COMPARISION OF SALIVARY PH AMONG CIGARETTE AND SNUFF (NASWAR) USERS IN A TERTIARY CARE HOSPITAL, PESHAWAR: A CROSS-SECTIONAL STUDY

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Abstract

Objectives: *The main objective of this study is to compare the variations in salivary pH of Tobacco users (smoked and smokeless/ Naswar) with non-tobacco users. Secondly, to correlate age and duration of tobacco use with salivary pH among tobacco users (smoked & smokeless form/naswar).*

Materials & Methods: *A cross-sectional study based on a comparison of salivary pH between tobacco users (snuff and cigarette) and non-tobacco users was done in Khyber teaching hospital, Peshawar for 5 months. A total of 250 patients were recruited in the study by consecutive sampling technique which was divided into four groups; cigarette smokers, snuff users, both cigarette and snuff users and non-tobacco users. The pH was determined by specific salivary pH strips and Digital pH meter and recorded on structure proforma. Data was analyzed by using SPSS ver 20.*

Results: *A total 250 male with mean age 29.54±7.87 years, majority 84(33.6%) were between 20-25 years. The age of comparative groups (cigarette smokers, snuff users, both cigarette and snuff users and non-tobacco users) was not significantly differed). Out of total non-tobacco users accounted for 72(28.8%), cigarette smokers were 60(24.0%), while 60 (24.0%) using both cigarette & snuff users, and 58 (23.2%) were only snuff users respectively. The mean salivary pH in cigarette smokers and snuff users was 5.52±0.676. In those using both snuff and cigarette smokers 4.67±0.629 while in non-tobacco users it was6.47±0.503, where the diference was significant (p= 0.0001). The salivary pH was not associated with age (r=-0.007, p=0.91), but it was negatively related (r=0.730, p<0.001) with the duration of the tobacco use.*

Conclusion: *This study concluded that the average salivary pH was acidic in cigarette and snuff users while it got more acidic in subjects using both. The use of tobacco for long duration leads to an acidic environment of oral cavity.*

Key Words: *Salivary PH, Tobacco Users, Non-tobacco Users, Smoking, Snuff.*

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, buffering capacity, protection and repair of the oral mucosa, and dental re-mineralization are some of the functions of saliva[1]. Taking this into account, quantitative and/or qualitative alterations in salivary secretion may lead to oral (caries, oral mucositis, candidiasis, oral infections, chewing disorders) or extra-oral (dysphagia, halitosis, weight loss) adverse effects[1].

Saliva is the first biological luid that is ex - posed to tobacco and is responsible for its changes especially the salivary low rate (SFR) and salivary PH. Alterations in salivary low rate (SFR) and pH have a significant impact on oral and dental health

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and can be used for the diagnosis of a wide range of diseases[1,2].

The habit of tobacco use in different forms have long been associated with the development of precancerous and cancerous lesions like oral leukoplakia, oral sub-mucous ibrosis, betel chewer's mucosa, lichenoid reaction and oral squamous cell carcinoma[3]. Both smoking and use of snuff causes discoloration of teeth, dental restorations and dentures[1,2]. The ingredients in snuff and other tobacco type cause erosion of critical bone support leading to loosened teeth that can be permanently lost1. Tobacco use was found to be the most significant factor predisposing to implant failure. Failure rates were 4.8% in non-smokers and 11.3% in smokers. Oral candidiasis on other hand very common due to tobacco smoking[1,3].

According to the World Health Organiza - tion(WHO), tobacco is the single most preventable cause of death in the world today[3,8]. It is estimatedthat 5.4 million deaths currently occur every year due to tobacco use and projected figures show that by 2030 there will be more than 8 million deaths every year, of which 80% will take place in middle- and low-income developing countries[4,8]. As many as 20% of high school boys and 2% high school girls use smokeless tobacco according to the centers for disease control and prevention (CDC)[4]. A 2008 study from the WHO international Agency for research on cancer concluded that smokeless tobacco users have an 80% higher risk of developing oral cancer and a 60% higher risk of developing pancreatic and esophageal cancer, chewing tobacco has been linked to dental caries[5,6].

