



Early (non-cavitated) and late (root caries) stages of oral non-communicable dental caries – assessment by novel Agrawal and Shah modified CAST instrument.

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ABSTRACT:

Background: Agrawal and Shah modified CAST instrument is the novel instrument which is modified CAST instrument and includes scores for non cavitated lesions and root surface cervical caries. **Objective:** To assess the prevalence of non cavitated lesions and root surface caries in adult Indian population. **Materials and Methods:** A cross-sectional transverse study was performed on 2000 adult patients above 15 years of age. After the examiners were trained and calibrated, all the adult patients were scored for non cavitated lesions and root surface cervical caries presence by Agrawal and Shah modified CAST codes on a structured proforma. **Results:** Maximum adults 36 (6.88%) with non-cavitated lesions were found in early age group of 15-34 years. None of the adults have shown non-cavitated lesions in later age groups of 45-64 age range and 65-74 age range. Contrary, Maximum cervical root caries 36.3% was seen in older

age group of 65-74 and none of the adults (0) in early age range of 15-34 suffered from cervical or root carious lesion. **Conclusion:** Non-cavitated lesions are commonly seen in younger adult population while root surface caries is more common as the age increases in older population. Agrawal and Shah modified CAST instrument is a novel instrument to assess prevalence of non-cavitated lesions and root caries.

Keywords: Adult population, Epidemiology, Non-cavitated lesions, Prevalence, Root surface caries

Introduction:

The disparity in demineralization and remineralization dynamics around the tooth surface led to an age-old dynamic disease termed dental caries. According to the Global Burden of Disease Study of 2017, caries of permanent teeth is the most prevalent condition. This study also appraised that 3.5 billion population worldwide suffer from oral diseases; out of which, 2.3 billion population suffer from caries of permanent teeth.^[1] The dental council of India conducted a national survey in 2003 and found that 80-96.5% of the Indian population suffered from dental caries which was quite high.^[2]

Dental caries is a controllable, preventable, and curable disease. For any government or health institution, a true definitive picture of a population suffering from dental caries is required to

implement dental caries prevention and treatment programs in an organized manner. A caries assessment and detection index covering the total dental caries range is necessary to make it possible. The most conventional index for caries detection in epidemiological studies is that of the World Health Organization (WHO), which includes data collection according to the Decayed, Missing, and Filled Teeth (DMFT).^[3] Though simple, there are major drawbacks with DMFT such as the lack of initial caries detection, making it insusceptible for use in the modern conception of caries prevention and treatment.^[4]

International Caries Detection and Assessment System (ICDAS-I & II)^[5,6] and the PUFA^[7] were developed to overcome the limitations and document carious lesions more precisely but they too have their drawbacks. Dental caries encroaching pulp was not recorded by ICDAS whereas PUFA did not evaluate enamel, dentine, or root caries as it only recorded the most severe carious lesions involving pulp and beyond.^[8] The CAST,^[8] represents the hierarchy of caries, from no carious lesions to the presence of caries sealant and caries restoration, caries involving enamel, dentine, pulp, and tissue surrounding the tooth in form of abscess or fistulae, and tooth loss. But again, CAST does not include the scores for non-cavitated lesions and root surface cervical caries lesions. Moreover, a study by Phansopkar S et al.,^[9] suggested some modifications in CAST index for its use in Indian population.

Based on suggestions by Phansopkar S et al.,^[9] and other subject area experts a Modified CAST index with inclusion of codes of non-cavitated lesions and root surface cervical caries was prepared and copyright under the name of Agrawal and Shah modified CAST index

[Copyright registration number: L-107683/2021] (TABLE 1).

In searching the literature there were no studies on adult population which scored both the non-cavitated and root surface caries prevalence in adult Indian population. Hence this study was conducted to assess the prevalence of non-cavitated lesions and root surface caries in adult Indian population using Agrawal and Shah modified CAST index.

Materials and Methods:

A cross-sectional transverse study was performed after getting ethical clearance from the ethical committee (Institutional Ethical committee approval no: SVIEC/ IN/ DENT/ PhD/ 18018). Patients visiting the outpatient department (OPD) of conservative dentistry and endodontics who are above 15 years of age were selected for the study. A purposive sample of 2000 adults were selected for screening (sample size calculation was done considering the mean number of adult patients having dental caries and being treated in a month in the department with a confidence interval of 95% and 80% power). Inclusion criteria included patients having no deciduous teeth and all permanent teeth fully erupted till second molars, and who were willing to give written consent. Exclusion criteria exclude patients with mental retardation, differently abled, pregnant females, immunocompromised, and undergoing orthodontic treatment and radiation therapy.

