

# Comparative Assessment of Dental Caries Using WHO and ICDAS II Criteria in Patients Visiting a Dental Hospital in Kathmandu

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## ABSTRACT

**Introduction:** Being the most common chronic dental disease in the world, dental caries can lead to pain, discomfort and disfigurement. Therefore, its detection is of epidemiologic importance. Previously WHO system was mostly used but now days, International Caries Detection and Assessment System (ICDAS) is being preferred for its improved quality of diagnosis, prognosis, and clinical treatment of caries and dental condition.

**Objective:** The main objective of this study was to compare the caries assessment of WHO and ICDAS system in Patients Visiting a Dental Hospital in Kathmandu

**Methods:** An analytical cross-sectional study was conducted for four months among the patients visiting the department of oral medicine and radiology department of Kantipur Dental College after taking ethical approval from institutional review board of Kantipur Dental College. Informed consent was taken from each patient before the study. A predesigned standard questionnaire was used for the data collection purpose. Descriptive statistics were presented as frequency and percentages and chi square test was done to test the statistically significant difference between the variables. P value <0.05 was considered statistically significant.

**Results:** A total of 231 study participants belonging to age group 14-50 years were there out of which 102(44%) were male and 129(56%) were female. The prevalence of caries according to ICDAS and WHO was 95.2% and 92.64% respectively. Comparison of caries assessment using both ICDAS and WHO showed a highly statistically significant difference ( $p < 0.001$ ).

**Conclusions:** Caries prevalence using ICDAS system was more compared to WHO system. ICDAS system can be a better tool compared to WHO system for detecting early carious lesions.

**Keywords:** Caries, ICDAS, WHO.

## INTRODUCTION

Dental caries is the most prevalent chronic disease of the communities worldwide and primary reason for tooth pain and tooth loss. It results in localized destruction of the susceptible dental hard tissues by acidic by-products from bacterial fermentation of the dietary carbohydrates.<sup>1,2</sup> A proper caries detection and classification contributes

to identify caries risk patients, to detect exact extent of lesions, and to plan further treatment.<sup>3</sup>

For assessing and measuring dental caries among populations, Decayed–Missing–Filled (DMF) method proposed by WHO is the most common method in oral health epidemiology which provides the recording of dental caries prevalence based on the presence of cavitation.<sup>4</sup> The International Caries Detection and Assessment System (ICDAS) was developed in 2001 with the aim to create universally accepted caries detection method and caries detection at different stages. The method was later updated as ICDAS II for coronal and root surface, and for caries assessment associated with restorations and sealants (CARS).<sup>3</sup> This system assesses both the cavitated and the non-cavitated carious lesions. A school of thought states that a carious lesion should be detected at an initial stage before preceding into a cavity

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so that preventive measures can be employed to halt the process of cavitation and reduce the cost of treatment.<sup>5,6</sup> Therefore the main aim of the study was to compare the caries assessment by both the systems.

## METHODS

An analytical cross-sectional study was conducted for four months (June-September 2024) among the patients visiting the department of oral medicine and radiology department of Kantipur Dental College after taking ethical approval from institutional review board of Kantipur Dental College (IRC no. 18/24) Informed consent was taken from each patient before the study. Convenience sampling technique was used for the data collection purpose. Sample size was calculated by taking prevalence of dental caries as 81.6% from the study conducted by Joshi et al.<sup>7</sup> and using the following formula

$$N = z^2pq/e^2$$

$$(Z=1.96, q=0.184, e=0.05, P=81.6\%=0.816)^7$$

$$n = 231$$

Patients belonging to age group 14-50 years was taken for the study. Only those individuals who had complete set

of permanent dentitions were included in the study. Patient who didn't give consent for the study was not included in the study. A predesigned standard questionnaire was used for the data collection purpose. The first part of the questionnaire had demographic details and second part had recording of DMFT index proposed by WHO as well as ICDAS II index for caries assessment among the study participants. Single examiner was used for the data collection purpose. The collected data was entered in Microsoft Excel and analyzed using SPSS version 21 software and  $p$  value  $<0.05$  was considered statistically significant. Descriptive statistics were presented as frequency and percentages and chi square test was done to test the statistically significant difference between the variables.

