

THE EFFECT OF SMOKING ON COMPONENT VOLUME OF GINGIVAL CREVICULAR FLUID IN PATIENTS WITH PERIODONTAL DISEASE IN SAUDI ARABIA

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Article Received on
23 July 2018,

Revised on 13 August 2018,
Accepted on 01 Sep. 2018

DOI: 10.20959/wjpr201816-13328

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ABSTRACT

Smoking increases the chances of advancement in periodontitis. Smokers are more susceptible to get progressive forms of periodontal diseases. Although, there are several studies that demonstrated the link between smoking and periodontal diseases, many of the questions still remain unanswered. Continuous and rigorous smoking may lead to impairment in the vasculature of the periodontal tissue in the chain smokers. The prevalence of smoking is more among the males when compared to females in Saudi Arabia. This increase in the percentage of smoking among Saudi's is an alarming sign to the health of the Saudi population. The medical history of all the patients was recorded.

The periodontal patients that fulfilled all the inclusion and exclusion criteria were selected and divided as smokers group and non-smokers group. The volume is to be determined using an electronic device named periotron 8000. The mean and standard deviation scores were calculated for age, Gender, gingival crevicular fluid volume. The mean difference in the Gingival Crevicular Fluid volume in smokers and non-smokers was analyzed and reported. The gingival crevicular fluid is supposed to be increased with the severity of inflammation in the periodontal tissues.

KEYWORDS: Gingival Crevicular Fluid, GCF, smoking, periodontitis, inflammation, periodontal tissues.

INTRODUCTION

The use of tobacco is known to cause negative impact on the health of human beings. The tobacco smoking is the major cause of health issues in human. In the British Medical Journal, Richard Doll explained a connecting link between tobacco smoking and lung cancer.^[1] One

of the major risk factors of progression and development of the periodontal disease is smoking. Non-smokers are at less danger when compared with the smokers in the alveolar bone loss. Smoking increases the chances of advancement in periodontitis.^[2] Smokers are more susceptible to get progressive forms of periodontal diseases. According to the clinical evaluation the smokers are less likely to respond to the treatment when compared with the non-smokers.^[3]

The results in the smokers related to the colonization of the pathogens and micro-organisms in the sub gingival micro-flora is altering from person to person. The previous researchers suggested that the risk factors concerned with tobacco smoking is related to chronic periodontal diseases.^[4, 5] The main effect of smoking is altering the host response like the production of antibodies, the activities of monocytes or neutrophils, the functioning of the vascular region and the release of cytokine that is the inflammatory mediator.

Although, there are several studies that demonstrated the link between smoking and periodontal diseases, many of the questions still remain unanswered.^[6] Any change in the micro-circulatory functions or vascular formations in the periodontal tissue in the smokers influence the immune function and also the inflammatory reactions in the gingiva. Number of blood vessels also vary in the inflamed gingiva among the smokers and non-smokers. Continuous and rigorous smoking may lead to impairment in the vasculature of the periodontal tissue in the chain smokers.

Gingival crevicular fluid (GCF) is primarily formed as a transudate of interstitial fluid that is produced by the osmosis in the basement membrane.^[7] This later turns into an exudate that is produced due to the increased membrane permeability of the blood vessels after the mechanical or the chemical stimulation. Initially the Gingival Crevicular fluid has same concentration as the interstitial fluid. Later, when it passes through the inflamed tissues it takes up the enzymes and also other products of tissue degradation and results in formation of true exudate of serum as inflammation exceeds. The volume of the Gingival Crevicular fluid (GCF) is been linked with the degree of the periodontal disease and it is also an indicator of the inflammation of gingiva.

The researchers showed that the gingival crevicular fluid flow is significantly less in the smokers when compared with the non-smokers.^[8] The nicotine that is present in the tobacco

causes vasoconstriction in the blood vessels which reduces the clinical signs of gingivitis or periodontitis.

Cigarette smoking is significantly high in Saudi population in different age groups. The prevalence of smoking is more among the males when compared to females in Saudi Arabia.^[9] They start to smoke at an early age and continue to smoke for many years. The smoking habit in males was most common in singles who were highly educated. The reasons were found to be psychological tensions, boredom, imitating others who smoke. As reported, on an average Saudi male's start smoking at 19 years of age and Saudi female's start smoking at 21.6 years.^[10] There is an increase in the rate of smoking among the males over the period of time. This increase in the percentage of smoking among Saudi's is an alarming sign to the health of the Saudi population.^[11] Thus with this study, we will determine the effect of smoking on the Gingival crevicular fluid content volume in the patients that have the periodontal disease in the region of Saudi Arabia.

