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ANALYSIS OF SALIVA FLOW RATE AND pH FROM ADDICTIVE USERS OF COHORT OF HYDERABAD AND AJOINING AREA

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ABSTRACT

OBJECTIVE: To analyze the effect of saliva flow rate (SFR) and pH of addictive substance users (tobacco chewers, cigarette smokers, naswar dippers, hashish smokers, bhang users and alcohol users) **METHODOLOGY:** The study comprised 49 Subjects which were involved in as addictive substance users (ASU) and these individuals were divided into 06 different groups, group 01 comprised the cigarette & hashish smokers (22%), group 02 contained tobacco chewers (34%), group 03 were naswar dippers (10%), group 04 were sweetened areca nut chewers (10%), group 05 comprised the bhang users (12%), whereas group 06 involved alcohol users (10%). The average age of the individuals included in this study (21.1 ±3.63 to 26.2 ±2.38). Saliva before and after consumption of addictive substances and serum samples were collected from each ASU. **RESULTS:** The average age of the alcohol users was high (26.2±2.38) as compared to the other 05 groups while reversed was true for tobacco chewers (21.1±3.63). The ratio of consumption of addictive substance was high in unmarried about 76.47% whereas married were 23.52%. A significantly increased salivary flow rate (SFR) was found after consumption of chewing tobacco and areca nut as compared to before its consumption. 33.33% headache was common among all ASU, Addictions related to chewing process (chewing tobacco, naswar, Areca nut) showed significant variation between before and after addiction salivary pH of ASU. Overall, we found a significant increased salivary pH of tobacco chewers after consumption (8.0±0.45) whereas before consumption (7.27±0.69),

while cigarette smokers and hashish smoker showed the decreased salivary pH after consumption of these substances. **Conclusion:** Students were highly involved in addictions as compared to other occupations, students of age 21 years were positively associated with addictive substance usage, Naswar was the cheapest addictive substance among all other addictive substances; headache was common in ASU and 3.92% ASU showed kidney disease followed by liver diseases with other diseases, Overall, we found a significant increased salivary pH of ASU after addiction as compared to controls.

KEYWORDS: Bakeries; addiction, ASU, salivary flow rate (SFR), tobacco.

1. INTRODUCTION

The use of addictive substances increasing significantly while everyone aware the hazards effect on health, because electronic media and print media play a main(dual) role for high consumption of addictive substance. Addictive substance induces many side effects to the human body and promotes the many diseases, basically drugs addiction is chronic disorder which evoke the negative behavior of the individuals beside this it may effect on central nervous system (CNS), loss the tolerance power, passion sensitization and deterioration, Although historical accounts of tobacco use vary.[1] Saliva is a lubricating agent contains a diverse host defense system; Saliva is the fluid produce in the mouth by salivary glands and the salivary gland form from epithelial cells which can be divided into two district region the acinar and duct regions. The salivary gland composed of combination of three main glands the sublingual gland, parotid gland and the submandibular with other various small glands.[2] In acinar region the fluid and protein synthesis take place, the mechanism of protein synthesis in acinar region, the amino acid enter into the acinar by active transport and intercellular protein can be synthesis by translation process, and greater part of these protein has been stored in granules that liberated in feedback to secretary stimulation.[3] Saliva mainly composed of water, 95% water and other four components such as mucus, amylase, electrolytes, lingual lipase and proteins. If there is variation in saliva which may be hypohydration or dehydration may cause the decreased salivary flow rate.[4] Saliva is most accessible fluid than other body fluids in the human body.[5] Diagnosis of different diseases through saliva is important and valuable for children and adult. Screen of different disease of large population through saliva is cost effective approach. The un-stimulated salivary flow rates are 0.3-0.4 ml/ minute and stimulates saliva flow rate is 1 -2.0 ml/ minute, however flow rate during night is negligible.[6] The scientists reported that the flow rate of saliva/secretion

rate of saliva of regular smoker did not show the major change than the nonsmokers.[7] while in the case of chronic tobacco users there is slightly difference in sensation of taste and flow rate of saliva than the non tobacco users.[8] Hypo function of salivary flow rate is associated with many diseases (oral and pharyngeal diseases) and indication for diagnosis of many disorders. Variable in saliva flow rate has been reported by various scientists.

