Icdas Score Comparison in Diabetic Vs Non Diabetic Patients Among South Indian Population

Running title - Comparison of ICDAS scores in diabetic vs non diabetic patients.

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ABSTRACT

AIM: The aim of this study was to compare the ICDAS score in diabetic vs non diabetic patients.

BACKGROUND: Dental caries is a complex multifactorial disease of the calcified tissues of the teeth, caused by interaction of various factors including the host, agent, substrate and time as demonstrated by the Keyes circle. Detecting carious lesions at the earliest possible stage of its development is definitely helpful in appropriate treatment planning for the same. The lack of consistency among the contemporary criteria systems for detecting carious lesions limits the comparability of outcomes measured in epidemiological and clinical studies. Therefore, the ICDAS criteria was developed by an international team of caries researchers to integrate several new criteria systems into one standard system for caries detection and assessment. It is a clinical scoring system for use in dental education, clinical practice, research, and epidemiology, and provides a framework to support and enable personalized total caries

management for improved long-term health outcomes. This study aims to compare the ICDAS score in diabetic vs non diabetic patients.

MATERIALS AND METHODS: A retrospective cross-sectional study was conducted using patient records from Saveetha Dental College, Chennai after reviewing and analysing the data of 74092 patients between June 2019 and March 2021. Microsoft Excel® was used to tabulate the data. The variables involved were gender, age group and factors associated with ridge augmentation and graft materials used. Data was then exported to the Statistical Package for Social Sciences (SPSS) for Windows (Version 19, 2010) for further analysis.

RESULTS: The sample size was 778 subjects. From the results obtained, we can observe that About 41.61% were Males and 58.39% were females. Association of risk assessment in ICDAS scoring between diabetic and non diabetic population revealed that diabetic patients were more in high risk category compared to non diabetic population. association in ICDAS scoring between diabetic and non diabetic population also revealed that diabetic patients were more in severe category.

CONCLUSION: Within the limitations of the given study, we can conclude that diabetic patients had more ICDAS scores as well as more prone to poor oral health compared to non diabetic patients.

KEYWORDS: ICDAS, caries, diabetes, periodontally compromised, innovative.

INTRODUCTION

The understanding of the caries process has continued to advance with the vast majority of evidence supporting caries as a dynamic process, which is affected by numerous modifiers tending to push the mineral equilibrium in one direction or another, i.e. towards remineralization or demineralization.1 With this greater understanding of the disease, there is a thrust to promote ‘preventative’ therapies that encourage the remineralization of noncavitated lesions resulting in inactive lesions and the preservation of tooth structure, function and esthetics.2 Central to this vision is the ability to detect caries lesions at an early stage and to quantify the degree of mineral loss, ensuring that the correct intervention is instigated.3 Till date, most studies conducted to measure the prevalence of caries had used DMFT(S)/ dmft(s) index thus allowing the recording of cavitated lesions only. Moreover, the use of WHO’s DMF index4 for caries recording will continue in future also due to its worldwide acceptance, convenience and the possibility to compare the past dental data with future findings, but there is a strong need to consider recording of noncavitated lesions as a relevant dental health indicator.5 For all of these reasons, there is a real need for a range of caries detection and quantification systems to augment the clinician’s diagnostic pathway.2 Various caries recording criteria have been used in the past based on histological picture,6,7 caries activity8 and descriptors, such as the iceberg diagrams,9 which described caries as a continuum from enamel, through dentin, to the pulp. But the impending need of an evidence-based system which would permit standardized caries detection and diagnosis in differing environments and situations led to the development of International caries detection and assessment system (ICDAS).

Hence, the ICDAS was developed to bring forward the current understanding of the process of initiation and progression of dental caries to the field of epidemiological and clinical research.10 This system allows us to record the severity and incidence of the caries in its continuum. The ICDAS I was developed in 2002 and was later modified to ICDAS II in 2005. The ICDAS I and II criteria incorporate concepts from the research conducted by Ekstrand et al (1995, 1997)11,6 and other caries detection systems described in the systematic review conducted by Ismail et al (2004).12

