Prevalence of tobacco-associated oral mucosal lesion in Hazaribagh population: A cross-sectional study

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ABSTRACT

Background: Smoking and chewing tobacco carry significant risks for the development of oral cancer and premalignant lesions. The present study was conducted to find the prevalence of tobacco-related habits in Hazaribagh population and its association with oral mucosal lesion. Methodology: The present study was carried out on patients who visited the Department of Oral Medicine and Radiology, Hazaribagh College of Dental Sciences And Hospital. A total of 5,000 subjects were screened for tobacco-related habits and associated mucosal changes. Detailed clinical history about tobacco-related habits was obtained. Oral mucosal lesions were screened using the WHO format for diagnosis of oral lesions. The findings were tabulated and analyzed statistically. Results: Of the 5,000 subjects enrolled for the study, 1,085 (21.7%) used tobacco in some forms. Habit of smoking tobacco was present among 273 (25.2%) and using smokeless tobacco among 811 (74.7%) individuals. Tobacco pouch keratosis (46.1%) was found to be most common lesion, followed by oral submucous fibrosis (OSMF) (16.1%), lichenoid reaction (14.1%), smokers palate/melanosis (12.2%), leukoplakia (7.2%), erythroplakia (2.3%), and oral cancer in (2%). Conclusion: The results provide insight into prevalent tobacco habits and associated oral mucosal lesions in Hazaribagh population. These may act as baseline data for the formulation of preventive programs and help future studies explore the prevalence of tobacco-associated lesions in vulnerable populations. Current knowledge, including findings from the present study, about the prevalence of tobacco use and various oral lesions associated with it may help primary health care physicians to promote among patients visiting them the awareness about the adverse effects of tobacco consumption and treatment options available for tobacco-related lesions at the early stage.

Keywords: Mucosal lesions, smokers, tobacco, tobacco chewers

Introduction

Tobacco is the world’s biggest preventable killer. According to World Health Organization (WHO), nearly one-third of the global adult population are tobacco users. In India, there are 240 million tobacco users (195 million men and 45 million women), accounting for one-fifth of the world’s tobacco-consuming population. India is among the largest tobacco-growing countries.

Christopher Columbus, who discovered tobacco among Native Americans, believed that tobacco possessed medicinal properties and introduced tobacco into Europe in 1556. It was the Spanish and Portuguese sailors who carried tobacco to the other parts of the world.

Tobacco was originally used to denote a Y-shaped piece of pipe named Tobago or tobaca, which was first used by the Mexican
Indians to inhale powdered leaves of a plant. Later, this plant came to be known as Nicotiana. Nicotiana gets its name from the French Ambassador to Portugal Jean Nicot, who introduced tobacco into the French court in 1560. Portuguese traders introduced tobacco in India.  

Tobacco possesses various harmful substances and has been proven to be addictive and harmful for health. Tobacco is basically of two types: smoked tobacco and smokeless tobacco. Both smoked and smokeless tobacco contain alkaloid nicotine, which is the main addictive agent. There are thousands of chemical compounds present in smoked as well as unburnt tobacco. They act not only as irritants and toxins but also are deadly carcinogens. The various forms of tobacco used in India are as follows: a) smoke tobacco—cigarettes: bidi, cigar/cheroot/chutta, reverse chutta smoking dhumti, reverse dhumti smoking hookli, chillum, hookah and b) smokeless tobacco, pan (betel quid) with tobacco, pan masala, Manipuri tobacco, mawa, tobacco–lime preparations, snuff, mishri, gudhaku, and red tooth powder. Effects of usage of tobacco can be seen not only in the oral cavity but also in different parts of body with various systems involved. Tobacco-induced problems may include disturbed sleep, irritability, respiratory, cardiovascular problems, peptic ulcers, and so on. The present study is an attempt to assess and compare the various tobacco-related habits and oral lesions caused by tobacco use among rural/urban populations in Hazaribagh.