AIM AND OBJECTIVE

The aim of this study is to determine the effect of smoking on the volume of gingival crevicular fluid among patients with periodontal disease in Saudi Arabia.

1. To collate and critically evaluate of effect of smoking on GCF volume.
2. To understand the physiopathology of periodontal disease.
3. To determine the oral hygiene followed by both smokers and non-smokers.

RATIONALE BEHIND THIS STUDY

The rationale behind this study is to survey the effect of smoking on the volume of gingival crevicular fluid among patients with periodontal disease in Saudi Arabia to provide information and details on the current state of knowledge, limitations of previous studies and to determine the significant gaps in knowledge and fill in the gaps with future research.

MATERIALS AND METHOD

About random 50 patients who got for the treatment who suffered with chronic periodontitis were asked to provide the written informed consent to participate in this study. The study population was asked to answer the questionnaire to determine whether they are smokers and non-smokers. By the results of the questionnaire the patients were differentiated according to their smoking habits. From this, the number of smokers and non-smokers were selected upon viewing the inclusion and exclusion criteria. The following exclusion criteria was observed to

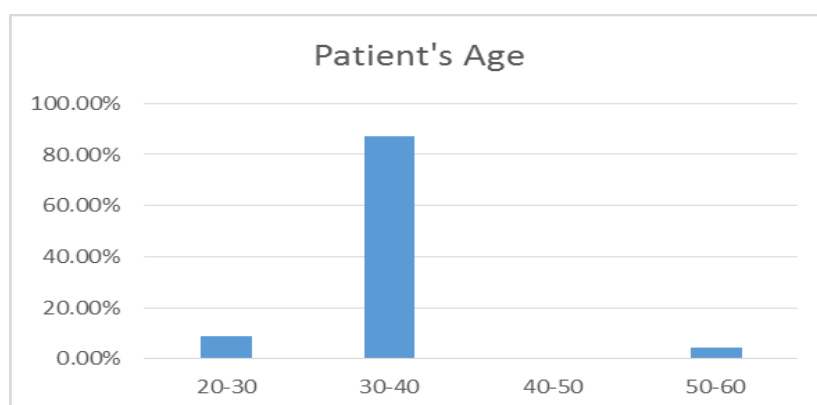
exclude the subjects from the study: patients suffering from aggressive periodontitis, ulcerative gingivitis, periodontal abscess; patients suffering with any other chronic medical diseases like diabetes or other infections; patients following periodontal treatment with antibiotics for more than 3 months. The medical history of all the patients was recorded. The periodontal patients that fulfilled all the inclusion and exclusion criteria were selected and divided as smokers group and non-smokers group. 11 of the subjects were smokers and 11 subjects were non-smokers and the volume of gingival crevicular fluid was measured in them. The volume is to be determined using an electronic device named periotron 8000.

Later the raw periotron scores were converted to the standardized GCF volume measurement in microliters.

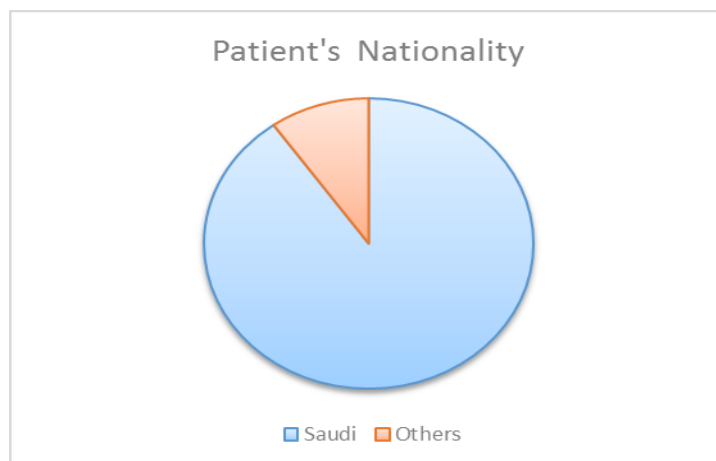
Statistical analysis was done using SPSS (SPSS Inc., Chicago, IL) software. The mean and standard deviation scores were calculated for age, Gender, gingival crevicular fluid volume. The comparisons were made between the smoking and non-smoking groups using the non-parametric ANOVA test. The null hypothesis was rejected at $P < 0.05$. The mean difference in the Gingival Crevicular Fluid volume in smokers and non-smokers was analyzed and reported.

