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## Original Research

### Assessment of salivary pH in smokers and non smokers- A clinical study

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#### ABSTRACT

**Background:** Smoking effects secretion of saliva which ultimately is harmful for health of oral cavity. This study was conducted to assess the effect of tobacco usage on pH of saliva. **Materials & Methods:** This study was conducted in department of Oral pathology. It consisted of 90 subjects (males- 45, females-45). They were divided into 3 groups. Group I (males- 15, females- 15) consumed smoke form of tobacco. Group II (males- 15, females- 15) that consumed smokeless form of tobacco. Group III was control group (males- 15, females- 15). In all subjects, saliva collection was done under resting condition. Measurement of salivary pH was done immediately after collection using salivary pH meter. **Results:** Group III had highest pH (7.3) followed by group II (6.4) and group I (6.7). The difference was significant ( $P < 0.05$ ). There was significant difference in pH of saliva in all three groups. The difference was significant ( $P < 0.05$ ). **Conclusion:** There was alteration in pH of saliva of tobacco user which may be using smokeless tobacco or smoking tobacco. Smokeless tobacco has more decrease in pH which ultimately leads to gingival and oral diseases.

**Key words:** pH, Saliva, Tobacco,

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#### INTRODUCTION

Saliva plays a critical role in oral homeostasis, as it modulates the ecosystem within the oral cavity. 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.<sup>1</sup> The saliva is secreted by major and minor salivary glands. Among major salivary glands, parotid, submandibular and sublingual glands contribute to produce saliva. Saliva can be stimulated or non stimulated. 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.<sup>2</sup> Tobacco is harmful for health. The effect varies depending upon the type of tobacco used. It is used in either smoking tobacco or non smoking tobacco. The adverse effects of tobacco on oral health have been well documented. It has deleterious effect on gingival, periodontium and on teeth. Tobacco contains arecanut which has four major alkaloids such as arecaidine, arecoline, guvacine and guvacoline. In the presence of lime, arecoline and

guvacoline are largely hydrolyzed into arecaidine and guvacine respectively.<sup>3</sup>

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, weight loss etc. Smoking effects secretion of saliva which ultimately is harmful for health of oral cavity.<sup>4</sup> This study was conducted to assess the effect of tobacco usage on pH of saliva.

#### MATERIALS & METHODS

This study was conducted in department of Oral pathology. It consisted of 90 subjects (males- 30 males, females-30). They were informed regarding the study and written consent was obtained. Patient's information such as name, age, gender etc was recorded on case history performa.

They were divided into 3 groups. Group I (males- 15, females- 15) consumed smoke form of tobacco. Group II (males- 15, females- 15) that consumed smokeless form of tobacco. Group III was control group (males- 15, females- 15). In all subjects, saliva collection was done under resting condition. Saliva collection was carried out between 9:00 am and 12:00 pm to avoid any diurnal

variation. Subjects were then asked to be seated on the dental chair and asked to spit 2-3 times in 1 min in a disposable container. During saliva collection, subjects were instructed not to speak or swallow. Measurement of salivary pH was done immediately after collection using salivary pH meter. Results thus obtained were subjected to statistical analysis. P value < than 0.05 was considered positive.