## RESULTS

A total of 231 participants were there. Out of total participants, 129 (56%) were female and 102 (44%) were male.

The criteria for recording ICDAS<sup>8</sup> and WHO<sup>9</sup> system for recording carious lesions are presented in Table 1 and Table 2.

**Table 1.** International Caries Detection and Assessment System criteria for the recording of decayed, missing, and filled teeth and Caries Associated with Restoration and Sealants.

International Caries Detection and Assessment System criteria for the recording of decayed, missing, and filled teeth	
Code	Description
0	Sound tooth surface: No evidence of caries after 5-s air drying
1	First visual change in enamel: Opacity or discoloration (white or brown) is visible at the entrance to the pit or fissure seen after prolonged air drying
2	Distinct visual change in enamel visible when wet, lesion must be visible when dry
3	Localized enamel breakdown (without clinical visual signs of dentinal involvement) seen when wet and after prolonged drying
4	Underlying dark shadow from dentine
5	Distinct cavities with visible dentine
6	Extensive (more than half the surface) distinct cavity with visible dentine

Caries Associated with Restoration and Sealants detection criteria	
Code	Description
0	Sound: that is, surface not restored or sealed
1	Sealant, partial
2	Sealant, full
3	Tooth-colored restoration
4	Amalgam restoration
5	Stainless steel crown
6	Porcelain or gold or porcelain-fused- to-metal crown or veneer or inlay or onlay or other restorative material
7	Lost or broken restoration
8	Temporary restoration
96	Tooth surface cannot be examined
97	Tooth missing because of caries
98	Tooth missing for reasons other than caries
99	Un erupted

**Table 2.** World Health Organization criteria for the recording of decayed, missing, and filled teeth.

Code	Description
Sound tooth	<p>A crown was coded as sound if it showed no evidence of treated or untreated clinical caries. A crown with the following defects, in the absence of other positive criteria, was coded as sound:</p> <ul style="list-style-type: none"> <li>• white or chalky spots;</li> <li>• discolored or rough spots that were not soft to touch with a metal Community Periodontal Index (CPI) probe;</li> <li>• stained enamel pits or fissures that did not have visible cavitation or softening of the floor or walls detectable with a CPI probe;</li> <li>• dark, shiny, hard, pitted areas of enamel in a tooth showing signs of moderate to severe enamel fluorosis;</li> <li>• lesions that, on the basis of their distribution or history, or on examination, appear to be due to abrasion</li> </ul>
Decayed tooth	<p>Caries was recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, had an unmistakable cavity, undermined enamel, or a detectably softened floor or wall. A tooth with a temporary filling, or one which is not only sealed but also decayed, was also included in this category. The CPI probe was used to confirm visual evidence of caries on the tooth surface(s). Where any doubt existed, caries was recorded as absent. A filled tooth was considered as decayed tooth when it had one or more permanent restorations and one or more areas that were decayed</p>
Missing tooth	<p>This code was used for permanent or primary teeth that had been extracted because of caries</p>
Filled tooth	<p>A crown was considered filled when one or more permanent restorations were present and there was no evidence of caries anywhere on the tooth. A tooth that had been crowned because of previous decay was also recorded in this category</p>

According to ICDAS II criteria, 220 (95.2%) had dental caries and according to WHO criteria, 214 (92.64%) had dental caries. Prevalence of dental caries was significantly higher ( $p < .001$ ) using the ICDAS criteria compared to WHO criteria (Table 3).

According to ICDAS II criteria, non cavitated lesion was found in 45(2.38%) teeth in male and 67(2.93%) teeth in female. Cavitated lesion was found in 347(18.33%) teeth of male and 488(21.44%) teeth of female. Score 3

was found to be in greater number of teeth. Prevalence of CARS was 147(7.8%) teeth in male and 193(8.45%) teeth in female. According to WHO criteria, decayed teeth were 343(17.09%) in male and 451(19.99%) in female (Table 4).

On applying chi square test, no any statistically significant association was found between dental caries and gender based on both the ICDAS II criteria and the WHO criteria (Table 5).