RESULTS

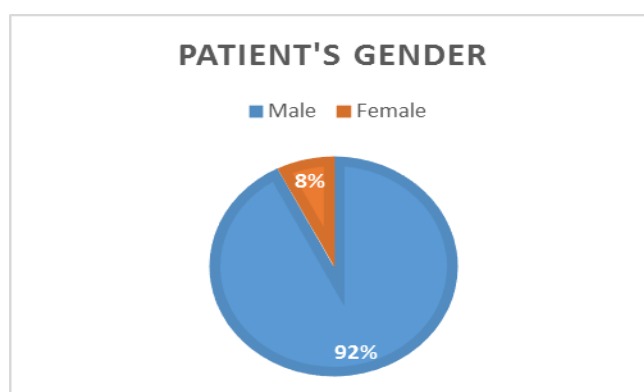
All the 50 patients that were randomly selected were asked to answer the questionnaire to help us differentiate all of them into smokers and non-smokers. The results of the questionnaire showed that majority of the patients were in the Age of 30-40 years of age, about 87%, while remaining 8.8% were in the range of 20-30 years and 4.2% in the range of 50 above.



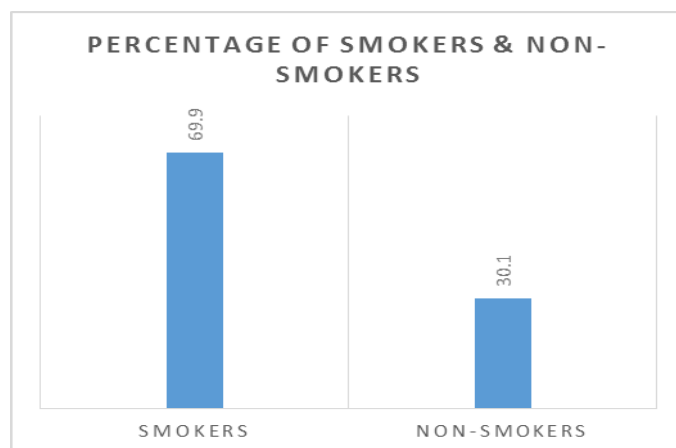
Majority of the patients were of Saudi nationality of about 90.2% and the remaining were others.



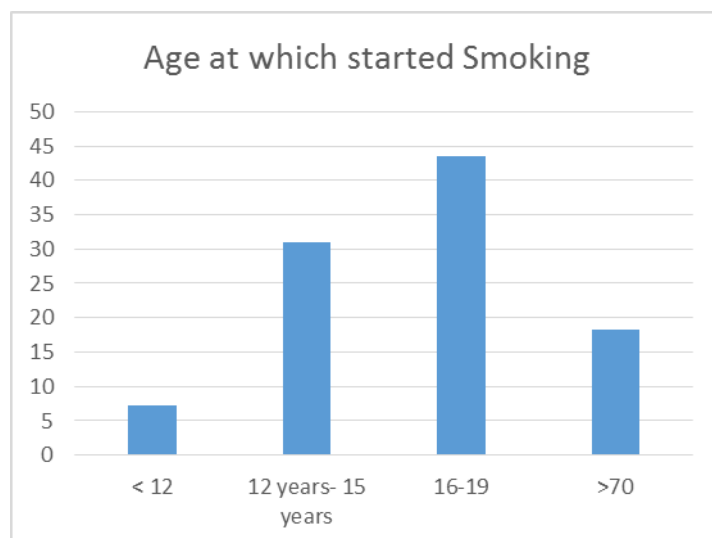
The results of the questionnaire reported as majority of the patients were males (92.5%) and only few females (7.5%).



