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Comparative Evaluation of Bacterial Population Among Smokers and Non-Smokers

P Aashiq Mohamed [1], R.V.Geetha[2]*, T. Lakshmi [3]

[1],[2]Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai , Tamilnadu, India.

[3]Centre for Transdisciplinary Research, Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai , Tamilnadu, India.

ABSTRACT

Background: Cigarette smoking kills more than 4,80,000 people every year, this also includes people that do not smoke (CDC, 2014). Cigarette smoking is one of the leading causes of death which includes Oral cancer, bronchitis, emphysema and many other life threatening conditions. In the study, the effect of smoking on bacterial populations was compared to healthy non-smoking individuals to observe different variants of bacterial growth.
Aim: The aim of this study is to analyze the various types of bacterial growth observed in smokers and non-smokers.
Method: Saliva samples were collected from 10 smokers and 10 non-smokers and the samples were processed for isolation of both aerobic and anaerobic organisms. Saliva samples plated into BHI agar and blood agar and incubated at 37 degrees for 24 hrs for isolation of aerobic organisms and in anaerobic jar with Gaspak for isolation of anaerobic organisms and the bacterial growth was identified by Colony morphology, Gram staining and biochemical reactions.
Results: Smokers showed significant bacterial diversity compared to non-smokers. Though some organisms like Streptococcus, Prevotella, Neisseria, Enterococcus were isolated from both smokers and non-smokers, few pathogens like Lactobacilli bacilli, Porphytomonas were isolated from smokers. Therefore these pathogens play an important role in Periodontal disease and septic disease.
Conclusion: From the study, we can conclude that smoking significantly alters the bacterial population which may favor periodontal disease. Public awareness should be created on the health implications of smoking and poor oral hygiene.

Corresponding Author e-mail: geetha@saveetha.com

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INTRODUCTION

The oral cavity of healthy humans harbors a diverse microbial community called the “normal flora”, which is composed of more than 700 bacterial species that regularly attach to and form biofilms on the surfaces of soft and hard tissues within the mouth(1). Members of the oral biofilms are regularly shed into the saliva, which is bathing the oral mucosa. Saliva is a complex biological fluid whose composition is affected both by local conditions in the oral cavity and systemic diseases(2). Since saliva can be collected in a painless, non-invasive manner, substantial efforts have been made to identify disease-related salivary biomarkers, recently. In addition to the biomolecules accumulating in saliva during pathological processes, the oral microbiome may also be regarded as a new biomarker reservoir. Thus, the changes of the salivary microbial community can also be exploited for the diagnosis and monitoring of oral and systemic diseases(3).

KEYWORDS:
Bacterial growth, smokers, non-smokers

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Smoking is an important risk factor for oral diseases, such as periodontitis and oral cancer, and it is also associated with a wide variety of systemic diseases. Although tobacco use, especially cigarette smoking, decreased in the last decades in Western countries, regular smoking is still a common habit in Central- and Eastern European countries, Asia, China, and North Africa. Tobacco smoke may contain more than 5,000 chemicals, among them toxic, mutagenic and carcinogenic substances(4). These chemicals may initiate pathogenic alterations by interacting directly with various host cells and extracellular matrix components. Nicotine, a major, highly addictive constituent of cigarette smoke modulates the immune responses. Toxic compounds in tobacco smoke may cause cellular injury and cell death whereas carcinogens, including N-nitrosamines and polycyclic aromatic hydrocarbons may initiate tumorigenesis by forming DNA adducts and blocking DNA repair(5). Chemicals in cigarette smoke may also contribute to disease development indirectly by changing the composition of the human oral microbiome. Alteration of the oral microbiome in cigarette smokers may favor disease development by increasing the local density of bacterial pathogens or decreasing the prevalence of their competitors(6).

Cigarette smoking is one of the most important aspects in the development of oral diseases, including periodontitis and oral cancer, which are particularly prevalent in India(7). Smoking may influence disease progress by altering the microbial communities of the oral cavity; therefore,e in this cross-sectional study, we characterized the bacterial growth of smokers and non-smokers.

MATERIALS AND METHODS

Saliva samples were collected from 10 smokers and 10 non-smokers and the samples were processed for isolation of both aerobic and anaerobic organisms. Saliva samples plated into BHI agar and blood agar and incubated at 37 degrees for 24 hrs for isolation of aerobic organisms and in anaerobic jar with Gaspak for isolation of anaerobic organisms and the bacterial growth was identified by Colony morphology, Gram staining and biochemical reactions.

