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CORRELATION OF SMOKING AND DENTAL CARIES WITH DIABETES AND DENTAL IMPLANTS

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Abstract:

Objective: The study was designed to assess the correlation between smoking and dental caries in diabetic patients placed with dental implants.

Study Setting: Name Of Hospital

Methodology: After the approval from Ethical Review Committee of our hospital and informed consent of every participant, the study was initiated. The patients who were diagnosed with diabetes mellitus with the laboratory examination of fasting blood sugar and hbA1c and placed with dental implants were selected. History of smoking is recorded along with other demographic characteristics and patients were assessed with DMF score in dental OPD.

Results: Out of 60 diagnosed diabetic patients, 81.7% were males and 18.3% were females. 39 individuals reported with cigarette smoking habit. The DMF score in smokers found with a mean of 9.4 and 2.9 in non smokers. Bleeding on probing resulted in 60% of diabetic individuals with dental implants and 40% did not show any bleeding on probing,

Conclusion: Patients with diabetes mellitus with dental implants and smoking habit are more prone to develop dental caries and delayed healing.

抽象的 :

目的 : 本研究旨在评估植入牙种植体的糖尿病患者吸烟与龋齿之间的相关性。

研究环境: 医院名称

方法 : 经我院伦理审查委员会批准并征得每位参与者的知情同意后, 开始研究。选择空腹血糖和hbA1c实验室检查确诊为糖尿病并植入种植牙的患者。记录吸烟史以及其他人口统计学特征, 并在牙科 OPD 中使用 DMF 评分对患者进行评估。

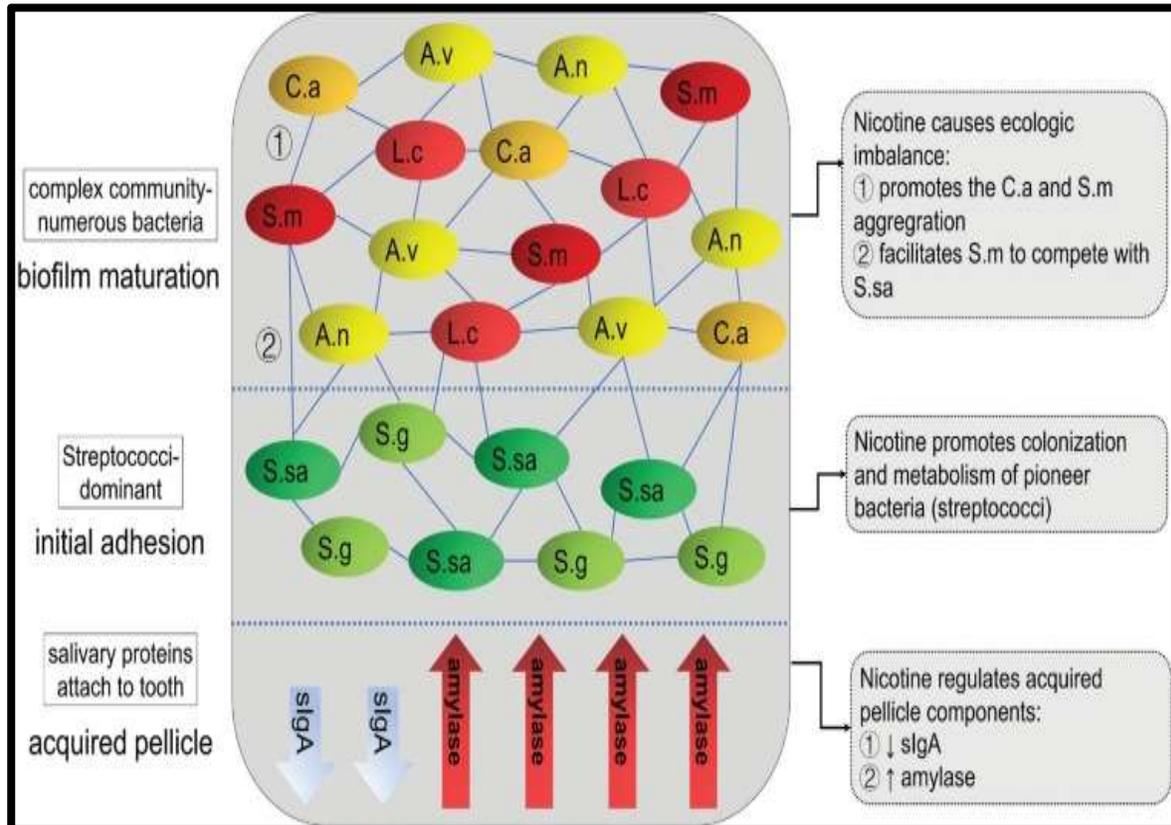
结果：在60名确诊的糖尿病患者中，81.7%为男性，18.3%为女性。39人报告有吸烟习惯。吸烟者的 DMF 得分平均值为 9.4，非吸烟者为 2.9。探诊出血导致 60% 的糖尿病患者种植牙，40% 的探诊没有出血，

