# **Specific Caries Index: A New System for Describing Untreated Dental Caries Experience in Developing Countries**

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## Abstract

**Objectives**: To develop a reproducible surface-specific caries index that provided qualitative and quantitative information about untreated dental caries, that could be used in conjunction with the DMFS index and would provide information on not only the caries prevalence but also the location and type of caries lesion in an individual based on clinical examination. **Methods**: Untreated carious lesions were divided into six types based on the location of the lesions.339 rural school children in the age group of 12-15 years were examined for dental caries using both the DMFS index and the Specific Caries Index. **Results**: Type 1 and 2 were found to be the most common type of caries lesions. The reproducibility of the Specific Caries Index was also found to be good. **Conclusions**: Encouraging indications about the validity and reproducibility of this new caries index was found, suggesting the need for further studies to test its applicability in larger and different populations.

Key Words: Specific Caries Index, surface-specific, India

## Introduction

Dental caries is the most prevalent chronic disease affecting the human race. Once it occurs, its manifestations persist throughout life even though the lesion is treated. Many investigators have formulated indices for dental caries. The DMFT/DMFS indices (1) are the most universally used indices for the assessment of the prevalence of dental caries in individuals and the general populations. Grainger (2) suggested a method of DMF examination where caries were scored according to the site of caries attack with the proximal surfaces of the mandibular incisors getting the maximum scores. Stone (3) and Tank and Storvick (4) described indices where caries was scored according to the number of lesions on a particular tooth and the extent and depth of the lesions. The Caries Susceptibility Index (5) measured the amount of tooth surface at risk and the amount of caries developing during the period of observation.

The DMF Surface Percentage Index (6) made an effort at describing caries according to the type and location of the lesion by giving a score of three for anterior proximal lesions and two for posterior proximal lesions. The Modified DMFT index (7) attempted to describe, in addition to the caries experience, previous dental treatment and future treatment needs. Moller's Index (8) described caries experience according to location, radiographic appearance and extent of the lesion. But the disadvantages were its inapplicability in rural field conditions and complexity of criteria.

Among the many requisites of an ideal dental caries index, the ability to provide accurate information about the type and location of caries in an individual or in a population is important. The DMFS index gives information about the specific surfaces involved, but does not provide any additional details about the exact location on that particular surface. This information may help in deciding the level of competence required of the trained manpower and the restorative materials required for that population. For example, in an area where occlusal caries is more, only the posterior restorative materials might be made available. Modifications in the DMFS index are required to gather such additional information.

The purpose of this study was to develop a reproducible, surface specific, caries index that would provide qualitative and quantitative information about untreated dental caries in an individual based on clinical examination and would provide, if used with the DMFS index, useful data for planning oral health care for a target population.

## **Materials and Methods**

Criteria for scoring of caries in the Specific Caries Index (SCI) were established as follows:

0 - No carious lesion detected.

1- Carious lesion occurring on the occlusal, buccal pits and fissures of molars and premolars and the lingual pits of the anterior teeth.

**2-** Proximal caries affecting the molars and premolars.

3- Carious lesion situated on the proximal surface of the anteriors and not involving the incisal angle.

4- Carious lesion situated on the proximal surface of the anteriors, involving the incisal angle.

5- Carious lesion situated on the cervical region of the tooth

6- Carious lesion situated on the occlusal cusp tips of molars and premolars and on the incisal edges of incisors;

6A- grossly decayed tooth/ root stumps indicated for extraction

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SCI scores for both 6 and 6A remain the same, i.e. six. The SCI score for an individual was calculated by adding the individual tooth scores. For example a finding of three lesions; an occlusion lesion in a second molar, a proximal lesion in a first molar and a carious lesion in the incisal edge of an anterior tooth would result in a SCI score of seven. The SCI scores for an individual can range from 0 to 192 (for 32 teeth).

This scoring pattern was based on Black's well-known classification of cavity preparation (9) for operative dentistry that was based on morphological considerations. This classification was proposed specifically for cavity preparation; however the system has relevance to morphological classification of dental caries since Black's Class 1 preparations are associated with Pit and fissure caries, while Class 2, 3,4,5 and 6 types are associated with smooth surface lesions in different locations. This scoring pattern was also based on the assumption that sites of the carious lesions became less common with ascending order of weightage, i.e., Type 1 (Pit and Fissure caries) caries was the most common followed by Type 2 (Proximal Caries) and so on. The presence of higher values in individual tooth scores therefore suggested higher caries risk and caries susceptibility for the tooth and the individual. If more than one lesion was present on a tooth, the higher score was given. Similarly, a higher score was given when there were combined lesions.