2. MATERIALS AND METHODS

The study has been conducted in cohort of Hyderabad and adjoining area. The subjects of present study were randomly selected among the study setting's population. Subjects in the present study comprised of 49 adult males, divided into 6 groups. Group 01 comprised the cigarette smokers & hashish smokers users (22%), group 02 contained tobacco chewers (34%), group 03 were naswar dippers (10%), group 04 were sweetened areca nut chewers (10%), group 05 comprised the bhang users (12%), whereas group 06 involved alcohol users (10%), Mean and standard deviation depicted in table 01. A questionnaire was administered to each selected subject. Each subject was interviewed face to face about habitual addiction, age, occupation, home destine, family history of any addiction, money spent on their addiction per day, age of commencement and duration of practice (addiction), reason of consumption, daily consumption, and frequency of consumption in social or psychological condition. In addition, the information about feelings after consumption, time of consumption, alternative of addiction, interval period, breathing & GIT problem, psychological problem, frequency of appetite, chewing problem, swallowing problem and disease were collected. For saliva collection the patient were requested to be seated, head slightly down and is asked not to speak and swallow during the period of collection and saliva was collected in beaker for the interval of one minute five spit were collected. Every individual were requested that do not drink or eat for at least 15 minutes. Thus two saliva samples were collected from each subject before and after the use of addictive substance. However, no saliva samples were collected from Tharra and Bhang consumers due to mood & behavior changes. And only un-stimulated saliva samples were collected form control subjects. The salivary samples collected were properly labeled and stored in refrigerator. Salivary pH was measured by manual pH meter and Flow rate of saliva was measured with graduated pipette and expressed in ml/min for 05 min by the procedure of Rooban[9]

RESULTS AND DISCUSSION

The result about the age of addictive substance user, the average age of alcohol users were high 26.2±2.38 whereas, reverse was true for tobacco chewers (21.1±3.63) as compared to users of other addictive substances this may be due to Alcohol is not widely available to public especially to adolescents except certain minor communities in Pakistan, results depicted in figure 01. Khawaja etal., (2005) reported that the 40 % population of Karachi (adults and adolescents) are using at least one chewable substance on a daily basis.[10] This percentage of consumption of addictive substance may be due to the industrial area, preparing chewable products (tobacco, betel and areca) in huge amount.[11,12] Figure 2 described the marital of status addictive substance the high ratio 76.47 % of ASU were non- married while 23.52% ASU were married. Samia Mazahir *et al*., (2006) reported the ratio of consumption of chewable products; mainly gutka, chaalia etc are much higher in unmarried as compared to married.[13] Figure 03 showed reasons to start using addictive substance. 74% ASU started using addictive substances mainly due to social company, while 11% due to interest towards particular addictive substance and 6% because of stress.[14] HughKlein *et al*., (2013) reported that approximately one-half (51.6%) of the study participants said that they received their first cigarette from a friend. Another one- quarter (25.8%) said that they secretly took or stole their first cigarette from someone (e.g., a parent, another relative, or a friend). It shows that company with ASU may lead to start an addiction. The high proportion of self-reported headache was common in 33.33% ASU and 3.92% ASU showed kidneys disease followed by liver diseases among other diseases. Headache was common among all ASU shown in figure 4. In the present study, ASU consumed addictive substances equally in psychological problems as well as in social problems and 21% ASU consume more addictive substance in economically strong conditions. Our results could be supported by results of several studies that described the smoking with health concern (especially mental disorders) are extensively much among the general population.[15,16] It is also reported that 70% chance of mental disease with smoking.[17] Saliva is complex body fluid provide a number of functions in the body e.g. help in digestion, provide the protection to the oral mucosa, taste sensation, pH balance, teeth re-mineralization and many other functions.[17] Saliva composes of peptides, number of electrolytes, glycoproteins and lipids therefore salivary flow rate is an important indication in dental diseases and oral pathogenesis.[18] Garrett JR. (1987) reported that the saliva flow rates of healthy person are about 0.3 to 0.5 ml/minute.[19] Many studies have been proved the adverse effect of tobacco

on health.[20] When saliva exposed to addictive substances such as tobacco responsible the structural and functional changes in saliva.[21]

