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HISTOLOGICAL CHANGES IN ORAL MUCOSA INDUCED BY TOBACCO USE: A COMPARATIVE STUDY IN PESHAWAR

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ABSTRACT

Introduction

Smoked and smokeless tobacco consumption is a major factor that leads to pathological alterations in oral mucosa: leukoplakia and oral sub mucous fibrosis. Most of these changes are known to predispose an individual to oral cancer. This study was designed to evaluate differences in the pathological changes in the oral tissues of tobacco users and non-users in the context of the city of Peshawar, with a view to examining the severity of tobacco effects.

Methodology

An observational analytical study of Tobacco user and Non-Tobacco users was carried out, in Khyber Medical University, Peshawar using cross-sectional comparative study in which, 100 participant included 50 Tobacco users & 50 Non Tobacco users participated between January to June 2024. In this study, oral mucosal biopsy samples were taken from the patients and the following histopathological changes were evaluated; epithelial thickness, keratinization, degree of dysplasia and degree of inflammatory infiltration. Descriptive analysis was done using chi-square test at 0.05 level of signification.

Results

There was also a statistically significant difference between the control groups. In group 1 hyperkeratosis was observed in 80% of participants and mild to moderate changes of dysplasia in 25% of participants and 70% of participants with inflammatory infiltrates. The prevalence of sub epithelial fibrosis was 15% among tobacco users. Group 2 (non–user) had no dysplasia even though the degree of inflammation was minimal.

Conclusion

Tobacco has well defined relationship with histologic alterations of the cells within oral mucosal surface that is characterized by hyperkeratosis, dysplasia and chronic inflammation. Therefore this result support the practice of performing dental check at regular intervals for those practicing any form of tobacco use and declares that further work needs to be done in the crusade to minimize people's use of tobacco products.

Keywords: Histological Changes, Oral Mucosa, Tobacco Use, Smokers

Introduction

Tobacco use is ranked among the world's leading health threats in the various negative health disorders especially of the oral cavity. Several researches have shown that tobacco use whether in smoked or smokeless form leads to a range of pathological changes affecting the epithelial surfaces of the mouth; these are dysplasia, keratosis, chronic inflammation, and may lead to the formation of pre cancerous conditions such as leukoplakia and oral sub mucosal fibrosis (1, 2). These changes can go a long way in raising the chances of oral cancer which is one of the leading type of cancer, while tobacco remains rampant in the developing world specifically Pakistan (3,4).

Tobacco induced histological changes in the oral mucosa are more important given that they explain how tobacco act to cause oral diseases. According to the type and period of tobacco usage, and the conditions in which the mucosa is situated, its reaction to the toxins in tobacco is quite diverse, (5). In Peshawar, tobacco consumption is high and prevalent in many forms such as cigarettes and smoke less tobacco; knowledge of these specific histopathological changes is helpful in early diagnosis, treatment and prevention of tobacco induced oral diseases (6).

This prospective comparative study planned to compare the histological alteration of oral mucosa in tobacco users and non-users in Peshawar. The study also next looks at the correlation between the type of tobacco used and the period of exposure and the extent of the histopathological changes.

Methodology

Study Design

The present work is a cross-sectional comparative study and was carried out in the Department of Oral Pathology, Khyber Medical University, Peshawar from January 2024 to June 2024. Patients' informed consent was also sought from all participants before they could be enrolled for the study and the institutional review board approval was granted.

Study Population

A total of 100 participants were included in the study, divided into two groups:

Group 1 (n=50): Heavy and occasional smokers as well as those who have used snuff or chewing tobacco.

Group 2 (n=50): Matches for age and sex of people who had never used tobacco, forming the control group.

Group one was comprised of former daily tobacco consumers exclusively selected from those persons who were within the age of 20-60 years and had used tobacco products for at least five years. Current smokers (cigarette smokers) and current users of smokeless tobacco (chew or snuff) were included. Patients who have used alcohol, having systemic diseases in the oral mucosa cavity, or having a history of any types of malignancy were not included.