A total of 339 school children in the age group of 12 to 15 years were examined in two rural schools of Udupi District, Karnataka State, India. Ethical clearance was obtained from the ethical committee of the university prior to the study. A group of 30 children were reexamined after a week by the two investigators (S.A. and a Post Graduate Student in Community Dentistry) to test the inter examiner and intra examiner variability. The examination was done with dental mirrors and blunt sickleshaped explorers under natural light and with gauzes to clean the teeth.

Figure 1 Correlation between DMFS scores and the SCI scores



Regression Equation: DMFS= 0.39 + 0.76(SCI scores)

Table 1
A summary of the caries experience in the study population according to
the SCI and the DMFS index

	Specific Caries Index Scores								DMFS Index		
	1 (SCI)	2 (SCI)	3 (SCI)	4 (SCI)	5 (SCI)	6 (SCI)	6a (SCI)	DS	MS	FS	
Total Number of lesions	542	20	18	4	10	4	1	726	50	4	
Mean Number of lesions	1.6	0.06	0.05	0.01	0.03	0.01	0.002	2.14	0.14	0.01	

The explorer was used only if and when the need arose, to clear the pits and fissures of any debris. The findings were dictated to a recorder who marked the appropriate numbers for each tooth on a prepared form.

## Statistical Analysis

Pearson's coefficient of correlation and regression was used to test the correlation between the SCI and the DMFS scores. Cohen's Kappa was used to test the inter and intra examiner variability. All the statistical analysis was done on the SPSS statistical software package (version 6).

## Results

A total of 339 school children of 12-15 years age group were examined. Caries status was assessed using both

the SCI and the DMFS index. The SCI scores ranged from 0- 22 and the DMFS score ranged from 0-15 in the same population. The mean SCI score of the study population was  $2.16 \pm$ 3.2, whereas the mean DMFS score was  $2.3 \pm 2.6$ . Pearson's coefficient was used to test the correlation and regression between the SCI scores and the DMFS scores and was calculated to be 0.93 (Graph-1). On summarizing the data from the SCI, it was seen that Type 1 caries was the most common of all the lesions with a mean number of lesions at 1.6 followed by the type 2 caries at 0.06 (Table-1). Cohen's Kappa for the inter examiner variability was found to be 0.65 and for intra examiner variability, 0.76 and 0.68 for the two examiners respectively.

## Discussion

The objective of this study was to develop a new surface specific caries index i.e. the SCI, whose criteria were simple and easy to remember. The new index would provide qualitative and quantitative information about untreated dental caries in an individual or populations based on clinical examination and would provide when used with the DMFS index, additional data for planning oral health care for a target population. The Black's classification of cavity preparation (9) was used to allot scores for caries in different areas of the dentition as it covered almost all the possible areas where a carious lesion could occur.

The results showed the reproducibility of this new index to be fair to good. The number of proximal lesions may have been underestimated as no bitewing radiographs were used in the study. In India, the future manpower and material requirements and also the type and level of training of manpower, required to treat the caries in a particular population might be assessed using the SCI and the DMFS scores. In areas where the Type 1 or 2 caries is more prevalent, provision can be made for the availability of specially trained schoolteachers and local medical practitioners or health workers who can deliver restorative treatments like ART. The level of technical competence required for the restoration of these types of lesions (Type 1 and 2) is lower as compared to the other types where technical competence required is much higher (Tooth colored restorations, etc). This will ensure optimal utilization of scarce dental manpower as well as materials.

Some of the limitations of this index were that, the high correlations between the DMFS and the SCI scores obtained could be due to the almost total lack of oral health care infrastructure in the study areas and hence may not be obtainable in other areas where the infrastructure is more advanced. Other drawbacks of this system are; in cases of large lesions, which cover more than one surface, only an assumption can be made regarding the originating lesion; the inability of this index, if used alone, to capture information useful for treatment planning; and the lack of provision for assessing root caries.

The findings of this study gave encouraging indications about the validity and reproducibility of this new system. However, further studies need to be done to test its applicability in larger and different populations.

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