结论：有种植牙和吸烟习惯的糖尿病患者更容易发生龋齿和延迟愈合。

Introduction:

Numerous epidemiological studies undertaken around the world have revealed a definite association between smoking and the development of dental caries. Men (94.6%) and women (5.4%) who smoke had a higher DMFT score than non-smokers¹. People in Finland with a history of daily smoking had a higher four-year incidence of caries. Smoking during pregnancy increases the risk of caries in a kid, according to a Scottish study³. Reduced exposure to smoking reduces caries incidence by 7 percent in Portugal. Tobacco use, according to a comprehensive study by Benedetti et al.⁵, is associated with a

significant increase in the incidence of dental cavities. On the other hand, smokers and nonsmokers differed in terms of education and economic status². Tobacco users had poor eating habits, neglected oral hygiene, sought professional medical aid infrequently, and had poor post-treatment compliance. Actions⁴ could contribute to an increase in caries. More research is needed to determine the cariogenic routes of smoking. It has been discovered that smoking has an influence on the bacteria that causes tooth decay.



Diabetes has been associated with an increased incidence of tooth decay, gingivitis, and periodontal disease, making it one of the twentieth century's most prevalent diseases. Changes in the oral environment can result in a rise in pathogenic microorganisms and the breakdown of hard and soft tissues in the mouth, which can result in cariogenic lesions. Additionally, xerostomia, salivary gland dysfunction, increased susceptibility to bacterial, viral, and fungal infection, peri-apical abscesses, tooth loss, taste impairment, lichen planus, burning mouth syndrome, and aberrant orthodontic tooth motions are all common oral complications associated with diabetes. These illnesses are all associated with increased fluid loss due to polyuria, an altered immune response, altered connective tissue metabolism, microvascular abnormalities, and impaired salivary glands.⁶

Type 2 diabetes is a carbohydrate metabolic disorder characterised by high blood sugar levels. An alteration in the physiological balance of glucose uptake by tissues, glucose liberation by the liver, and pancreatic anterior pituitary and adrenocortical hormone production-liberation is responsible for the development of diabetes type 2. In the second century AD, Aretaeus, who believed that the disease was characterised by the disintegration of flesh and limb into urine, termed it diabetes, which means "siphon."⁷ According to multiple recent studies and conclusions, diabetes mellitus affects virtually every tissue in the body, either directly or indirectly through late ramifications.⁸ Periodontal disease is the sixth most prevalent diabetic consequence, according to Loe⁹. The oral mucosa and, with some controversy, the alveolar bone have been reported to be damaged

by persistent hyperglycemia, according to several investigations.

Multiple researches have shown that dental implant therapy in diabetic patients can be successful or unsuccessful, and this study aims to demonstrate the correlation of smoking, diabetes and dental implants in the prevalence of dental caries.

Methodology:

Sampling Technique: Randomized Control Trial

Sample Size: Sample size will be calculated using WHO calculator. Sample size estimated to be 60 by keeping confidence interval 95% and 10% margin of error.