Result of salivary flow rate shown in table 2 and figure 5 & 6, a significantly increased salivary flow rate (SFR) was found after consumption of chewing tobacco and areca nut as compared to before its consumption. We did not see the significant variation between salivary flow rate of ASU and controls. The flow rate of saliva of smokers was not significantly decreased after smoking. Tobacco chewers, Areca nut chewers ($p<0.05$) and naswar dippers showed increased SFR immediately after using these products however smokers and Hashish smokers showed decreased SFR immediately after smoking and can correctly indicate feeling of dry mouth. Significantly higher SFR in Tobacco-chewers may be due to the higher sensitivity of the salivary mechanism. Many studies have been proved that the cigarette smoking cause the short term increase in flow rate of saliva and the long term affect is still ambiguous.[22] The result of our study is comparable with Khan GJ *et al* (2003) which showed that the smoking is one risk factor of reduction of salivary flow rate and xerostomia.[23] 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 un-stimulated in case of saliva collection before chewing.

Similar results were observed in a study that paan chewing induces more salivary secretion in its users without any overall unpleasant effect on secretion of saliva.[24] It reported that the use of tobacco responsible for the high rate of saliva, while long term effect of consumption of tobacco in any form (especially smokeless form) is one of the cause of reduction of salivary flow rates.[25]

We found no variation in SFR between before and after naswar dipping. Naswar does not completely mix with saliva because of mode of its usage, thus do not stimulate as much secretion of saliva. The difference between the naswar users and control group was statistically insignificant ($P > 0.05$).[26] Observed that the effect of nicotine on the taste nerve apparatus appears to be initial stimulation followed by depression because tobacco is the major ingredient of naswar and Nicotine in tobacco significantly depressed salivary flow rate in naswar dippers.[26]

Results regarding salivary pH depicted 3 and figure 7& 8, it is clear that the addictions related with chewing process showed significant variation between before and after addiction salivary pH of ASU. The results show that the pH of the saliva is altered after contact with the chewing tobacco, naswar, or areca nut. The alkaline pH in tobacco chewers is due to the slaked lime present in chewing tobacco products that increased the P H. Different studies have been shown that tobacco is ever chewed with lime is responsible for elevated alkaline p H, Many scientists reported that the salivary p H ranged 5.5 to 7.9 with increased salivary flow rate.[4] The saliva flow rate affects the salivary p H saliva.[27] Normally, the saliva p H has been maintained by different buffer systems (Phosphate buffer system, bicarbonate system and protein buffer system.[28] The saliva from the individual taking chewing product has higher SFR, produced the carbon monoxide and increased bicarbonate concentration which responsible higher pH value. It is also reported that saliva p H increased with stimulation.[29] Dawes C (2005b) reported that salivary flow rate increased by the increased concentration of bicarbonate. The salivary p H increased up to 7.5 when salivary flow rate 1.0 ml/min.[30,31] The smokeless tobacco product has additive which contain bicarbonate, ammonia, carbonate responsible to increase the p H.[32] The salivary pH of smokeless tobacco products is important, because nicotine most readily crosses the oral mucosa in the non-protonated form. The presence of Ca (OH)2 in slaked lime leads to alkaline conditions in the oral cavity, favouring Reactive oxygen species (ROS) generation.[29] Similar observations reported in a study that Chewing tobacco and snuff (i.e., naswar) are buffered to alkaline pH to facilitate absorption of nicotine through oral mucosa.[33]

Our results showed that salivary pH after smoking cigarette is none significantly (p=0.07) decreased as compared to before smoking. The pH of smoke from flue-cured tobaccos, found in most cigarettes, is acidic (pH 5.5–6.0).[34] At this pH, nicotine is primarily ionized. As a consequence, there is little buccal absorption of nicotine from flue- cured tobacco smoke, even when it is held in the mouth. Nicotine as a weak base (pKa= 8.0) is rapidly absorbed across biological membranes with an environment at physiological pH (7.4) or slightly alkaline. This is the case for nicotine in cigarette smoke when it reaches the lung alveoli.[35]

Our results showed that salivary pH after smoking hashish was non-significantly decreased as compared to before smoking hashish. No any study is done on effect of smoking hashish on the salivary flow rate and salivary pH. The salivary pH before smoking hashish was

7.3±0.16 lies in Normal saliva pH range. But the quantity of saliva was very low and the pH was in alkaline range, this may be due to the effect of hashish on saliva pH.

