

Comparative Evaluation of Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region using Caries Assessment Spectrum and Treatment (CAST) criteria and International Caries Detection and Assessment System II (ICDAS-II) score criteria

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Abstract

Introduction : Dental caries is most common disease of childhood. Visually impaired children have limited eye-hand coordination or manual dexterity which is necessary to execute adequate oral hygiene skills such as brushing and flossing, further inability to visualize debris or calculus on the tooth surface also lead to the progression of dental caries and inflammation of periodontium. This white spot lesion areas progress into frank cavitation if the bacterial colony is not timely removed from the tooth surface. This stage of dental caries is reversible and tooth structure can be remineralized to normal enamel, if diagnosed at early stages, Hence efforts can be done in these children to control caries progression.

Aim : In this study the Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region was assessed by comparative analysis of Caries Assessment Spectrum and Treatment (CAST) index and International Caries Detection and Assessment System II (ICDAS-II) score criteria

Methodology : Prevalence of dental caries and incipient white spot lesions in 1000 visually impaired children of 12 years of age from different blind schools of Delhi NCR region were assessed using Caries Assessment Spectrum and Treatment (CAST) and International Caries Detection and Assessment System II (ICDAS-II) score criteria and obtained data was analysed statistically.

Results : Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region was found to be 54.57% with CAST index whereas according to ICDAS-II index code 1 Prevalence was 48.07% and according to Code 2 Prevalence was found to be 53.06%

Conclusion : This study concluded that CAST index described disease distribution very well and identified lesion severities and preventive or curative needs in examined population and it requires visual assessment without use of compressed air to dry tooth surface in epidemiological survey which is easy to use.

Key words : Visually impaired children, Caries Assessment Spectrum and Treatment (CAST) index, International Caries Detection and Assessment System II (ICDAS-II) score criteria, incipient white spot lesions, Remineralization,

Introduction

Dental caries is a multifactorial disease which affects the tooth decay by imbalancing equilibrium between demineralization and remineralization process around the tooth surface. If demineralization phase continues, initial loss of minerals occur from interprismatic enamel which appears as initial white spots on tooth surface to naked eye called as incipient caries. Reduced frequency of intake refined sugars can prevent biofilm formation,

remineralization with fluoride and other remineralizing agents limits the rate of progression of these incipient caries as these incipient white spot lesions are reversible which can be remineralized with remineralizing agents. [1-10]

The prevalence of these incipient white spot lesions could be comparatively high in visually impaired children due to inability to maintain oral hygiene as well as problems in accessing dental care. One of the primary cause of these lesions is inability to visualize the plaque on tooth surfaces. Moreover, lack of manual-visual coordination or parental/caretaker's supervision and the child's reduced concern for his/her appearance increases the risk of dental caries in these special children. [11-20]

For application of any preventive or therapeutic measure regarding caries control, dentist should have an actual picture of prevalence of dental caries in that particular region, which can

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be assessed using suitable index. Index is numerical value on a graduated scale with upper and lower limit for specific condition or parameter eg:- caries, fluorosis etc. Accurate understanding of indices help in gathering the information about treatment modalities for upper and lower grade score of disease according to specific Indices. Many indices has been described in literature for caries ,amongst which ICDAS II and CAST index are recently been applied in epidemiological surveys due to their advantages over others.

In 2011 , International Cries Detection and Assessment System II (ICDAS II) had been described for coronal and root surface caries which is a two digit code system. The codes ranges from sound surface to primary lesions in Enamel ,dentin to pulpal involvement.

Further International caries detection and assessment system (ICDAS-II) is a clinical two -digit scoring system (from 0 to 6) which is employed to record the severity, incidence as well as prevalence of the caries. The advantage of ICDAS II over the other indices is that its first three codes 0, 1, 2 includes score of initial white spot incipient caries lesions (0= sound, 1= First visual change in enamel after air drying the tooth surface, 2= distinct visual change in enamel).²¹

Recently, Frencken et al in 2011 introduced CAST instrument i.e THE CARIES SPECTRUM AND TREATMENT.in CAST instrument word Spectrum covers whole data of particular condition which ranges from minimum to maximum limit from one to opposite direction. Therefore this CAST instrument was designed to diagnose spectrum of caries lesion from initial stages of sound tooth to incipient caries and their further progression to dentine, pulp and tooth surrounding tissues with scoring criteria from 0 to 9.²²Score 0 of CAST instrument describes sound tooth structure where as Score 3 of CAST instrument describes incipient caries lesion.

Therefore, present study was planned to know which index is better for evaluation of Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region by comparative analysis of Caries Assessment Spectrum and Treatment (CAST) index and International Caries Detection and Assessment System II (ICDAS-II) score criteria, so that preventive treatment regimens can be formulated to remineralize these lesions to normal enamel which will further decrease their incidence and progression.