The most common forms of smokeless tobacco (ST) available and used in Pakistan include: Pan/betel with tobacco, tobacco, catechu (Acacia catechu)and slaked lime (calcium oxide and calcium hydroxide), wrapped in a betel leaf (Piper betel) with sweeteningagents and Naswar(a mixture of sun-dried), Chalia/ Supari – areca nut (used plain, coated with tobacco)[5]. Most people place these forms of Smokeless Tobacco in the mandibular or labial groove or simply apply them to their teeth and gums and suck on them slowly for 10–15 minutes. Smokeless tobacco is highly addictive and is a high risk factor for pharyngeal cancers as well as cancers of the head and neck, esophagus and pancreas[2]. During tobacco (snuff and cigarette) use chemicals are leached out into saliva, which in turn alter the property & composition of saliva. However the tobacco will lead to lower the pH to acidic nature which may in turn lead to different pathological conditions of oral cavity.

Snuff (Naswar, a common name given by local people) the most common form of smokeless tobacco used in KPK with different composition from the rest of the world i.e. Sun and heat-dried tobacco leaves, slaked lime, ash from tree bark, and lavoring and coloring agents are mixed together[5]. Water is added and the mixture is rolled into balls[5,9]. The main ingradient of tobacco is nicotine, which acts on certain cholinergic receptors in the brain and other organs causing neural activation leading to altered salivary secretion. The ingredients of naswar are blended to achieve a specific nicotine content, pH, taste, lavor and aroma and a moist non-fermented product[9].

An assessment of the potential toxicity of 30 brands of naswar available in the Pakistani market 34 showed that the average values of all toxicant studied were above limits deemed allowable by the Agency for Toxic Substances and Disease Registry at the U.S. Centers for Disease Control and Prevention (CDC)[3,7]. Smokeless tobacco (ST), widely used in Pakistan, poses a high risk for oral cancer (oropharyngeal cancer 9.9%)[5]. Urdu-speaking communities have a proportionately higher rate of oropharyngeal cancer (20.4%), followed by Balochi's (19.9%), Sindhi's (16.8%), Punjabi's (11.7%) and Pashtuns (9.6%)[5]. Association of oropharyngeal cancer with ST use was four times higher[6]. These facts pose a potential threat to the health of our community. Literature shows that there is not enough data available on the variations of salivary pH with uses of tobacco (smokeless and smoked form) in this region. This data will help to improve the oral health status, control on tobacco use ,and help generate different policies and strategies for implementation in the future.

The main objective of this study is to compare the variations in salivary pH of Tobacco users (smoked and smokeless/ Naswar) with non-tobacco users. Secondly, to correlate the age and duration of tobacco use with salivary pH among tobacco users (smoked & smokeless form/naswar).

Materials and Methods

Study Design:

Cross-sectional study

Study settings:

Khyber Teaching Hospital, Peshawar.

Study population:

Study population consists of all patients (age ranges from 20-50 years) presented at outpatient department of Khyber Teaching Hospital, Peshawar Khyber Pakhtun-khwa during the period of data collection (Feb to April 2015).

Patient were divided into four groups on the basis of their tobacco using status

Group A: Those who smoke cigarette only
Group B: Those who use snuf/ naswar only
Group C: Those who use cigarette and snuf/naswar.
Group D: Non-Tobacco users

a. Inclusion criteria:
- Patients aged 20-50 years
- Those who at the time of the study reported that they are tobacco users for the past six months at-least.

b. Exclusion Criteria:
- History of major salivary glands pathology or extirpation.
- Denture wearers
- Patients using medication like pilocarpine, anti-histamine etc.
- Patient with active oral disease like aphtha's stomatitis
- Patient with the history of radio/chemotherapy
- Diabetic patients
- Patients having GERD
- Snuff (Naswar) made outside KPK

Sampling Techniques:

Consective sampling techniques

Sample size:

All the patients attending dental OPD of KTH during Feb 2015 till June 2015 were included in the study. A total of 600 patients attended dental OPD, however only 250 patients were included in the study that fulfilled our inclusion criteria and were willing to participate as well.