Our results showed that mean salivary pH after dipping naswar was significantly increased as compared to before dipping naswar[35] reported the pH of all brands of naswar. The average pH of all 30 brands of naswar studied was 8.56, which favours the formation of tobacco specific amines thus making the product potentially toxic.[35]

Our results showed that the pH of the saliva is significantly altered after contact with the moist snuff (naswar). The salivary pH after chewing areca nut was significantly increased as compared to before chewing areca nut. In contrast Rooban *e t a l* .,(2006) reported a mean pH of 6.77 in non‑chewers and those who chew Raw Area Nut (RAN), the mean pH turns acidic.[9] Overall, we found a significant increased salivary pH of ASU after consumption of addictive substance as compared to controls.

Table: 1 Demographic distribution of the subjects

Group	Smoker & Hashish smokers	Tobacco Chewers	Naswar dippers	Areca nut chewers	Bhang users	Alcohol users
Subjects	6(22%)	17(34%)	5(10%)	5(10%)	6(12%)	5(10%)
Age (years) Mean±SD	22.83±2.48	21.1±3.63	21.8±1.48	22.2±1.92	23.5±2.73	26.2 ±2.38

Table: 2 Individual comparison of salivary flow rate (ml/min) for 05 min between the ASU and controls.

Groups	Salivary flow rate before consumption (Mean±SD)	Salivary flow rate after consumption (Mean±SD)	P-value (<0.05)
Tobacco Chewers (n=17)	2.47±1.16	3.82±1.43	2×10^{-5}
Cigarette Smokers(n=06)	3.61±3.34	3.13±2.21	0.38
Hashish Smokers (n=05)	2.18±1.30	1.42±0.46	0.91
Naswar Users (n=05)	2.24±0.31	2.24±0.79	0.07
Areca Nut Chewers (n=05)	2.74±0.28	3.94±0.64	0.002
Total ASU (n=38)	2.62±1.59	3.21±1.58	4.82×10^{-5}

Table: 3 Individual comparison of salivary pH between the ASU and controls

Groups	Salivary pH before consumption Mean±SD	Salivary pH after consumption Mean±SD	P-value (<0.05)
Tobacco Chewers (n=17)	7.27±0.69	8.0±0.45	0.001
Cigarette Smokers (n=06)	7.45±0.58	6.81±0.50	0.07
Hashish Smokers (n=05)	7.3±0.16	6.98±0.26	0.05
Naswar Users (n=05)	7.43±0.18	7.75±0.21	0.03
Areca Nut Chewers (n=05)	7.16±0.28	7.78±0.37	0.02

