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RESEARCH ARTICLE

CONSEQUENCES OF HABITUAL ARECANUT CHEWING ON UNSTIMULATED WHOLE MOUTH SALIVARY FLOW RATE AND pH

***,[1]Miss Yashashree Kantak, [2]Dr. Vidya Kadashetti, [3]Dr. K. M. Shivakumar, [4]Dr. Rajendra Baad, [5]Dr. Nupura Vibhute, [5]Dr. Uzma Belgaumi, [2]Dr. Sushma Bommanavar, [2]Wasim Kamate, [1]Miss. Akshata Pawaskar and [1]Mr. Nakul Malgundkar**

[1]BDS Intern, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University Malkapur, Karad-415539, Satara(Dist.), Maharashtra, India
[2]Assistant Professor, Oral Pathology & Microbiology, Forensic Odontology, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Malkapur, Karad-415110, Satara(Dist.), Maharashtra, India
[3]Associate Professor & Head, Public Health Dentistry, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Malkapur, Karad-415539, Satara(Dist.), Maharashtra, India
[4]Professor & HOD, Oral Pathology & Microbiology, Forensic Odontology, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Malkapur, Karad-415110, Satara(Dist.), Maharashtra, India
[5]Reader, Oral Pathology & Microbiology, Forensic Odontology, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Malkapur, Karad-415110, Satara(Dist.), Maharashtra, India

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ABSTRACT

Background: Saliva is the first biological fluid that is exposed to arecanut/tobacco and is responsible for its changes especially the salivary flow rate (SFR) and salivary pH.
Aims and Objectives: The aim of this study was to observe the effects of areca nut and various other products of areca nut on salivary flow rate and pH of saliva.
Materials and Methods: A total of 74 Subjects were divided into arecanut/tobacco chewers i.e. study group (group A) and non areca nut/tobacco chewers i.e. control group (group B). Saliva of each subject was collected under resting condition and salivary flow rate was expressed in ml/min for 10 min. Salivary pH was determined using digital pH meter.
Results: The difference between the mean SFR for chewers and non-chewers is statistically insignificant.(p=0.5) The difference between the mean salivary pH for chewers and non-chewers is statistically significant.(p=0.05)
Conclusion: Salivary flow rate is altered in a lesser extent in Areca Nut chewers and salivary pH is altered to a greater extent in Areca Nut chewers. Thus determining oral mucosa to be vulnerable to the toxic effects of Areca Nut chewing.

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INTRODUCTION

The oral cavity is kept moist by a film of fluid called saliva that coats the teeth and the mucosa (Kanwar *et al.,* 2013; Hand, 2009). It is a complex and important body fluid, which not only helps in lubrication but also helps to remineralize teeth, develop taste sensation, stimulation and digestion, phonetics and also to balance the pH. 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 (Kanwar *et al.,* 2013; Khan *et al.,* 2008). Saliva plays a critical role in oral homeostasis because it modulates the ecosystem within the oral cavity (Grover *et al.,* 2016; Atkinson and Baum, 2001). Saliva is being used for the

Corresponding author: **Miss Yashashree Kantak**
BDS Intern, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University Malkapur, Karad-415539, Satara (Dist.), Maharashtra, India.

