

# SALIVARY FLOW RATE AND TOBACCO CONSUMPTION – DO THEY CORRELATE?

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**Abstract:** The aim of this study was to assess the severity of adverse effects of tobacco consumption using the saliva flow rate (SFR).

**Methodology:** A total of 120 patients participated in this study and were divided in three groups; [tobacco chewers, group A; smokers, group B and non-tobacco consumers, group C]. A questionnaire was developed to collect demographic and habitual information of subjects. The salivary flow rate (SFR) was recorded by asking patient to spit in a graduated container at each minute for 5 minutes. Mean SFR was calculated.

**Results:** Results showed that there is no effect of tobacco consumption on resting mouth salivary flow rate.

**Conclusion:** It can be concluded that the mean resting mouth SFR does not get affected by consumption of tobacco.

**Keywords:** Dry mouth, Oral health, Xerostomia, Saliva flow rate.

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## 1. INTRODUCTION

The oral cavity is kept moist by a film of fluid called saliva that coats the teeth and the mucosa. [1] Saliva, the fluid in the mouth, is a combined secretion of the three pairs of salivary glands: The parotid, the submandibular and the sublingual; together with numerous small glands. [2] When flow is unstimulated, the parotid, submandibular, sublingual and minor mucous glands contribute about 25%, 60%, 7–8% and 7–8%, respectively, to whole saliva, but when flow is stimulated, the parotid glands contribution increases by at least 10%. [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]

It is the most easily accessible fluid in the human body and in the future it is probable that it will provide an easy tool for non-invasive measurements of various body parameters. [2] Salivary contents are supposed to be altered by drugs (anti cholinergic, anti-hypertensive, antihistamines, diuretics and psychoactive substances) and conditions such as post-surgery, metabolic, nutritional, in any property of saliva, whether pH or flow rate could be associated with oral and dental diseases, pharyngeal, esophageal, neoplastic changes, autoimmune diseases, inflammatory changes and systemic diseases. [4]

It is believed that tobacco usage on a long-term basis can decrease the sensitivity of taste receptors, leading to decreased salivary reflex. It is hypothesized that long-term tobacco usage might lead to altered taste receptors' response, changing the SFR. 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. [5] Few studies have shown an increase in SFR in the short-term usage.

Saliva is the first fluid that gets exposed to tobacco whether smoked or smokeless form. The aim of current study was to analyze and compare the long term effect smoked and smokeless tobacco on SFR. The aim of this study was to assess the severity of adverse effects of tobacco consumption using the saliva flow rate as diagnostic parameters. In addition, the effects of the chewing tobacco and smoking tobacco were also compared.

## 2. METHODOLOGY

A total of 120 subjects were recruited for this study. Each subject was explained about the study protocol and an informed consent was obtained to participate in the research. Patients were divided in three groups (40 subjects in each group; Group A; included tobacco chewers, Group B included smokers and Group C included non-consumers of tobacco) and all required data were collected using the questionnaire within three months.

The questionnaire was used to collect demographic information, and subjects reported of smoking and chewing habits.

**Inclusion Criteria:**

- 1) Subjects in the age range of 20 to 50 years.
- 2) Patients who consumed tobacco either in smokeless form or in smoke form.
- 3) Apparent healthy patients; no systematic disease.

**Exclusion Criteria:**

- 1) Subjects who had history of trauma to head and neck.
- 2) Subjects who wore dentures.
- 3) Subjects who had undergone radiotherapy.
- 4) Subjects who had salivary gland diseases.

**Saliva Collection:**

After obtaining the informed consent, saliva of each subject was collected under resting condition using the simple drooling method for 5 minutes. The salivary flow rate expressed in ml/min. Saliva was collected between 10 am to 1 pm. Each subject was requested not to eat, drink, perform any oral hygiene, chew or smoke before and during the entire procedure. Saliva was collected in graduated container every 1 min for 5 minutes. During saliva collection subject was instructed not to speak or swallow. After collection, SFR was measured and expressed in ml/min for 5 minutes.

**Statistical Analysis:**

Data was analyzed using IBM SPSS (v 23.0, Statistical Package for Social Service; IBM, USA) computer software. The frequency and percentage was computed for qualitative variables. One-way ANOVA test was applied to compare mean or median of the outcome variable.

**3. RESULTS**

In group A, 35 % was the highest frequency noted among the subjects which had 0.20 ml/min mean resting mouth SFR. Where as in the group B, 30 % was the highest percentage that had 0.25 ml/min mean SFR (Table 1). In group C, 35 % was the highest frequency which had mean SFR of 0.20 ml/min, while second highest frequency of subjects i.e. 32.5 % had 0.5 ml/min SFR. The subjects presented in our study were in the age group from 25-40 years. The mean age ( $\pm$ SD) in the group A, was 32.40, group B- 29.45 ( $\pm$ 0.56) and group C 36.28 ( $\pm$ 0.85).

There was a statistically insignificant difference between groups as determined by one-way ANOVA ( $p \leq 0.05$ ). There was no statistically significant difference between and within the chewers, smokers and control groups.

Each group consisted of 40 subjects in total with 20 females and 20 males. Subjects in group A consisted of tobacco chewers, subjects consumed tobacco for more than 10 years, with the Mean ( $\pm$ SD) duration, consumption and frequency of habit was 14.10 ( $\pm$ 1.20), 11.4 ( $\pm$ 0.9 pieces/ day) and 9.40 ( $\pm$ 0.94) in Group A.

