

SALIVARY FLOW RATES IN PAAN “TOBACCO-BETEL-LIME QUID” CHEWERS

Ghulam Jillani Khan¹, Muhammad Ishaq²

¹Department of Physiology, Khyber Medical College Peshawar - Pakistan

²Department of Physiology, Bannu Medical College, Bannu - Pakistan

ABSTRACT

Objectives: To study whether ingredients of Paan especially tobacco has got any untoward effects on secretion of saliva or otherwise.

Material and Methods: Subjects of the study were divided into paan-chewers and non-chewers as controls. Each group contained 20 healthy male adults. The saliva of each subject was collected under resting condition and following stimulation by crude nicotine and citric acid solutions applied to the tip of the tongue.

Results: After stimulation with nicotine and citric acid, all subjects of both groups showed a high increase in their salivary flow rates. The pattern of salivary flow rates of Paan-chewers was not much different from that of non-chewers except that the salivatory response in Paan-chewers was more exaggerated than in non-chewers.

Conclusion: Paan (“tobacco-betel-lime quid”) chewing induces more salivary secretion in its users.

Key Words: Salivary flow, Pan-chewers.

INTRODUCTION

Paan (tobacco-betel-lime quid) is a habit creating traditional product consumed in the form of chewing in many parts of Pakistan, India, Bangladesh, Sri Lanka and some other South East Asian countries. However, now on account of world-wide immigration, paan-chewers may be found nearly in every corner of the world. It is composed of roughly powdered areca nut, slaked lime in the form of paste, katha (a brown powder paste) and some other ingredients, with some local and regional variations, wrapped up in a betel leaf. The product is introduced into the oral cavity and chewed for a long time with profuse salivation and spitting, spoiling the environment for non-users. It has many varieties and one of its varieties contain tobacco as an essential ingredient; this variety is locally called as “tambaku paan”. Tobacco is also consumed as smoking, snuffing and dipping into the oral cavity in the form of moist oral snuff. Paan chewing is a hazardous procedure for health because in addition to oral cancer, significant increases were seen among chewers for cancer of the esophagus, liver, Paancreas, larynx, lung, and all cancer. Chewing and smoking, as combined by most chewers, interacted synergistically and was responsible for half of all cancer deaths in

this group. They were responsible for the recent increases in oral, esophageal, pancreatic, and liver cancer in Taiwan. Chewing and smoking shortened their life sPaan by nearly 6 years¹. In Paan-chewers the taste receptors, a primary site for stimulation of salivary secretion, are repeatedly exposed to the ingredients of Paan especially tobacco for long time. It is generally considered that long term use of tobacco suppresses the sensitivity of taste receptors which in turn leads to depressed salivary reflex. Therefore it is fair to assume that this might lead to altered taste receptors response and hence to changes in salivary flow rates.

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 glands². It is the most easily accessible fluid in the human body and in future it is probable that it will provide an easy tool for non-invasive measurements of various body parameters³. Saliva is essential to maintain and preserve oral health⁴. Approximately 0.5 liters of saliva is secreted per day. The salivary flow rates are 0.3 ml/minute when un-stimulated and rise to 1.5-2.0 ml/minute when stimulated, but flow rate is negligible during night⁵. Saliva enters the mouth at several locations, and the different secretions are not well-mixed. Saliva in the mouth forms a thin film, the velocity of which varies greatly at different sites⁶.

The present study was part of a study which aimed to determine the effects of tobacco on the

Address for Correspondence:

Dr. Ghulam Jillani Khan

Associate Professor

Department of Physiology,

Khyber Medical College, Peshawar - Pakistan

Cell: 0346-9029233, 091-5851227

Email: banisy_no1@yahoo.com

secretion of saliva in individuals who used tobacco orally for long time. That is why tambaku paan-chewers were selected for the study. It is generally agreed upon that repeated exposure of a sensory receptor (in this case taste receptors) to a stimulus (in this case ingredients of Paan especially tobacco) for long time inactivates or decreases the sensitivity of the receptor; this is called adaptation. Whether ingredients of Paan especially tobacco has got any untoward effects on secretion of saliva or otherwise, when the taste receptors, a primary site for stimulation of salivary secretion, are exposed to Paan ingredients for long time, which contains many noxious substances including nicotine of tobacco, was the main objective of the study.

