

Effect of Addition of Incipient Carious Lesions in Caries Diagnostic Criteria on Prevalence of Caries in North Indian Preschool Children of East Lucknow Region

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ABSTRACT

Aim and objective: To investigate the effect of the addition of incipient carious lesions into the WHO caries index on the prevalence of caries in preschoolers of East Lucknow city.

Study design: A cross-sectional observational study was conducted on 530 participants in the age-group of 3–6 years.

Materials and methods: The participants were randomly selected from nursery schools of the East Lucknow region. The dental caries status was assessed according to WHO and Ekstrand's criteria. In addition, the prevalence of cavitated and incipient carious lesions was also evaluated. The data were then subjected to statistical analysis.

Statistics: Chi-square test and Wilcoxon signed-rank test were performed to carry out statistical analysis. p value < 0.005 was taken as statistically significant.

Results: Out of 530 participants examined, caries prevalence by WHO and Ekstrand's criteria was (36.8%) and (57.4%), respectively. The mean dmft values according to WHO criteria and Ekstrand's criteria were 1.16 and 1.60, respectively. The prevalence of cavitated carious lesions was higher (66.27%) when compared with that of incipient carious lesions (33.73%).

Conclusion: A significant number of incipient carious lesions observed in the present study is an indication to include these lesions in caries diagnostic criteria. This would help in determining the exact prevalence of caries and aid in implementing proper preventive protocols for remineralization of incipient carious lesions.

Keywords: Carious lesions, Infection control, White spot lesions.

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INTRODUCTION

Dental caries in primary dentition poses a serious threat to a child's welfare. At times, undiagnosed and untreated caries lead to the destruction of tooth structure and untimely loss of an involved tooth. This, in turn, may also result in difficulty in speech, mastication, deleterious oral habits, and deviated path of eruption of permanent teeth. Caries in primary dentition, being its strong predictor in permanent dentition, has received renewed attention in recent years.¹ Various detailed caries diagnostic methods have been employed at clinical and radiographic levels.^{2,3} However, at the epidemiological level, the WHO caries index has been the most accepted method worldwide,⁴ but caries detection in this criteria is restricted to cavitation stages. The incipient carious lesions remain ignored by this criterion, resulting in underestimated caries prevalence. The progression of these lesions into cavitations has been well documented.^{1,5}

In a study, a new criterion named Ekstrand's criterion was proposed to identify incipient and cavitated stages of dental caries.⁶ It helps in the early detection of carious lesions which aids in the implementation of preventive protocols for their management and arresting their progression to cavitations. A significantly higher prevalence of incipient carious lesions compared to the cavitated ones has been reported.^{1,5,7} A remarkably high prevalence and their progression into cavitated lesions are the factors that suggest their inclusion into caries diagnostic criteria for more appropriate

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caries assessment. Thus, the present study aimed to investigate the effect of the addition of incipient carious lesions into the WHO caries index on the prevalence of caries in preschool children of East Lucknow city.

MATERIALS AND METHODS

Ethical Approval

The present study was approved by the Institutional Ethical Committee of Babu Banarasi Das College of Dental Sciences, Lucknow. Children were randomly selected from nursery and primary schools of East Lucknow area after obtaining prior permission and consent from respective school authorities and parents to examine the children in school premises.

A minimum sample size of 384 children was required to achieve a level of precision with a standard error of 0.05. A 95% confidence interval was used to calculate the sample size. A total of 530 children aged between 3 years and 6 years participated in the study including 294 (55.84 %) males and 236 (44.52%) females. The following exclusion criteria were applied: children whose parents and school authorities did not give consent, children with any permanent tooth erupted in the oral cavity, and systemic disease with any chronic ailment. Two diagnostic criteria; WHO-1997 and Ekstrand's criteria were used for the diagnosis of caries. According to Ekstrand's criteria, frank cavitations were recorded as caries, whereas incipient carious lesions were also recorded along with cavitations (Table 1). Incipient carious lesions are represented by chalky, rough, white spot lesions without surface breakdown located close to the gingival margins of teeth where an accumulation of plaque takes place.⁸ The units of evaluation used in the clinical exams were dmft and V1, V2, V3, V4 according to WHO and Ekstrand's criteria, respectively. The

