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Estimation of Salivary Calcium And Its Relation To Periodontal Health Among Smokers And Non Smokers: A Clinical Study.

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Abstract : *Saliva plays an important role in acquired pellicle formation on tooth surfaces, crystal growth homeostasis, bacterial adhesion, plaque formation. The role of smoking as a contributory factor in the progression of the periodontal disease process has long been suspected.*

Keywords : *Salivary calcium, periodontitis, smoking*

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I. Introduction

Cigarette smoking is a kind of lifestyle factor that affects the health of humans. Dentistry has long been aware of the effects of tobacco on the soft tissues of the oral cavity and the implications of this in clinical practice. In the past 20 years there has been an increasing awareness of the role of tobacco use on the prevalence and severity of periodontal diseases. As proposed by Gelesky, smoking meets the majority of criteria given for causation of a disease. Experimental evidence accumulated over the last two decades has indicated cigarette smoking is a true risk factor for periodontitis. This environmental exposure has been associated with two to three fold increases in the odds of developing clinically detectable periodontitis and subsequent tooth loss.[1] The role of tobacco and, more specifically, cigarette smoking as a public health problem has long been recognized. Tobacco smoking, mostly in the form of cigarette smoking, is recognized as the most important environmental risk factor in periodontitis and with respect to this, there is large number of supporting epidemiological studies. It has usually been necessary to rely on the vast body of medical literature that describes the noxious effects of smoking, and to apply this knowledge to the pathogenesis of periodontitis.[2]

Saliva is a complex and important body fluid which is very essential for oral health. Saliva is required for protecting the oral mucosa, teeth remineralization, digestion, taste sensation, pH balance and phonation. It includes a variety of electrolytes, peptides, glycoproteins, and lipids which have antimicrobial, antioxidant, tissue repair, and buffering properties. Therefore, altered whole-mouth salivary flow rate (SFR) has an important role in the pathogenesis of oral and dental diseases. Saliva is the first biological fluid that is exposed to cigarette smoke, which contains numerous toxic compositions responsible for structural and functional changes in saliva.[3]

Tobacco smoking is an addictive habit first introduced into Europe. Smoking is now recognized as the most important cause of preventable death and disease. Currently, the most of adult population smoke cigarettes. The number of cigarette smokers is slowly declining, but those who do smoke are smoking more. However, nowadays, the smokers are changing to lower-tar brands. Consumption is rising in developing countries, particularly where tobacco production bring great economic benefits, and it will probably continue to rise for the foreseeable future.[4]Epidemiological investigations support a firm relationship between smoking and periodontal disease. The mechanisms by which smoking may influence the development and progression of periodontal disease are as yet unclear, but may include changes in the vasculature, the immune and inflammatory systems, tissue oxygenation and the healing processes.[5] It is important to know more about the effects of smoking on the composition of saliva and in particular on its inorganic constituents. Thus this study was conducted to evaluate the effect of tobacco smoking and salivary calcium on the periodontal status of young adults.

II. Materials And Method

The present study was conducted among the patients attending the outpatient department of K. D. Dental College & Hospital, the research protocol was reviewed and approved by the ethical committee of K.D. Dental College and Hospital, Mathura and verbal informed consent was obtained from each subject. The final sample size comprised of 200 students (100 smokers and 100 non smokers) which were selected randomly. The questionnaire was used, which contained general demographic information as well as questions about tobacco smoking habits. The clinical examination was carried out using Gingival Bleeding Index (1974)[6], Community Periodontal Index[7], and DMFT index (1938)[8]. All clinical examinations were performed by the same trained examiner.

Inclusion Criteria

- Patients more than 18 years of age.
- Smoking status (defined as smoking at least 10 to 20 cigarettes per day for more than 5 years).
- Non smoking status (defined as those who have not consumed any form of tobacco)

Exclusion Criteria

Diagnosis of systemic diseases or prolonged prescribed medication within six months prior to study enrollment. The statistical analysis was performed using SPSS version 15. The mean and standard deviation of scores were calculated, comparison between groups was done using t-test, $p \leq 0.05$ was considered statistically significant.