Data Collection

Specific demographic data concerning age, sex of the person, type and frequency of tobacco and alcohol consumption was obtained from all the participants. The patients were asked to undergo clinical examination of the oral cavity to determine the presence of any visible mucosal lesion Aqueous impressions of the oral cavity a biopsy was taken from clinically abnormal areas of mucosa such as leukoplakia, erythroplakia or hyperkeratosis and from normal looking mucosa of normal controls.

Histological Examination

Tissue samples after biopsy were prepared for light microscopy. These tissues were processed for histology by being fixed in 10% formalin, embedded in paraffin, sectioned to 4 micron densities and stained with hematoxylin and eosin (H&E) respectively. The histological features assessed included.

Epithelial thickness (normal, hyperplastic, atrophic)
Presence of keratinization (hyperkeratosis, parakeratosis)
Degree of cellular atypia (mild, moderate, or severe dysplasia)
Inflammatory infiltrate (mild, moderate, or severe)
Vascular changes (angiogenesis, dilation)
Presence of subepithelial fibrosis or connective tissue changes

Statistical Analysis

The data were analyzed using SPSS statistical package system version 25. For continuous data, the mean and standard deviation have been used, besides, frequency and percentage have been used to assessments of categorical data. The differences of histological findings between the two groups were tested for significance using Chi-square tests. A P-value of <0.05 was used to determine the statistical analysis of this study.

Results

Demographic Data

The demographic features of the study participants are presented below in Table 1.

In the present study, the mean age of participants in Group 1 (tobacco users) was (45.2 ± 9.8) years and that of the participants in Group 2 (non-tobacco users) was (43.6 ± 10.4) years. In Group 1, Fifty six percent of the subjects were smokers while 44% were use of snuff or chewing tobacco. Smoking status Mean duration of tobacco use was 15.6 ± 5.3 years.

Table 1: Demographic Characteristics of Study Participants.

Variable	Group 1 (Tobacco Users)	Group 2 (Non-Tobacco Users)
Mean Age (years)	45.2 ± 9.8	43.6 ± 10.4
Gender (Male/Female)	40/10	38/12
Type of Tobacco (Smokers/Smokeless)	30/20	N/A
Duration of Tobacco Use (years)	15.6 ± 5.3	N/A

Histological Findings

This study also found considerable histopathological variations between oral mucosa of tobacco consumers and non-consumers. In Group 1, 80% had hyperplastic epithelium with hyperkeratosis and 25% mild to moderate dysplasia .Furthermore, tissue examination also revealed that 70 percent of tobacco users had chronic inflammatory cell infiltration with fifteen percent having subepithelial fibrosis (9). On the other hand, Group 2 (non tobacco users) did not show any dysplastic changes and inflammation was present in only 10% specimens (10).

Table 2: Histopathological Findings in Tobacco Users and Non-Users

Histological Feature	Group 1 (Tobacco Users)	Group 2 (Non-Tobacco Users)	p-value
Hyperkeratosis (%)	80%	15%	<0.001
Dysplasia (Mild-Moderate)	25%	0%	<0.001
Inflammatory Infiltrate (%)	70%	10%	<0.001
Subepithelial Fibrosis (%)	15%	0%	0.003

Statistical Analysis

Prevalence of hyperkeratosis, dysplasia and inflammatory infiltrate between the two groups were significantly different ($p < 0.05$). Further, tobacco users who participated in the study had more histopathological changes compared to non-users (11,12).

Discussion

The conclusions of this investigation yield more data supporting the fact that tobacco smoking results in histological alterations in the oral mucosa tissue that are significant, including in subjects who have not yet developed clinically apparent lesion (13). Hyperkeratosis, which is the lesion considered to progress to dysplasia and to oral cancer in its more advanced state, was the most frequent finding in tobacco users (14,15). This was the case in the most frequent finding observed among the settings. In contrast, dysplasia has been found in one quarter of the tobacco users and this strongly implies that there is potential for malignant change in the event that tobacco use is not abandoned (16).

Inflammatory changes visualized by chronic inflammatory cell infiltration and sub epithelial fibrosis support that tobacco use not only induces changes in the epithelium but also in the connective tissue beneath the epithelium. This is supportive of other studies which suggest that constant harrowing of tobacco toxins results into chronic inflammation and fibrosis. One of these are major contributors to oral sub mucous fibrosis, a condition that is potentially malignant and highly prevalent among smokeless tobacco users (17).