**Table 3.** Difference in caries occurrence between ICDAS and WHO systems.

Caries status	ICDAS	WHO	P value
Present	220(95.2)	214(92.64)	<0.001*
Absent	11(4.76)	17(7.35)	

\*=statistically significant (chi square test)

**Table 4.** Detail findings using ICDAS and WHO criteria

ICDAS II	Male	Female
0	1350(71.4)	1530(66.98)
1	6(0.32)	15(0.66)
2	39(2.06)	52(2.27)
3	163(8.62)	195(8.54)
4	19(1)	26(1.13)
5	127(6.71)	183(8)
6	38(2)	84(3.77)
CARS	147(7.8)	193(8.45)
Missing due to other reasons	1(0.053)	6(0.26)
WHO Criteria		
Sound teeth	1400(69.79)	1592(70.57)
Decayed teeth	343(17.09)	451(19.99)
Missing due to caries	131(6.53)	73(3.24)
Filled	132(6.58)	140(6.21)

**Table 5.** Association between dental caries and gender using ICDAS II and WHO criteria

Caries status	Male n(%)	Female n(%)	P value
ICDAS			
Present	95(93.1)	125(96.9)	0.221NS
absent	7(6.9)	4(3.1)	
WHO			
Present	94(92.2)	120(93.0)	0.806NS
absent	8(7.8)	9(7.0)	

## DISCUSSION

To create awareness among the community, early detection of incipient caries is one of the important steps in modern dentistry.<sup>10</sup> For treatment of dental caries as well its proper detection is an important step.<sup>11</sup> For the comparison of caries status and prevalence in different populations and countries worldwide, there are methods to measure carious lesions that are based on standardized diagnostic thresholds.<sup>3</sup> In this study we have used the recent as well as commonly used caries detection systems i.e. WHO system and ICDAS system for caries assessment as well as their comparison in the caries assessment. In the present study caries assessment using ICDAS system was significantly higher compared to the WHO system. This finding is similar to other studies done in the past.<sup>9,12</sup> This finding is because of the fact that ICDAS II can detect non cavitated lesions as well but WHO caries detection method cannot. Because of this reason, ICDAS provides early detection of carious lesions making it possible to contemplate preventive dental care, whereas using WHO systems early stages of caries management cannot be addressed. The distribution of caries code according to ICDAS II showed greatest percentage in code 3 for both male and female followed by code 5. The finding is similar to the study conducted by Reddy, et al.<sup>10</sup> The least percentage was found in score 1 for both male and female in the present study. The highest prevalence of cavitated lesion could be due to low dental attendance and not properly utilizing the preventive measures. But the findings are in contrast to the study conducted by Ponnudurai Arangannal et al.<sup>13</sup> where the prevalence of non cavitated lesion is higher. In the present study CARS Codes 10, 20, 30, 40, 50, 60, 70, 80, 97 were considered and the prevalence was found to be 7.8% in male and 8.45% in female. Similar studies in the past showed the prevalence of CARS to be 1.39<sup>12</sup> and 0.49%<sup>10</sup> respectively. Lesser use of Sealants and

restorations indicates the lack of awareness for prevention of oral diseases. Gender wise comparison of caries using both ICDAS and WHO criteria showed slight difference in caries occurrence in female i.e higher in female compared to male but which was not statistically significant in both cases. This finding coincides with other studies.<sup>13-15</sup> This can be attributed to number of facts, including early eruption of teeth in girls compared to boys, less dental attendance on the part of female due to lack of financial independence.<sup>14</sup>

The limitations of the study are that the intra-examiner variability could not be assessed as it was not feasible to re-examine the study subjects later. Also, this study was conducted at a single center so that the findings cannot be generalized to all over the country.

## CONCLUSIONS

For the assessment of caries ICDAS seems better compared to WHO criteria since it can detect non cavitated lesions as well. The prevalence of cavitated lesions was more compared to non cavitated lesions in the present study suggesting urgent treatment of those lesions before progressing to pulp. Also repeated awareness as well as preventive programs should be conducted to decrease the dental caries risk as well as to minimize the need for invasive, expensive and painful treatment procedures in the future.

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**Conflict of Interest:** None

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