The ICDAS II Visual Scoring Criteria: Discussion

The international caries detection and assessment system (ICDAS) was developed to provide clinicians, epidemiologists and researchers with an evidence-based system, which would permit standardized caries detection and diagnosis in different environments and situations.13 The ICDAS presents a new paradigm for the measurement of dental caries that was developed based upon the insights gained from a systematic review of the literature on clinical caries detection system12 and others sources.6,14,15 The members of the coordinating committee of ICDAS have attempted to include the largest input of the cariology community in the process of developing integrated criteria.10 The new emphasis on caries measurement and management may indicate that the dental community worldwide has started to recognize that we need new approaches in caries detection, assessment and management.16 The development of new technologies and applications has the potential to supplement clinical caries detection, but these assessments will have to be clinically meaningful by providing measurements over and above the rattle of the arrested initial and subclinical lesions.13

ICDAS: THE SCORING SYSTEM

Coronal Primary Caries Detection Criteria

The surface characteristics of a tooth structure determine the ICDAS measurements of potential histological depth of the carious lesions. The primary requirement for applying the ICDAS system is the examination of clean and dry teeth. Drying of the tooth surface is the key for detecting non cavitated lesions because water usually clogs the pores in the carious teeth and the similar refractive index of tooth and water obscures the detection of early white spot lesions. A ball-ended explorer is used to remove any remaining plaque and debris, and to check for surface contour, minor cavitation or sealants. The teeth should be cleaned with a toothbrush or a prophylaxis cup before the clinical examination. The use of a sharp explorer is not necessary because no additional accuracy is provided and it may damage the enamel surface covering the early carious lesions.17 The ICDAS detection codes for coronal caries range from 0 to 6 depending on the severity of the lesion. There are minor variations between the visual signs associated with each code depending on a number of factors, including the surface characteristics (pits and fissures versus free smooth surfaces), whether there are adjacent teeth present (mesial and distal surfaces) and whether or not the caries is associated with a restoration or sealant. Therefore, a detailed description of each of the codes is given under the following headings to assist in the training of examiners in the use of ICDAS: Pits and fissures; smooth surface (mesial or distal); free smooth surfaces and caries associated with restorations and sealants (CARS).18

CODES DESCRIPTION :-

Pit and Fissure Caries18

Code 0: Sound Tooth Surface

Code 1: First Visual Change in Enamel

Code 2: Distinct Visual Change in Enamel

Code 3: Localized Enamel Breakdown due to Caries with no Visible Dentin or Underlying Shadow

Code 4: Underlying Dark Shadow from Dentin with or without Localized Enamel Breakdown

Code 5: Distinct Cavity with Visible Dentin

Code 6: Extensive Distinct Cavity with Visible Dentin

Smooth Surface (Mesial and Distal) - This requires visual inspection from the occlusal, buccal and lingual directions.

Code 0: Sound Tooth Surface

Code 1: First Visual Change in Enamel

Code 2: Distinct Visual Change in Enamel when Viewed Wet

Code 3: Initial Breakdown in Enamel due to Caries with no Visible Dentin

Code 4: Underlying Dark Shadow from Dentin with or without Localized Enamel Breakdown

Code 5: Distinct Cavity with Visible Dentin

Code 6: Extensive Distinct Cavity with Visible Dentin

Caries-AssociatedwithRestorationsandSealants(CARS) Detection Criteria

Since outer carious lesions adjacent to restorations are thought to be analogous with primary caries, the broad principles applied to the criteria for primary caries are also applied to CARS where relevant. However, it should be noted that the scientific basis for doing so has not been established and the literature in the area of secondary caries is far more limited than that for primary coronal caries.16

Code 0: Sound Tooth Surface with Restoration or Sealant

Code 1: First Visual Change in Enamel

Code 2: Distinct Visual Change in Enamel/Dentin Adjacent to a Restoration/Sealant Margin.

Code 3: Carious Defects of < 0.5 mm with the Signs of code 2.

Code 4: Marginal Caries in Enamel/Dentin/Cementum Adjacent to Restoration/Sealant with Underlying Dark Shadow from Dentin.

