

Original Research Article

Epidemiological study on the association between tobacco chewing and cigarette smoking in head and neck cancer patients, India

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ABSTRACT

Background: Tobacco consumption, including smoking and chewing, is a significant risk factor for head and neck cancer in India. This study aims to examine the correlation between tobacco use and the causation of cancer among oral cancer patients.

Methods: We used the hospital-based cancer registry database at Savera cancer and multispeciality hospital in Patna. This is a retrospective analysis of head and neck cancer patients. The study was conducted from January 2019 to December 2022, involving patients aged 18-75 years. Histopathology Confirmed cases (n=691) of head and neck cancer were categorized into four groups: Only smoking tobacco (N=286), Only chewing tobacco (N=243), Smoking and chewing tobacco (N=139) and non-smoking and non-chewing (N=23), and examined.

Results: Among the random cases examined (n=691), the distribution was as follows: only smoking tobacco - 286 (41.4.0%), only chewing tobacco 243 (35.2%), Smoking and Chewing Tobacco 139 (20.1%), and non-smoking and non-chewing tobacco 23 (3.3%). Statistical analysis revealed a significant ($p<0.005$) association between tobacco consumption and oral cancer incidence.

Conclusions: Long-term exposure to chewing/non-chewing tobacco appears to play an important role in the development of head and neck cancer. There is an urgent need for preventive measures, including targeted interventions and public health campaigns, to mitigate the burden of cancer associated with it.

Keywords: Head and neck cancer, Tobacco and non-tobacco chewing, Tobacco smoking and non-smoking

INTRODUCTION

Tobacco chewing and cigarette smoking are major risk factors for head and neck cancer in India. Head and neck cancer (HNC) is the most common cancer worldwide, with 890,000 new cases and 450,000 deaths in 2018^[1]. Tobacco usage has been deeply rooted in Indian culture for centuries, with smoking and smokeless forms such as

tobacco, areca nut, betel quid, etc.^{1,2} This research focuses on studying the relationship between tobacco chewing, cigarette smoking, and the occurrence of head and neck cancer in Bihar, India. Previous studies have highlighted the substantial impact of tobacco and alcohol consumption on head and neck cancer cases.^{3,4} Tobacco contains numerous carcinogenic substances that can damage DNA and lead to the development of head and

neck squamous cell carcinoma (HNSCC).^{5,6} The harmful effects of tobacco use are not limited to lung cancer but also extend to other types of cancer, including head and neck cancer, and is aggravated with the usage of alcohol.^{6,7} While overall tobacco use has declined in India, certain regions, including Assam, Tripura, and Manipur, have witnessed an increase in tobacco usage. Bihar, located in northern India, is one such region where tobacco use remains a significant public health issue.¹

Tobacco-related cancers account for a significant proportion of cancer cases in both men and women, particularly in the northern regions of India.^{1,8} Conversely, eating fruits and vegetables have been associated with lower incidences of oral cancer.⁹ However, the socio-economic conditions of the population largely decide the availability of fruits/vegetables to poor population.¹⁰ These confounding factors have led to an increase in the incidence of head and neck cancer in Bihar over the decades, and it is crucial to understand the specific factors contributing to this trend. This study aims to provide a comprehensive understanding of the prevalence and effects of tobacco chewing and cigarette smoking on head and neck cancer in Bihar. By examining the patterns of tobacco use among individuals diagnosed with head and neck cancer, the study seeks to identify the risk factors associated with these behaviors. The research will involve a cross-sectional study design, in which data will be collected from a representative sample of individuals diagnosed with head and neck cancer in Bihar. Detailed information regarding their tobacco usage history, including the duration, frequency, and types of tobacco consumed, was gathered through structured interviews. The collected data was analyzed using statistical methods to determine the prevalence of tobacco chewing and cigarette smoking among head and neck cancer patients in Bihar. Additionally, the study will investigate the association between tobacco use and the location, stage, and histological subtypes of head and neck cancer.

In this study, we explored the potential interactions between tobacco use and other risk factors, such as alcohol consumption and dietary habits. Understanding these interactions will provide valuable insights into the multifactorial nature of head and neck cancer development in Bihar. The findings of this research will have significant implications for public health interventions and policies. By identifying the specific risk factors and prevalence of tobacco chewing and cigarette smoking in Bihar, targeted awareness and prevention programs can be developed to reduce the burden of head and neck cancer in the region. Furthermore, the study results will contribute to the existing body of knowledge on the impact of tobacco use on head and neck cancer, particularly in the Indian context. This knowledge can inform healthcare providers, policymakers, and researchers in designing and implementing effective strategies for cancer prevention, early detection, and treatment. In conclusion, this research aims to provide a

comprehensive understanding of the prevalence and effects of tobacco chewing and cigarette smoking on head and neck cancer in Bihar, India. By studying the patterns of tobacco use among head and neck cancer patients, this study seeks to identify the risk factors associated with these behaviors and contribute to the development of targeted interventions to reduce the burden of head and neck cancer in the region.

