



Assessment of taste perception in tobacco users with and without potential malignant disorders- A comparative study.

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ABSTRACT:

Introduction: Tobacco use has been unequivocally linked to various adverse health outcomes. It is a leading cause of preventable diseases, including lung cancer, COPD, heart disease, stroke, and respiratory infections. The primary psychoactive substance in tobacco is nicotine, a highly addictive compound that stimulates the release of dopamine in the brain, leading to feelings of pleasure and reinforcement of the tobacco use behavior. The addictive nature of nicotine makes smoking cessation challenging for many individuals, as they often experience withdrawal symptoms and cravings upon quitting. **Materials and methods:** 90 Individuals with a history of tobacco use were selected and they were grouped into smokeless tobacco users, 30 smokers and normal individuals with no habit. sweet , sour, bitter and salty solutions were prepared and the subjects were tested for their taste perception and with the collected data further potentially malignant lesions were intervened. **Results and discussion:** smokeless tobacco users have delayed taste perception for all 4 tastes as they react late when compared to the normal population. 9% and 3% of the smokeless tobacco users and smokers who have potentially malignant lesions have diminished taste sense respectively. **Conclusion:** The study concludes that taste perception affects tobacco users generally, and the taste which took the most time to be recognised was bitter in both smokeless tobacco users and smokers.

Keywords: Tobacco, nicotine, smokeless, smokers, oral malignancy, oral lesions.

INTRODUCTION:

Tobacco users include cigarette smokers, pipe smokers, and users of smokeless tobacco products, who are exposed to a range of harmful substances found in tobacco smoke or tobacco products (1). The primary psychoactive substance in tobacco is nicotine, a highly addictive compound that stimulates the release of dopamine in the brain, leading to feelings of pleasure and reinforcement of the tobacco use behavior (2) . Nicotine addiction makes quitting smoking or tobacco use challenging for many individuals. Tobacco smoke contains thousands of chemicals, including numerous toxicants and carcinogens (3). When tobacco is burned, it releases substances such as carbon monoxide, formaldehyde, benzene, and polycyclic aromatic hydrocarbons (4). These toxic



compounds can have damaging effects on multiple organ systems, including the lungs, cardiovascular system, immune system, and reproductive system.

Tobacco use has been unequivocally linked to various adverse health outcomes. It is a leading cause of preventable diseases, including lung cancer, chronic obstructive pulmonary disease (COPD), heart disease, stroke, and respiratory infections. Additionally, tobacco use is associated with an increased risk of developing cancers of the mouth, throat, esophagus, bladder, pancreas, and more (5). And also highlighted the economic burden of tobacco use. The cost of purchasing tobacco products adds up over time, and smoking-related health issues can result in increased medical expenses and lost productivity (6,7). To address the harmful effects of tobacco use, public health efforts have focused on tobacco control policies, including increased taxes on tobacco products, smoking bans in public places, and educational campaigns to raise awareness about the risks associated with tobacco use (8). Additionally, smoking cessation interventions, such as counseling and medications, have proven effective in helping individuals quit tobacco use and improve their health outcomes.

Smokers are individuals who engage in the habit of tobacco smoking, exposing themselves to a wide array of harmful substances and toxins present in tobacco smoke (9). These substances exert detrimental effects on multiple organ systems, including the lungs, cardiovascular system, immune system, and reproductive system (10). The addictive nature of nicotine makes smoking cessation challenging for many individuals, as they often experience withdrawal symptoms and cravings upon quitting. When a smoker tries to quit or goes for a period without smoking, they may experience withdrawal symptoms. These can include cravings, irritability, anxiety, difficulty concentrating, increased appetite, and insomnia (11).

Smoking can be an expensive habit. The cost of purchasing cigarettes adds up over time, and smokers may spend a significant amount of money on tobacco products. Smoking also has social and environmental implications. Research on taste perception in tobacco users has provided valuable insights into the effects of tobacco on the sensory experience of taste (9,12). Numerous studies have consistently demonstrated that smokers exhibit reduced taste sensitivity compared to non-tobacco users. The chemicals present in tobacco smoke, such as nicotine and carbon monoxide, have been identified as key contributors to this diminished taste perception (13),(14). These substances can damage the taste buds, leading to a decreased ability to detect and discriminate flavors accurately. As a result, tobacco users may experience a blunted or dulled sense of taste (15).