Code 5: Distinct Cavity Adjacent to Restoration/Sealant

Code 6: Extensive Distinct Cavity with Visible Dentin

ICDAS Two-digit Coding Method

A two-number coding system is suggested to identify restorations/sealants with the first digit, followed by the appropriate caries code, e.g. a tooth restored with amalgam, which also exhibited an extensive distinct cavity with visible dentin would be coded 4 (for an amalgam restoration) and 6 (distinct cavity), an unrestored tooth with a distinct cavity would be 06. The suggested restoration/sealant coding system is as follows:18

0 = Sound, i.e. surface not restored or sealed (use with the codes for primary caries)

1 = Sealant, partial

2 = Sealant, full

3 = Tooth colored restoration

4 = Amalgam restoration

5 = Stainless steel crown

6 = Porcelain or gold or PFM crown or veneer

7 = Lost or broken restoration

8 = Temporary restoration

9 = Used for the following conditions

96 = Tooth surface cannot be examined; Surface excluded

97 = Tooth missing because of caries (tooth surfaces will be coded 97)

98 = Tooth missing for reasons other than caries (all tooth surfaces will be coded 98)

99 = Unerupted (tooth surfaces coded 99)

Unbalanced diabetes is associated with significant cariogenic changes in the oral environment including less resting and stimulated whole saliva, lower saliva buffering capacity and acidic pH, higher salivary glucose, higher salivary albumin concentrations, high proportion of salivary mutans streptococci and yeast [11, 12, 17–19]. Changes in the oral microflora of diabetic subjects in poor glycemic control may significantly influence the prevalence of gingivitis and caries [20, 21]. However, contrary to previous findings, lower caries experience was also reported [22, 23]. No significant differences regarding caries experience between Type 1 diabetic and non-diabetic children was described [24], even if the number of untreated dental caries was higher among the diabetic children, reflecting a lower dental attendance. A high caries susceptibility was also reported in children and adolescents with Type 1 diabetes

mellitus in poor metabolic control [18, 25, 26]. Poor metabolic control is defined as a HbA1c level exceeding the target range of HbA1c for all age-groups of < 7.5% (58 mmol/mol) [7].

From these premises, there is the need to understand the association between Type 1 diabetes and oral health, especially caries, that has still a high prevalence in children populations; this association might be critical for the diabetes long-term management [27]. The number of people affected by diabetes in Sardinia is estimated at almost 95,000 individuals (56 cases/1000 individuals). In the Sassari area 1,013 children affected by Type 1 diabetes are reported (41 cases/1000 individuals) [28]. To reply to this need, caries experience and caries-related variables between diabetic and non-diabetic children were compared; a comparison was also performed among the diabetic children according to their metabolic status. The null-hypothesis was that no difference regarding caries experience between diabetic and non-diabetic children and among diabetic children with differences in the metabolic control would be observed. This study aims to compare ICDAS scores in diabetic vs non diabetic patients.

MATERIALS AND METHODS

This Study was carried out in a university setting which consists of subjects of predominantly South Indian population. Sample size was 778 subjects. Pros of this study include available data, similar ethnicity. Cons of this study is the fact that it is a uni centered study and the geographic locations, trends are not assessed. Approval for the study is by the ethical board of Saveetha University (applied). Number of people involved include 3 reviewers - A Guide, researcher and a reviewing expert. This is a retrospective study in which the radiographs were assessed from the DIAS (dental information archiving software). Radiographs reviewed for the research includes All those applicable for study and cross verification of the required samples were by a reviewing expert through photographs. Measures were taken to minimise the sampling bias. These are inclusion of only clear and readily available data Followed by simple random sampling. Both Internal and external validation was also obtained to carry out the study.

The required data for the study was obtained from DIAS (dental information archiving software) which is a patient management system that records all the patients data. The required data- i.e, ICDAS score data of diabetic and non diabetic patients were collected and entered in a methodical manner in an excel sheet for the tabulation of data and further statistical analysis.

Data was validated by 1-2 external reviewers and all the non specific , unclear or incomplete data were excluded from the study.

Statistical software used for analysis is the SPSS (statistical package for the social sciences) by IBM and the statistical tests used were chi square tests, custom tables, frequency tables, bar graphs to analyse and compare the obtained results. The type of analysis performed was exploratory data analysis. Independent variables include ICDAS score , gender, age and the Dependent variables include diabetic and non diabetic patients. Statistical analysis was set at $p<0.05$.

