

Association of Oral Hygiene Status and Dental Caries among Diabetic Patients – A Cross Sectional Study

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Abstract: Introduction: The DMFT and OHI-S indices are two of the most important quantitative factors, measuring tooth health and oral hygiene. Aims and objectives: To evaluate the association between dental caries and oral hygiene status among diabetic patients aged 35-65 years attending the outpatient division of Government Medical College, Kottayam. Methodology: A cross sectional study was conducted among 120 diabetic patients. DMFT score was calculated on each patient; oral hygiene status was assessed using OHI-S. Results: The association between OHI-S scores and caries scores were found to be statistically significant. Patients with poor oral hygiene had shown higher caries experience. Conclusion: The findings of present study demonstrated that lack of oral hygiene maintenance is a causative factor for higher caries prevalence among diabetic patients.

Key words: Dental caries, DMFT, OHI-S, Cross sectional study

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I. Introduction

Dental caries, is one of the most prevalent chronic diseases of people worldwide. Individuals are susceptible to this disease throughout their lifetime. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors including teeth and saliva. Dental caries results from an ecological imbalance in the physiological equilibrium between tooth minerals and oral microbial biofilms. The risk factors include poor oral hygiene, dietary habits, age, socioeconomic status, lifestyle and behavioral factors so on.¹ A person's risk of caries can vary with time since many risk factors are changeable. Physical and biological risk factors include inadequate salivary flow, variation in salivary composition, high number of cariogenic bacteria, insufficient fluoride exposure, gingival recession, immunological components, need for special health care, and genetic factors.²

Diabetes mellitus is a common chronic metabolic disorder which affects millions of people, characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Manifestations of diabetes in the oral cavity include increased frequency and intensity of caries, pathologies of the oral mucosa, xerostomia as well as atrophic changes in the alveolar process.^{3,4} Diabetes mellitus is responsible for causing ascendancy in the proportion and activity of saliva that impacts the oral health. Decrease in the flow rate of saliva cause reduction in the cleansing, buffer activity and diminished levels of calcium that is essential for the repair of decayed tooth.⁵ Diabetic patients are at a high risk of developing caries.⁶ Studies by Lin et al and Malvania et al., have demonstrated that diabetic patients have more active dental caries than control subjects.^{7,8} A study conducted by Hintao et al., in diabetic patients found that type II diabetic patients had poorer oral hygiene than non-diabetic patients.⁹ Holmes in 2016 evaluated the effect of tooth brushing frequency on the incidence or increment of new carious lesions and found that individuals who brush their teeth infrequently are at greater risk for the incidence of new carious lesions than those brushing more frequently.¹⁰ According to Borgnakke, there is insufficient evidence to claim that more frequent tooth brushing reduces the risk of developing new caries.¹¹ Present study attempts to find out whether there is any association exist between caries and oral hygiene among diabetic patients.

II. Materials And Methods

A cross sectional study was conducted in the General Medicine outpatient division of Government Medical College, Kottayam among 35 – 65 year old adult diabetic patients with sample size of 120. Ethical clearance was obtained from the Ethical committee of Government Dental College and the study was initiated.

2.1 Inclusion criteria: Type II Diabetes mellitus patients (35-65 Years) under treatment (either insulin therapy or oral hypoglycemic drugs) for 5 years, who gives an informed consent.

2.2 Exclusion criteria:

- Physically or mentally challenged patients
- Not willing to participate
- Xerostomia causing drugs & conditions (Anti-hypertensives, anti-depressants, diuretics and radiation therapy)
- Chronic systemic diseases such as asthma & epilepsy

After getting informed consent, data was collected using a validated questionnaire and dental examination was conducted. Patient was made to sit in a semi reclined position with adequate lighting and examination done using a standard mouth mirror and probe. Caries experience recorded using WHO criteria for oral health assessment and DMFT score was calculated on each patient. Severity of dental caries (DMFT) is categorized according to the WHO classification-: Nil, Low (1-2.9), moderate (3-5.9), high (6-8.9), very high (≥ 9). Oral hygiene status was assessed using OHI-S. It has two components- Simplified Debris index (DI-S) and the Simplified Calculus index (CI-S). The OHI-S scores range from 0 to 6 and are categorized as good (score 0.0 to 1.2), fair (score 1.3 to 3.0) and poor (score 3.1 to 6.0). Association of Oral hygiene status with DMFT score among diabetic patients was then assessed.

