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ORIGINAL RESEARCH ARTICLE

Assesment of Dental Caries Based on CAST, ICDAS II and Nyvad's Criteria in Primary Molars

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Abstract

Purpose: This study aims to test and compare three caries measurement methods, including the Caries Assessment Spectrum and Treatment (CAST), the International Caries Detection and Assessment System (ICDAS), and the Nyvad' criteria, to assess the degree and severity of dental caries in primary molars.
Materials and Methods: A descriptive cross-sectional study was conducted with 200 children aged 3-5 years to evaluate primary molars based on the CAST, ICDAS II, and Nyvad criteria by two calibrated dentists. Intra- and inter-examiner reliability was established. Statistical significance was accepted at $p<0.05$.
Results: The inter-examiner Kappa coefficient values of agreement were 95% for the Nyvad criteria, 97% for the CAST score, and 93.6% for the ICDAS II score. There was a statistically significant difference in the distributions of ICDAS II scores according to CAST scores ($p = 0.001$). Furthermore, 87.5% of teeth classified as sound by the CAST method were also classified as sound according to the ICDAS II score. The rate of teeth with enamel caries according to both CAST and ICDAS II was 89.9%, while the rate of teeth with dentine caries is according to both methods was 92.1%. The mean caries rates according to the Nyvad criteria was statistically significantly lower than that for CAST and ICDAS II ($p<0.05$). According to all indices, no significant difference in caries rates existed between the sexes ($p > 0.05$).
Conclusions: This study revealed significant differences in caries prevalence rates with the application of different diagnostic criteria; the Nyvad criteria yielded lower caries rates compared to CAST and ICDAS II scores, likely due to its activity-based diagnostic thresholds. These outcomes could inform clinical practice and guide future research on caries prevention and intervention strategies in pediatric populations.

Keywords: Primary molar; Dental caries; CAST; ICDAS II; Nyvad criteria

Introduction

Despite notable variations in the frequency and severity of oral health problems, dental caries remains the most prevalent oral disease and poses a significant public health risk.[1] Accurately identifying the presence and severity of carious lesions is the first step in selecting appropriate preventive and treatment strategies.[2] Recently, the ORCA and the IADR Cariology Research Group published a paper emphasizing the importance of evaluating caries severity in planning preventive and therapeutic interventions.[3] Reliable caries detection and categorization can facilitate the diagnosis of enamel lesions, identify individuals at risk for caries, and guide the development of non-operative treatments. Furthermore, precise classification of dentine lesions provides valuable information for tissue preservation.[2]

Standardized diagnostic thresholds offer a foundation for measuring carious lesions, allowing for comparisons of caries state and prevalence. However, it has been noted that there is no consensus on which criteria and methods should be employed for caries diagnosis, and few studies have assessed different approaches to evaluating caries in epidemiological surveys involving pediatric populations.[4] Over the past few decades, the number of novel methods for measuring caries in different populations has significantly increased, and they employ various diagnostic cut-off points.[5]

The Nyvad Caries Diagnostic System, proposed by Nyvad in 1999, established a classification method that specifies precise standards for assessing the activity of both cavitated and non-cavitated lesions. Based on visual-tactile caries classification, the Nyvad

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criteria address carious signs in the pre-cavitation stages and differentiate between active and inactive caries at both cavitated and non-cavitated levels. [6,7]

The International Caries Detection and Assessment Tool (ICDAS II), provided another set of diagnostic criteria, in 2005 to support the identification of non-cavitated caries lesions. One of the advantages of the ICDAS II index is its ability to distinguish between stages of caries progression in early enamel, enamel, and dentin. [8,9] However, it is not suitable for analyzing dentin caries that have progressed to the pulp or abscess stage. The ICDAS method calls for the direct visual inspection of clean teeth with careful drying of the lesioned area for the diagnosis of early carious lesions. [10,11] To provide a reliable data system that integrates the criteria of both the WHO-DMFT and ICDAS II, Frencken proposed the Caries Assessment Spectrum and Treatment (CAST) index in 2011. This index does not require drying the tooth surface and it can identify all types of dental caries, including pulp involvement, abscess/fistula, tooth loss, and preventive (fissure sealants) and restorative (direct/indirect) caries related to enamel and dentin. [12,13]