Table 1: Summary of caries diagnosis criteria codes, according to WHO and Ekstrand's criteria

WHO criteria		Ekstrand's criteria	
A	Sound tooth	V0	No or slight change in enamel translucency after prolonged air-drying (5 seconds).
B	Cavitated tooth	V1	Opacity or discoloration is hardly visible without drying, but visible after air-drying.
C	Tooth filled with cavity	V2	Opacity or discoloration is visible even without air-drying.
D	Tooth filled with no cavity	V3	Localized enamel breakdown in opaque or discolored enamel and/or grayish discoloration from the underlying dentin.
E	Tooth missing as a result of caries	V4	Cavitation in opaque or discolored enamel exposing the dentin.

Missing and filled teeth by WHO criteria were considered as same in Ekstrand's criteria

Table 2: Prevalence of dental caries by WHO and Ekstrand's criteria

Age	Total no. of cases	WHO criteria		Ekstrand's criteria		Statistical significance	
		No. of children with caries	% of children with caries	No. of children with caries	% of children with caries	χ^2	p
3-4 Years	137	36	26.3	67	48.9	14.950	<0.001
4-5 Years	209	79	37.8	135	64.6	30.027	<0.001
5-6 Years	175	77	44.0	99	56.6	5.532	0.019
6 Years	9	3	33.3	3	33.3	0	1
Total	530	195	36.8	304	57.4	44.988	<0.001

clinical examinations were conducted at the preschools under field conditions (daylight: without access to a dental unit and radiography). The gauze was used to clean the teeth, favoring the identification of incipient carious lesions. A mouth mirror and CPITN probe (Trigiene dental company) was used to confirm questionable findings. All examinations were carried out by a single dentist under strict cross-infection control measures.

Statistical Analysis

Categorical variables were compared by Chi-square (χ^2) test. Wilcoxon signed-rank test was employed to compare dmft scores by two criteria. The analyses were performed using Statistical Package for Social Sciences SPSS 13.0 (SPSS Inc., Chicago, IL, USA) statistical software. For all analyses, an alpha level of 0.05 and a confidence interval of 95% were used.

RESULTS

Caries prevalence according to Ekstrand's criteria was reported to be higher than that by WHO criteria. Chi-square test (χ^2) showed this difference to be statistically significant ($p < 0.001$) (Table 2). The number of caries-free children was reported to be higher by WHO criteria (63.2%) when compared with that reported by Ekstrand's criteria (42.6 %). Caries prevalence was higher in females (39% by WHO criteria, 58.9% by Ekstrand's criteria) when compared with males (35% by WHO criteria, 56.1% by Ekstrand's criteria). The dmft scores were increased by Ekstrand's criteria when compared with the WHO criteria. Wilcoxon signed-rank test showed a statistically significant difference between dmft values by WHO and Ekstrand's criteria ($p < 0.005$) (Fig. 1).

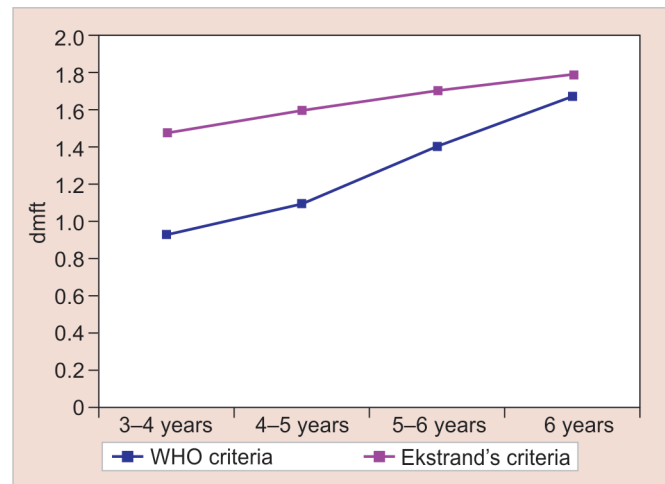


Fig. 1: Comparison of dmft by WHO and Ekstrand's criteria

Table 3: Prevalence of cavitated and incipient carious lesions

Total number of teeth examined	Total no. of carious lesions	No. of cavitated carious lesions	% of cavitated carious lesions	No. of incipient carious lesions	% of incipient carious lesions
10,600	848	562	66.27	286	33.73