METHODS

This study was conducted between January 2019 to December 2022 at Savera Cancer and Multispeciality Hospital in Patna. This is a retrospective analysis of head and neck cancer patients. In this study, a total of (n=691) head and neck cancer cases selected to examine the prevalence of smoking tobacco cigarettes and chewing tobacco (khaini) among the patients sample randomly sampling technique was data collected using questionnaires and analyzed using statistical for SPSS version 23. The inclusion of a large sample size ensures that the findings are more representative of the population and increases the statistical power of the study. To analyze the prevalence of tobacco use, detailed information on smoking and chewing habits was collected from the participants. The participants were asked about their history of smoking tobacco cigarettes, including the duration and frequency of smoking. Similarly, information on the use of chewing tobacco (khaini), such as the frequency and duration of use, was also obtained.

Inclusion criteria

Inclusion criteria were; Patient in between the age groups of 18-75 years and Histopathologically confirmed cases of oral, oropharyngeal and lingual cancer.

Exclusion criteria

Exclusion criteria was; Other sub site cases were not taken i.e., thyroid, lymphoma.

The collected data was subjected to rigorous statistical analysis to determine the significance of the observed associations between tobacco use and head and neck cancer. Confidence intervals were calculated to estimate the precision of the prevalence estimates. These intervals provide a range of values within which the true prevalence is likely to fall. Furthermore, p values were calculated to assess the statistical significance of the associations between tobacco use and head and neck cancer. The p value indicates the probability of observing the association by chance alone. A p-value less than a predetermined threshold (usually 0.05) is considered statistically significant, suggesting that the association is unlikely to be due to random variation. The prevalence of smoking tobacco cigarettes and chewing tobacco (khaini) among the patients was analyzed using rigorous statistical methods. Confidence intervals and p-values were

calculated to assess the precision and significance of the observed associations. This robust statistical analysis contributes to the reliability and validity of the study findings, enabling a better understanding of the relationship between tobacco use and head and neck cancer in the population under investigation.

RESULTS

Among 691 patients head neck cancer, Majority of the around three fourth male constituting (56.43%) 310 and rest (43.12%) 298 were female.

Table 1: Statistics analysis of the effected tobacco for only smokers, only chewing tobacco, smoking & chewing, non-smoking & non-chewing in head neck cancer patents.

Groups	N (%)	Confidence interval (CI) at 95%		P value
		Max	Min	
Only smokers	286 (41.4)	4.3724	1.5812	<0.002
Only chewing	243 (35.2)	4.2373	1.5336	<0.003
Smoking & chewing (both)	139 (20.1)	9.1213	3.2089	<0.001
Non-smoking & non-chewing	23 (3.3)	251.45	90.148	<0.001

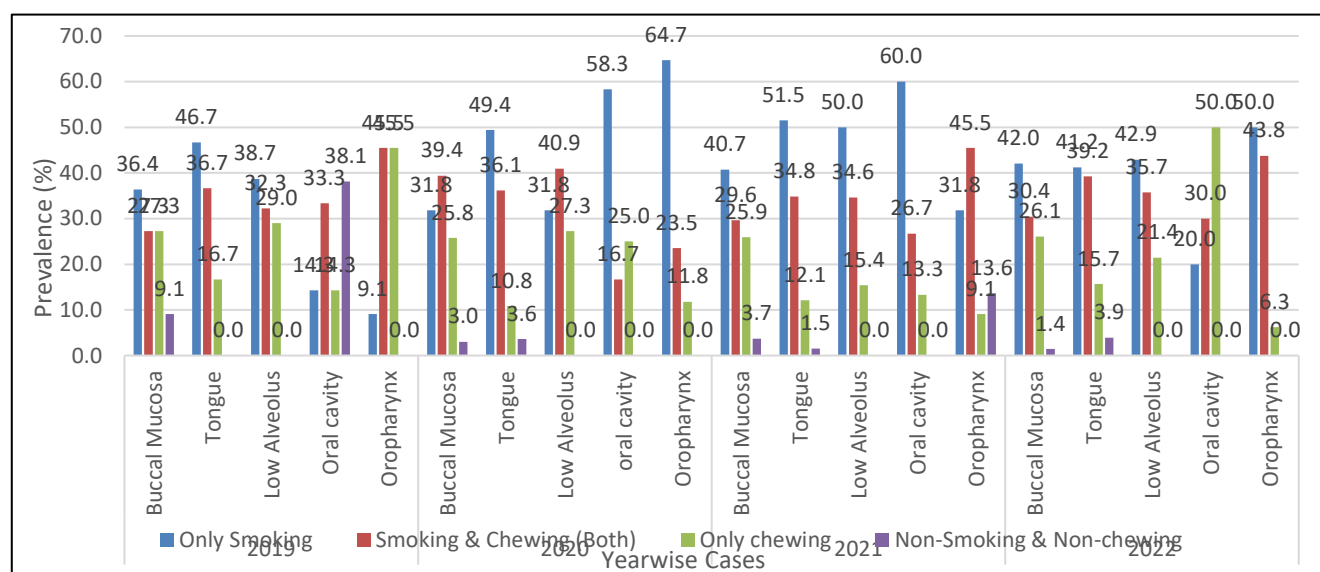


Figure 1: Year wise prevalence of oral cancer sub sites of head and neck cancer in Bihar population and patient's tobacco consumption habit.