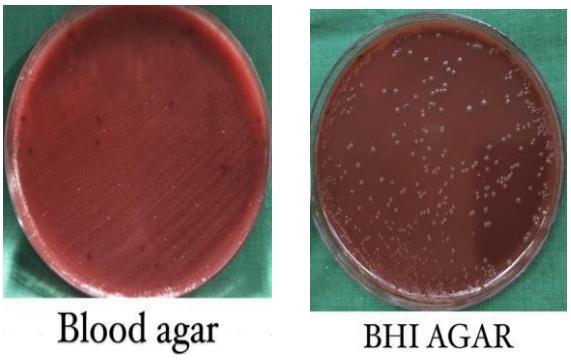

Figure 2: represents the bacterial growth on Blood agar and BHI agar

RESULTS

Saliva samples were collected from 10 smokers and 10 non smokers and cultured for aerobic and anaerobic organisms. The bacterial growth were identified and the results are tabulated in table 1. From table 1 it is shown that smokers show significant bacterial diversity compared to non-smokers. Organisms like streptococcus, Prevotella, Neisseria, Enterococcus were isolated from both smokers and non-smokers, and few pathogens like Porphytomonas were isolated from smokers. These pathogens play an important role in Periodontal disease and septic disease.

Table 1: The table shows the type of bacteria present in saliva of both smokers and non-smokers

SAMPLE Number	SMOKERS	NON-SMOKERS
1	Prevotella, streptococcus	streptococcus, enterococcus
2	Streptococcus, nisseria, lactobacilli	Streptococcus, Prevotella
3	Streptococcus, porphytomonas	streptococcus
4	Bacteroidetes, fusobacteria, nisseria, lactobacilli	Nisseria, streptococcus, Prevotella
5	Porphytomonas, lactobacilli	Enterococcus, streptococcus
6	Prevotella, streptococcus, lactobacilli	Streptococcus, enterococcus
7	Streptococcus, nisseria, prevotella	Prevotella, fusabacteria, porphytomonas
8	Fusobacteria, enterococcus, nisseria, Prevotella	Prevotella, streptococcus
9	Prevotella, streptococcus, enterococcus	Streptococcus, nisseria, enterococcus
10	Lactobacilli, streptococcus, nisseria	Nisseria, prevotella

DISCUSSION

Smokers showed significant bacterial diversity compared to non-smokers. Though some organisms like Streptococcus, Prevotella, Neisseria, Enterococcus were isolated from both smokers and non-smokers. Few pathogens like Lactobacilli, Porphytomonas were isolated from smokers. Therefore these pathogens play an important role in Periodontal disease and Septic diseases(8). From the previous studies results showed that tobacco smoking reduced the diversity of saliva. Gram positive bacterial species from 18 in non-smokers down to 7 in smokers(9–18).

Other investigations further clarified the differences between smokers and non-smokers with chronic mild periodontitis in the subgingival microbiota makeup. Smokers are also more likely to develop additional oral conditions such peri-implant mucositis and peri-implantitis(19). Smoking affects the peri-implant microbiome in peri-implant biofilm samples from patients with peri-implant health, peri-implant mucositis, and peri-implantitis, according to research. The underlying mechanism is that smoking drives commensals out of this niche, allowing pathogens to colonize more readily(20). Smokers had a statistically significant higher risk of developing severe periodontitis than non-smokers, according to evidence linking periodontitis to smoking and complex microbial populations in the subgingival sulcus(21). Researchers have increasingly concentrated on the links between smoking and specific subgingival bacterial species in the development of periodontitis. Periodontitis brought on by smoking is less varied and distinct than that of non-smokers(22). Shchipkova et al. investigated the microbial profile of smokers with moderate to severe chronic periodontitis and found significant variations in the prevalence and abundance of disease-associated and health-compatible microorganisms, with higher abundances of Parvimonas, Fusobacterium, Campylobacter, Bacteroides, and Treponema and lower levels of Veillonella, Neisseria, and Streptococcus(23).

The quantity of lactobacilli and daily cigarette consumption were substantially associated. More than twice as many smokers as non-smokers had more than or equal to 10(6) S. mutans CFU/ml, or about 40% of the population(24). In a related study, conducted on 20 smokers, the immediate impact of smoking on salivary secretion rate and the buffering effect of stimulated whole saliva were examined for one hour after smoking. No discernible impact was discovered(25).

In future this study can be performed with a larger population size over different ethnic groups over a wide geographical area. Limitations involve small sample size and only one ethnic group was taken into account.

CONCLUSION

According to the study, smoking considerably changes the bacterial population, which may help to promote periodontal disease. The negative effects of smoking and poor oral hygiene on health should be brought to the public's attention. We anticipate that this study will contribute to a better understanding of the increased susceptibility to bacterial diseases in people who are exposed to smoke, give efforts to reduce exposure to smoke more momentum, and stimulate further epidemiological and, in particular, mechanistic research into this crucial area.

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Conflict Of Interest

The authors would like to declare no conflict of interest in the present study.

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Authorship contribution

AMP compiled the manuscript RVG conducted the study LT designed the study

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