Morphological characteristics of primary molars in children aged 3–5 years further justify the need for sensitive diagnostic methods. Primary teeth exhibit thinner enamel and dentin layers, larger pulp chambers, and less mineralized hard tissues compared to permanent teeth. [14,15] These structural differences facilitate faster caries progression and may obscure early lesion detection during conventional visual examination. [16] Moreover, the occlusal anatomy of primary molars, including shallower fissures and broader contact areas, can influence caries distribution and detection sensitivity. [17] Therefore, diagnostic systems capable of identifying early and subtle changes in enamel and dentin are particularly important in this age group to ensure timely and minimally invasive management. Previous studies have been conducted to evaluate caries in school-aged children using three different detection methods. [2,18] However, in the present study, the primary molars of Turkish children aged 3 to 5 years are evaluated for the first time in the literature using three different detection methods. This study addresses the prevalence of dentin caries, enamel caries, and pre-cavitated carious lesions in greater depth, together with clinical outcomes of dental caries including (-tooth loss, pulp involvement, and abscess/fistula-). The findings could support the development of dental caries prevention methods at both individual and community levels by guiding oral health care professionals in selecting appropriate diagnostic criteria for estimating caries prevalence.

Material and Methods

Study design

This descriptive cross-sectional study was conducted with Turkish children aged 3-5 years in İstanbul, Türkiye between November 2022 and July 2023. Ethical approval was acquired from the Research Ethics Board of the Altınbaş University Faculty of Dentistry (2022/164). Following an explanation of the study's aims, the parents' or guardians' of all participating children provided written informed consent before the research began.

Sample size

A minimum sample size of 69 participants was determined for this study, with 5% (two-tailed) probability of statistical significance, 80% power, and 50% prevalence of primary molars caries. [12,19] It should be noted that the sample selection was hospital-based, not community-based, as all participants were recruited from children presenting to the pediatric dental clinic rather than from the general population. A total of 225 children who presented to the Altınbaş University Faculty of Dentistry's Pediatric Dentistry Clinic due to pain or for a standard check-up were invited to participate in the study. Twenty-five children were not eligible for enrollment due to a lack of cooperation during the dental examination or a lack of written informed consent. Thus, the total sample comprised 200 children. Only children with all eight erupted primary molars were selected for further analysis. Children with hypoplasia or developmental abnormalities affecting their primary molars were excluded. Children with eruption of any of the first permanent molars were also excluded, because in these cases it is clinically difficult to determine whether there is a carious lesion in the distal region of the primary second molars.

Examiners' training and calibration

With appropriate guidance, two examiners (S.C.I. and H.O.) received training for this study from the Department of Pediatric Dentistry. For each caries diagnostic technique, a training session was held that included both theoretical and practical components. The theoretical component involved a literature review and a PowerPoint presentation on the CAST, ICDAS II, and Nyvad criteria. The practical component consisted of each examiner examining and scoring extracted primary molars. The examiners compared their individual scores, and in the event of a discrepancy, they deliberated on the results until a consensus was reached.

Clinical calibration was conducted in December 2023 in the Altınbaş University, Department of Pediatric Dentistry. During this session, 20 children aged 3 to 5 years were examined and re-examined four times (twice by each examiner) using each detection method over a two-week period. It was aimed to evaluate the reproducibility as well as intra- and inter-examiner reliability of the diagnostic techniques employed.

Dental examination

The dental examinations were conducted in the period from January 2023 to June 2023. The children were examined on a dental chair using a dental light and dental instruments, including a WHO probe and a plain dental mirror. All of the children brushed their teeth prior the clinical examination. The probe was also used to remove dental plaque or debris that was still present after tooth-brushing.

To record the score for each primary molar using each diagnostic method, a form was prepared. All of the children's primary molars were examined by the two calibrated examiners according to the three caries diagnostic methods as described in Table 1. The CAST system is hierarchical and covers the full caries spectrum, from a sound surface to pit and fissure sealants, dental fillings, caries lesions in enamel and dentine, and pulpal and periapical inflammation up to tooth loss as a result of caries. In this study, CAST code 9 was assigned to teeth with clinical conditions not represented by codes 0–8, including broken restorations, traumatic tooth loss, and developmental defects. These teeth were excluded from the primary caries analyses, as they do not reflect carious lesions. For the ICDAS II, potential scores for the caries stage assessment range from sound to extensive, distinct cavities with visible dentine, as follow: sound (score of 0), enamel caries (score of 1–3), and dentinal caries (score of 4–6). [8,10] The ICDAS two-digit coding system is recommended for identifying restorations and sealants, with the first digit representing the type of restoration/sealent and the second digit indicating the specific caries code. [17] To record the surface condition in line with the the Nyvad criteria, the examiners assigned one of nine possible scores according to active/inactive caries stage. [20] The higher score was recorded in cases where two different conditions were present on the same surface. For ICDAS II and CAST assessments, scores were initially recorded at the tooth surface level. When different scores were observed on different surfaces of the same tooth, the highest score representing the most