A major impact of tobacco is altered taste preferences in individuals. Tobacco users often exhibit a preference for more intense or stronger flavors to compensate for their diminished (7)taste sensitivity. This shift in taste preferences may not only affect the enjoyment of food but also have implications for dietary choices and overall nutritional status (16). Specific tastes can also be influenced by tobacco. Studies have revealed that tobacco users tend to have a reduced sensitivity to bitter tastes. The diminished ability to perceive bitterness can alter the taste experience and potentially affect dietary patterns and preferences. Recent advanced research suggests that taste perception can partially recover after tobacco cessation. When individuals quit tobacco, the



damaged taste buds have the potential to heal and regain some of their normal function (17),(18) While the extent and timeline of recovery may vary among individuals. However, it is essential to note that further research is needed to fully understand the underlying mechanisms and long-term effects of tobacco on taste perception. Factors such as duration and intensity of tobacco use, individual variations, and the impact of other substances in tobacco smoke require more investigation. Continued exploration in this field can contribute to a better understanding of the relationship between tobacco use and taste perception, ultimately aiding in the development of effective interventions and strategies to support tobacco users in their journey towards better health and improved sensory experiences. The aim of our study is to assess the taste perception of tobacco users with and without potentially malignant disorder.

MATERIALS AND METHODS:

SUBJECTS:

The study was conducted at the department of oral medicine and radiology, Saveetha Dental College and Hospitals. Before conducting the study, the institutional ethical review board at Saveetha Dental College and Hospitals, Chennai, India examined and approved the clinical protocol and informed consent. Individual consent from the subjects were obtained before the study was initiated. The subjects in this study were evaluated and segregated according to their tobacco use. Selected subjects included 90 Individuals with a history of tobacco use and the subjects were segregated into 3 groups: 30 smokeless tobacco users (group 1), 30 smokers (group 2) and 30 individuals with no habit (group 3). The groups were again divided based on the individuals who show the signs of developing potentially malignant disorder and individuals who have no signs of developing potential malignant disorder. Patients who had chewed and smoked tobacco for more than a year and were in the age range of 20 to 60 years of either sex made up the study group 1 and 2 . The type of tobacco product and the intensity used by each individual was not taken into consideration which was seen as limitations of this study.

PREPARATIONS OF SOLUTIONS:

Taste perception was assessed using four basic different aqueous solutions prepared in gold lab, Saveetha dental college and hospitals. The flavors included sweet solution, salty solution, sour solution and bitter solution. Sweet solution was prepared by dissolving 0.5 g of sucrose in 10 ml of distilled water. Salt solution was prepared by dissolving 0.5 g of sodium chloride in 10 ml of distilled water. Sour solution was prepared by mixing equal parts of vinegar and distilled water. Bitter solution was prepared by dissolving 1 g of coffee powder in distilled water without sugar. All the prepared solutions were stored in a glass container FIGURE 1.



FIGURE 1: This picture represents all the 4 different solutions prepared.

STUDY PROCEDURE:

All the subjects were given a stopwatch to time themselves when they were able to taste the solutions, to eliminate time error. In order to reduce results bias brought on by circadian variation, the study was conducted from 8:00 am to 12:00 pm, and subjects fasted from eating and drinking one hour before the appointment. After being instructed to rinse their mouths with distilled water, the subjects were given a timer to hold in their right hand to time how long it took them to identify tastes. Using a dropper, the individuals were given the four different aqueous solutions. Random locations on the tongue's dorsum were used to introduce the solution. For each taste, the subject's taste recognition time was recorded in seconds. The participants were instructed to thoroughly rinse their mouths with distilled water after each solution.

STATISTICAL ANALYSIS:

The results were calculated using one-way analysis of variance (ANOVA), input into Microsoft Excel using SPSS 20.0 software, and expressed as mean and standard deviation. To compare flavor identification times in the study and control groups, an unpaired t-test was used. At the 5% level of significance, a P value of 0.05 indicated a significant connection.



