Prevalence of Dental Caries Using Novel Caries Assessment Index - CAST

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ABSTRACT

Objective: To assess the caries experience among patients visiting a public sector hospital of Karachi, Pakistan, using novel caries detecting index - CAST (Caries Assessment Spectrum and Treatment).

Material and Methods: This cross-sectional study was carried out in a public sector tertiary care hospital located in Karachi city of Pakistan, over a period of one month. The single examiner was trained and calibrated to perform the dental examination under standardized conditions to record the dental caries status of each subject using CAST- index. A structured and validated proforma was used to gather and record the data. Data entry and analysis were performed using SPSS 16 and descriptive statistics were executed (frequencies and percentages) to record the prevalence of carious lesions. The p-value was set at 5% and the power of the test was kept at 80%.

Results: A total of 100 subjects were recruited out of which 63% were females and 37% were males with mean age of 31+17 years. Majority of the teeth examined (84.08%) were recorded as sound, whereas, the rest 16% represented the previous, present and predicted stages of dental caries. The overall Prevalence of dental caries was found to be 8.28% in which the enamel and dentinal carious lesions were 4.21 and 4.07% respectively.

Conclusion: CAST has introduced a new paradigm by reassessing the pathogenesis of dental caries. It has not presented an overestimated caries prevalence suggesting the potential of CAST Index for scoring the whole spectrum of dental caries, precisely.

Key words: Dental caries, primary prevention, prevalence.

INTRODUCTION

Dental caries being the multifactorial oral disease manifests clinically as a course of action from initial visual change in enamel to frank cavitation. A white spot lesion in enamel is the very first visual clinical presentation of early caries, which does not necessarily transform into the frank cavitations. The non-cavitated stage can be reversed and arrested by the application of required preventive measures.[1] 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. This also facilitates the policy makers to present a more steadfast representation of the caries status of a particular population. In this context, diagnosis of this initial stage of dental caries is critically important and requires pragmatic, reliable and validated tools or indices that can identify and measure both the cavitated and non-cavitated stages of caries.[2]

DMFT (decayed missing and filled teeth) index has enjoyed an unbeaten tenure of eight decades for dental caries detection.[3] It was established in the era when dental caries was thought to be an irreversible dental infection.[4] Evidences have now proved that dental caries is a completely reversible and preventable disease of dental hard tissues if diagnosed at an early non-cavitated stage.[3,5,6] With this new concept, the paradigm shifted from curative to preventive dentistry. This index does not bear the capacity to weight the early enamel and dentinal lesions and therefore, its use in only limited to those populations who have high prevalence of dental caries.

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Many initiatives were taken since late 19th century to develop an index that records the diverse spectrum of this pandemic disease.[7] One such remarkable step against the apparent need was taken almost a decade back, when a visual/tactile inspection based caries index was introduced as ICDAS (International Caries Detection and Assessment System). This index records both the restorative and the carious status from earliest visual change in enamel to the dentinal cavitation in a two digit coding system. However, ICDAS faced the reluctance for its application due to multiple reasons with its complicated recording criteria topping the list.[8,9]

Furthermore, the burden of dental caries in developing countries is fundamentally because of the untreated part of dental caries. Thus, as a perceptible need in 2010, PUFA/pufa (Pulpal involvement, Ulceration, Fistula, Abscess) was reported that pertinently record the later consequences of dental caries. However, PUFA was recommended to be used as an adjunct to standard caries indices.[9]

Keeping in view the intricacy of ICDAS, restraint nature of PUFA and no potential ways to compare their outcomes with DMF, suggests the need for the introduction of a superior doorstep for the diagnosis of initial reversible stages of caries development. This goal was accomplished in 2011, when the potencies of ICDAS, PUFA and the DMF index were amalgamated by the faction of people from the Radboud University Nijmegen Medical Centre, The Netherlands (Jo E. Frencken, Rodrigo G. de Amorim) and from the University of Brasília, Brazil (Jorge Faber and Soraya C. Leal). This innovation has been given the title "Caries Assessment Spectrum and Treatment" (CAST) as illustrated in table-1. This index is proposed to be used worldwide.[8]

Considering the significance of assessing dental caries in all its manifestations and the fact that so far no research using CAST has been published worldwide, it was decided that this system be used in local Pakistani setting so as to obtain the complete spectrum of caries experience where the mean DMFT level is already known and reported as low.[10]

Hence, the objective of the study was to assess the caries experience among patients visiting a public sector hospital of Karachi, Pakistan, using novel caries detecting index-CAST.

MATERIAL & METHODS

Study Settings and Population: The data for this cross-sectional study were collected from an Out Patient Department (OPD) of a public sector dental hospital situated in an extremely populated area of Karachi city. This hospital provides the superior quality dental treatment to the patients on very reasonable charges and so has a massive turnover of the patients coming from almost all the corners of the city. All subjects were healthy, ambulant, had at least 20 teeth, had no fixed orthodontic brackets or prosthesis and able to attend a single standing research dental chair, were conveniently selected for this study. The positive and negative aspects of the study were explained to all the study participants while seeking informed consent. Non-consented cases were excluded from the study.