Table 1. Caries diagnostic methods

CAST			ICDAS II		Nyvad's Criteria	
0	**Sound**	No visible evidence of a distinct carious lesion is present	**0**	Sound	**0**	Sound
1	**Sealent**	Pits and/or fissures are at least partially sealed with a sealant material	**1**	First visual change in enamel	**1**	Active caries (intact surface)
2	**Restoration**	A cavity is restored with an (in)direct restorative material	**2**	Distinct visual change in enamel	**2**	Active caries (surface discontinuity)
3	**Enamel**	Distinct visual change in enamel only. A clear caries discolouration is visible with or without localised enamel breakdown	**3**	Localised enamel breakdown	**3**	Active caries (cavity)
4	**Dentine**	Internal caries-related discoloration in dentine; the discoloured dentine is visible through the enamel, which may or may not exhibit a visible localised breakdown	**4**	Underlying dark shadow from dentin	**4**	Inactive caries (intact surface)
5	**Dentine**	Distinct cavitation into the dentine; the pulp chamber is intact	**5**	Dentine distinct cavity	**5**	Inactive caries (surface discontinuity)
6	**Pulp**	Involvement of the pulp chamber; distinct cavitation reaching the pulp chamber, or only root fragments are present	**6**	Dentine extensive cavity	**6**	Inactive caries (cavity)
7	**Abscess/Fıstula**	A pus-containing swelling or a pus-releasing sinus tract related to a tooth with pulpal involvement			**7**	Filling (sound surface)
8	**Missing**	The tooth has been removed because of dental caries			**8**	Filling+active caries
9	**Others**	Does not correspond to any of the other categories			**9**	Filling+inactive caries
					X	Extracted because of caries

severe lesion was used for tooth-level analysis. All three indices (ICDAS II, CAST, and Nyvad) were primarily compared in terms of caries presence/absence. Severity-based classification according to lesion depth (sound, enamel caries, and dentin caries) was applied only to the ICDAS II and CAST indices. The diagnostic thresholds used for comparison were defined as follows: teeth were categorized as sound, enamel caries, or dentin caries according to the corresponding codes of each system. Specifically, sound teeth were defined as CAST scores 0 and ICDAS II score 0. Enamel caries corresponded to CAST score 3 and ICDAS II scores 1, 2 and 3. Dentin caries included CAST scores 4 and 5 and ICDAS II scores 4, 5 and 6.[6,11,13] The Nyvad index, consistent with its methodology, was evaluated based on lesion activity, and lesions were classified as sound, active caries, and inactive caries.

In the CAST index, pulp involvement and abscess/fistula are classified under the 'severe morbidity' category as advanced clinical outcomes. Therefore, codes 6 and 7 were not included in the dentin caries category.

In this study, although ICDAS II is based on a two-digit coding system, lesion classification for analysis was based on the second digit (caries code) to ensure comparability with CAST and Nyvad indices. The first digit (restoration/sealant status) was recorded but not included in the definition of sound teeth. Therefore, restored but caries-free teeth were not classified as sound in the ICDAS II analysis.

Statistical analysis

IBM SPSS Statistics 22 was used to analyze the data. The Kolmogorov-Smirnov test revealed that the studied parameters did not acomply with normal distribution. In addition to descriptive statistical methods (i.e., minimum, maximum, mean, standard deviation, median, and frequency values), the Friedman test and Wilcoxon signed-rank test were used to compare quantitative data. The Chi-Square test was employed to compare qualitative data. The Kappa coefficient of agreement was calculated to assess the level of agreement between examiners and scores. Statistical significance was accepted at $p<0.05$.

Results

Of the 200 children who took part in this study, 110 (55%) were female and 90 (45%) were male. All children were between the ages of 3 and 5 years, with a mean age of 4.57±0.64 years.