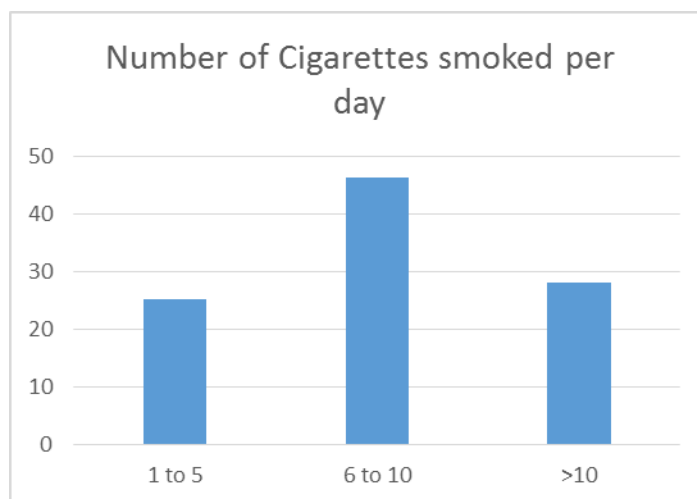
Apart from this general questions, the questionnaire included questions that help us differentiate smokers and non-smokers. From the results we found that, 69.9% were found to be current smokers and 30.1% were found to be current non-smokers.



It also showed that 73.9% were former smokers and 26.1% former non-smokers. It was determined that about 43.5% of the patients have started to smoke in the age of 16-19 years followed by 31% by the age of 12-15 years.



About 46.5% smoke about 6-10 cigarettes per day, while 28.2% smoke more than 10 cigarettes per day and 25.3% smoke around 1-5 cigarettes per day.



About 86.5% doesn't use smokeless tobacco and 75.1% is trying to quit smoking. 63.2% doesn't smoke shisha while remaining 36.8% smoke shisha. 83.5% of the smokers smoke shisha for hours while remaining 16.5% smoke shisha only for minutes.

About 11 smokers and 11 non-smokers were selected after the patients met all the inclusion and exclusion criteria. The gingival crevicular fluid volume was measured in both the smokers and non-smokers with periodontal diseases. Before the volume of gingival crevicular fluid was measured the individual site of the tooth was isolated with cotton rolls, the supra-gingival plaque was carefully removed and the tooth-site was air dried. The paper-strip was inserted in the crevice 1-2mm. Then the volume of gingival crevicular fluid was measured using an electronic device, periotron 8000®. The paper strips if contaminated with blood were discarded. The paper strips was immediately placed in the recording sensors, in such a way that the entire moistened area of paper strips was in contact with sensors. The readings were measured and the periotron scores were converted to gingival crevicular fluid volume measurements in microliters.

Gingival Crevicular Fluid volume in microliters (µl) with P value (P=0.027)

CATEGORY	MEAN	STANDARD DEVIATION
SMOKERS	0.41	0.23
NON-SMOKERS	0.23	0.14

It is observed that the volume of the gingival crevicular fluid increased in the smokers. As smoking causes vasoconstriction that may lead to gingival vascular dysfunction and periodontal disease. Thus by this study, the gingival crevicular fluid volume was increased in the smokers.

DISCUSSION

One of the major risk factors for the periodontal disease is smoking.^[1] Previous studies had reported extreme side effects of smoking on periodontal layer. Nicotine that is found in high concentrations in tobacco acts on the periodontal tissue layer and causes the damage to the surrounding supporting tissues.^[3, 4, and 5] Smokers have decreased blood flow in the periodontal tissues.^[7, 8, and 9] This study was conducted on the smokers and non-smokers with periodontal diseases to differentiate and calculate the volume of gingival crevicular fluid. The volume of GCF among smokers is high when compared to the non-smokers.

The gingival crevicular fluid is supposed to be increased with the severity of inflammation in the periodontal tissues.^[12] Initially the Gingival Crevicular fluid has same concentration as the interstitial fluid.^[14] Later, when it passes through the inflamed tissues it takes up the enzymes and also other products of tissue degradation and results in formation of true exudate of serum as inflammation exceeds. The volume of the Gingival Crevicular fluid (GCF) is been linked with the degree of the periodontal disease and it is also an indicator of the inflammation of gingiva.

CONCLUSION

The vascular fluid concentration fluctuation when a person smokes every time. When a person smokes, the volume of gingival crevicular fluid is increased as it's a sign of degree of inflammation. The increased volume of the gingival crevicular fluid in smokers indicated a presence of masked inflammation in the smokers. There is decreased clinical outcomes in the smokers when compared with the non-smokers. The future studies should be carried out to better understand the components and materials present in the gingival crevicular fluid and also its role to better understand the effect of smoking on the components of the gingival crevicular fluid in Saudi Arabia.

CONFLICT OF INTEREST: The authors do not have any commercial associations that might pose or create a conflict of interest with information presented in this communication. No intramural or extramural funding supported any aspect of this work.

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