Dental Examination: Two trained and calibrated examiners, whose calibration results are presented elsewhere,[11] recorded the dental caries status of each subject using CAST index. Table 1 is given as a summary of the codes and criteria of this index.[9] All subjects were examined in the supine position under adequate halogen light. Before scoring each tooth, it was wiped with a cotton wool roll to dry its 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 (record form) was used to collect and record the data. The record form included the details of demographic characteristics (name, age and gender) and a dental chart (for coding 28 teeth, third molars were not included).

Statistical Analysis: Data entry and analysis were performed using Statistical Package of Social Sciences (SPSS) software version 16.0. Descriptive statistics were executed that involved the frequencies of age and gender. Percentages were calculated to record the prevalence of carious lesions. The p value was set at 5% and the power of the test was kept at 80%.

RESULTS

A total of 100 subjects were recruited in the month of September 2012 for the present study. There were 63% females and 37% males with a mean age of 31 ± 17 years.

Table 2 illustrates the overall Prevalence of dental caries using CAST index which was found to be 8.28%. Majority of the teeth examined (84.08%) were recorded as sound (code 0), while fissure sealants (code 2) were found to be placed in just 0.07% of the teeth. The study examiner detected 1.04% 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 2.30%, 1.93% & 3.36% respectively. However, pulp was found to be involved in 0.71% of the cases and 1.14% subjects had dental abscesses. History represented that 5.32% of the teeth were extracted (lost) because of caries.

Table 1: The Codes and Description of CAST

Codes	Characteristic	Description
0	Tooth	Sound No visible evidence of a carious lesion is present
1	Sealed	Sealed Pits and Fissures have been at least partially covered with a sealant material
2	Restored	Restored A cavity has been restored with an (in)direct restorative material, currently without a dentine carious lesion and no fistula/abscess present
3	Enamel	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 dentinal involvement
4	Dentine	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	Dentine	Distinct cavitation into dentine. No (expected) pulpal involvement is present
6	Pulp	Involvement of pulp chamber Distinct cavitation reaching the pulp chamber or only root fragments are present
7	Pulp	Abscess /Fistula A pus containing swelling or a pus releasing sinus tract related to a tooth with pulpal involvement is present
8	Lost	The tooth has been removed because of dental caries
9	Other	Does not match with any of the other categories
A	Absent	The tooth has not been erupted

Table 2: Prevalence of Total Spectrum of Dental Caries

0	Sound	84.08%
1	Sealed	0.07%
2	Restored	1.04%
3	Distinct visual change in enamel	2.30%
4	Internal caries-related discoloration in dentine	1.93%
5	Distinct cavitation into dentine	3.36%
6	Involvement pulp chamber	0.71%
7	Abscess / Fistula	1.14%
8	Lost (due to caries)	5.32%
9	Does not match with any of the other categories	0%
A	Absent	0%

DISCUSSION

This study was undertaken to evaluate the complete spectrum of dental caries experience using a new caries detecting tool - the CAST index. This index has the integral capability to record the whole progressive spectrum of dental caries for which its rationale and development are already being published.[9] To date, there is no evidence of reported data of dental caries from any part of the world using CAST. This implies that it is high time to work on this endeavor and divulge the consequences for further progress of this pragmatic index. This was one of the first studies on CAST, which has revealed the caries prevalence in the local population of Karachi, which has never done before.

In the present study, around 84% of the examined teeth were found to be sound whereas, the rest 16% represented the previous, present and predicted stages of dental caries. Out of this 16%, major part (5.32%) was contributed by the "lost" component followed by 3.36% by dentinal cavitation. The overall prevalence of dental caries in this study was found to be 8.28%. Prevalence was calculated by combining both the enamel and dentinal carious lesions, which were 4.21 and 4.07% respectively. 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, while the rest six signify the restorative (code 1 and 2), caries severity (code 7) and lost/missing status (code 8).

The emphasis of this ingenious caries detection criterion is prevention and risk assessment. In the present study it was well appreciated that the prevalence of sealants and restorations were just 0.07 & 1.04% respectively. This strongly suggests that lack of awareness for prevention of oral diseases is actually leading to the deteriorating oral health status of developing populations including Pakistan. Even though, evidences have proved that advocacy of preventive measures have reduced the caries rate in developed countries; these results are still discouraging in Pakistan where the DMFT score of 12-15 years old age group has increased from 0.9 in 1999 to 1.38 in 2003.[10, 12, 13] Therefore, preventive strategies should be applied in order to reduce the caries treatment burden from our part of the globe. The measures for the augmentation of oral health entail the understanding of those stages of dental caries which are reversible and preventable. CAST ideally supports this proposal and provides the podium to identify and report these elementary steps. 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. Even though, being a most recent diagnostic tool, it has not given an overestimated caries prevalence. On the basis of these results this index may be proposed to have the potential for scoring the whole spectrum of dental caries precisely. Yet, more data are required to authenticate this index for detecting caries progression.

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