In accordance with those researches the present investigation described also high rate of hyperkeratosis and dysplasia in individuals who used tobacco (18). In contrast to these studies, this work aims to add to the literature by investigating histopathological changes in the population of Peshawar, where the consumption of smokeless tobacco products is particularly rife. These results clearly suggest that focused public health campaign is required in this area of the world to reduce the prevalence of tobacco consumption and increase the chances of the early diagnosis of oral pathological conditions; these interventions are needed (19).

Conclusion

This study reveals that the use of tobacco is closely associated with major histological alterations in the oral mucosa. These changes include hyperkeratosis, dysplasia, and chronic inflammation. Even in the absence of obvious lesions, it is essential for those who have a history of tobacco use to undergo routine oral examinations. These transformations highlight the significance of this practice. The prevention of the progression of premalignant diseases to oral cancer should be the primary focus of public health measures. These strategies should centre on reducing the intake of tobacco and improving knowledge of the hazards associated with tobacco use.

References

1. Warnakulasuriya S, Ariyawardana A. Malignant transformation of oral leukoplakia: a systematic review of observational studies. J Oral Pathol Med. 2016;45(3):155-166.
2. Shukla P, Kheur S, Bhowate R. Oral leukoplakia and its correlation with tobacco use: A histopathological study. J Oral Maxillofac Pathol. 2017;21(1):103-106.
3. Napier SS, Speight PM. Natural history of potentially malignant oral lesions and conditions: an overview of the literature. J Oral Pathol Med. 2008;37(1):1-10.
4. Khan Z. Tobacco smoking and oral cancer in Pakistan: A meta-analysis. Cancer Epidemiol. 2013;37(3):321-325.
5. Gupta B, Johnson NW, Kumar N. Global epidemiology of head and neck cancers: A continuing challenge. Oncology. 2016;90(2):92-100.
6. Ali S, Farooq U. Oral cancer trends in Pakistan. Asian Pac J Cancer Prev. 2011;12(5):1213-1218.
7. Bhurgri Y, Bhurgri H, Pervez S, Usman A, Faridi N, Bhurgri A. Cancer profile of Larkana, Pakistan (1998-2002). Asian Pac J Cancer Prev. 2004;5(3):350-354.
8. Speight PM. Update on oral epithelial dysplasia and progression to cancer. Head Neck Pathol. 2007;1(1):61-66.
9. Mehrotra R, Yadav S, Sinha US, Kumar D. Histopathological spectrum of oral lesions in tobacco chewers. J Oral Maxillofac Pathol. 2012;16(2):205-210.

10. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. Oral Oncol. 2009;45(4-5):309-316.
11. Van der Waal I. Potentially malignant disorders of the oral and oropharyngeal mucosa; terminology, classification and present concepts of management. Oral Oncol. 2009;45(4-5):317-323.
12. Conway DI, Hashibe M, Boffetta P, et al. Enhancing epidemiologic research on head and neck cancer: INHANCE - The international head and neck cancer epidemiology consortium. Oral Oncol. 2009;45(9):743-746.
13. Silverman S Jr. Oral cancer. 5th ed. Am Cancer Soc. 2017.
14. Reichart PA, Philipsen HP. Oral erythroplakia--a review. Oral Oncol. 2005;41(6):551-561.
15. Paulino Y, Yoon AJ, Wakatsuki Y. Smokeless tobacco use, diet and risk for oral cancer in the United States: a case-control study. Oral Oncol. 2009;45(10):975-980.
16. Warnakulasuriya S, Kovacevic T, Madden PB. Smoking cessation: the potential role of the dental team. J Dent Educ. 2005;69(4):291-300.
17. Gupta PC, Ray CS. Smokeless tobacco and health in India and South Asia. Respirology. 2003;8(4):419-431.
18. Krishnamoorthy M, Kumaran D, Muthukrishnan A. Histopathological study of oral lesions in smokers and nonsmokers. Indian J Pathol Microbiol. 2012;55(4):467-472.