Inter- and intra-examiner agreement rates during calibration for Nyvad, CAST, and ICDAS II criteria are shown in Table 2. The inter-examiner Kappa coefficient values of agreement were 95% for the Nyvad criteria, 97% for the CAST score, and 93.6% for the ICDAS II score. For intra-examiner agreement, all Kappa coefficient values were 100% for both the Nyvad criteria and the CAST score, while for the ICDAS II score, they were 100% and 98.3%. These findings confirmed the existence of substantial agreement between the three diagnostic methods.

The distributions of Nyvad criteria, CAST, and ICDAS II scores for the assessed primary molars are shown in Table 3. There was a statistically significant difference in the distribution of ICDAS II scores according to CAST scores ($p=0.001$; $p<0.05$). According to the Nyvad criteria, 62% of the teeth had caries, while according to the CAST and ICDAS II scores, this rate was 60.5%. The Kappa coefficients of agreement were 0.953 between the Nyvad criteria and CAST scores, 0.961 between the Nyvad criteria and ICDAS II sscore, and 0.976 between the CAST and ICDAS II scores (Table 4).

There was a statistically significant difference in mean caries rates between the three indices ($p=0.001$; $p<0.05$). The mean caries rates according to the Nyvad criteria was statistically significantly lower than that for the CAST and ICDAS II methods ($p<0.05$). There was no statistically significant difference between the CAST and ICDAS II ($p>0.05$) (Table 5). No significant difference in caries rates was found between the sexes with any of the selected methods ($p>0.05$) (Table 6).

Discussion

The objective of caries assessment methods is to evaluate and record uniform and standardized data about tooth condition, producing data that could be used for clinical, research, and epidemiological purposes.[5] A variety of caries assessment methods have been devel-

Table 2. Inter- and intra-examiner agreement during calibration for NYVAD's criteria, CAST, and ICDAS II

	NYVAD's criteria		CAST		ICDAS II	
	Kappa	95% CI	Kappa	95% CI	Kappa	95% CI
Inter examiners						
Examiner 1-2	0.950	0.895-1.000	0.970	0.929-1.000	0.936	0.875-0.998
Intra examiners						
Examiner 1	1.000	1.000-1.000	1.000	1.000-1.000	1.000	1.000-1.000
Examiner 2	1.000	1.000-1.000	1.000	1.000-1.000	0.983	0.951-1.000

Table 3. Distribution of the Nyvad's Criteria, CAST, ICDAS II codes in the evaluated primary molars

	Codes	n	%		Codes	n	%		Codes	n	%
CAST	**0**	547	34.1	**ICDAS II**	**0**	553	34.6	**Nyvad's Criteria**	**0**	550	34.4
	1	4	0.3		**1**	8	0.5		**1**	38	2.4
	2	73	4.6		**2**	69	4.5		**2**	161	10.1
	3	159	9.9		**3**	108	6.6		**3**	656	41
	4	163	10.2		**4**	136	7.4		**4**	37	2.3
	5	409	25.6		**5**	280	17.5		**5**	49	3
	6	177	11.1		**6**	358	23.7		**6**	17	1.1
	7	55	3.4						**7**	58	3.6
	8	5	0.3						**8**	20	1.3
	9	8	0.5						**9**	9	0.6
									X	5	0.3
CAST	**Sound**	624	39	**ICDAS II**	**Sound**	553	34.6	**Nyvad's Criteria**	**Sound**	608	38
	Enamel caries	159	9.9		**Enamel caries**	185	11.6		**Active caries**	875	54.7
	Dentine caries	572	35.8		**Dentine caries**	774	48.6		**Inactive caries**	112	7

Table 4. Caries distributions according to Nyvad's criteria, CAST, and ICDAS II, along with kappa coefficients of agreement for these index

	Caries absent	Caries present
	n (%)	n (%)
Nyvad's criteria	608 (%38.0)	992 (%62.0)
CAST	632 (%39.5)	968 (%60.5)
ICDAS II	632 (%39.5)	968 (%60.5)
	Kappa	**95% CI**
Nyvad's criteria - CAST	0.953	0.937-0.968
Nyvad's criteria - ICDAS II	0.961	0.947-0.975
CAST - ICDAS II	0.976	0.966-0.987

oped over time for various objectives and each has unique strengths and shortcomings; however, they are frequently utilized in comparable circumstances.[2] With a study sample of children aged 3-5 years-old, this study aimed to evaluate caries data obtained for primary molars using three different scoring systems: the ICDAS II, CAST, and Nyvad criteria.

In this study, both intra- and inter-examiner reliability were high while using the Nyvad criteria, the CAST score, and the ICDAS II score, which helped to ensure dependable data. These findings emphasize that more thorough assessment methods do not compromise reliability as long as the examiners are well calibrated.