Aim :

The aim of the study was to evaluate the Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region by comparative analysis of Caries Assessment Spectrum and Treatment (CAST) index and International Caries Detection and Assessment System II (ICDAS-II) score criteria.

Objective

- Comparative analysis of the prevalence of incipient white spot lesions in visually impaired children which can be reversed using Remineralizing agents.

- Assessment of effectivity of Caries Assessment Spectrum and Treatment (CAST) criteria and International Caries Detection and Assessment System II (ICDAS-II) score criteria in epidemiological surveys.
- To use this data in designing the oral health policies for school dental health programs and preventive strategies for educating parents and teachers regarding oral health to reduce incidence of these lesions by application of various remineralizing agents to reverse them to normal enamel.

Materials And Armamentarium

Gauzes, Savlon-disinfectant solution, Face Masks, Gloves, Mouth Mirrors, CPI probes, Tweezers, Containers, Chip Blowers, Cotton rolls

Method

1000 visually impaired children of 12 years of age from different blind schools of Delhi NCR region were assessed using Caries Assessment Spectrum and Treatment (CAST) and International Caries Detection and Assessment System II (ICDAS-II) score criteria. Percentage of extent of score of carious lesions and decayed teeth with respect to scoring criteria of codes of ICDAS-II and CAST Index has been shown in (Table 1).

For CAST INDEX examination each tooth was examined using a plane dental mirror for indirect vision and 0.5mm ball ended periodontal probe.

International Caries Detection and Assessment System II (ICDAS-II) score criteria was recorded with a Sterile mirror and WHO periodontal probe. Suspected lesion was dried with help of chip blower and then coded as per criteria

Statistically From this data, Prevalence of dental caries and incipient white spot lesions in 1000 samples of children according to CAST (code 3) and ICDAS-II score criteria (code 1 & 2) was evaluated (Table 2 ,3 &4)

Results :

Table 1 : Percentage of extent of decay of incipient white spot carious lesions and decayed teeth with respect to scoring criteria of codes of ICDAS-II and CAST Index

ICDAS-II Index (Codes)	Extent of Decayed as per ICDAS-II index (%)	CAST Index (Codes)	Extent of Decayed as per CAST index (%)
0	29.3	0	5.5
1	32	1	0.13
2	24	2	0.87
3	11.7	3	59.9
4	16.8	4	9.9
5	11.2	5	11.6
6	2.1	6	17.6
		7	7.3
		8	1
		9	1

Table 2:- Prevalence of dental caries with respect to CAST, ICDAS-II score criteria in sample of 1000 visually impaired children students of age 12 years from blind schools of Delhi NCR Region i.e. 19.58%, 13.83% respectively.

INDICES	PREVALENCE(%)
CAST	39.83%
ICDAS-II	36.58%

Table 3 : Prevalence Of Incipient White Spot Lesions In 1000 Samples Of Children according To Cast And Icdas-ii Score Criteria:

CAST SCORE	Prevalence	ICDAS-II SCORE	Prevalence
CODE 3	54.57%	CODE 1	48.07%
		CODE 2	53.06%

The table shows the prevalence of white spot lesions according to CAST Index and ICDAS-II index. Prevalence according to CAST index shows 54.57% which is higher than ICDAS-II code 1 (48.07 %) and code 2 (53.06%) . This signifies that CAST index has shown better results than ICDAS II scoring criteria.

Table 4 : Statistical analysis (Wilcoxon W test) for prevalence of incipient white spot lesions in 1000 samples of children according to CAST index and ICDAS-II score criteria

Significant Value	CAST	ICDAS-II
p-value	0.018	0.027

Discussion

Patient 's general physical and mental wellness affects integral body which is further related to oral health as mouth is an integral part of the body. Therefore a detailed health history is an important prerequisite to safe dental treatment.²⁵ Various studies have shown that direct relationship of people with disability and higher incidence of dental caries along with improper oral hygiene associated with severe periodontal diseases. Also ;lack of oral health education is further a barrier in accessing dental care.^{2,3,4,25}

Onto the etiologies of higher prevalence of dental caries in disabled individuals, most important cause is the inadequate plaque removal. As Visually impaired cannot visualize the plaque on the teeth surfaces because understanding the importance of oral hygiene is difficult for them, which results in the progression of dental caries as well as inflammatory disease of the periodontium.^{5,25} However, Health care providers should be aware of about communication skills to deal educate these visually impaired individuals about how to maintain their oral hygiene eg:- ATP technique. Various studies²³⁻²⁴ have shown that Audio Tactile Performance i.e. ATP technique is most effective brushing technique in visually impaired children which provides verbal information on the importance of teeth , proper tooth brushing method, and the manner of feeling how to brush the teeth using typhodont model .