Data collection tool:

The data was recorded on a structured Proforma, comprising of three parts i.e. demographic, pH level and status of tobacco use (see Annexure 1).

Data collection process:

Approval from the hospital ethical committee was taken. Subjects fulfilling the inclusion criteria were invited to take part in the study. The purpose, procedures, risk and benefits of the study were explained to them. They were assured of maintaining confidentiality of their personal data collected. An informed consent was signed by the participants before the start of the study. Females were excluded from the study because of the cultural taboos associated with tobacco use in females. Detailed history; examination and status of Tobacco use were recorded. PH evaluation (Qualitative analysis) was done with the help of color coded pH Paper (Fix 0-14 manufactured by MACHEREY NAGEL). While exact Quantitative analysis of pH was done by using Digital pH meter.

Patients were advised not to eat or drink anything or use mouthwash at least one hour before the readings were recorded. Patients were seated on the dental chair and asked to open the mouth. The pH paper was dipped in the look of the mouth for 1 minute. The color obtained was compared with the color index provided by the manufacturer with pH paper. This was then confirmed by using digital pH meter.

Stimulated salivary samples from each of the participants were collected in a standardized manner. To start saliva collection subjects were irst asked to swallow all the saliva in the mouth, then asked to chew a piece of modeling wax (1cm2) for ive minutes and spit saliva into a sterile test tube. Subsequently 1ml of collected saliva of each subject obtained and was then diluted with 5 ml of distilled water in a sterile beaker. It was homogenously mixed. The pH of the saliva was then determined using the Digital pH meter. This procedure was performed between 10:00 P.M to 11:00 A.M because of the sufficient time gap after breakfast and procedure which was needed forthe accuracy of the results.

Data analysis:

SPSS version 20 was used for analysis. Descriptive statistics in the form of mean, median mode and

standard deviation determined.

For comparison among Tobacco users & Non-tobacco users one way ANOVA was used for multiple group comparisons & student's t-test for two group comparisons. Where P-value <_0.05is considered signiicant.

Results

A total of 250 Male participants were included in the study. The mean age was 29.54±7.87 years (ranging from 20-50 years) (Figure 1).The mean age of Cigarette smokers was 29.05 ± 7.5 (20-48 years), Snuff Users 28.86 ±7.58 (22-48 years), both cigarette & snuff users29.07 ± 7.53 (20-48 years) and Non-Tobacco Users30.88 ±8.62 (20-50 years). Analysis of variance indicate that the difference in age of study group was not statistically differed (p = 0.401)(Table 1)

The participants were divided into four different groups based on their tobacco using status. The most frequent group was non tobacco user (28.8%) which was followed by ciggrate smokers (24%) and cigrate& snuff user(23.2%)while snuff user (23.2%) were the least one.(Table 2).

The mean salivary pH level was 5.48± 0.95. The results of this study indicated that 50% of the participants had salivary pH level below 6 and same about this scale and majority 90(36%) of them had salivary pH of 6 unit as well.

The Overall salivary pH level of participants measured by pH paper is given in figure 2.

The mean salivary pH of cigarette smokers and snuff/ naswar users was acidic in nature(5.52±0.676 and 5.05±0.782).However it was more acidic (4.67±0.629) in participants using cigarette& snuff/ naswar. On the other hand the mean salivary pH among non-tobacco users was nearly neutral (6.47±0.503)(Figure 3). By using post hoc test, significant variation in pH level among tobacco user and non-tobacco users was found (p= 0.0001). However Test of Homogeneity of Variances indicate no significant difference (p=0.256), between different groups of tobacco users(Table 3).

Mean age was converted to different categories and the chi square test among these groups gave an insignificant result (p= 0.97)(Table 4).

However, the results of this study shows that the trends of tobacco use tends to decrease as age increases. (Figure 4). When the salivary pH was plotted against age for all study samples, it was found that there was signiicant correlation among age and salivary pH (Figure 5).