**Methodology**

A cross-sectional study was conducted on patients who visited our institute during the period between July 2018 and January 2020, at the Department of Oral Medicine and Radiology, Hazaribagh Dental College and Hospital. The study was approved by the Institutional Ethical Committee (HCDSH/IEC/2018/039 dated 12.01.2018). The study’s sample size was determined by conducting a pilot study with a smaller sample based on the demographic data of Hazaribagh population, and the final sample included 5,000 subjects. Our pilot study was done to assess the feasibility for conducting the large-scale main study and determining the sample size needed for the same (20 clusters or blocks of Hazaribagh and adjacent districts); our calculations showed that the patients who visited our dental college hailed from areas whose combined population was around 19,00,00. The final sample size was calculated using the formula for sample size as recommended by WHO: 

\[
N = \frac{z^2 \cdot p \cdot (1 - p)}{d^2},
\]

where \(P\) = prevalence of disease in a population, \(z = 95\%\) confidence interval, and \(d = \) acceptable margin of error (0.05). The prevalence of oral tobacco habits in our pilot study was 26%. We however succeeded in gathering a sample of 5,000 subjects, which was larger than the sample of 4,200 subjects that we originally planned for.

All the subjects were explained in detail about the study, and written informed consents were taken from them before including them in the study sample. Each patient was asked to fill a 12-point survey questionnaire which was prepared using the Adult Tobacco Use Questions of the National Health Interview Survey regarding tobacco use habits.

Oral cavity examination for the presence of mucosal lesions was carried out on dental chair using standard diagnostic instruments and illumination. Areas of oral cavity were examined in sequence lips, labial mucosa, buccal mucosa, floor of the mouth, tongue dorsal and ventral surface, hard palate, soft palate, and oropharynx. The clinical diagnoses of oral mucosal lesions were established using the criteria provided by the *Epidemiology Guide for the Diagnosis of Oral Mucosal Diseases (WHO)*. Based on the habits observed, the study group was categorized into smokers and chewers. Smokers were grouped as those who smoked cigarette, bidi, or other forms of smoking. Chewers were classified as those chewing tobacco quid (khaini), gutka (mixture of tobacco and betel quid), pan (pan, betel nut tobacco/zarda), and other forms of smokeless tobacco like gul or guraku. Details about the habit, including duration of smoking, were recorded. In chewers, details like duration and frequency of the habit, and also the site of placement of quid in the oral cavity, were recorded. Patient responses were tabulated for use in the correlation analysis carried out to determine the correlation between adverse habits, including the use of tobacco in some form, and the oral mucosal lesions. The results were statistically analyzed using SPSS software (Statistical Package for the Social Sciences [SPSS]; IBM Statistics for windows, Version 21.0). All patients who had the habit of tobacco consumption were explained about the harmful effects of tobacco and were motivated to quit.

**Results**

An epidemiological study was carried out to assess the prevalence of tobacco use and tobacco-use-induced oral lesions among the Hazaribagh population. The patients examined included both men and women from different age groups. Data collected were analyzed, and we arrived at the following findings on the basis of our analysis.

**Prevalence of different types of habits among the population**

From a total of 5,000 subjects examined, only 1,085 patients had tobacco-related habits. Among them 274 (25.2%) subjects smoked tobacco and 811 (74.7%) chewed tobacco.

In relation to smoking habits, bidi smoking (n = 183; 66.7%) was more common than cigarette smoking (n = 70; 25.5%). In relation to chewing habits, most subjects chewed khaini (a mixture of tobacco and lime; n = 313, 38.5%), followed by those who chewed gutka (mixture of tobacco and processed betel nut; n = 263, 32.4%). Pan chewing (betel leaf + betel nut + tobacco + lime) was common among 174 (21.5%) individuals, and a few were taking other chemically processed forms of tobacco, such as gul and guraku (n = 61; 7.5%; see Table 1 and Graph 1).
Prevalence of oral lesion associated with various habits

Among the 1,085 subjects with tobacco habits, no lesion was present in 781 (72%) individuals. Tobacco-associated changes in the oral cavity were present in 304 (28%) individuals. Among alterations in oral mucosa present in tobacco users, 137 (41.8%) subjects had premalignant or suspected malignant disorder and 177 (58.2%) had tobacco-associated changes in oral mucosa which were benign. [Table 2]

The most common lesion observed among tobacco abusers was tobacco pouch keratosis ($n = 140$; 46.1%), followed by 49 cases (16.1%) of OSMF, 43 (14.1%) cases of lichenoid reaction, 37 (12.2%) cases of smokers palate/hyperkeratosis. Leukoplakia was seen in 22 (7.2%) cases, whereas erythroplakia was seen in 7 (2.3%) cases, and only 6 (2.0%) cases of ulceroproliferative lesions were seen. [Table 3 and Graph 2]

Discussion

Tobacco is a powerful addictive substance. It alters the addicted person’s pharmacological, psychological, emotional, and social behavior. Tobacco-related habits are rapidly gaining popularity among the youth of our country. Today, our world is in a state of tobacco epidemic with the number of tobacco users growing every day.