III. Results

The mean salivary calcium, probing depth and loss of attachment respectively were found to be higher among smokers as compared to non smokers (Table 1, 2, 3). However, the mean gingival bleeding scores were found to be higher among non-smokers as compared to smokers(Table 4). The results difference was statistically significant when compared between smokers and non smokers (Table 1,2,3 & 4). In the total study population, 3.20 ± 1.68 was the mean DMFT observed. The mean number of decayed, missing and filled teeth were 1.54 ± 1.93, 0.76 ± 0.93 and 0.90 ± 1.10 respectively. Among the smokers group, 3.02 ± 1.86 was the mean DMFT observed. Among the non smokers group, 2.42 ± 1.42 was the mean DMFT observed. A statistically significant difference (p= 0.011) has been observed when dental caries among smokers and non smokers was compared (Table 5).

IV. Discussion

About 99% of the total calcium in the human body exists in the bones and teeth, providing a structural function; the remaining 1% is found in tissues and fluids and is crucial for the maintenance of cell metabolism, nerve transmission, and muscle contraction. In vertebrates, calcium is the major component of bones\ and teeth, and it is not surprising that disturbances in calcium metabolism have been implicated in most of the major chronic diseases, including osteoporosis, kidney disease, obesity, heart disease and hypertension.[10]

Periodontal diseases are a group of conditions affecting the supporting structures for the dentition. Diagnosis of periodontitis and the identification of affected individuals can sometimes be difficult because there may be no self-reported symptoms. It is therefore recommended that clinicians should screen patient's susceptibility to periodontitis by evaluating their exposure to associated risk factors so that early detection and appropriate management can be achieved. Tobacco smoking has been found to be a major environmental factor associated with generalized forms of severe periodontitis in several studies. Despite the fact that smoking is known to be a risk factor in many other diseases, its effect on periodontal disease is not completely clear because divergent findings have been published concerning the role of smoking in the etiology of periodontal disease. Early studies failed to reveal any correlation between smoking and the amount of dental plaque accumulation. Similarly, smoking was not found to influence the degree of gingival inflammation- or the presence of periodontal pockets. In contrast, it has also been reported that tobacco smoking has a detrimental effect on periodontal health and is a risk factor in periodontal disease. Therefore, this study was conducted to evaluate the effect of tobacco smoking on the periodontal status of young adults and to determine the relationship between salivary calcium in unstimulated whole saliva and the periodontal status of young adults further to elucidate whether quantitative changes in the chemical composition of the saliva of smoking and non smoking patients could be significant for early diagnosis and prognosis of periodontal disease progression or not. The sample size comprised of 200 (100 smokers and 100 non smokers) subjects which were selected randomly from Out Patient Department of K.D Dental College and Hospital, Mathura.

In the present study, the mean salivary calcium level among the smokers group was found to be 8.83±1.63 in comparison to non smokers group where it was found to be 5.79±0.70. A significantly higher mean salivary calcium level was found in tobacco users than in non tobacco users ($p \leq .05$). Our finding is in accordance with the study conducted by Sewon et al (2004) who found higher salivary calcium i.e. 9.02±1.26 in subjects who smoke more than ten cigarettes per day than in non-smokers (5.86±0.56).[11] Khan et al (2005) also found a higher level of salivary calcium in tobacco users (8.79±1.50) than in nonusers (4.81±0.70) under resting conditions and following stimulation with nicotine i.e. 8.86±1.26 and 5.34±0.56 respectively.[1] The mean gingival bleeding was 7.9±6.19 among smokers whereas; it was 10.49±7.24 in non smokers. A statistically significant difference was observed when gingival bleeding among smokers and non smokers was compared ($p \leq .05$). These results were in concordance with the findings of the study conducted by Hunter et al (2008) who found that mean gingival bleeding was 7.34±3.06 among smokers whereas, it was 9.42±6.01 in non smokers.[12] This may be because of the potential vasoconstrictive effect of nicotine.