Discussion

The mean salivary pH level was acidic (5.48± 0.95). According to this study (46%) had a ph ranged

Fig: 1 Age distribution of study group

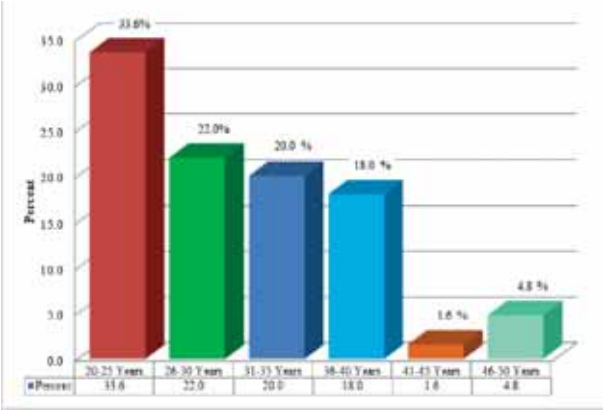

Fig: 2 The Overall salivary pH level of participants measured by pH paper

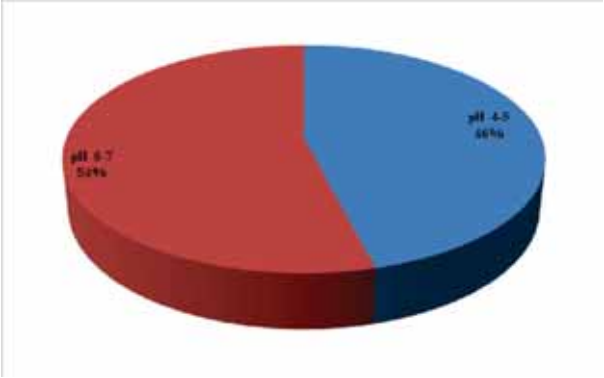

Fig: 3 Mean variation in salivary pH in four diferent study groups

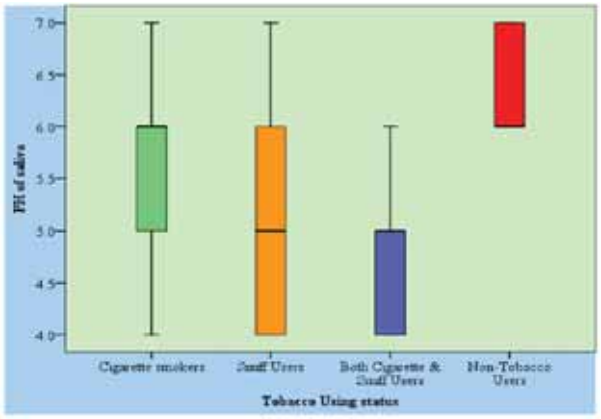

Fig: 4 Trends of tobacco use with age

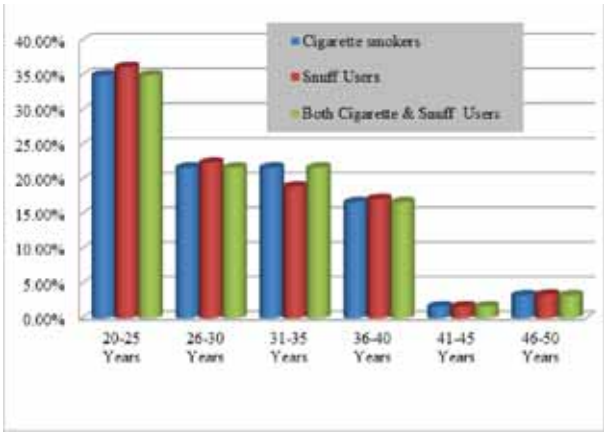

Fig: 5 Correlation between age and slivery pH (r=-.007, p=0.91)