In our study out of the 5,000 subjects, 1,085 (21.7%) used tobacco in any and every form. This was in accordance with the study by Koothati et al. where they found that 23% of their subjects used tobacco. According to the National Sample Survey Organization report in 1993-1994, prevalence of tobacco usage, in any form, was found to range from 45.3% in rural areas to about 29.9% in urban areas in India. Rani Desai et al. found that 63.6% of the population were tobacco abusers compared to the national average of 35%. This may be due to their study on a limited population who worked in a factory in south India.

In our study population, 274 (25.2%) subjects were smokers and 811 (74.7%) subjects chewed tobacco in many forms. One reason for the higher number of tobacco chewers compared to smokers was perhaps the legislation that banned smoking in public places. Cigarette smoking was found to be more common in the younger age group. Of the 274 subjects who smoked, 183 (66.7%) were bidi smokers, 70 (25.5%) smoked cigarettes, and 21 (7.6%) used other forms of smoking like hukka and chillum. Poor socioeconomic condition may also be a reason for the larger number of bidi smokers in our study. One interesting fact noted in our study was that a large number of ethnic tribal people smoked chillum.

Among the 811 subjects who used smokeless form of tobacco, 313 (38.5%) were khaini users, 263 (32.5%) used gutka with tobacco, 174 (21.5%) chewed pan with zarda, and 61 (7.5%) used tobacco in the form of dentifrice (gul and guraku).

| Study Subjects                  | Numbers | Percentage |
|--------------------------------|---------|------------|
| No tobacco habits              | 3,915   | 78.3       |
| With tobacco habits            | 1,085   | 21.7       |
| Total                          | 5,000   | 100        |

| Habits                          |         |            |
|--------------------------------|---------|------------|
| Smoking                        | 274     | 25.2       |
| Bidi                           | 183     | 66.7       |
| Cigarettes                     | 70      | 25.5       |
| Other forms                    | 21      | 7.6        |
| Smokeless tobacco              | 811     | 74.7       |
| Khaini (quid)                  | 313     | 38.5       |
| Gutka (betel quid)             | 263     | 32.5       |
| Pan (betel leaf and tobacco)   | 174     | 21.5       |
| Dentifrice (gul and guraku)    | 61      | 7.5        |

| Presence of tobacco-associated mucosal lesion | Number | Percentage |
|----------------------------------------------|--------|------------|
| No lesion                                    | 781    | 72         |
| Lesion present                               | 304    | 28         |

| Category of lesion                          | Number | Percentage |
|----------------------------------------------|--------|------------|
| Premalignant lesion                          | 127    | 41.8       |
| Benign mucosal lesion                        | 177    | 58.2       |

| Types of mucosal lesions associated with tobacco usage | Numbers | Percentage |
|------------------------------------------------------|---------|------------|
| Leukoplakia                                           | 22      | 7.2        |
| Erythroplakia                                         | 7       | 2.3        |
| Oral sub mucus fibrosis                              | 49      | 16.1       |
| Lichenoid reaction                                   | 43      | 14.1       |
| Ulceroproliferative changes (carcinoma)              | 6       | 2.0        |
| Tobacco pouch keratosis                               | 140     | 46.1       |
| Smoker’s palate/hyperkeratosis                       | 37      | 12.2       |
Choudhary, et al.: Incidence of tobacco-associated lesions

Khaini is a readily available and cheaper alternative. At present gutka and tobacco are available in two separate pouches in India, and it is premixed before using. The plain betel nut containing gutka is aggressively advertised in media. Gul and guraku dentifrice are readily available in general stores locally and readily used by women in this area. The findings were similar to the study conducted by Gupta N. et al.; the geographic distribution of the target population in their study was similar to that of our study’s target population.[13-15]

From among as many as 1,085 tobacco users involved in our study, 781 (72%) did not have any associated lesions and only 308 (28%) individuals had tobacco-associated lesions in some form. In relation to the presence of tobacco-associated lesions, 177 (58.2%) individuals had nonmalignant lesions, whereas premalignant lesions were observed in 127 (41.8%) of the subjects. Presence of lesion depends on various factors, like form, frequency, duration, type of habit, and genetic factors.[16] The results were similar to that of the studies by Sharma G et al.[17] and Koothati et al.[18] whose findings showed the presence of tobacco-associated lesions in 33.2% and 30% of their study subjects, respectively.