Data was recorded on a validated and structured proforma. Clinical examination was done using a sterile mouth mirror, Community Periodontal Index (CPI) periodontal probe ending with a 0.5 mm ball which helps in removing any dental plaque or debris if present, tweezers, and cotton rolls. The patients were examined for non-cavitated lesions and root surface cervical caries on a chair under adequate illumination for Agrawal and Shah modified CAST scores. In a situation

where two separate carious lesions were present on the same tooth, one being a superficial lesion and another deep, a higher score for the deepest lesion was recorded. No drying of teeth while recording scores and no radiographs were taken as per the CAST index.

Out of the total 2000 adults screened, gender wise distribution showed 1082 were males and 918 were females. Hence, 59.7% were male who participated in this study and rest 40.3 % were females (Table 2).

Results:

According to WHO criteria Age-wise distribution was done of 2000 adults in the age range of 15-34, 35-44, 45-64 and 65-74. 523 (26.2%) adults were present in age range of 15-34, 801 (40%) adults were present in 35-44 age range, 654 (32.7%) adults were present in age range of 45-64 and only 22 (1.1%) adults were present in 65-74 age range (Table 3)

The prevalence of the non-Cavitated lesion were checked in different age groups of the Adults. Results showed that maximum adults 36 (6.88%) with non-cavitated lesions were found in early age group of 15-34 years. None of the adults have shown non-cavitated lesions in later age groups of 45-64 age range and 65-74 age range. The total prevalence of non-cavitated lesion was 2.1% (42 Adults). [Table 4]

On evaluating the prevalence of cervical caries and root surface carious lesions in different age groups of adults, results showed that none of the adults (0) in early age range of 15-34 suffered

from cervical or root carious lesion. But as the age increases the percentage of cervical caries and root surface carious lesion also goes on increasing with maximum percentage 36.3% of root surface and cervical carious lesion seen in age range of 65-74 years. The total prevalence of root surface cervical carious lesion was 10.6% (206 adults). [Table 5]

Discussion:

Agrawal and Shah modified CAST is a promising index for caries epidemiology as it depicts the full range of carious lesions including the non-cavitated lesions and root surface cervical carious lesions. By including the non-cavitated lesions in the prevalence study, data in literature suggest that only a small number of individuals will remain unaffected by tooth decay.^[10,11] Prevention and conservative approaches in today's dentistry for the management of caries lesions have made assessing non-cavitated lesions essential for complete understanding of the true treatment needs of patients and populations.^[10] There are few researches published for assessing prevalence of non-cavitated lesions in child age groups but none of the research published on adult population in India. Therefore, it is important to evaluate its prevalence in adult population and its differences by age.

In our study the prevalence of the non-Cavitated lesion were checked in different age groups of the Adults. Results showed that maximum adults 36 (6.88%) with non-cavitated lesions were found in early age group of 15-34 years. None of the adults have shown non-cavitated lesions in later age groups of 45-64 age range and 65-74 age range. In searching the literature there were studies who has found the prevalence of non cavitated lesions using the ICDAS index in children who were less than 15 years of age in Indian population but none of the studies has found its

prevalence in adult population >15 years in india. The reason behind the occurrence of non-cavitated lesion in early ages in our study might be the type of dietary habits in age group of 15-34 years i.e more of processed food and junk food consumption by young adults.^[12]

In our study, the prevalence of cervical caries and root surface carious lesions in different age groups of adults, results showed that none of the adults (0) in early age range of 15-34 suffered from cervical or root carious lesion. But as the age increases the percentage of cervical caries and root surface carious lesion also goes on increasing with maximum percentage 36.3% of root surface and cervical carious lesion seen in age range of 65-74 years. This finding more common is seen as the individual age increases because of the longer retention of the dentition makes it more susceptible for the root surface to get exposed either pathologically or physiologically. Also, the comorbidity conditions of the adults, untreated caries, decrease access to the oral hygiene protocols, bone loss and gingival recession conditions exposing the root surface and making them more prone for caries are the factors responsible for increased prevalence of caries in adult population. Also, the medical condition such as diabetes make the adult more prone to development of carious lesion. This is due to hyposalivation which is seen in diabetic patients making teeth at high risk of developing caries. In a study conducted by Hegde MN et al,^[13] they found that 71.36% of diabetic patients exhibited root surface caries whereas in non-diabetic patients the prevalence was 28.64%. They evaluated prevalence of root surface caries in adults more than 15 years of age in Dakshina Kannada population of India and found that highest prevalence of root surface caries of 36.36% in age group of 56-65 years. This result is in accordance with the result obtained in our present study.