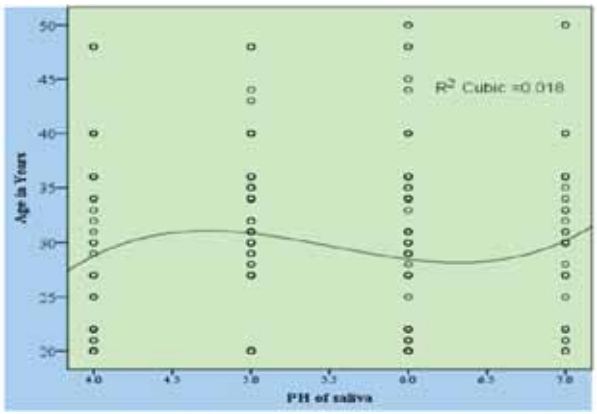

Table 1: Mean age diference among four study groups

	Mean ± SD	95% Conidence Interval for Mean		Min	Max
		Lower Bound	Upper Bound	Total	
Cigarette smokers	29.05± 7.505	27.11	30.99	20	48
Snuf Users	28.86± 7.584	26.87	30.86	20	48
Both Cigarette & Snuf Users	29.07± 7.537	27.12	31.01	20	48
Non-Tobacco Users	30.88± 8.628	28.85	32.90	20	50

Table 2: Distribution of participants according to tobacco using status

Categories of tobacco	Frequency	Percent
Cigarette smokers	60	24.0
Snuf Users	58	23.2
Both Cigarette & Snuf Users	60	24.0
Non-Tobacco Users	72	28.8

Table 3: Post hoc test for Comparasionof salivary pH level among study groups

Tobacco using status	n	Mean± SD	95% CI	Ranged of pH level		P-value
				Min	Max	
Cigarette smokers	60	5.52±0.676	5.34, 5.69	4	7	
Snuf Users	58	5.05±0.782	4.85, 5.26	4	7	P= 0.0001
Both Cigarette & Snuf Users	60	4.67±0.629	4.50, 4.83	4	6	
Non-Tobacco Users	72	6.47±0.503	6.35, 6.59	6	7	

between 4 and 5, 54%) had ph ranged between 6 and 7.

The mean salivary pH of cigarette smokers and snuff/ naswar users was acidic in nature (5.52±0.676 and 5.05±0.782). But more acidic salivary ph was observed in participants using both cigarette & snuff/ answer(4.67±0.629). A nearly neutral ph was observed among non-tobacco users(6.47±0.503). The chi square value showed a signiicant relation - ship among tobacco user and non-tobacco users (p<0.0001). Similar results were reported by a number of studies1,5,6,7. Also Rooban et al. reported that the mean pH turns acidic in those who chew RAN and neutral ph in non-chewers2. In contrast to this study Reddy et al. and Alpana Kanwar et al. observed no difference in salivary pH between the tobacco chew- ers and non-tobacco chewers3,4,9 ,this contradiction may be because difference in the contents of RAN and tobacco.

However it was more acidic (4.67±0.629) in par-

Table 4: Comparison tobacco use among diferent age group

Age Group (in Years)	Tobacco Using status				Total
	Cigarette smokers	Snuf Users	Both Cigarette & Snuf Users	Non-Tobacco Users	
20-25	21 (35.0%)	21 (36.2%)	21 (35.0%)	21 (29.2%)	84 (33.6%)
26-30	13 (21.7%)	13 (22.4%)	13 (21.7%)	16 (22.2%)	55 (22.0%)
31-35	13 (21.7%)	11 (19.0%)	13 (21.7%)	13 (18.1%)	50 (20.0%)
36-40	10 (16.7%)	10 (17.2%)	10 (16.7%)	15 (20.8%)	45 (18.0%)
41-45	01(1.7%)	01(1.7%)	01 (1.7%)	01(1.4%)	04 (1.6%)
46-50	02 (3.3%)	02 (3.4%)	02 (3.3%)	06 (8.3%)	12 (4.8%)
Total	60 (24.0%)	58 (23.2%)	60 (24.0%)	72 (28.8%)	250 (100.0%)

Table 5: Correlation of pH and long term use of tobacco

Correlations			
		Duration of Use	PH of saliva
Duration of Use	Pearson Correlation	1	-.730**
	Sig. (2-tailed)		.000
	N	178	178
PH of saliva	Pearson Correlation	-.730**	1
	Sig. (2-tailed)	.000	
	N	178	178
**. Correlation is signiicant at the 0.01 level (2-tailed).			

ticipants using both cigarette & snub/ naswar. On the other hand the mean salivary pH among non-tobacco users was nearly neutral (6.47±0.503). The similar was reported by Kanwar et al, According to him lowest salivary pH 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.

