average number of teeth with a restoration was larger than of those with early stages of caries (code 3-4). This was not in accordance with **Baginska *et al.* (2014)**.[5,17,18]

The results of the present study showed the prevalence of teeth with enamel caries to be 2.3%. We observed that the percentage of teeth with enamel lesions was at a similar level for second primary and first permanent molars, but with regard to first primary molars the prevalence of code 3 was lower in accordance with **Borse *et al.* (2016)**.[19] The presented results are in accordance with the study done by **Honkala *et al.* (2011)** on Estonian children aged 7 & 8 years who assessed molar teeth by the ICDAS involving enamel caries.[4,10]

The highest percentage of teeth with dentin lesions was found to be 4.8% which was in accordance with the study found by **Baginska *et al.*** In the study done by **Honkala *et al.* (2011),** the highest percentage of teeth with dentin lesions was observed for Estonian children for lower second primary molars which is similar to our findings. Primary teeth are also more prone to a faster lesion progression from enamel to dentin and then to the development of pulpitis due to a lower thickness and a relatively larger pulp chamber in accordance with the study of **Lynch RJM (2013)**[2,10,20]

The category involving a cavity reaching the pulp or the presence of root fragments, was found to be 3.8% which was

higher and are in accordance with the study conducted by **Malik *et al.* (2014),** who observed that the pulpal involvement, the category involving a cavity reaching the pulp or the presence of root fragments was the most serious stage in 26.4% in primary teeth and 0.3% in permanent teeth of the subjects. In a study done on Polish children of 7 year age, 16.4% children were observed with endodontic treatment.[3] The neglects in dental treatment with regard to the deciduous dentition have been observed worldwide **[Bangiska *et al.* (2014)]**.[2]

The mean number of teeth with odontogenic infections was small i.e. 1.6% probably due to the young age of the surveyed children which was similar to the study done by **Baginska *et al.* (2014)**.[2]

The prevalence of tooth loss due to caries was found to be 0.7%. The percentage of molars with a serious morbidity (involvement of pulp and tooth surrounding tissues) was low and these teeth showed the lowest tooth mortality. This observation was in contrast to many previous studies **[Elfrin *et al.* (2006); Wyne AH, (2008); Zhang *et al.* (2014)]**. We found that a large proportion of molars at different stages of progression remained untreated. In the study conducted by **Malik *et al.* (2014)**, the major part (5.32%) was contributed by the lost component.[3,4,21,22,23]

CAST codes ranged from 0-9, out of which 3 and 4 represented enamel while 5 and 6 defined dentinal caries. Therefore, these four codes actually correspond to the real carious burden.[3] The overall prevalence of dental caries in the study was found to be 12.8%. Prevalence was calculated by combining both the enamel and dentinal carious lesions which were 4.2% and 8.6% respectively. The prevalence of dental caries was found to be lower and this was in favour with the study conducted by **Malik *et al.* (2014)**. In their study prevalence of dental caries was 16%.[3]

A study conducted by **Narang *et al.* (2012)** in Lucknow population found that the value for the DMFT of the entire boys and girls were low compared to many populations of similar age and sex, regarding the values observed. 45.83% of the children were represented by decayed and missing component, thereby demonstrating a dire need for dental treatment. 1.17% of the children represented the filing component demonstrating the need of the population. In our study 12.8% represented the caries and 3.8% sealed and 3.3% restored according to CAST. The variance noted may be because of the lack of awareness towards oral hygiene, lack of access to dental care as there are no health services available in the vicinity and also the poor affordability because of lower socioeconomic status.[24]

CONCLUSION

The CAST index is particularly useful for assessing stages of carious lesion progression and rendered care in an epidemiological setting. This is considered an advantage over the individual use of the ICDAS II, PUFA, and DMF indices. The CAST index would be suitable for the Indian population but with a few modifications of the original index.

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