RESULTS AND DISCUSSION:

Scientific studies on smokeless tobacco users have revealed that regular use can significantly alter sensory and taste perceptions. Nicotine and other chemicals found in smokeless tobacco can impair the function of taste buds and alter the neural pathways involved in taste sensation. Research shows that individuals who use smokeless tobacco often report reduced sensitivity to certain tastes, particularly sweet and salty flavors. This is thought to be due to the toxic effects of nicotine and other chemicals on the taste receptors and salivary glands (19). Prolonged use can also contribute to oral health issues, such as gum disease and oral lesions, which may further diminish taste perception. Additionally, smokeless tobacco use has been linked to a condition called "oral dysesthesia," where users experience abnormal sensations in the mouth, including altered taste and a persistent bitter or metallic taste (20),(21).

Studies also suggest that these sensory changes might influence dietary habits, as users may have a reduced ability to detect or enjoy certain flavors, which could lead to an altered eating pattern or decreased enjoyment of food (22). The graph in FIGURE 2 clearly shows that the smokeless tobacco users have delayed taste perception for all 4 tastes as they react late when compared to the normal population. The smokers also react similarly when compared to smokeless tobacco users. Both populations react late to bitter and sweet taste when compared to the normal population. The mean of the taste perception of each flavor was calculated and clearly depicted in the graph, late reaction in smokeless tobacco patients was seen for bitter taste followed by sweet, sour and salt tastes. And for smokers the most late reaction was for bitter flavor and quickest was for salt flavor. When comparing it with the normal population the quickest reaction was for sour and late reaction was for bitter. This could be due to several factors but critically due to change in the tastebuds morphology, density and conduction of signals due to eroded surface epithelium. FIGURE 3 depicts the individuals who show signs of oral potentially malignant disorders and out of them how many have diminished taste in total 9% of the smokeless tobacco users and 3% of the smokers have diminished taste perception. The use of tobacco and its products whether smoked or smokeless has been extensively linked to a range of oral health complications, many of which are severe and long-lasting. Scientific research consistently shows that tobacco use is a major risk factor for oral cancer, with users of both smoked and smokeless tobacco being at significantly higher risk for cancers of the lips, tongue, mouth, and throat (3). Smokeless tobacco, in particular, is known to cause lesions and sores in the oral cavity, including white patches (leukoplakia) (23) and red patches (erythroplakia) (24), which are precursors to cancer. Additionally, tobacco use is a leading cause of gum disease (periodontal disease), as it impairs blood flow to the gums, weakens the immune response, and reduces the ability to fight off bacterial infections (5). Smokeless tobacco also contributes to gum recession and tooth loss due to the irritation and damage caused



by direct contact with the tobacco. Moreover, tobacco products contain numerous harmful chemicals, including carcinogens like nitrosamines, which can promote the growth of harmful bacteria in the mouth, leading to increased plaque and tartar buildup, further exacerbating oral disease (25). Chronic users of tobacco products are also more likely to experience persistent bad breath (halitosis) and dry mouth (xerostomia), as tobacco reduces saliva production. Overall, the combination of these oral complications highlights the significant risks to oral health posed by tobacco use (26). There is a growing body of scientific evidence that demonstrates a strong link between oral health and systemic health, emphasizing that oral diseases can significantly impact overall well-being. Poor oral health, particularly conditions like gum disease (periodontal disease), has been associated with a range of systemic health issues, including cardiovascular disease, diabetes, respiratory infections, and adverse pregnancy outcomes (27,28).

Chronic periodontal disease mentioned by (29), has been shown to increase the risk of heart disease, potentially by promoting systemic inflammation and the release of harmful bacteria into the bloodstream, which can contribute to the formation of arterial plaque and blood clotting. Similarly, individuals with diabetes are more susceptible to periodontal disease due to the effects of high blood sugar on immune function, and periodontal infection can, in turn, make it harder to control blood sugar levels (30). There is also evidence linking oral infections with respiratory conditions, as oral bacteria can be aspirated into the lungs, leading to pneumonia and other lung infections, particularly in individuals with compromised immune systems. Furthermore, pregnant women with untreated periodontal disease are at a higher risk of delivering preterm or low-birth-weight babies, likely due to the systemic inflammation caused by oral infections (31), (32). These findings underscore the importance of maintaining good oral hygiene as part of a broader approach to preventing or managing various systemic health conditions. Beyond health, tobacco use also has social and economic consequences. Smoking often results in increased healthcare costs and absenteeism from work due to illness. It is also associated with a stigma, which can impact social interactions and workplace dynamics. Research indicates that tobacco use can lead to decreased productivity (33), as nicotine dependence can create cycles of cravings and withdrawal, disrupting focus and efficiency throughout the day (34). These factors together underscore the profound influence of tobacco on both the physical well-being and day-to-day functioning of individuals and communities.