There was significant variation in pH level among tobacco user and non-tobacco users (p= 0.0001). However Test of Homogeneity of Variances indicate no significant difference (p=0.256), between different groups of tobacco users.

An insignificant difference was observed among tobacco users across different age group (p= 0.97). It was observed from the results of this study that the trends of tobacco use tend to decrease as age increases.

A significant correlation among age and salivary Ph, which means that as the age increases the salivary phincreases. This comes in contrast toa study done by S Chauhan who reported that salivary ph decreases as age increases9. When the salivary pH was plotted against age for all study samples, it was found that there was significant correlation among age and salivary pH. Similar results were seen in study conducted by Tuhunoglu O.S. which showed no correlation between pH values and age.

Conclusion

The results of this study indicate that nicotine is one of the substances in snuff that has a biological effect on the oral mucosa, especially pH. This highlights the need for policymakers, researchers and health advocates to better understand and address the burden of smokeless tobacco use. Policy makers should take strong action to reduce all tobacco use - including smokeless tobacco use - through proven strategies such as higher tobacco taxes; large, graphic health warnings; bans on tobacco advertising, promotion and sponsorship; and product regulation.

References

1. Khan GJ, Javed M, Ishaq M. Efect of smoking on sal - ivary low rate. J Med Sci. 2010;8:221–4.
2. Rooban T, Mishra G, Elizabeth J, Ranganathan K, Saraswathi TR. Efect of habitual arecanut chewing on resting whole mouth salivary low rate and pH. Indian

J Med Sci 2006;60:95-105.

3. 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.
4. Kanwar A, Sah K, Grover N, Chandra S, Singh RR. Long-term effect of tobacco on resting whole mouth salivary low rate and pH: An institutional based com - parative study. Eur J Gen Dent. 2013;2:296–9.
5. Neeraj Grover, Jyoti Sharma, ShamindraSengupta,Nishant Singh,Harjeet Kaur. Long-term efect of tobacco on unstimulated salivary pH.Journal of Oral and Maxillofacial Pathology. 2016 Jan-Apr; 20(1): 16–19.
6. Fatemeh Ahmadi Motamayel, Parisa Falsai, Moham - mad T.Goodari,JalalPoorolajal.Comparison of Salivary pH, Bufering Capacity and Alkaline Phosphatase in Smokers and Healthy Non-Smokers,Retrospective cohort study. Sultan Qaboos Medical Journal. 2016 Aug; 16(3): e317–e321.
7. Ahmadi Motamayel F, Davoodi P, Dalband M, Hendi S. Saliva as a mirror of the body health. Avicenna J Dent Res. 2010;1:1–15\
8. Shaila M, Pai GP, Shetty P. Salivary protein concentration, low rate, bufer capacity and pH estimation: A comparative study among young and elderly subjects, both normal and with gingivitis and periodontitis. J Indian Soc Periodontol. 2013;17:42–6. doi: 10.4103/0972-124X.107473.
9. Khan GJ, Mehmood R, Din SU, Marwat FM, Haq IU, Rehman JU. Secretion of calcium in the saliva of long-term tobacco users. J Ayub Med Coll Abbottabad 2005;17:60-2.

Annexure 1: Data Collection Checklist

A. PATIENT DEMOGRAPHICS

SR No:_____**DATE:**_____**NAME:**_____

AGE:_____**GENDER:**_____

ADDRESS:_____

1. Tobacco user

Yes No

2. Cigarette smoking

Yes No

3. Snuf dipping

Yes No

4. Both cigarette and snuf users

Yes No

5. Duration of use

Months Year

6. pH of saliva_____