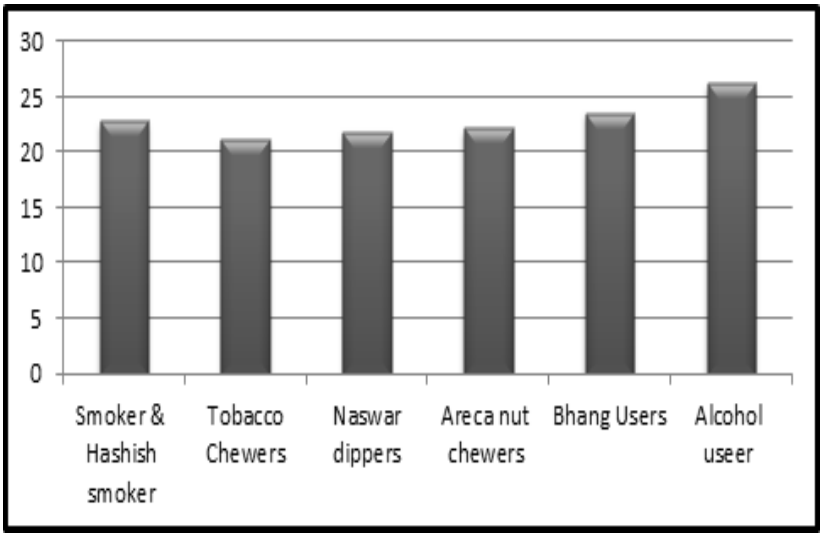

Figure: 1 Age wise comparison between addicted groups

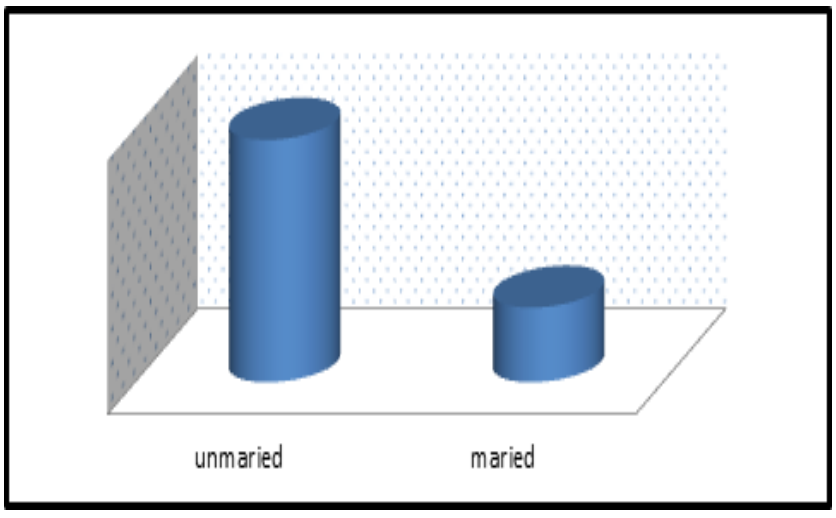

Figure: 2 marital status of ASU

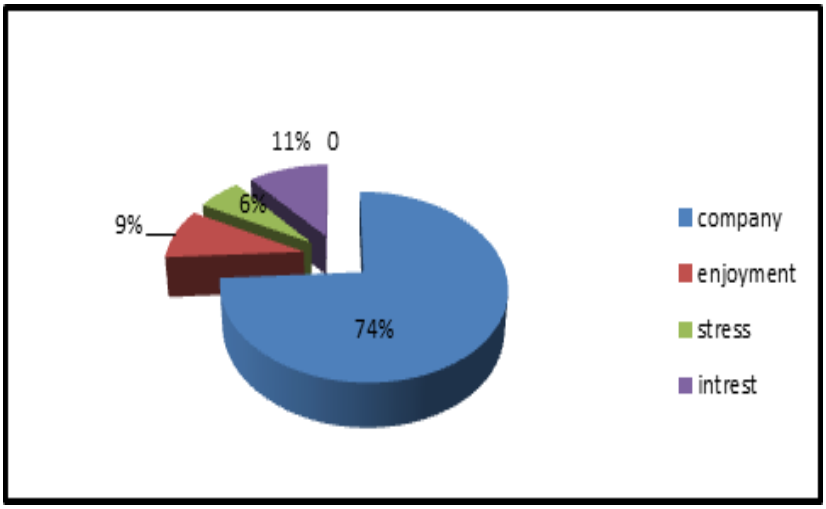

Figure: 3 Reasons to start using addictive substances reported by ASU

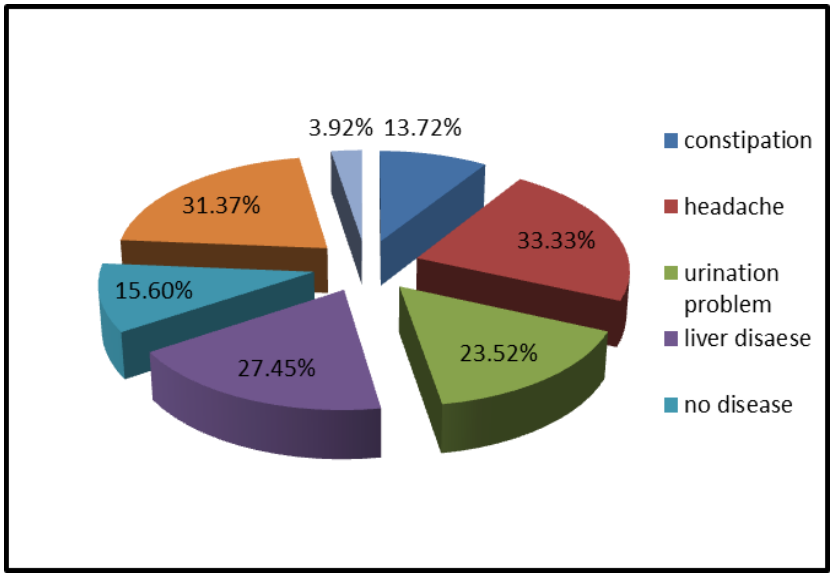

Figure: 4 Adverse health effects of addictive substances among ASU

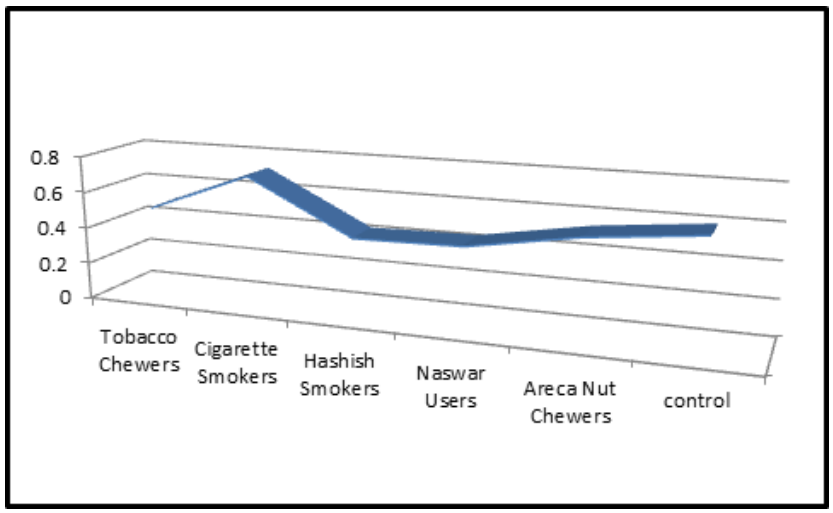

Figure: 5 salivary flow rate before consumption of Addictions

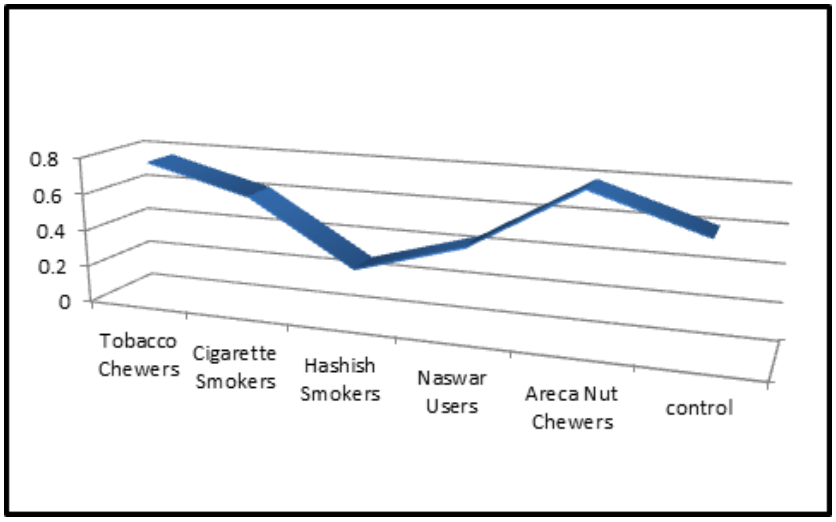

Figure: 6 salivary flow rate after consumption of Addictions

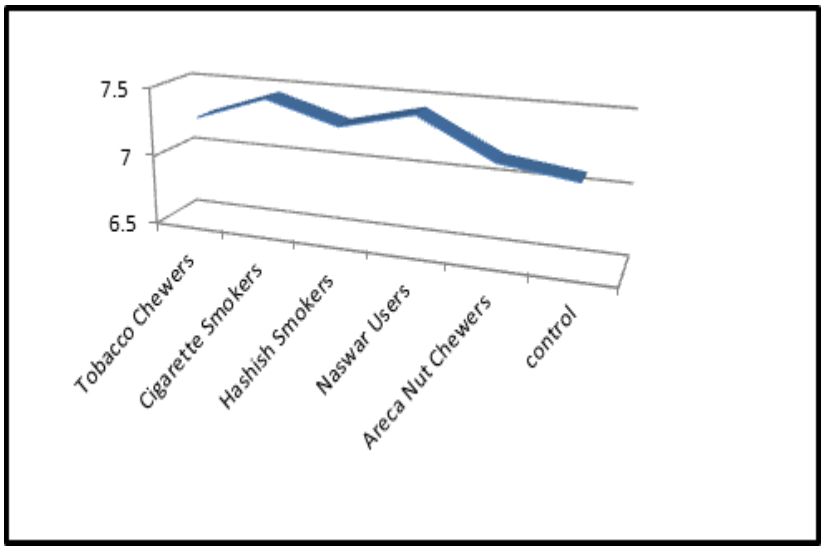

Figure: 7 salivary p H before consumption of Addictions