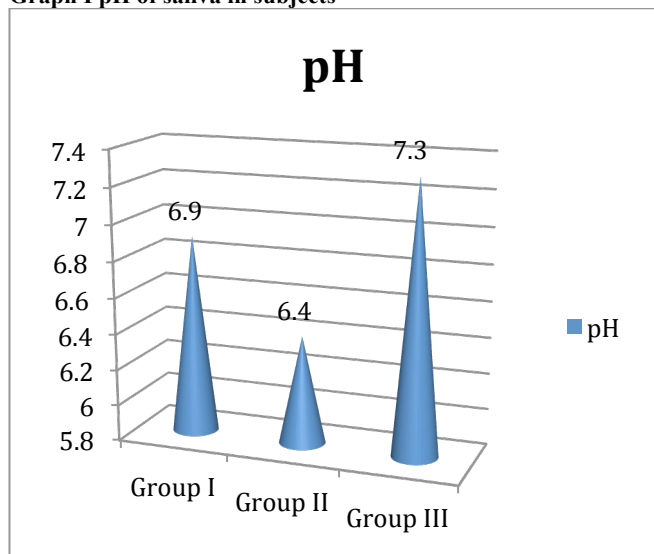
**RESULTS**

Table I shows that group I, group II and group III contained equal number of males (15) and females (15). Graph I shows that group III had highest pH (7.3) followed by group II (6.4) and group I (6.7). The difference was significant (P< 0.05). Table II showed significant difference in pH of saliva in all three groups. The difference was significant (P< 0.05).

**Table I Distribution of subjects**

Group I		Group II		Group III	
(Smoke tobacco)		(Smokeless tobacco)		(Control)	
Male	Female	Male	Female	Male	Female
15	15	15	15	15	15

**Graph I pH of saliva in subjects**



**Table II Means, standard deviation of pH of saliva in all subjects**

Group	Mean	S.D
Group I	6.9	0.132
Group II	6.4	0.211
Group III	7.3	0.217

**DISCUSSION**

Saliva is required for lubrication of the alimentary bolus, protection against virus, bacteria and fungi, protecting the oral mucosa, teeth remineralization, digestion, taste sensation, pH balance and phonation. Saliva has many functions such as cleansing, lubrication, maintaining homeostatis, 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. 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.<sup>5</sup> This study was conducted to assess the effect of tobacco on pH of saliva in study population. We observed that group III had highest pH (7.3) followed by group II (6.4) and group I (6.7). When we compared the pH in group I and II, the difference was non - significant but group III had slightly higher pH as compared to other 2 groups. We found that salivary pH was the lowest in group II compared to group I and group III probably because of use of lime in smokeless form, 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. This is in agreement with et al.<sup>6</sup> Sonies BS et al<sup>7</sup> in their study divided subjects into smokers and nonsmokers. Each group comprised of 35 male adults. The saliva of each subject was collected under resting conditions. The mean (±standard deviation) SFR and pH were 0.20 (±0.05) ml/min and 6.30 (±0.36) respectively in smokers while the mean SFR and pH were 0.36 (±0.06) ml/min and 7.10 (±0.24) in nonsmokers. The difference was statistically significant. Long term smoking significantly reduces the SFR and salivary pH. We found that there was significant difference in pH of saliva in all three groups. This is similar to study by Atkinson et al.<sup>8</sup> Mohan et al<sup>9</sup> conducted a study in which the pH of saliva and buffering capacity was measured using a digital pH meter. The results revealed a gradual decrease of flow rate with advancing age. The flow rate of men was also significantly higher than women. Flow rate did not vary with obesity, smoking status, or alcohol consumption. Salivary pH was found to decrease with advancing age, and was found to be more in males than in females. The pH was found to decrease with obesity and alcohol consumption, but did not change with the smoking status of the patients. The buffering capacity of saliva was found to also decrease with age, and with obesity, smoking and alcohol consumption but was not found to vary with gender. Valdez et al<sup>10</sup> in their study found that at pH > 7.0, there is a low incidence of dental decay and little or no calculus. Therefore, stable conditions should basically be found in this environment. A saliva pH below 7.0 usually indicates academia. If a chronic condition exists, the mouth is more susceptible to dental decay, halitosis and periodontitis. Chronic acidemia can be a causative factor for a multitude of diseases affecting the whole body. Ship<sup>11</sup> stated that lime could cause a free radical injury or the high alkaline content probably reacts with the salivary buffering systems and alters the pH. A salivary pH of 7.0 usually indicates a healthy dental and periodontal situation.

**CONCLUSION**

There was alteration in pH of saliva of tobacco user which may be using smokeless tobacco or smoking tobacco. Smokeless tobacco

has more decrease in pH which ultimately leads to gingival and oral diseases.

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