In case of smokers, the mean probing depth was higher i.e. 2.55±0.92 than in non smokers where it was 1.07±0.64 and the difference was found to be statistically significant (p=0.0001). Similar results had been quoted by M.Radvar et al (2011) who found that the mean probing depth among smokers and nonsmokers were 3.40±0.70 and 2.90±0.70 respectively.[13] Kiss et al (2010) also revealed that mean probing depth among smokers and nonsmokers were 3.91±0.52 and 2.05±0.90 respectively.[14]

The mean value for the loss of attachment among the smokers was 1.43±0.71 whereas, it was 0.66±0.50 among non smokers. Greater loss of attachment was found in smokers than in non smokers and difference was found to be statistically significant (p =0.001). This is in accordance with the study of Radvar et al (2011) who observed significantly greater attachment loss on both the palatal and buccal regions of the smoker's anterior maxilla as compared to the non-smoker group.[13]

Among smokers and non smokers group, dental caries was found in 82 and 67 subjects respectively. The caries experience (DMFT/DMFS) was 3.02±1.86 and 2.42±1.42 respectively in smokers and non smokers group and the difference was statistically significant when compared between smokers and non smokers group (p value=0.011).Our findings were consistent with the findings of Athra M et al(2005) who found that the caries experience (DMFT/DMFS) was 2.98±1.67 and 2.41±0.78 among smokers and non smokers group respectively and the difference was statistically significant when compared between the two groups.[15]

On the contrary study conducted by Utez et al (2012) revealed that caries experience (DMFT/DMFS) was 1.67±0.07 and 3.01±0.70 respectively among smokers and non smokers group.[16]

Figures and Tables

Table 1: Distribution of Study Subjects according to Salivary Calcium

Salivary Calcium	Smokers (n=100)	Non-Smokers (n=100)	t	p-value
Mean ± SD	8.83 ±1.63	5.79 ± 0.70	17.13	0.000*

*p ≤ 0.05: Statistically Significant

Table 2: Distribution of Study Subjects according to Probing Depth

Probing depth	Smokers (n=100)	Non-Smokers (n=100)	t	p-value
Mean ± SD	2.55 ± 0.92	1.07 ± 0.64	13.20	0.000*

*p ≤ 0.05: Statistically Significant

Table 3: Distribution of Study Subjects according to loss of attachment

LOA	Smokers (n=100)	Non-Smokers (n=100)	t	p-value
Mean ± SD	1.43 ± 0.71	0.66 ± 0.50	8.877	0.00*

*p ≤ 0.05: Statistically Significant

Table 4: Distribution of Study Subjects According to Gingival Bleeding

Gingival Bleeding	Smokers (n=100)	Non-Smokers (n=100)	t	p-value
Mean ± SD	7.9 ± 6.19	10.49 ± 7.24	2.71	0.003*

*p ≤ 0.05: Statistically Significant

Table 5: Distribution of study subjects according to comparison of dental caries among smokers and non-smokers

Dental Caries	Smokers(n=100)	Non-smokers(n=100)	TOTAL (N= 200)	p value
Decayed (D)	1.61 ± 1.87	1.50 ± 1.91	1.54 ± 1.93	0.011*
Missing (M)	0.50 ± 1.48	0.42 ± 0.72	0.76 ± 0.93	
Filled (F)	0.91 ± 2.20	0.50 ± 0.76	0.90 ± 1.10	
T0TAL (D+M+F)	3.02 ± 1.86	2.42 ± 1.42	3.20 ± 1.86	

*p ≤ 0.05: Statistically Significant

V. Conclusion

In conclusion, the results of the present study showed the increased salivary calcium, probing depth, loss of attachment, dental caries and salivary pH among smokers as compared to the non-smokers. Gingival bleeding found to be less in smokers than non-smokers. Cigarette smoking is considered to be one of the most significant risk factors associated with periodontal disease initiation and progression. Furthermore, more case-control studies need to be conducted in various populations with a focus on identifying the association between smoking and periodontitis.

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