2.3 Statistical analysis

Data was entered in MS Excel sheet transferred to SPSS statistics for analysis. Data analysis includes descriptive statistics (frequency distribution & cross tabulation). For inferential statistics Pearson Chi-square test was used to find the association between oral hygiene status and dental caries. The level of significance set as $p < 0.05$.

III. Results

Based on OHI-S score of the total 120 individuals; 4 (3.3%) individuals had good oral hygiene, 105 (87.5%) with fair and 11 (9.2%) with poor oral hygiene status. (Fig 1)

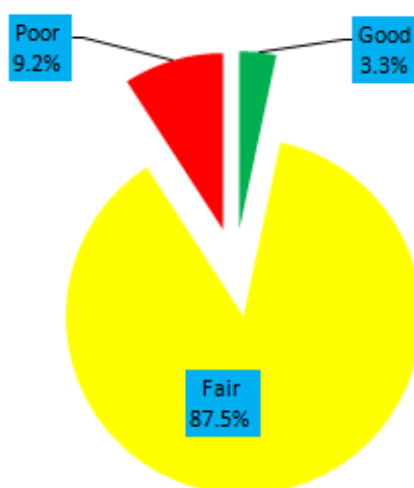


Fig 1: Frequency distribution of study population based on OHI-S scores

Association between caries score and OHI-S Score

Among 120 diabetic patients, none of them were caries free. Majority of patients with low, moderate and high caries scores (93.9%, 91.7% and 89.7%) maintained fair oral hygiene. Among very high caries patients, increased number of patients with poor oral hygiene (20%) was noticed compared to other groups (Table 1, Fig 2). Association between oral hygiene (OHI-S) and caries score (DMFT) was statistically significant ($p < 0.05$).

Table 1: Descriptive statistics showing the association between caries score &OHI-S score

OHI-S Status	Caries Score					p-value
	0 Nil	1.0 – 2.9 Low	3.0 – 5.9 Moderate	6.0 – 8.9 High	≥ 9 Very High	
Good	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (40.0%)	0.00
Fair	0 (0.0%)	31 (93.9%)	44 (91.7%)	26 (89.7%)	4 (40.0%)	
Poor	0 (0.0%)	2 (6.1%)	4 (8.3%)	3 (10.3%)	2 (20.0%)	
Total	0 (0.0%)	33 (100%)	48 (100%)	29 (100%)	10 (100%)	