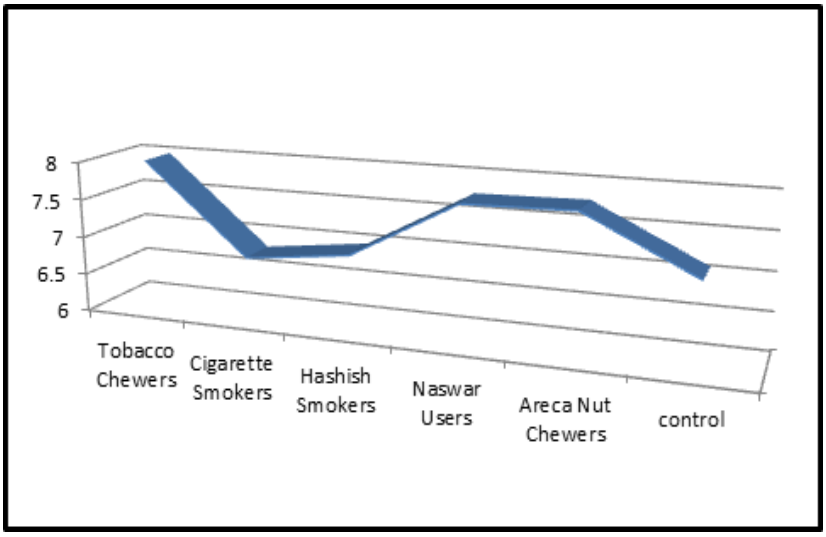

Figure: 8 salivary p H after consumption of Addictions

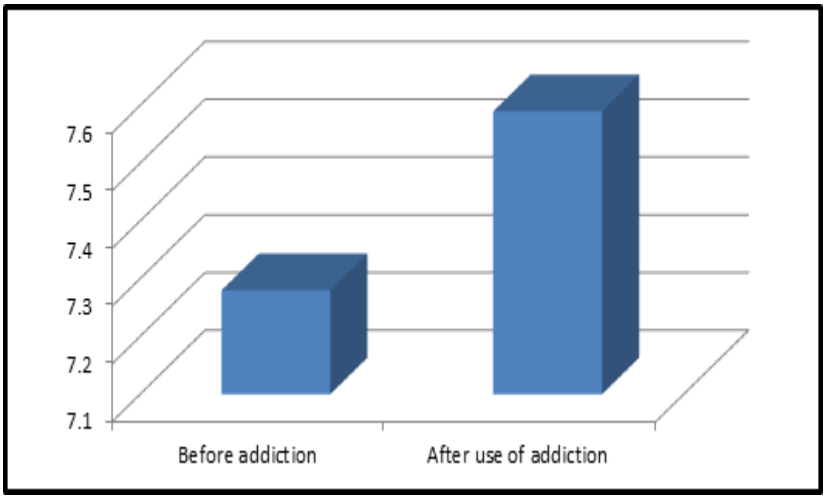

Figure: 9 salivary p H after consumption of Addictions

CONCLUSION

Present study concluded that high prevalence of daily use of the product of areca and smokeless tobacco has been identified among adolescents, the frequency of use of chaalia and pan masala was higher in adolescents of lower economic status, low cost and convenient availability to adolescents make them habitual consumer of addictive substances. 80% ASU were consumer of tea. The Naswar was the cheapest addictive substance among all other addictive substances; headache was common in 33.33% ASU and 3.92% ASU showed kidneys disease followed by liver diseases among other diseases. Students were highly involved in addictions as compared to other occupations, a significantly increased salivary flow rate (SFR) was found after consumption of chewing tobacco and areca nut as compared to before its consumption. We did not find significant variation between the salivary flow rate of ASU and controls. Addictions related to chewing process (chewing tobacco, naswar, Areca nut) showed significant variation between before and after addiction salivary pH of ASU. Overall, we found a significant increased salivary pH of ASU after consumption of addictive substances as compared to controls.

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