Selection Criteria:

Inclusion Criteria:

- Age between 20 and 60
- Both genders
- Patient who were willing to participate
- Patient with diabetes mellitus
- Patients placed with dental implants

Exclusion:

- Children less than 14 years were excluded
- Patients who were not willing to participate
- Patients with other systemic and metabolic syndromes
- Patients with autoimmune diseases
- Pregnant women were excluded

Data collection: The study was launched following clearance from our hospital's Ethical Review Committee and the provision of written informed permission by each participant. Those individuals who had been diagnosed with diabetes mellitus through a laboratory evaluation

of fasting blood sugar and hbA1c and who had been fitted with dental implants were chosen for this study. Patients were tested with the DMF score in the dental OPD, and their smoking history was documented along with their other demographic information. While bleeding in gingival tissue is assessed using dental probe.

Statistical Analysis: The recorded data is analyzed using SPSS software, version 25.

Frequencies, percentages, mean and standard deviation is calculated of the qualitative and quantitative variables like, age, gender, smoking, bleeding and DMF scores. Independent t test is applied to correlate DMF score and smoking habits of diabetic patients with dental implants. While Chi square test is performed to associate smoking variable with bleeding assessed with dental probe.

Results:

Out of 60 patients with diabetes mellitus and dental implants, the mean age of the patients is 42.5 years with a standard deviation of 10.7

	N	Minimum	Maximum	Mean	Std. Deviation
Age	60	20.00	62.00	42.5167	10.71430

81.7% participants were males while 18.3% were only females, listed blow:

GENDER	Frequency	Percent
male	49	81.7
female	11	18.3
Total	60	100.0

36 diabetic patients with implants showed bleeding when assessed with dental probe as given below:

BLEEDING ON PROBING	Frequency	Percent
Yes	36	60.0
No	24	40.0
Total	60	100.0

Independent t test is performed to evaluate the difference between smokers and DMF score of the patients. The resultant p value is less than 0.05 hence the test is significant statistically and there is a considerate correlation observed between smoking habit and DMF score of the patients.

		Group Statistics			
	smokers	N	Mean	Std. Deviation	Std. Error Mean
DMF.score	yes	39	9.44	3.500	.561
	no	21	2.95	1.203	.263

		Independent Samples Test								
		Levene's Test for Equality of Variances			t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
DMF score	Equal variances assumed	21.313	.000	8.203	58	.000	6.484	.790	4.901	8.066
	Equal variances not assumed			10.475	51.770	.000	6.484	.619	5.241	7.726

The habit of smoking and bleeding on probing is compared to evaluate the association between the two variables. The resulted p value is less than 0.05, hence the test is significant statistically and there is a strong correlation between smoking habit and bleeding on probing:

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	28.132 ^a	1	.000		
Continuity Correction ^b	25.278	1	.000		
Likelihood Ratio	30.049	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	27.663	1	.000		
N of Valid Cases	60				

- a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.40.
 b. Computed only for a 2x2 table

Discussion:

There is a resulted mean of 9.4 DMF score among smokers as compared to those who did not smoke with mean DMF score 2.9, according to the findings of this study. This conclusion was reached as a result of a register-based study design and adjustments for additional factors of interest^{10,11}. Several studies have found that adult smokers who smoke have a higher incidence of dental caries than non-smokers. After conducting an investigation on 955 adult patients over four years, Bernabé et al¹² discovered that daily smoking had a significant impact on the net rise in the number of decaying, filled, and missing teeth. According to the findings of the study, smokers had a greater frequency of dental caries as well. Cigarette smoking has been shown to be associated with the development of caries, with smokers having 70% more decaying teeth than nonsmokers.

Smoking can have an impact on the development of dental caries because of its ability to modify the patient's saliva. Patients who smoke have higher levels of bacteria (*Streptococcus mutans*) in their saliva, as well as a reduced ability to buffer the effects of the medication. These factors, which account for 25 percent of the variability in caries risk, have the potential to enhance the incidence of dental caries.¹⁵ Smoking has also been linked to a decrease in salivary secretory immunoglobulin A levels, according to certain studies (IgA).¹⁶ The specificity of IgA action in the oral cavity is a primary protective mechanism that has been identified.¹⁷ IgA, in concert with other antimicrobial compounds, contributes to the preservation of oral cavity health by preventing

bacteria from sticking to epithelial and tooth surfaces.^{18,9,20} Cigarette smoking has also been linked to decreased salivary cystatin activity and cystatin C levels.²¹, both of which help to dental health by blocking certain proteolytic enzymes that, when combined with acid demineralization, are hypothesised to play a role in caries lesion formation.²²