Tooth integrity in oral cavity depends upon equilibrium between demineralization and remineralization process in saliva which is further determined by salivary pH. If salivary pH remains below critical pH i.e 5.5 (due to increased frequency of consumption carbohydrates), the enamel demineralization process begins which results in the loss of calcium and phosphates from the tooth surface. Therefore, Initial loss of minerals occurs at interprismatic enamel i.e subsurface demineralization occurs in this stage which clinically appear as incipient white spot lesion (with low calcium and phosphate content). The white spot lesion will progress into frank cavitation if it is not remineralized with topical remineralizing agents along with maintenance of oral hygiene by use of proper brushing technique in these children .²⁶ Hence this stage of dental caries is reversible and tooth structure can be remineralized to normal enamel by topical application of remineralizing agents professionally eg:- Fluoride Varnishes, Casein Phosphofluoride Amorphous calcium phosphate (Tooth Mousse creame) MI Varnishes etc.

Visually impaired children have limited eye-hand coordination or manual dexterity which is necessary to execute adequate oral hygiene skills such as brushing and flossing, further inability to visualize debris or calculus on the tooth surface also lead to the progression of dental caries and inflammation of periodontium. Most importantly it makes an affected individual to constantly depend on others for daily routine tasks, hurting an individual self esteem. Therefore people with the visual impairment are not in a position to detect or recognize initial caries lesions which lead to further cavitation or pulpal diseases hence halting the caries process at the initial stages of white spot lesions via topical application of remineralizing agents (self/professional) can revert the tooth back to normal stage or stop the progression of dental caries. Thereby painful experiences or loss of tooth in these children can be reduced. Further, guiding the children for maintaining the oral hygiene by tactile perception can improve the conditions of periodontium.

In recent years, it has been observed that there are various community and school dental health programs ,concerning the dental health of general population. However, very little attention has been paid to the dental health of the physically handicapped population, who actually needs to have special care and attention in this field.⁶

Therefore ,present study was conducted to evaluate the Prevalence of incipient white spot lesions in visually impaired children of Delhi NCR region by comparative analysis of Caries Assessment Spectrum and Treatment (CAST) index and International Caries Detection and Assessment System II (ICDAS-II) score criteria so that this data can be used for designing the oral health policies for school dental health programs and preventive strategies for educating parents and teachers of visually impaired children regarding oral health to reduce incidence of these lesions by application of various remineralizing agents to reverse them to normal enamel.

Further, Both ICDAS-II score criteria and CAST index have advantage over WHO score criteria 2013 as both these criterias have coding criteria for diagnosis of incipient white spot lesion is available. More elaborated prevalence of incipient white spot lesions is available by ICDAS II than Cast scoring because it has two scoring codes (i.e code 1= First visual change in enamel after air drying the tooth surface, code 2= distinct visual change in enamel) whereas CAST index has one code for it i.e code 3

In this study it was observed that (Table 1) the percentage of extent of score of decayed number of tooth surfaces according to each index. When it was calculated according to CAST index, then maximum number of decayed tooth surfaces were scored with code 3-7. After that, when the decayed is calculated with ICDAS-II index, then maximum number of decayed tooth surfaces were scored with code 1-6. Where , maximum Percentage for incipient white spot lesions as per CAST index was Code 3 i.e 59.9% (Prevalence 54.57. Table 3) where as Percentage for incipient white spot lesions as per ICDAS-II index is code 1 is 32% (Prevalence . 48.07% Table 3) and Code 2 is 24% (Prevalence 53.06% Table 3). Whereas overall prevalence of dental caries according to CAST index and ICDAS-II index was found to be 39.83% and 36.58% respectively (Table 2)

Statistical analysis was done using Wilcoxon W test, (table 4) shows p-value for CAST index i.e. 0.018 which is more significant as this index has the whole spectrum of dental caries from sound teeth to advanced caries lesions. Then p-value for ICDAS-II is 0.027 as it shows the initial lesions but does not show advanced caries lesions.

Conclusion

This study concluded that, CAST index analysed prevalence of incipient white spot lesions better in comparison to ICDAS II score criteria as it described disease distribution very well along with lesion severity, preventive or curative needs in examined population. Also it requires visual assessment without use of compressed air to dry tooth surface in epidemiological survey which is easy to use.

In case of application of self or professional application of remineralizing agent on incipient lesions for their remineralization, though we can examine their reversal from code 2 to code 1 to code 0 with ICDAS II scoring criteria But its more time consuming than CAST index because ICDAS II is two digit coding system and analysis is complex to be used in epidemiological survey, the same examination can be done with CAST index with less time consumption.

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