Subjects in the group B smoked 12.5  $\pm$  6.15 cigarettes per day (minimum=4, maximum=30 cigarettes). Subjects who smoked and chewed tobacco per day had the habit of intake for longer periods having the greater risk for developing xerostomia.

Group A (Chewing)		Group B (Smoking)		Group C (Control)	
SFR	Numbers (%)	SFR	Numbers (%)	SFR	Numbers (%)
			3 (7.5)		
0.02	2 (5.0)	0.01	4 (10.0)	0.02	2 (5.0)
0.03	2 (5.0)	0.02	4 (10.0)	0.10	2 (5.0)
0.10	9 (22.5)	0.10	8 (20.0)	0.20	14 (35.0)
0.20	14 (35.0)	0.20	3 (7.5)	0.30	8 (20.0)
0.30	3 (7.5)	0.25	12 (30.0)	0.40	8 (20.0)
0.32	2 (5.0)	0.30	2 (5.0)	0.50	13 (32.5)
0.40	6 (15.0)	0.32	2 (5.0)	1.00	3 (7.5)
0.50	2 (5.0)	0.40	2 (5.0)	1.50	
Total	40 (100)		40 (100)		40 (100)

#### 4. DISCUSSION

The salivary flow and composition alter greatly under different conditions as salivary secretion is a complex process. 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] Sympathetic as well as Parasympathetic nervous system determines the quality of saliva. Para-sympathetic system involves vasodilation of blood vessels within salivary glands and thus increased mobility of liquid within saliva, thus producing serous saliva. In contrast Sympathetic system has an influential role in producing thick concentrated saliva. [4,7]

The main ingredient of tobacco is nicotine which itself is Para-sympathomimetic and acts on cholinergic receptors and induce Para-sympathetic response and thus it has been seen that initially with use of tobacco SFR increase, in short term. [2,8] Whereas in long term, some studies suggest that SRF remains unaffected 30. However, there are also studies which suggest that salivary flow reduces with long term consumption of tobacco in any form. [2,9] Kanwar et al.[10] compared long term effect of tobacco among tobacco chewers, smokers and non-tobacco consumers. They found significant difference with most decreased SFR for smokers, while chewers also had decreased SFR in comparison to non-consumers.

Khan et al. proposed that long term habit of smoking leads to development of tolerance to salivary effects in some individuals, which may be the reason why some studies suggest that long term effects of tobacco consumption remains unclear, they also compared pH values between smokers and non-smokers and found lower pH in smokers. [2] However, studies have shown that long-term consumption of tobacco in any form, especially smokeless form, is one of the risk factors for reducing saliva, [8,11] which was observed in the present study. These findings were also consistent with the finding of Rad et al. [8]

#### 5. CONCLUSION

Based on calculated frequencies, it can be concluded that, the mean resting mouth SFR does not get affected by consumption of tobacco. ALSO effect on levels of salivary pH for tobacco consumers may suggest that tobacco usage can impair the salivary defence mechanism and may eventually result in multiple mucosal and dental diseases. Thus, more studies correlating other parameters of saliva should be taken in to consideration for more diagnostic purposes.

#### REFERENCES

- [1] Hand AR. Salivary glands. Ten Cate's Oral histology: Development, Structure and Function. In: Nanaci A, editor. 7th ed. New Delhi: Mosby, Reed Elsevier India; 2009. p. 290.
- [2] Khan GJ, Javed M, Ishaq M. Effect of smoking on salivary flow rate. IJMS 2010;8:221-5.
- [3] Dawes C. Salivary flow patterns and the health of hard and soft oral tissues. J Am Dent Assoc 2008;139 Suppl: 18S-24.
- [4] Garrett JR. The proper role of nerves in salivary secretion: A review. J Dent Res 1987; 66: 387-97.
- [5] Bouquot DJ, Schroeder K. Oral effect of tobacco abuse. J Am Dent Inst Cont Educ 1992;43:3-17.
- [6] Reddy MS, Naik SR, Bagga OP, Chuttani HK. Effect of chronic tobacco-betel-lime "quid" chewing on human salivary secretions. Am J Clin Nutr 1980;33:77-80.
- [7] Nanci A. Ten Cate's oral histology: development, structure, and function. St. Louis, Mo.; London: Mosby. 2008: 411.
- [8] Rad M, Kakoie S, Brojeni FN, Pourdanghan N. Effect of long-term smoking on whole-mouth salivary flow rate and oral health. J Dent Res, Dent Clinics, Dent Prospects 2011; 4: 110-4.
- [9] Winn DM. Tobacco use and oral disease. J Dent Educ 2001; 65: 306-12.
- [10] Kanwar A, Sah K, Grover N, Chandra S, Singh RR. Long-term effect of tobacco on resting whole mouth salivary flow rate and pH: An institutional based comparative study. Eur J Gen Dent 2013; 2: 296.
- [11] Rooban T, Mishra G, Elizabeth J, Ranganathan K, Saraswathi TR. Effect of habitual arecanut chewing on resting whole mouth salivary flow rate and pH. Indian J Med Sci 2006;60:95-105.