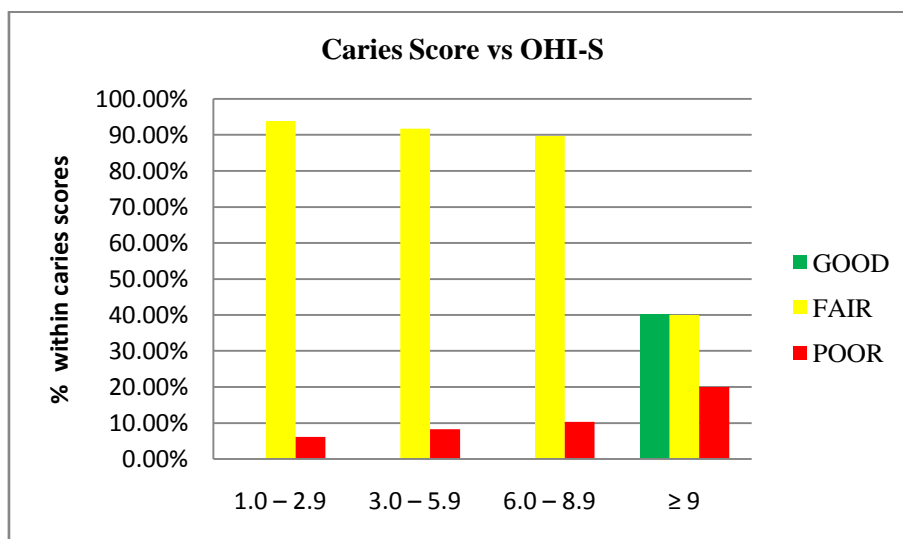


Fig 2: Descriptive statistics showing the association between caries score &OHI-S score

IV. Discussion

Dental caries is a major public health problem globally and is the most widespread non-communicable disease. Dental caries occurs due to demineralization, which is triggered by the accumulation of microbial plaque flora, decrease in the flow rate of saliva causing reduction in the cleansing, buffer activity and diminished levels of calcium that is essential for the repair of decayed tooth. It is important to identify patients who are particularly at high risk of dental caries.

Diabetes mellitus is a common chronic metabolic disorder which affects millions of people. Diabetes mellitus is responsible for causing ascendency in the proportion and activity of saliva that impacts the oral health. Diabetes increases one's susceptibility to dental caries.¹² Insulin deficiency in diabetes may lead to hyposalivation and elevated salivary glucose level, which may put diabetic patients at a high risk of developing caries⁶.

This study was conducted among 120 diabetic patients under 35 – 65 year age group with an aim to find out whether there is any association exist between oral hygiene status and DMFT index among diabetic patients. The association between OHI-S scores and caries scores were found to be statistically significant ie, those with poor oral hygiene had shown higher caries experience. In other words as the oral hygiene gets worse, more would be the risk for developing carious lesions. Our study result is in accordance with study conducted by Hintao et al.⁹

Majority of the study group members (105 out of 120) maintained fair oral hygiene. Individuals having poor oral hygiene were found to be very few (<10%) numbers among low and moderate caries score groups. Among very high caries score group, increased number of patients with poor oral hygiene (20%) was noticed compared to other groups. Among 120 diabetic patients none of them were caries free, which indicates diabetic patients have increased risk for dental caries. This is in accordance with studies by ciglar et al.,¹³ and kanjirath et al.,. Increased caries in diabetic patients may be because of lack of awareness regarding the oral complications of the disease and a perceived lack of time for this additional health care activity when patients are busy with management of diabetes¹⁴. Elevated salivary glucose level favors the growth of Lactobacilli and Streptococcus mutans bacteria^{5,9,15} and hyposalivation may result in low buffering activity which is needed for remineralization of early carious lesions¹⁶. Other reasons for increased caries rate in diabetic patients can be due

to microvascular and macrovascular changes¹⁷ (complications of diabetes) or can be due to frequent daily intake of low molecular carbohydrates with an improper calcium phosphorus ratio.¹³ Repeated intakes of even small amount of carbohydrates may be cariogenic when coupled with elevated blood glucose level and hyposalivation.^{18, 19}

Based on our study results, lack of oral hygiene is a causative factor for dental caries in diabetic patients. So regular dental visits for diabetic patients are necessary for early detection of dental caries.

V. Conclusion

Dental caries and diabetes mellitus are two major public health problems and are most widespread non-communicable diseases globally. They can impair the quality of life. Studies showed that diabetic patients have higher caries prevalence. Based on our study results, negligence in oral hygiene maintenance is one of the causative factor for higher caries experience among diabetic patients. So awareness should be made regarding importance of oral hygiene maintenance among diabetic patients. They should be motivated to do regular oral hygiene practices. Oral health care instructions accompanied with practical demonstrations may be more meaningful .

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