The overall male to female ratio of head neck cancer was (3:1). Among the examined (Male & Female) both cases, 20.1% (N=139) patients were tobacco chewers as well smoker, around 41.4% (N=286) patients were only smoking, the prevalence of tobacco chewer (khaini) patients was found to be 35.2% (N=243). Around 3.3% of patients were not addicted to tobacco i.e. no smoking and chewing tobacco. Statistical analysis using Chi-square test revealed significant ($p < 0.001$) between tobacco consumption and head and neck cancer. Further details can be found in (Table 1), which presents the statistical analysis of the affected tobacco groups (Only smokers, only chewing tobacco, Smoking and chewing tobacco, Non-Smoking & Non-Chewing) in head and neck cancer cases.

We also examined the frequency (%) of tobacco smoking and chewing habits in specific subtypes of head and neck cancer sites. The results are presented in Figure 1, providing insights into the prevalence of smoking

cigarettes and chewing tobacco (khaini) across different years and oral cancer sub-sites.

DISCUSSION

Tobacco usage has been deeply ingrained in Indian culture for several centuries, with people using tobacco in two main forms: smoking and smokeless. The smoked tobacco category includes cigarettes, bidis, and cigars, while smokeless tobacco encompasses products like khaini, gutka, pan with tobacco, and pan masala. This study focuses on exploring the epidemiological data of head and neck cancer patients in relation to the risk factors of tobacco cigarette smoking and chewing khaini. It has been observed that approximately 72% of all head and neck cancer cases are associated with tobacco and alcohol consumption.⁸ In recent years, there has been an overall decline in tobacco use in India, from 34.8% in 2009-2010 to 28.6% in 2016-2017. However, certain regions have witnessed an increase in tobacco use during the same period. For instance, Assam experienced a rise

from 39.3% to 48.2%, Tripura from 55.9% to 64.5%, and Manipur from 54.1% to 55.1%.⁹⁻¹¹ Notably, 57% of all cancers in men and 28% of all cancers in women in these regions are tobacco-related.¹² Additionally, an alarming 97% of the population in North India is addicted to tobacco.¹³

The present oncological study explores the distinct patterns of tobacco smoking (cigarettes) and tobacco chewing (khaini) in various areas affected by head and neck cancer. The buccal mucosa of tobacco smokers (50%) does not show a significant difference from patients who chew tobacco (53%). Surprisingly, the tongue exhibits a higher occurrence (55%) of cancer cases in patients who smoke tobacco (cigarettes), as compared to those who chew tobacco (44%). In contrast, the lower alveoli demonstrate a higher impact (66.7%) in tobacco-chewing patients than in tobacco smokers (33%). The oral cavity (2.3%) and oropharynx (1.5%) exhibit a lower percentage of patients prone to tobacco smoking. This discrepancy may be attributed to the fact that the oral cavity and oropharynx are not in direct contact with tobacco during the act of chewing, thereby resulting in a lower incidence of malignancy. These findings shed light on the varying effects of different tobacco consumption patterns on head and neck cancer. The study highlights the specific areas of the mouth and throat that are more susceptible to cancer development based on tobacco habits. Understanding these patterns and the associated risks contributes to the body of knowledge regarding tobacco-related head and neck cancer in India. In conclusion, tobacco usage in various forms has been deeply ingrained in Indian culture for centuries. This study focuses on the prevalence and impact of tobacco cigarette smoking and chewing khaini among head and neck cancer patients. The data reveals a decline in overall tobacco use in India, but certain regions have experienced an increase. The study further elucidates the differential effects of tobacco smoking and chewing on various areas of the mouth and throat, providing valuable insights into the epidemiology of head and neck cancer in relation to tobacco consumption patterns.

CONCLUSION

This study highlights the significant association between tobacco chewing, cigarette smoking, and the incidence of head and neck cancer in Bihar, India. The results highlight the pressing requirement for specific interventions and public health campaigns to tackle the widespread use of tobacco and alleviate the burden of cancer it brings. Policies should prioritize the promotion of tobacco cessation programs and the encouragement of healthier lifestyle choices to minimize the impact of tobacco-related cancers. Through awareness-raising efforts and the implementation of effective strategies, it is feasible to combat the negative consequences of tobacco consumption and enhance public health outcomes in the area.

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