ORIGINAL RESEARCH PAPER

Dental Science

EFFECT OF SMOKING ON SALIVARY FLOWRATE AND PH STATUS.

KEY WORDS: Saliva, Salivary Flow Rate, Ph Of Salvia, Smokers.

Dr. Anuja Pawar* P.G Student, Department Of Oral Medicine And Radiology, Csmss Dental College, Aurangabad. *Corresponding Author

Dr. Lata Kale Head, Department Of Oral Medicine And Radiology,csmss Dental College, Aurangabad.

Dr. Firdous Shaikh P.G Student, Department Of Oral Medicine And Radiology, Csmss Dental College, Aurangabad.

Shivani Dhake Intern, Csmss Dental College, Aurangabad.

ABSTRACT

AIM: The aim of the study is to analyze and compare the long term effect of smoking on salivary Flowrate and pH among Smokers and Controls.

MATERIALS AND METHODS: The study group consisted of 50 patients, subjects were divided into 25 smokers and 25 nonsmokers. They were asked to spit in a graduated container at an interval of 60 s for 5 min. Salivary flowrate(SFR) was measured using graduated tubes and pH of salivary flowrate using pH strips. Student t tests was used on continuous scale between two groups by using the Statistical software IBM SPSS statistics 20.0.

RESULTS: The mean (±standard deviation) SFR and pH were 1.22(±0.32) ml/min and 5.32(±0.47) respectively in smokers while the mean SFR and pH were 2.18(±0.31) ml/min and 6.92(±0.27) in nonsmokers. The difference was statistically significant ($P = 0.00$).

CONCLUSION: Our findings indicated that long-term smoking significantly reduces SFR and salivary pH .

INTRODUCTION:

Saliva is a complex and important body fluid, which is very essential for oral health. [1]Saliva is necessary for protection, lubrication of oral mucosal tissues, remineralization of teeth, digestion, taste sensation, stimulation, pH balance, phonation. Saliva, the fluid in the mouth is a combined secretion of three pairs of Salivary glands: the Parotid Gland, the Submandibular Gland, the Sublingual Gland; together with numerous minor salivary glands.[2]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] Approximately, 0.5 L of saliva is secreted per day.The salivary flow rates (SFRs) are 0.3 ml/min when unstimulated and rise to 1.5–2.0 ml/min when stimulated but flow rate is negligible during night. [2] Nicotine, tar, carbon monoxide, formaldehyde, ammonia etc., is present is present in the cigarette smoke. Nicotine at first increases the flow of saliva in the mouth and with later doses it decreases the salivary flow. [4]It has been discovered that smoking increases the activity of salivary glands and indeed, this observation has been made by everyone who begins smoking. It has also been observed that some tolerance develops to the salivatory effects of smoking because habitual smokers do not salivate as do novice smokers in response to smoking. [2]

The pH in the saliva plays an important role in the life, growth and multiplication of oral bacteria. The number of acidophilic bacteria is increased when the pH in the saliva is very low, whereas the number of the acid-sensitive bacteria is decreased. [3] Salivary proteins, phosphate and bicarbonates contribute to pH.

Maintenance of oral pH above 5.5 is necessary to avoid dissolution of calcium salt from enamel leading to tooth erosion. Normal salivary pH varies in the range from 5.75 to 7, which may rise further up to 8 upon stimulated secretion. [5]

Alterations in salivary function may lead to impairment of oral tissues and have a large impact on the patient's quality of life. A higher incidence of dental caries, oral mucositis, dysphagia, oral infections and altered taste has been reported in individuals with reduced salivary flow.[3] Therefore, the aim of the present study was to analyze the long-term effects of smoking on SFR and salivary pH.

MATERIALS AND METHOD

This study was conducted , in which a total of 50 subjects were selected from the outpatient Department of Oral medicine and radiology.

Inclusion Criteria:

Consists of patients in the age group of 20 to 60 years who are Chronic smoker of more than 6 months. who smoked 10–15 cigarettes daily or 1–2 bundles of bidi per day

Exclusion Criteria:

Included subjects who wore denture, had a history of radiotherapy, patients with systemic or salivary gland disease, alcohol consumption or those who consumed smokeless tobacco in any form.

The study was categorized into two sub-groups 25smokers and 25 non-smokers.

Saliva collection Method

Saliva collection was done between 9am to 12.00 pm to avoid diurnal variation. Each subjects were advised not to drink, eat or perform oral hygiene or smoke 60 minutes before and during the study. Subjects were asked to spit the saliva on a saliva collecting container for every 1min for 5 minutes and later transferred to a graduated container. During saliva collection, subjects were instructed not to speak or swallow. After collection the salivary flowrate was measured in the graduated tube and expressed in ml/minute. Armamentarium used Figure.1

Laboratory procedure:

Salivary pH was measured immediately after measuring salivary flowrate using pH strips. the indicator strip was dipped in the saliva for 30 s and the color on the strip was compared with the standard color chart provided by the manufacturer. Based on the color change of the indicator paper strip, the pH was assessed in comparison with a color chart Figure 2. Manufacturer's instructions were followed while measuring salivary pH.