CONCLUSION:

The study concludes that taste perception affects tobacco users generally, and the taste which took the most time to be recognised was bitter in both smokeless tobacco users and smokers. And out of which 9% and 3% of the smokeless tobacco users and smokers who have potentially malignant lesions have diminished taste sense respectively.

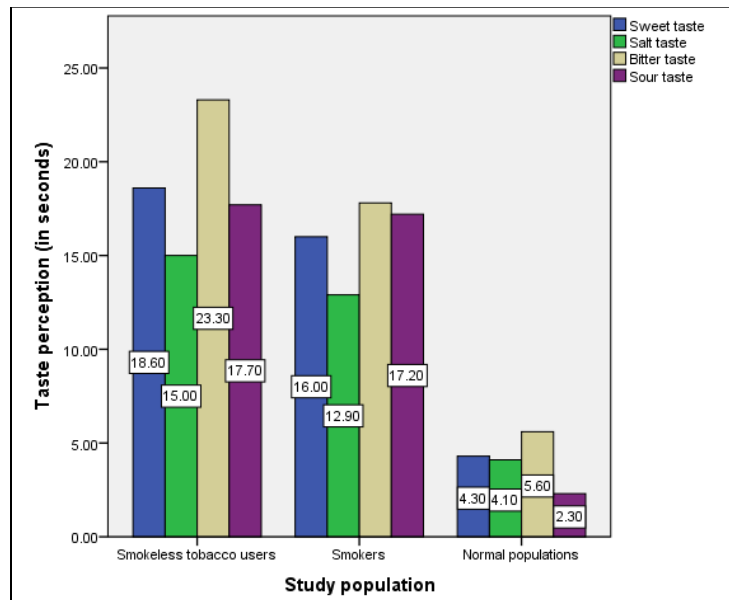


FIGURE 2: The above graph represents the comparison of the taste perception in smokeless tobacco users, smokers, and normal population.

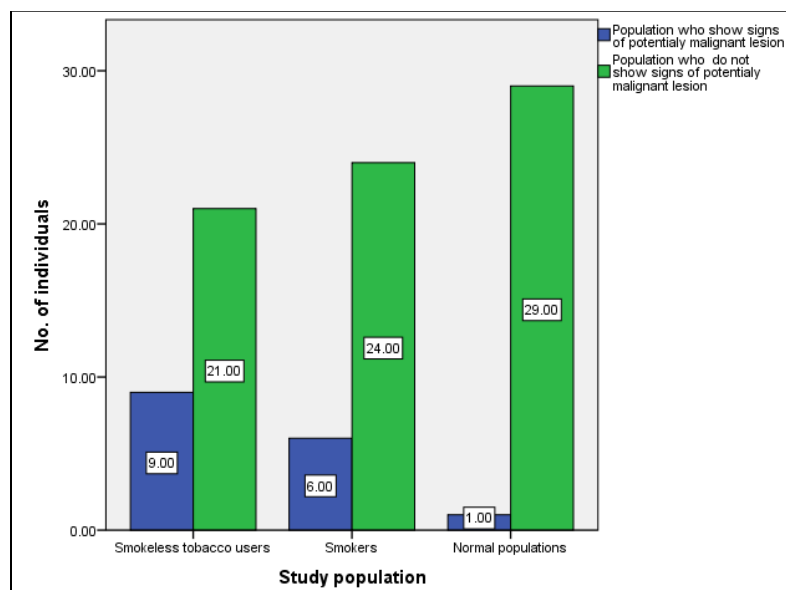




FIGURE 3: The above graph represents the malignant lesion in smokeless tobacco users, smokers, and normal population.

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