The ICDAS II method offers multiple advantages, particularly in terms of its high accuracy. By coding the various stages of a lesion, it enables clinicians and researchers to distinguish between different phases of carious lesions.[2,13] However, in clinical practice, the ICDAS II method is considered the most complex due to its two-digit coding system, whereby the first digit denotes fillings and sealants and the second digit indicates the presence of carious lesions. Enamel lesions are categorized into three distinct levels. During examinations, it is essential to classify each tooth surface using these two digits and assess each surface both before and after drying the tooth. Previous studies have highlighted the limitations of the ICDAS II method, and these findings have been confirmed in this study as well. The reliance on a two-digit coding system and an extensive number of codes, which complicate the data analysis, and the requirement of air-drying tooth surfaces which add to the time needed to apply this method.[9,21,22] These drawbacks were confirmed in the present study Furthermore, in this study, the ICDAS II method demonstrated relatively lower agreement compared to the CAST score and Nyvad criteria. Accordingly, the ICDAS II method resulted in a greater number of misclassification errors than the other methods. The higher rate of misclassification observed with the ICDAS II method may be attributed to its complex two-digit coding system, which increases the likelihood of recording errors during clinical examination and data entry.[11,23] Additionally, the requirement for air-drying tooth surfaces and the subjective interpretation of early enamel changes may introduce variability between examiners, thereby contributing to potential misclassification.[8,17]

Particularly, ICDAS code 3 lesions represent a diagnostic challenge, as visual criteria may not consistently correspond with the actual histological depth of the lesion, leading to discrepancies in enamel versus dentin classification.[24,25] In the present study, these lesions were classified as enamel caries; however, histological validation studies of the ICDAS II system have shown that code 3 lesions frequently extend into the outer or even middle third of dentin. Previous research also emphasized that the visual characteristics of code 3 may reflect subsurface dentin demineralization, rather than being confined to enamel.[23,25] Therefore, classifying all ICDAS code 3 lesions as enamel caries in this study might have led to a slight underestimation of dentin caries prevalence, which should be taken into account when interpreting the findings.

Several studies have noted that the CAST method is straightforward to implement and analyze. There were no without experiencing challenges experienced during its application in calibration or clinical assessments, nor in the subsequent analysis. This method entails 10 hierarchical codes and does not require the teeth to be dried, which enhances its ease of use.[21,22] From an epidemiological perspective, the CAST index offers a significant cost-effectiveness advantage, as it does not require air-drying, compressed air devices, or extensive clinical setup.[13,26] Its hierarchical structure and simplified coding system reduce examination time and facilitate easier data recording and analysis, making it particularly suitable for large-scale field studies.[13,27] Moreover, the ability of CAST to capture the full spectrum of caries, including advanced clinical outcomes such as pulp involvement and tooth loss, enhances its utility in public health surveillance and planning.[5,13] These characteristics make the CAST index a pragmatic and resource-efficient alternative for epidemiological surveys, especially in settings with limited infrastructure.[26,27] In contrast to the ICDAS II system, which uses

Table 5. Comparison of caries according to Nyvad's criteria, CAST and ICDAS II

	Caries		
	n	**Min-Max**	**Mean±SD (median)**
Nyvad's criteria	992	1-9	2.98±0.94 (3)
CAST	968	3-7	4.79±1.10 (5)
ICDAS II	968	1-7	4.76±1.30 (5)
[1]p			0.001*
Nyvad's criteria - CAST [2]p			0.001*
Nyvad's criteria - ICDAS II [2]p			0.001*
CAST - ICDAS II [2]p			0.176

[1]Friedman Test [2]Wilcoxon sign test *p<0.05
*Caries for CAST score; 3,4,5, Caries for ICDAS II score; 1,2,3,4,5,6, Caries for Nyvad score; 1,2,3,4,5,6

Table 6. Evaluation of caries rates according to Nyvad's criteria, CAST and ICDAS II according to gender

	Female (n=880)	**Male (n=720)**	
Rate of caries	**n (%)**	**n (%)**	**p**
Nyvad's criteria	544 (%61.8)	448 (%62.2)	0.868
CAST	537 (%61.0)	431 (%59.9)	0.636
ICDAS II	535 (%60.8)	433 (%60.1)	0.789