STATISTICAL ANALYSIS

Descriptive and inferential statistical analyses were carried out in the present study. Results on continuous measurements were presented on Mean SD and results on categorical measurement were presented in number (%). Level of significance was fixed at p=0.05 and any value less than or equal to 0.05 was considered to be statistically significant.

Student t tests (two tailed, unpaired) was used to find the significance of study parameters on continuous scale between two groups.

The Statistical software IBM SPSS statistics 20.0 (IBM Corporation, Armonk, NY, USA) was used for the analyses of the data and Microsoft word and Excel were used to generate graphs, tables etc.

RESULTS

The mean (±standard deviation) SFR and pH were 1.22(±0.32) ml/min and 5.32(±0.47) respectively in smokers while the mean SFR and pH were 2.18(±0.31) ml/min and 6.92(±0.27) in non-smokers. The difference was statistically significant (P = 0.00).Table 1,2,3,4,Figure 3,4,5,6.

Table 1: Comparison of age in terms of {Mean (SD)} among both the groups using unpaired t test

Group	N	Mean	Std. Deviation	t value	P value
Cases	25	48.84	11.357	0.0	1.00
Controls	25	48.84	11.357		

Table 2: Gender wise distribution of the study participants among both the groups

			Gender	Total
			Male	
Group	Cases	Count	25	25
		% within Group	100.0%	100.0%
	Controls	Count	25	25
		% within Group	100.0%	100.0%
Total		Count	50	50
		% within Group	100.0%	100.0%

Table 3: Comparison of saliva in ml/5 mins in terms of {Mean (SD)} among both the groups using unpaired t test. (p < 0.05 - Significant*, p < 0.001 - Highly significant)**

Group	N	Mean	Std. Deviation	t value	P value
Cases	25	1.220	0.3253	**10.537**	**<0.001****
Controls	25	2.180	0.3189		

Table 4: Comparison of pH value in terms of {Mean (SD)} among both the groups using unpaired t test (p < 0.05 - Significant*, p < 0.001 - Highly significant)**

Group	N	Mean	Std. Deviation	t value	P value
Cases	25	5.32	0.476	**14.525**	**<0.001****
Controls	25	6.92	0.277		

Figure 3: Comparison of age in terms of {Mean (SD)} among both the groups using unpaired t test

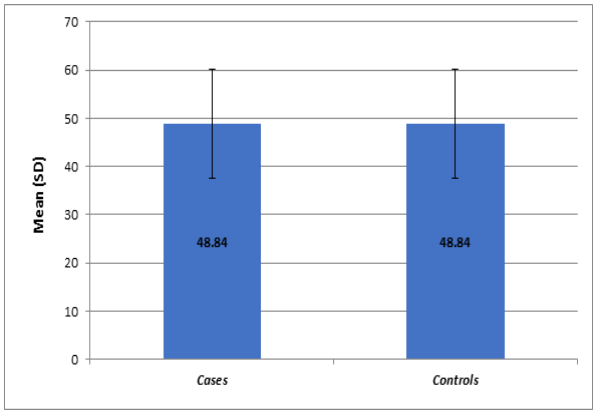


Figure 4: Gender wise distribution of the study participants among both the groups

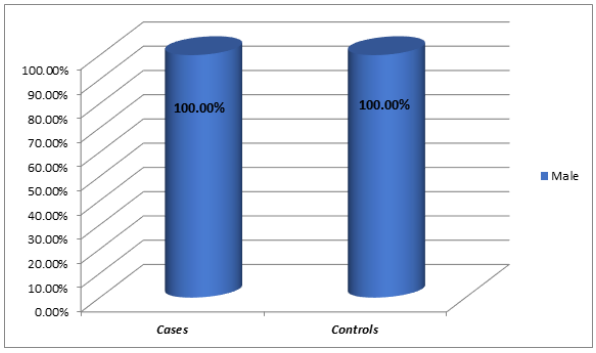


Figure 5: Comparison of saliva in ml/5 mins in terms of {Mean (SD)} among both the groups using unpaired t test