diagnosis for a wide range of diseases as saliva is proven to be an easily available, reliable and non-invasive diagnostic medium (Hand, 2009; Rooban *et al.,* 2006). Salivary parameters are supposed to be altered by drugs such as anti cholinergics, diuretics, antihistaminics, antihypertensive agents and psychoactive substances and conditions such as post-surgery, metabolic, nutritional, neurological abnormalities and hydration status (Kanwar *et al.,* 2013; Mandel, 1990). Resting whole saliva is the mixture of secretions and enter the mouth in the absence of exogenous stimuli (Grover *et al.,* 2016; Garrett, 1987). The pH of saliva is maintained by the carbonic acid, bicarbonate system, phosphate system and protein system (Hand). Alterations in salivary flow rate (SFR) and pH have a significant impact on orodental health (Rooban *et al.,* 2006). Based on the clinical and epidemiological evidence adverse effects of tobacco on oral health is already been established (Kanwar *et al.,* 2013; Garrett, 1987; Bouquot, 1992). Approximately 600 million people use areca nut (AN) worldwide in some form and is the fourth most commonly used psychoactive substance (Rooban *et al.,* 2006; Trivedy, 2002). The common oral lesions associated with areca nut chewing include dental attrition, staining, dental caries, periodontal diseases, lichenoid lesions, betel chewer's mucosa, oral leukoplakia, oral submucous fibrosis and oral squamous cell carcinoma (Hand). Areca nut contains 4 major alkaloids: arecoline, arecaidine, guvacoline and guvacine. In the presence of lime (calcium oxide, turns to alkali calcium hydroxide in aqueous form) arecoline and guvacoline are highly hydrolyzed into arecaidine and guvacine respectively (Rooban *et al.,* 2006; Barman and Umesh, 2015).

Arecoline is a parasympathomimetic while arecadine lacks it (Rooban *et al.,* 2006; Barman and Umesh, 2015). AN can be chewed as such in raw form (Raw Areca Nut) or wrapped in betel leaves (Piper Betel), lime and other condiments in a traditional form (referred as pan denoted as Betel Quid) and at times tobacco is added to the mixture (Betel Quid Tobacco). Processed AN forms (PAN) contains chemically or naturally cured AN mixed with saffron, catechu, artificial flavouring and sweetening agents (supari) and lime (pan masala) along with tobacco (gutkha). The bolus formed by mastication of these products is referred as quid. Tobacco which is often chewed along with AN (PAN, BQT) and nicotine acts on certain cholinergic receptors in the brain and other organs causing a neural stimulation (Rooban *et al.,* 2006; Tripathi, 2001). Only very few studies has been done on the influence of AN chewing on the salivary parameters (Khan *et al.,* 2003; Khan *et al.,* 2003). Given the paucity of literature on the influence of AN chewing on SFR and pH, the present study was undertaken to observe the alteration in SFR and pH between AN and non-ANchewers (Rooban *et al.,* 2006).

MATERIALS AND METHODS

Study Design:

Comparative study

Subjects in the present study comprised of 74, divided into 2 groups . One being a study group and the other being a control group. The study group consists of patients with age and sex matched control group. Patients were selected among the out patients attending the Department of Oral Medicine and Radiology, School Of Dental Sciences, Karad.

Selection Criteria

Inclusion criteria: Areca nut/tobacco/areca nut containing product chewing habit for more than 6 months.

Exclusion criteria: Individuals with any known systemic disorders, Individuals under any drugs like anticholinergics, diuretics, antihistamines, antihypertensive and psychoactive substance that might have altered the salivary parameters.

Method of collection of data: Subjects – A detailed case history along with habit of smoking, alcoholism, oral hygiene habits was taken from all the individuals.

A thorough clinical examination was performed with diagnosis of OSMF as per the criteria described by Bailoor D N. An informed consent was then obtained from all the patients along with the explanation of the procedure that was performed.

Salivary Flow Rate pH Determination: Saliva of each subject was collected under resting condition and SFR was expressed in ml/min for 10 min the pH was recorded by using a Digital pH meter.

Statistics

The data was analyzed using Statistical Package for Social Services. Statistical analysis were performed to find the statistical significance of mean SFR and mean salivary pH between chewers and non-chewers. The mean SFR and pH of chewers and non-chewers depending on their chewing status was done and A p value of 0.05 and less was considered as statistically significant. The entire student t tests were performed under 95% confidence interval, test statistic value and degree of freedom.

