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A COMPARATIVE STUDY OF ALTERATION IN SALIVARY pH AMONG TOBACCO USERS AND HEALTHY CONTROLS

Medical Science

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ABSTRACT

Saliva is a body fluid which plays a critical role in oral homeostasis because it modulates the ecosystem within the oral cavity. Saliva can be stimulated or non stimulated. Any alteration in quantity or quality of salivary secretion may lead to local effects such as caries,oral mucositis, candidiasis, oral infections, chewing disorders or extraoral effects like dysphagia, halitosis. The pH in the saliva plays an important role in the life, growth and multiplication of oral bacteria. Using tobacco which contains numerous toxic compositions responsible for structural and functional changes in saliva. The use of tobacco products has been considered as the most important etiological factor in the development of oral cancer. The international agency for research of cancer has stated that there is sufficient evidence to show that tobacco is carcinogenic. Tobacco is consumed in various forms such as smoking, chewing, and snuff dipping.

AIM: The aim of the study is to assess the alteration of salivary pH in smokers, chewers and healthy controls who visit the out patient department of our institution.

MATERIALS AND METHODS: A total of 60 participants including above the age of 20 years to 50 years,out of which 20 smokers and 20 chewers and 20 healthy controls were included in the study and documented as group I,group II, group III respectively. The saliva of each subject was collected under resting conditions. Patient was instructed to spit the saliva for 2-3 times in 1 min in a disposable container. Measurement of the salivary pH was done immediately after collection using salivary pH meter. Data were analyzed by Kruskal Wallis test, ANOVA, Mann-Whitney test using SPSS 15.

RESULTS: The mean (±standard deviation) pH for smokers were 6.1(±0.13),chewers were 6.0 (±0.17), healthy controls were 7.1(±0.1).The difference was statistically significant (P = 0.05).

CONCLUSION : Long-term smoking significantly reduces the salivary pH. There was a significant decrease in salivary pH of tobacco chewers when compared to smokers.

KEYWORDS

Saliva, Salivary pH, Tobacco, Smokers, Chewers.

INTRODUCTION :

Salivary fluid is an exocrine secretion of the three pairs of salivary glands, namely, the parotid, the submandibular, and the sublingual, along with that of numerous minor salivary glands. It is an important body fluid consisting of a variety of constituents which play an essential role in maintaining oral health. It is necessary for growth and maturation of taste buds, protection and lubrication of the oral mucosa, maintenance of integrity of enamel by tooth remineralization, stimulation, dilution, and cleaning, pH balance, and phonation. It has been used as a source of non-invasive investigation of various body parameters as it is the most easily accessible fluid in the human body.[1] Various drugs such as antihypertensives, anticholinergics, diuretics, psychoactive substances, antihistamines, conditions such as nutritional, metabolic, neurological abnormalities, and post surgery alter the salivary constituents, thereby altering the salivary parameters like salivary pH, buffering capacity. Early diagnosis and intervention are required in various oral, pharyngeal, and esophageal disorders; neoplastic, metabolic, nutritional, inflammatory, genetic, and autoimmune conditions; and disorders of the nervous system, which can affect the salivary gland function.

Nicotine is the main ingredient of tobacco which leads to altered secretion of saliva by acting on specific cholinergic receptors in the brain and other organs and causing neural activation.[2]

Resting whole saliva is the mixture of secretions and enters the mouth in the absence of exogenous stimuli. It has many functions. It has cleansing effects. Lubrication of the alimentary bolus, protection against virus, bacteria and fungi, buffer capacity, protection and repair of the oral mucosa and dental remineralization are some of the functions of saliva.[3]

The saliva is composed of 99% water and 1% solids. The components of the saliva also determine the pH. Saliva has a pH normal range of 6.2-6.7,with 6.7 being the average pH. Resting pH of mouth does not fall below 6.3. In the oral cavity, the pH is maintained near neutrality (6.7 – 7.3) by saliva.[4]

In long-term smoking, the taste receptors, a primary site for salivary secretion, are repeatedly exposed to tobacco for long-time thus presumably affecting the salivary reflex.[5] Therefore, the aim of the present study was to analyze the long-term effects of smoking on salivary pH.

MATERIALS AND METHODS:

A total of 60 individuals have participated in the study which include 20 that consume smoke form of tobacco,20 that consume smokeless form of tobacco and 20 healthy controls.

Patient was instructed to spit the saliva for 2-3 times in 1 min in a disposable container. Measurement of the salivary pH was done immediately after collection using salivary pH meter. .

Data were analyzed by Kruskal Wallis test, ANOVA, Mann-Whitney test using SPSS 15.

Figure 1 : Measurment of salivary pH using salivary pH meter

Inclusion criteria :
Divided into 3 groups
1. Group 1 – contains 20 patients that consume smoke form of tobacco for more than 5 years.
2. Group 2 – contains 20 patients that consume smokeless form of tobacco for more than 5 years.
3. Group 3 – contains 20 healthy subjects.