The prevalence of cavitated carious lesions was reported to be higher when compared with incipient carious lesions (Table 3). A maximum number of incipient carious lesions were present on mandibular canines (73.3%), followed by maxillary canines (11.41%) and mandibular incisors (0.90%), whereas minimum were present on maxillary incisors (0.30%).

DISCUSSION

Caries prevalence varied drastically after the inclusion of incipient carious lesions in the WHO caries index. The overall prevalence increased after the inclusion of incipient carious lesions using Ekstrand's criteria (Table 2), which was in accordance with various studies.^{9–11} This clearly depicts the importance of incipient carious lesions which go unnoticed in the WHO caries index.

Prevalence increased with age according to WHO criteria. It could be possible due to prolonged exposure of teeth to the oral environment and cariogenic challenge, change in dietary habits, and oral hygiene practices. It can also be attributed to the fact that incipient carious lesions, which were not detected earlier by this criterion, might have progressed into cavitations. These findings were in accordance with other studies.^{12,13} Conversely, findings by Ekstrand's criteria matched with various studies, where increased prevalence with age was not reported.^{14,15} This could be due to the reason that as incipient carious lesions were already noted by these criteria, hence their progression into cavitations did not have any impact on caries prevalence with an increase in age.

According to WHO criteria, the mean dmft was lower at all age-groups as compared to Ekstrand's criteria ($p < 0.001$) except in 6 years age-group ($p = 0.655$).

The overall mean dmft by Ekstrand's criteria was higher than that obtained by WHO criteria (Fig. 1). This finding was in accordance with various studies, where also increased dmft was reported after including incipient carious lesions in caries detection.^{8,16}

According to Ekstrand's criteria, the number and percentage of cavitated carious lesions were twice that of incipient carious lesions which contributed to a significant proportion of carious lesions (Table 3). Similar results were observed by few authors;¹¹ however, contradictory results were obtained by various authors.¹⁷

A maximum number of incipient carious lesions were present on mandibular canines (73.3 %) followed by maxillary canines (11.41%) and mandibular incisors (0.90%). Minimum incipient carious lesions were present on maxillary incisors (0.30%). This could be attributed to the plaque accumulation on mandibular canines due to improper cleaning of these teeth. These findings were different from those obtained by authors, where such lesions were present on molars.^{9,11}

Incipient carious lesions remain ignored by WHO criteria leading to underestimated caries prevalence. These lesions may progress to cavitations if not diagnosed and treated initially.^{1,5} However, their early detection followed by preventive measures result in remineralization and finally their arrest.¹⁸ Hence, if these lesions are incorporated in caries detection criteria, their progression can be arrested on time.

CONCLUSION

The observations from the present study strongly depict that incipient carious lesions contribute to a significant proportion of total carious lesions. Hence, the evaluation of incipient carious lesions should be included in the WHO caries index to detect these undiagnosed lesions.

The epidemiological application of this criteria would help in determining the exact prevalence of caries in deciduous dentition, thereby aid in implementing proper preventive protocols for remineralization of incipient carious lesions.