According to our findings, bleeding on probing was found to have a protective effect in our analysis, which was similarly reported in an earlier study¹² and dental hygiene is worsened with diabetes and dental implants. Patients who have missing or filled teeth are more prone than others to acquire dental caries as they get older, according to research. However, in contrast to prior studies' findings, the variable socioeconomic class did not generate statistical significance in the current study. As a consequence of their meta-analysis, Schwendicke et al¹³ determined that the included studies had a low or very low level of evidence due to the possibility of bias in their findings. It is possible that the current study was done in a dental hospital with patients who were part of a recall regimen, as opposed to the Schwendicke et al meta-analysis¹³, which included population-based studies. Each of the three socioeconomic categories had similar short-term dental caries development, underscoring the importance of clinical monitoring of patients in order to prevent dental caries lesions from developing.

According to the AUC metric, an accurate multivariable model has an accuracy of 0.835. For the performance of prediction models, this is a very favourable result in terms of accuracy.²³ When it comes to generating predictions about

the possibility of developing dental caries, there are a huge number of true positives and false negatives. Patients who are at high risk of developing dental caries can be detected with the help of this model. This information can also be used to aid in the decision-making process when it comes to implementing more strict dental caries prevention and smoking cessation strategies.

A misalignment between demineralization and remineralization results in the formation of dental cavities.²⁴ When dental caries first appeared, there was a 13.5-month gap between that occurrence and the conclusion of the study. According to the authors, this type of statistic has never been calculated previously. We should proceed with caution when reviewing these figures because they were based on recall appointments. This is true independent of the method used to collect and monitor patient data. Because of the potential for early diagnosis, a more exact measurement is required.

Dental caries has clinical ramifications in three different ways, depending on when it is discovered in the mouth. According to the findings of the current investigation, a reduced recall regimen could potentially increase the frequency of diagnostic measurements while also allowing for the monitoring of patient adherence to dietary, smoking, and oral hygiene regimens. Bacteria, as is generally known, can cause dental caries to form in the mouth. Dental hard tissues become even more demineralized as a result of bacteria in the mouth creating acid by digesting fermentable carbohydrates through enzyme release or metabolism. According to a 1991 study²⁴, chewing inhibited the growth of gram-positive cocci such as *Neisseria*, which is one of the first bacteria to colonise dental plaque and cause tooth decay. Later research, however, found that

smokers were no more likely than non-smokers to have gram-negative bacteria in their mouths. Baboni and colleagues²⁵ discovered that when exposed to smoke condensate, the bacteria *Streptococcus mutans* and *Candida albicans* attached more strongly to the acquired pellicle on orthodontic materials. The work of Zonuz et al.²⁶ involved the cultivation of *S. mutans* and *Streptococcus sanguis* (formerly known as *Streptococcus sanguinis*) in a variety of environments including ambient air and tobacco smoke.

Despite the fact that both bacteria strains developed at a quicker rate in the presence of tobacco smoke, *S. mutans* was the one that suffered the most damage out of the two tests. The fact that the previous study did not include the most common cariogenic bacteria, such as *S. mutans*, could be one possible explanation for this. Alternative bacteria strains, cigarette kinds, and exposure periods, for example, may have been employed in the experiment to test the hypothesis. Furthermore, according to the findings of the study, *in vitro* cultivation did not completely replicate bacterial growth *in vivo*.

Due to the fact that tobacco smoke contains over 7000 different types of chemicals²⁷, it is difficult to determine which one has the biggest impact on caries-causing bacteria. Over 30 years ago, researchers hypothesised that tobacco's high sugar content encouraged and promoted the proliferation of *S. mutans* and *S. sanguinis*, although tobacco's pharmacological components, such as nicotine, had no effect on the oral microbiota. According to current research, nicotine, the principal bioactive and addictive component of cigarette products, appears to have a significant impact on caries-causing bacteria.

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