RESULTS

The sample size was 778 subjects. From the results obtained, we can observe that About 41.61% were Males and 58.39% were females. Association of risk assessment in ICDAS scoring between diabetic and non diabetic population revealed that diabetic patients were more in high risk category compared to non diabetic population. Association in ICDAS scoring between diabetic and non diabetic population also revealed that diabetic patients were more in the severe category.

DISCUSSION

The main outcome was that the oral environment in diabetic population was more prone to caries compared to non-diabetic population even if the caries figures were not statistically significantly different, data consistent with the results of previous studies. As in non-diabetic population, in diabetic group a skewed caries distribution was evident. On the other hand, several authors reported a lower prevalence of caries in diabetic groups than in non-diabetic population. In this study, statistically significant higher caries figures were observed in diabetic subjects in bad metabolic control compared to those in good metabolic control.

A higher intake of sugary snacks and beverages was recorded in the diabetic children compared to non-diabetic; this difference was indeed mostly related to diabetic group in bad metabolic control, since diabetic subjects in good metabolic control reported a sugared food intake even lower than non-diabetic subjects. International clinical guidelines on the management of Type 1 diabetes call for a healthy diet [The same result is found in the present study. These results also coincide with our findings.

Similarly, Melloni et al., revealed in his study that ICDAS score differed among patients with systemic illness such as diabetes. These results coincide with the findings in our study.

Limitations of the study are the non-inclusion of some data in the study that were unclear of certain reporting parameters. There was no limitation for external validity. The generalizability of this study results is possible. However, the drawback of the current study is the small sample size. A larger study with more subjects, in different ethnic backgrounds can be assessed.

Future prospects of this study includes overcoming the limitations and emphasis on knowledge and association of ICDAS among diabetic and non diabetic patients with various parameters, as it is essential for a dental practitioner. International caries detection and assessment system allows us to record the severity and incidence of the caries in its continuum. It is certainly leading to a paradigm shift in the concept of recording both the cavitated and non cavitated lesions. In today's scenario, the use of a sharp explorer should certainly be discouraged for detection of dental caries as it may damage the intact enamel covering the early demineralization. As a consequence of this changing trend to record the non cavitated lesions in the daily practice, ICDAS would certainly promote preventative therapies worldwide that encourage the remineralization of noncavitated lesions resulting in inactive lesions and the preservation of tooth structure, function and esthetics and a much decreased DMF all-over.

CONCLUSION

Within the limitations of the given study, we can conclude that diabetic patients had more ICDAS score as well as being more prone to poor oral health compared to non diabetic patients.

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CONFLICT OF INTEREST

The Authors declare no potential conflict of interest.