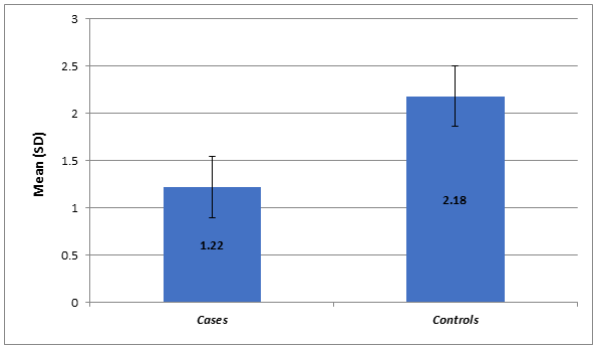
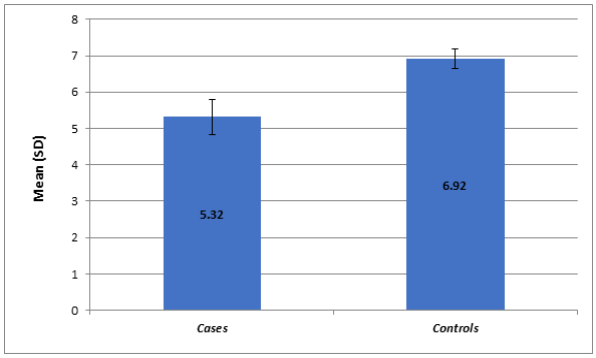


Figure 6: Comparison of pH value in terms of {Mean (SD)} among both the groups using unpaired t test



DISCUSSION

The salivary secretion is a complex process, and its flow and composition vary greatly under different conditions.[6] The salivary flow rate is influenced by a large number of factors, including the degree of hydration, body position, exposure to light, previous stimulation, circadian and circannual rhythms, gland size and drug use.[7] The unstimulated flow rate averages 0.3 to 0.4 milliliter per minute, but the range is wide. Unstimulated flow rates of less than 0.1 mL/minute are considered evidence of hypo-salivation. Several studies have been conducted to determine the effects of various stimuli on the salivary flow rate and many have reported flow rates of less than 2 mL/minute.[6]

In present study, the mean salivary flow rate were 1.22(±0.32) ml/min in smokers and 2.18(±0.31) ml/min in non-smokers. Which was in accordance to the study conducted by Singh et al , in which the mean SFR was 0.20 ± 0.05 ml/min in smokers and 0.36 ± 0.06 ml/min in nonsmokers Khan et al. observed that some individuals develop tolerance to the salivary effects of smoking in the long term use. Similarly, Khan *et al*.[2] showed that SFR was 0.46 ± 0.05 ml/min in smokers while 0.43 ± 0.05 ml/min in nonsmokers. There was no statistically significant difference was observed Rooban et al. observed that the raw

form of areca nut (RAN) has a highest mean Salivary Flowrate (4.18 mL/10 min) as compared to the nonchewers (3.5 mL/min for 10 min) and other chewers (Rooban et al., 2006).[8] Rooban *et al*.[8] revealed that SFR was 3.88 ml/min ± 1.32 in smokers while the mean SFR was 3.52 ± 1.41 in nonsmokers.

A no. of studies shown that while cigarette smoking would typically cause a noticeable short-term increases in Salivary flowrate because it increases the activity of salivary glands in anyone who begins smoking, but in long-term use it has been observed that some individuals develop tolerance to the salivary effect of smoking so it reduces Salivary flowrate. And also smoking is one of the risk factors for reducing saliva and xerostomia.

Present study revealed that the mean salivary pH was 5.32(±0.47) in smokers and 6.92(±0.27) in nonsmokers. the mean salivary pH was 6.30 ± 0.36 in smokers and 7.10 ± 0.24 in nonsmokers in accordance to study conducted by Singh et al.

Similarly, Rooban *et al*.[8] 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). 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.[9]

Saliva remains super saturated with calcium phosphate whose concentration relates inversely to the pH. Bicarbonate input overtakes pH maintenance upon stimulated salivary secretion. [10] pH is thus checked from falling below 5.5. Saliva also becomes more viscous with fall of pH. . The alteration in electrolytes and ions alters the pH as they interact with the buffering systems of saliva.[8] studies should be carried out to correlate the SFR and 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) [11]

CONCLUSION

From the present study, it can be concluded that the long-term use of smoked form of tobacco significantly reduces the Salivary flowrate and salivary pH. Saliva flow rate is crucial determinant of salivary function by virtue of controlling all the players. Optimal flow rate varies among the individual subjects. Hence salivary flow rate and salivary pH measurements can be used as a chair side, non-invasive measures for assessing the pathological changes in oral mucosa linked to the vulnerable effects among people addicted to these adverse habits

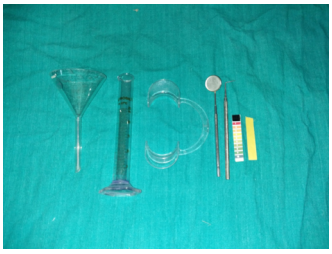


Figure 1: Armamentarium used.

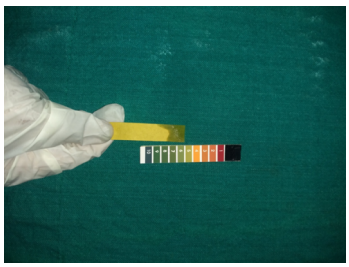


Figure 2: The color change of the indicator paper PH strip

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