Chi-square test

three stages of enamel caries lesions, the CAST scoring system possesses only one category for enamel caries lesions.[28] In the present study, according to CAST scores, the rate of enamel caries was 9.9%. In contrast, according to ICDAS II scores, this rate was 11.6%. Furthermore, the difference in enamel caries prevalence between the CAST and ICDAS II systems should be considered an expected outcome arising from the diagnostic thresholds and application characteristics of each index. In the literature, when comparing ICDAS II and CAST, it has been reported that ICDAS II has the capacity to detect early-stage enamel lesions, particularly subtle changes revealed after air-drying, whereas CAST focuses on more pronounced premorbid and morbid lesions, resulting in higher prevalence rates observed with ICDAS II.[5] This difference may be due to the fact that CAST evaluates tooth surfaces without drying, which limits its ability to identify the earliest clinical changes in enamel, while the air-drying step in ICDAS II allows these early lesions to be detected, thereby increasing measured prevalence.[5] Therefore, the observed discrepancy between the two systems should be interpreted as a methodological classification difference.

The benefit of using the Nyvad's criteria is that non-cavitated lesions are diagnosed with this method, allowing for the using application of treatments to stop the lesion's progression and reducing the need for long-term therapy. Furthermore, this method evaluates the activity of carious lesions, faciliating cost/benefit assesments of possible treatment options.[29] In the present study, the mean caries rates according to the Nyvad criteria were statistically significantly lower than those according to the CAST and ICDAS II scores, with no significant difference between CAST and ICDAS II scores. However, in a previous study, the WHO-DMFT system defined approximately two-thirds of a sample as being caries-free, whereas the ICDAS classified only one-a fifth of the teeth as sound and the CAST score and Nyvad criteria yielded intermediate results that were more similar to one another.[2] The use of only the second digit of ICDAS II may explain the lower proportion of sound teeth compared to CAST. Since restored but caries-free teeth were not considered sound in ICDAS II, this methodological difference likely contributed to discrepancies between the indices.

For the indices evaluated in this study, no statistically significant variation in caries diagnostic rates was found according to sex. This result is in line with, a previous study in which no statistically significant relationship was found between sex and dental caries according to the ICDAS II and WHO criteria.[30]

Comparing three different methods, as done in the present study, is challenging because they involve different scoring systems related to both lesion stages and restorative conditions. Moreover, the scores of these methods are not entirely comparable. This represents an important limitation of the present study, as each diagnostic system is based on distinct conceptual frameworks, diagnostic thresholds, and classification structures. While ICDAS II focuses on detailed detection and staging of carious lesions, CAST provides a hierarchical evaluation including the clinical consequences of caries, and the Nyvad criteria assess lesion activity in addition to severity. These fundamental differences limit direct comparability and may have contributed to the variations observed in caries prevalence and distribution. In addition, differences in examination protocols—such as the requirement for air-drying in ICDAS II but not in CAST—may have influenced the detection of especially early enamel lesions. Therefore, the findings of this study should be interpreted with caution, and comparisons between diagnostic systems should be considered within the context of their specific methodological characteristics.

Currently, the best clinical practices in dentistry involve either arranging for operative caries treatment for dentine cavities or non-surgical caries therapy for early lesion stages. Therefore, regardless of the method used, evaluation of lesions at an early stage increases the possibility of non-surgical treatment.[2]

Conclusion

This study showed that caries prevalence varies according to the diagnostic method used, with the Nyvad criteria yielding lower rates than CAST and ICDAS II due to its stricter assessment of lesion activity.

All methods demonstrated high reliability; however, they differ in their clinical use. The CAST index is practical and suitable for epidemiological surveys due to its simplicity and broad coverage of caries stages. ICDAS II provides detailed information on lesion severity and is more appropriate for research settings, although its complexity may limit routine use. The Nyvad criteria, by assessing lesion activity, are particularly useful for individual patient evaluation and monitoring caries progression.

In conclusion, no single method can be considered a universal gold standard. The choice of diagnostic system should depend on the purpose: CAST for epidemiological studies, ICDAS II for detailed lesion assessment, and Nyvad criteria for clinical monitoring and risk evaluation.

Ethical Approval

Ethical approval was acquired from the Research Ethics Board of the Altınbaş University Faculty of Dentistry (2022/164). Following an explanation of the study's aims, the parents' or guardians' of all participating children provided written informed consent before the research began.

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AI Statement

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Idea/Concept : S.C.I.
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Conflict of Interest

The author declare that there is no conflict of interest.

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