Exclusion criteria :
1. Hypertensive
2. Diabetic patients

RESULTS:
The mean (±standard deviation) pH for smokers were 6.1(±0.13),chewers were 6.0 (±0.17), healthy controls were 7.1(±0.1).The difference was statistically significant (P = 0.05).

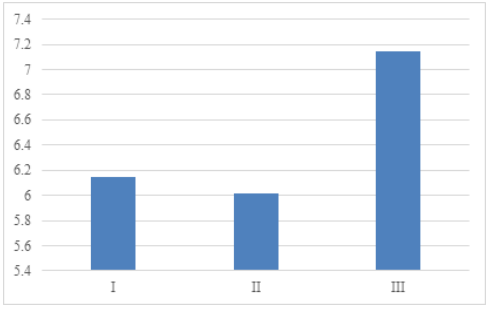

Figure 2 : Mean salivary pH among three groups

DISCUSSION :
The salivary flow and composition alter greatly under different conditions as salivary secretion is a complex process. The salivary flow and protein secretion in unstimulated whole saliva depend on the sizes of the parotid and submandibular glands, i.e. the larger the sizes of the glands, the faster will be the salivary flow and protein secretion. It is hypothesized that the salivary secretion from the glands is generally elicited in response to stimulation of the autonomic innervations to the glands or because of the drugs mimicking the actions of autonomic innervations.[6]

Saliva, being the first biological fluid, is exposed to the harmful constituents of tobacco, both smoked and smokeless forms, which leads to various structural and functional changes. The taste receptors responsible for salivary secretion are constantly being affected by the harmful by-products of tobacco. Saliva is composed of various glycoproteins, peptides, electrolytes, and lipids having antioxidant, antimicrobial, buffering, remineralization of tooth, and tissue repair activities. Therefore, altered salivary pH have an important role in the causation of various oral changes and conditions.[1]

The widespread use and growing acceptability of saliva as a diagnostic tool is helping, individuals, researchers, health care professionals and community health programs to better detect and monitor disease and to improve the general health of the public. As it is a readily available,non-invasive sampling procedure that needs no special equipment or trained professionals to handle the specimen, expectorated whole saliva might one day replace blood as a suitable monitoring medium for diagnostic procedures.[7]

Measurement of salivary pH can be useful in evaluation of oral as well as generalized health status of the individual. Unstimulated saliva passes through the ducts more slowly and has enough time to mix the various components while stimulated saliva gushes out of the ducts in a more pure,dilute form. After it enters the oral cavity,the saliva gets mixed with gingival crevicular fluid,food debris, microorganisms and desquamated cells. Hence, the study of unstimulated salivary secretion is an accurate method to analyze salivary gland status while stimulated saliva is useful for the study of the functional reserve.There is substantial evidence suggesting that the risk of oral diseases increase with frequent use of tobacco and that quitting smoking results in reduced risk. In our study we have estimated salivary pH of tobacco smokers and chewers to understand the effect of tobacco on the pH.[8]

Present study revealed that the mean (±standard deviation) pH for smokers were 6.1(±0.13),chewers were 6.0 (±0.17), healthy controls were 7.1(±0.1).The difference was statistically significant (P = 0.05) among the three groups. Rooban etal[9] also observed a lower salivary pH in smokers that is, 6.48 ± 0.36 in comparison to 6.59 ± 0.56 in nonsmokers. The difference was statistically significant (P = 0.03).On the contrary, the study conducted by Al-Weheb showed that the mean salivary pH was higher in smokers that is 7.32 as compared to nonsmokers that is 7.27.[5]

Khan etal,[10] also observed a lower salivary pH in smokers which was consistent with the findings of the present study.

Further studies should be carried out to correlate the salivary pH with various oral diseases like oral candidiasis, that can manifest itself as erythema, white plaque, thrush, median rhomboid glossitis, and angular cheilitis (deep furrow at the mouth of corners from years of smoking can predispose).

CONCLUSION:
The present study concludes that mean pH for healthy controls was 7.1(±0.1432), smokers was 6.150 (±0.1357) and chewers was 6.015 (±0.1785). The present study showed **highly significant** results in alteration of pH among the three groups considering the p value, $p<0.05$.

From the results of the study and within the limitations of the study, it can be concluded that tobacco significantly decreases salivary pH due probably because of lime used in tobacco which can react with bicarbonate buffering system by the loss of bicarbonate, turning saliva more acidic. The alteration in electrolytes and ions alters the pH as they interact with the buffering systems of saliva. All the three groups showed significant results when compared to each other.

Based on the results obtained we found that there was a significant decrease in salivary pH of tobacco chewers when compared to smokers. Thus we can conclude that tobacco has deleterious effects on saliva, no matter what form it is used in, making the oral cavity more susceptible to damage and thereby playing a role in development of various diseases.

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