More future studies on a large scale are required for validation and reliability of the Agrawal and shah modified CAST index to assess prevalence of non-cavitated lesions and root surface and cervical carious lesions in adult Indian population. The sample collection in our study was obtained conveniently from the outpatient department of a dental hospital. Hence it is not the complete representative of the adult population in the study area. Thus future studies on a larger scale and with more representative samples are requisite.

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TABLES:

TABLE 1: AGRAWAL AND SHAH MODIFIED CAST INSTRUMENT

Characteristic	Code	Description	Treatment Needs
Sound	0	Sound – no visible evidence of a distinct carious lesion is present. The surface of the enamel appears smooth and unpitted or discolored.	Tn 0 – No treatment needed (Healthy Dentition)
Restored	1	A cavity restored with a direct/indirect or permanent/temporary restorative material without a dentine carious lesion and no fistula/abscess present.	Tn 0 – No treatment needed (Healthy Dentition)
Non-Cavitated lesions	2	Discoloration of enamel (white or brown in color) without cavitation or enamel breakdown/loss of translucency of enamel.	Tn 1 – Remineralization therapy (Pre-Morbidity stage)
Enamel	3	Distinct cavitation in enamel – localized enamel breakdown without clinical visual signs of dentine involvement.	Tn 2 – Restoration (Mild Morbidity Stage)

Dentine	4	Enamel appears grayish black due to undermining as a result of dentin involvement or the presence of distinct cavitation into dentine. No (suspected) pulpal involvement is present.	Tn 3 – Restoration (Moderate Morbidity Stage)
Pulp	5	Involvement of pulp chamber – distinct cavitation encroaching pulp chamber or only root fragments are present or pulpal involvement with pus, abscess, fistula, sinus tract, etc.	Tn 4 – Endodontic Therapy (Severe Morbidity stage)
Root Surface and Cervical caries	6	Discolored/Cavitated area on the root surface or at the cementoenamel junction	Tn 2, Tn 3, or Tn 4 depending on the extent of the lesion
Lost (missing)	7 a	The tooth has been removed because of dental caries	Tn 5 – No Treatment except replacement of teeth
	7 b	Teeth are lost due to other reasons like periodontal problems, orthodontic reasons, trauma, etc.	(Mortality stage)

Others	8	Does not match with any of the other categories e.g., Amelogenesis imperfecta, Dentinogenesis imperfecta, Fluorosis, etc.	-----
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Table 2: GENDERWISE DISTRIBUTION OF STUDY POPULATION

GENDER	FREQUENCY	PERCENTAGE
MALE	1193	59.7
FEMALE	807	40.3
TOTAL	2000	100

Table 3: AGE-WISE DISTRIBUTION OF STUDY POPULATION

AGE-GROUP	FREQUENCY	PERCENTAGE
15-34	523	26.2
35-44	801	40
45-64	654	32.7
65-74	22	1.1
TOTAL	2000	100

Table 4: PREVALENCE OF NON-CAVITATED LESION (CODE 2) IN DIFFERENT AGE-GROUPS

AGE IN YEARS	TOTAL SAMPLES	SAMPLES WITH NON-CAVITATED LESIONS
15-34	523	36 (6.88%)
35-44	801	6 (0.74%)
45-64	654	0
65-74	22	0
OVERALL PREVALENCE	2000	42 (2.1%)

Table 5: PREVALENCE OF ROOT SURFACE AND CERVICAL CARIOUS LESION (CODE 6) IN DIFFERENT AGE-GROUPS

AGE IN YEARS	TOTAL SAMPLES	SAMPLES WITH NON-CAVITATED LESIONS
15-34	523	0
35-44	801	74 (9.2%)
45-64	654	124 (18.9%)
65-74	22	8 (36.3%)
OVERALL PREVALENCE	2000	206 (10.6%)