The most common benign lesion present among smokers was benign palatal changes associated with smoking (n = 140; 46.1%), including smokers palate, hyperkeratosis, and pigmentation. Other conditions observed include the following: smoker’s melanosis/smoker’s palate/or nicotine stomatitis. These may have been caused by the effects of nicotine and heat on melanocytes located along the basal cells of the lining epithelium of oral mucosa and also on minor salivary glands.[19]

The most common lesion found in our study among smokeless tobacco users was tobacco pouch keratosis, which was present among 140 (46.1%) individuals. Keratosis was a common condition arising from use of chewing tobacco mixed with lime; the condition becomes apparent after 5 to 10 years of sustained tobacco chewing but regresses with cessation.[13,17]

Oral submucous fibrosis was seen in 49 (16.1%) subjects. This finding was similar to studies by Krishna et al., Alshayeb M et al.,[19,20] and Naveen-Kumar B et al.[16] whose findings showed the prevalence of this condition at 12.2%, 14.5% and 12.4% respectively in study populations.

In the present study, leukoplakia and erythroplakia were present, respectively, in 22 (7.2%) and 7 (2.3%) subjects. The results were in agreement with the findings reported in Sharma et al. (10.35%),[17] Alshayeb M et al. (8.2%),[20] Patil PB et al. (8.1%),[21] Kamala KA et al. (8.27%),[16] and Koothati et al. (9.78%).[18] It was much higher nevertheless than the figure reported by Matthew et al. and Bhatnagar et al., which was 2.38%; it may be that the said researchers addressed specific forms of tobacco usage that were different from the ones targeted in other studies.[11]

In tobacco chewers, lichenoid reaction occurs at the site of placement of quid or gutka resembling lichen planus. Betel quid chewing was found to be strongly associated with this lesion that; it occurs at the site of the placement of quid. In the present study, lichenoid lesion was seen in 12.2% of lesion cases compared to the study by Patil et al. which found lesions in only 1.5% of their subjects,[20,23]

The present study showed a higher prevalence of ulceroproliferative lesion (oral carcinoma) in 6 (2%) individuals. This was way lower compared to the rates of prevalence reported by Naveen-Kumar B et al.[16] and Patil et al.[24] at 6.6% and 1.6%, respectively.[24]

Limitations of the present study: Tobacco-related habits are diverse, and various factors, both identified and unidentified, contribute to the formation of lesions. Although detailed physical assessments were carried out, analysis of various factors like association of tobacco with psychological conditions and genetic constitutions of the subjects was not carried out. The study group consisted of population from various ethnicity and also from professions, economic strata. A study within closed group considering local conditions may be helpful. The occurrence of specific lesions in particular age, sex, nutritional status, and other systemic disease was not discussed. In relation to the subject matter of the present research, long-term future studies that evaluate the prevalence of oral mucosal lesions arising from tobacco consumption may yield more robust findings that government and policymakers can use to draw up plans and policies to curtail the use of tobacco.

Conclusion

This study presents epidemiological data on the prevalence of tobacco-related habits and their association with various oral mucosal lesions. This information may be of great value in formulating preventing programs, targeting the most vulnerable population, and formulating future oral health programs. Currently, WHO advocates term M P O W E R as the most effective tool against tobacco use (Monitor tobacco use and prevention policies; Protect people from tobacco smoke;
Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion, and sponsorship; Raise taxes on tobacco.\(^{[23]}\)

Tobacco-associated lesions were found in one-fourth of our study population and OSMF was found to be the most commonly associated lesion among tobacco users. Dentists are the first to observe and diagnose these lesions. So, dental education programs should be conducted regularly for imparting sound knowledge about such lesions at the undergraduate level for effective prevention at the early stages.

Despite efforts by government to spread awareness among population about the adverse effects of tobacco, tobacco use continues to remain high among population, especially among rural population. In the Indian scenario, doctors’ words are of great importance among populations. One effective approach to curtail the prevalence or emergence of tobacco-related lesions is for the physicians to perform oral screening for tobacco-associated lesions on the general population of patients visiting them for other diseases and educate them about the adverse effects of tobacco use. Such efforts on the part of physicians may prove very effective in motivating the patients to quit tobacco in all forms and, in turn, reducing the country’s health and economic burdens arising from tobacco abuse.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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