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REFERENCES

- Warren JJ, Levy SM. Longitudinal study of non-cavitated carious lesion progression in the primary dentition. *J Public Health Dent* 2006;66(2):83–87. DOI: 10.1111/j.1752-7325.2006.tb02560.x.
- Nyvad B, Machiulskiene V, Baelum V. Reliability of a new caries diagnostic system differentiating between active and inactive caries lesions. *Caries Res* 1999;33(4):252–260. DOI: 10.1159/000016526.
- Pitts N. "ICDAS"—an international system for caries detection and assessment being developed to facilitate caries epidemiology, research and appropriate clinical management. *Community Dent Health* 2004;21(3):193–198.
- World Health Organization. Oral health surveys basic methods. Geneva: World Health Organization; 1997. p. 85.
- Amarante E, Raadal M, Espelid I. Impact of diagnostic criteria on the prevalence of dental caries in Norwegian children aged 5, 12 and 18 years. *Community Dent Oral Epidemiol* 1998;26(2):87–94. DOI: 10.1111/j.1600-0528.1998.tb01933.x.
- Ekstrand KR, Ricketts DN, Kidd EA. Reproducibility and accuracy of three methods for assessment of demineralization depth on the occlusal surface: an in vitro examination. *Caries Res* 1997;31(3):224–231. DOI: 10.1159/000262404.
- Autio-Gold JT, Tomar SL. Prevalence of non-cavitated and cavitated carious lesions in 5-year old head start school children in Alachua County, Florida. *Pediatr Dent* 2005;27(1):54–60.
- Parisotto TM, Steiner-Oliveira C, Souza-e-Silva CM, et al. Assessment of cavitated and active non-cavitated caries lesions in 3- to 4-year old preschool children: a field study. *Int J Paediat Dent* 2012;22(2):92–99. DOI: 10.1111/j.1365-263X.2011.01171.x.
- Warren JJ, Levy SA, Kanellis MJ. Dental caries in the primary dentition: assessing prevalence of cavitated and non-cavitated lesions. *J Public Health Dent* 2002;62(2):109–114. DOI: 10.1111/j.1752-7325.2002.tb03430.x.
- Correa Kassawara AB, Assaf AV, de Castro Meneghim M, et al. Comparison of epidemiological evaluations under different caries diagnostic thresholds. *Oral Health Prev Dent* 2007;2:137–144.
- Kuvvetli SS, Cildir SK, Ergeneli S, et al. Prevalence of noncavitated and cavitated carious lesions in a group of 5-year-old Turkish children in Kadikoy, Istanbul. *J Dent Child* 2008;75:158–163.
- Simratvir M, Moghe GA, Thomas AM, et al. Evaluation of caries experience in 3-6-year-old children, and dental attitudes amongst the caregivers in the Ludhiana city. *J Indian Soc Pedod Prev Dent* 2009;27(3):164–169. DOI: 10.4103/0970-4388.57097.

13. Gadhiane AM, Patil M, Khatib N, et al. Prevalence and determinants of early childhood caries among the children attending Anganwadis of Wardha district, India. *IJDR* 2013;24(2):199–205.
14. de Carvalho FS, Paz de Carvalho CA, da Silva Bastos R, et al. Dental caries experience in preschool children of Bauru, SP, Brazil. *Braz J Oral Sci* 2009;8(2):97–100.
15. Malvania EA, Krishnan A. Nursing caries prevalence among preschool children of Piparia village. *J Oral Health Community Dentis* 2011;5(1):37–41. DOI: 10.5005/johcd-5-1-37.
16. Gonzá'lez MC, Ruíz JA, Fajardo MC. Comparison of the defindex with Nyvad's caries diagnostic criteria in 3- and 4-year-old Colombian children. *Pediatr Dent* 2003;25:132–136.
17. Ismail AI, Brodeur J-M, Gagnon P, et al. Prevalence of noncavitated and cavitated lesions in a random sample of 7- to 9-year-old schoolchildren in Montreal, Quebec. *Community Dent Oral Epidemiol* 1992;20(5):250–255. DOI: 10.1111/j.1600-0528.1992.tb01693.x.
18. Trairatvorakul C, Kladkaew S, Songsiripradaboon S. Active management of incipient caries and choice of materials. *J Dent Res* 2008;87(3):228–232. DOI: 10.1177/154405910808700301.