RESULTS

The study compromised of 74 study population. There were 33 male and 11 female among chewers and 10 male and 20 female among non-chewers. The age distribution of the study population is given in [Table 1]. It was observed that 50% of the chewers were in the age group of 21-30 years. The mean frequency, exposure time and chewing habits are listed in [Table 2]. The mean SFR for chewers was 3.35 ± 1.7 and for non-chewers was 3.55 ± 1.39. The difference was not statistically significant. (p=0.5). The pH of chewers was 6.57 ± 0.52 and for non-chewers it was 6.0± 0.61. The difference was statistically significant. (p=0.05) [Table 3].

DISCUSSION

Saliva is the biological body fluid in the oral cavity secreted by salivary gland tif its gets exposed to cigarette smoke, which contains numerous toxic compositions responsible for structural and functional changes in saliva (Fox and Ship, 2008). There are many clinical and epidemiological evidences regarding the adverse effects of areca nut/tobacco on oral health (Kanwar *et al.,* 2013; Millar and Locker, 2007; Sham *et al.,* 2003). The effects of areca nut are habit related and dose dependent. The report of effects being more pronounced in fresh or occasional chewers and less in habitual chewers, suggests that the tolerance or habituation also occurs in areca nut use. Hence habituation to the stimulus occurs in the receptors (Rooban *et al.,* 2006; Chu, 2001).

Table 1. Age distribution of study population

Age in years	Non chewers n (%)	Chewers n (%)
Below 20	3 (10)	4 (9)
21-30	16 (53.3)	22 (50)
31-40	5 (16.6)	10 (23)
Above 40 years	6 (20)	8 (18)
total	30 (100)	44 (100)

Table 2. Descriptive statistics of the frequency, exposure time and duration of Arecanut use in chewers (n =44)

	Frequency	Exposure time (In minutes)	Duration (In years)
Mean	3.90	14	6.41
Median	3.57	12	3.2
Standard deviation	4.78	19.2	9
Minimum	1	1	0.08
Maximum	40	124	42

Table 3. Mean salivary flow rate and salivary pH in non chewers and chewers

	Non chewers (n=30)		Chewers (n=44)		t value	df	P-value
	Mean ± SD	95%CI	Mean ± SD	95%CI			
Salivary flow rate	3.55 ± 1.39	3.15 - 3.95	3.35 ± 1.7	3.04-3.67	0.72	152	0.5
Salivary pH	6.0± 0.61	6.65 - 6.89	6.57 ± 0.52	6.47 - 6.67	2.4	156	0.05

*P = 0.05.SD- Standard deviation; CI - confidence interval; t – Test value; df – degree of freedom

In the present study, Rooban *et al.,* 2006 observed that the raw form of areca nut (RAN) has a highest mean SFR (4.18 mL/10 min) as compared to the non-chewers (3.5 mL/min for 10 min) and other chewers. This finding is in contrast with the study where differences in mean SFR between smokers 3.12 (±1.56) and non-smokers 3.40 (±1.69) as well as between tobacco chewers and tobacco non-chewers were not significant (Kanwar *et al.,* 2013; Rooban *et al.,* 2006). Khan *et al*., observed that some individuals develop tolerance to the salivary effects of smoking in the long-term use (Kanwar *et al.,* 2013; Khan, 2008). A number of studies have shown that cigarette smoking would typically cause a noticeable short term increase in SFRs, where as the long-term influence of tobacco use is still unclear (Kanwar *et al.,* 2013; Chu, 2001). However, studies have shown that long-term consumption of tobacco and areca nut in any form, especially smokeless form, is one of the risk factors for reducing saliva, (Kanwar *et al.,* 2013; Rooban *et al.,* 2006; Rad *et al.,* 2010) which was observed in the present study. These findings were also consistence with the finding of (Kanwar *et al.,* 2013; Rad *et al.,* 2010). The pH of chewers was 6.57 ± 0.52 and for non-chewers it was 6.0± 0.61. The difference was statistically significant. (p=0.05) These findings were also consistence with the finding of study conducted by Rooban *et al.* 2006.

Conclusion

The habitual AN chewers show alterations in SFR and salivary pH. The alteration in SFR and pH are vital in causation of various oral diseases. Also the complex action of arecanut chewing reflects as variation in SFR and pH.

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