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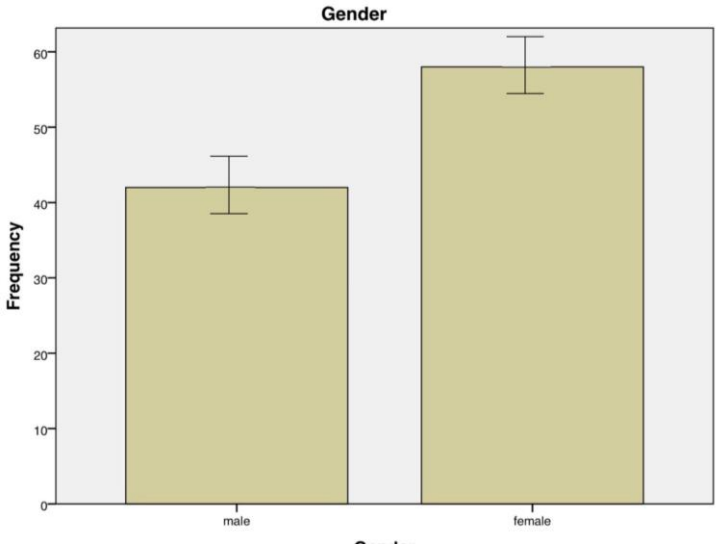
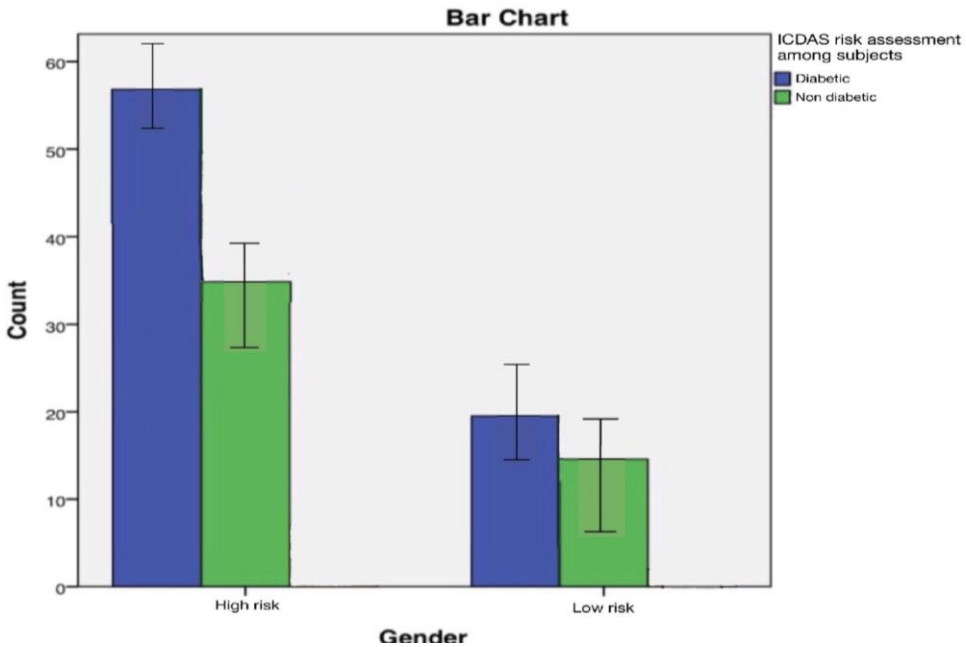
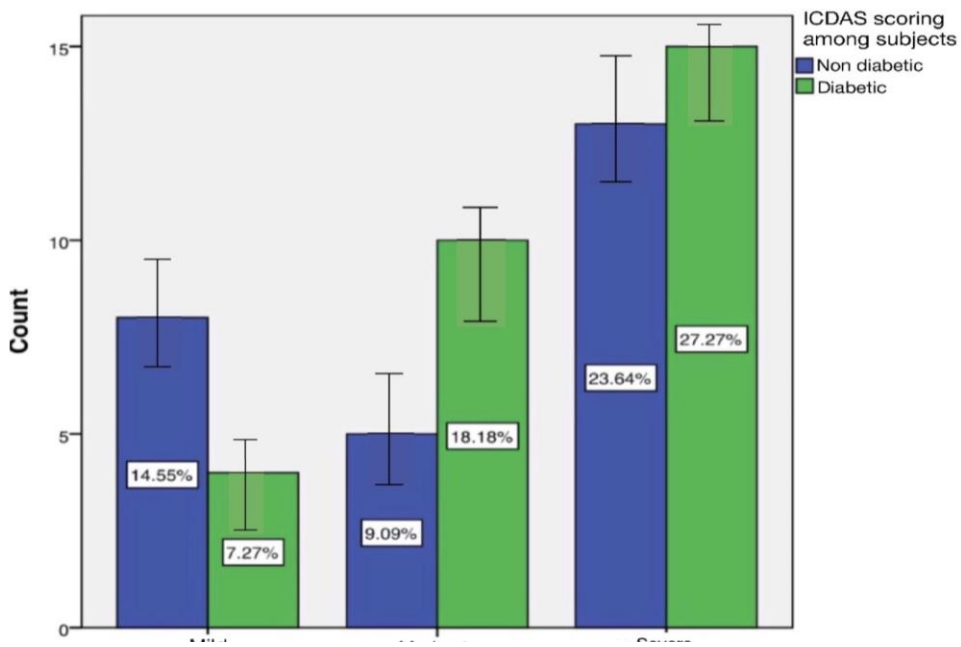


Graph 1- Bar graph representation of frequencies of males and females for whom ICDAS score was assessed- X axis represents gender and Y axis represents the percentage of males and females on a scale of 1-100. About 41.61% were Males and 58.39% were females.



Graph 2- Bar graph showing the association between risk assessment in ICDAS scoring and diabetic and non diabetic population.



Graph 3- Bar graph showing the association in ICDAS scoring between diabetic and non diabetic population.