MATERIAL AND METHODS

The subjects of the study were selected from the lower staff of Basic Medical Sciences Institute (BMSI), Jinnah Post Graduate Medical Centre (JPMC) and the general population of Karachi. Paan has so many varieties in common use but only those individuals were included in the study who were addicted to tobacco (tambaku) Paan. The subjects were divided into two groups; Paan-chewers and non-chewers as controls. Each group comprised of 20 apparently healthy male adults. All the subjects were well matched with respect to age. Subjects in the habit of more than one type of tobacco use, bad orodental hygiene or with too little salivary secretion were not included in the study. Before sampling, each subject was briefed about the procedure and instructed to wash his mouth thoroughly and gargle with plain water. The saliva of each subject was collected (for 10 minutes) under resting condition and following application of crude nicotine solution (50 μ l of 1% v/v) and citric acid solution (50 μ l of 1% w/v) to the tip of his tongue. Crude nicotine was extracted from tobacco⁷ and citric acid was obtained from the Physiology Department of BMSI of JPMC in Karachi. Flow rate (ml/min) of saliva was determined by allowing the saliva to flow into a graduated tube. The data was analyzed statistically by Student's T test^{8,9}.

RESULTS

The resting (basal) salivary flow rates in both of the groups demonstrated nearly a same steady level during 10 minutes of sampling in the range of 0.45ml/min \pm 0.04SD to 0.49ml/min \pm 0.05SD ml/min in Paan-chewers and 0.43 \pm 0.05 to 0.49ml/min \pm 0.05SD ml/min in non-chewers (controls). After application of crude nicotine solution (50 μ l of 1% v/v) to the tips of their tongues, a gradual increase in the flow rate was seen in controls which reached its peak level (0.89 \pm 0.06 ml/min) within 3.0 minutes and then gradually subsided to its basal level within the next 3-4 minutes. The increase in Paan-chewers was also gradual reaching its peak (0.89 \pm 0.06 ml/min) within 3.0

minutes and then also gradually declined but never came completely to its resting level within the sampling time of 10 minutes. Even after 10 minutes it still remained on 0.51 \pm 0.04 ml/min. This demonstrated that the response of salivation to stimulation with crude nicotine solution in Paan-chewers was more exaggerated than in non-chewers.

Following stimulation with citric acid solution (50 μ l of 1% w/v), the peak salivary flow rate (0.89 \pm 0.05 ml/min) in controls was noted within the first minute and then gradually fell down to its resting level within the next 7.0 minutes. In Paan-chewers the rise in the flow rate was very much abrupt which reached its peak level (1.07 \pm 0.05 ml/min) within the 1st minute and never came to its resting level within the sampling time of 10 minutes. Even after 10 minutes it remained on 0.53 \pm 0.04 ml/min. This established that the response of salivation to stimulation with citric acid solution in Paan-chewers was more exaggerated than in

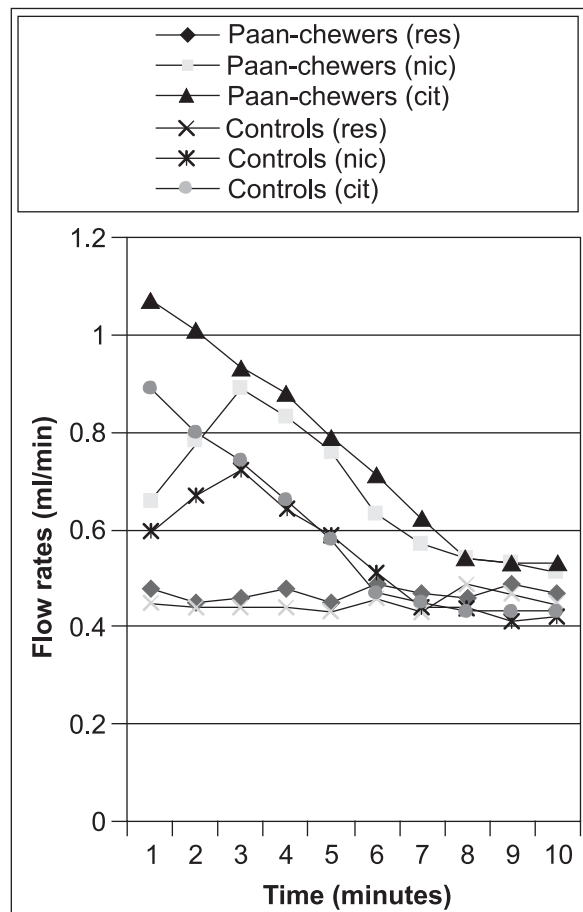


Fig 1: Comparison of salivary flow rates of Paan-chewers and non-chewers as controls before and after stimulation with nicotine (50 μ l of 1% v/v) and citric acid (50 μ l of 1% w/v) solutions (res = resting condition, nic = after stimulation with nicotine solution, cit = after stimulation with citric acid solution).

non-chewers. Moreover, with citric acid stimulation the salivary response was more pronounced than with nicotine stimulation even in the same group. This proved that citric acid is more potent in stimulation than nicotine. Figure 1.

Under resting conditions the mean salivary flow rate of controls (0.44 ± 0.04 ml/min) and Paan-chewers (0.47 ± 0.04 ml/min) did not show much difference from each other and no statistically significant difference was observed. After stimulation with nicotine, the mean salivary flow rates were increased to 0.54 ± 0.04 ml/min (22.73%) in controls which was statistically significant ($P < 0.05$), and to 0.67 ± 0.04 ml/min (42.55%) in Paan-chewers which was highly significant ($P < 0.005$) meaning that the stimulation of saliva was more pronounced in Paan-chewers than controls. Moreover, the increase in Paan-chewers, when compared to the corresponding value in controls, was also significant ($P < 0.05$).

Following stimulation with citric acid, the mean flow rates further increased to 0.59 ± 0.05 ml/min (34.09%) in controls and 0.76 ± 0.04 ml/min (61.70%) in Paan-chewers. The increase was highly significant ($P < 0.005$) in Paan-chewers and significant ($P < 0.05$) in controls. This again confirms that the salivary flow rates in Paan-chewers are more increased than non-chewers. Moreover, the increase was also significant ($P < 0.05$) in Paan-chewers when compared with the matching value in non-chewers.

DISCUSSION

The salivary secretion is a complex process and its flow and composition vary greatly under different conditions¹¹. The results of a study suggest that the larger the sizes of the parotid and submandibular glands, the faster the fluid flow and protein secretion rates in un-stimulated whole saliva¹². Our results showed that the resting salivary flow rates in Paan-chewers and non-chewers fluctuates in the same range when un-stimulated but on stimulation with chemical stimulants (crude nicotine and citric acid), the Paan-chewers secreted more saliva than controls. One of the possible reasons for this higher flow rates in Paan-chewers may be the higher sensitivity of the salivary mechanism. This sensitivity in turn, if present at all, might be due to some of the ingredients of Paan, including tobacco, in these individuals. Another possible reason might be the hyperplasia of salivary glands and the hypertrophy of the muscles of mastication due to chronic chewing of Paan ingredients as referred to by Ono K and his colleagues¹³. The muscular hypertrophy squeezes the salivary glands more powerfully to pull out more saliva from the glands during chewing but certainly this mechanism is not operative when the process of chewing is not in action and the salivary mechanism is stimulated by chemical means alone as in case of

our study. Our results also demonstrated that the salivary response after stimulation with citric acid is more amplified than after stimulation with crude nicotine confirming that citric acid is a more potent salivary stimulant (sialogogue) than nicotine. But we were unable to find any unpleasant effect of chronic Paan chewing on salivary secretion although it does induce more salivary secretion in its users. However, salivary flow rate and pH are altered in areca nut chewers, rendering the oral mucosa vulnerable to the toxic effects of areca nut¹⁴ but patients with reduced or increased salivary flow do not present alterations in masticatory efficiency¹⁵. An interesting query comes to one's mind that if long term Paan chewing causes excessive salivary secretion on account of salivary glandular hyperplasia then it may be possible that Paan chewing be used to alleviate the severity of xerostomia (dryness of the mouth), when the cause is unknown.

CONCLUSION

Paan chewing induces more salivary secretion in its users without any over all unpleasant effect on secretion of saliva.

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