Association Of Tobacco Use And Cancer Incidence In India; A Systematic Review

Abhishek Verma,[1] Saurabh Singh,[2] Monika,[3] Chidananda S,[4] Nikhil Ajabrao Bomble,[5] Jaya Anandani[6]

[1]Professor, Department of Public Health Dentistry, Sardar Patel Post Graduate Institute of Dental Sciences, Lucknow
[2]Reader, Department of Public Health Dentistry, Geetanjali Dental and Research Institute
[3]Assistant Professor, Department of Public Health Dentistry, Kalka Dental College, Meerut
[4]Assistant Professor, Department of Conservative Dentistry and Endodontics, SJM Dental College and Hospital, Chitradurga
[5]Professor and Head of Department, Department of Public Health Dentistry, YCMM and RDF's Dental College and Hospital, Ahilyanagar
[6]Post Graduate Student, Department of Oral and Maxillofacial Pathology, KD Dental College and Hospital, Mathura

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Abstract

Purpose- To determine extent to which tobacco use and cancer incidence are related in Indian population**. Materials And Methods-**Data from the Virtual Health Library, PubMed, and Embase was accessed from the databases' creation until April 30, 2022. Other than the English language and human investigation, there were absolutely no limitations. Cohort and case-control studies investigating the association between tobacco use and cancer incidence were chosen. The requirements of the Preferred Reporting Items for Systematic Reviews and Meta Analyses were adhered**. Results -** The majority of them were case-control designs (60, 89.6%), and they covered a variety of geographical areas, with Kerala (12, 20%) and Maharashtra (18, 30%) being the most researched. Males were associated with smoked tobacco at 2.35 (95% CI, 2.05 to 2.65), while females were associated with smokeless tobacco at 1.77 (95% CI, 1.47 to 2.07) and 2.34 (95% CI, 1.26 to 3.42). **Conclusion-** In order to help stakeholders and policymakers develop tobacco-specific interventions, investigation emphasises that both smoked and smokeless tobacco are equally detrimental to human health within Indian population.

INTRODUCTION

Almost ten million people die from cancer each year, making it a major global health concern.[1]A significant modifiable risk factor, tobacco smoking accounts for about 30% of all cancer-related fatalities.[2] Tobacco, either smoked or chewed, has been used for centuries and is still a major cause of cancer-related morbidity and death. Combined problems of increasing instances of cancer and extensive tobacco usage in India exacerbate this effect. According to a national poll, 28.6% of Indian adults smoke, with men and those living in rural areas using tobacco at higher rates.[2]

Whilst there is ample evidence linking tobacco use to cancer, prolonged use after a diagnosis is still a serious worry. According to investigations, smokers with cancer typically have higher levels of nicotine dependence than smokers without the disease.[4] Additionally, continuing using tobacco products raises risk of therapy-related problems and cancer recurrence in addition to contributing to worse outcomes after therapy, such as decreased chemotherapy efficacy.[5] Benzopyrenes, polycyclic aromatic hydrocarbons, and tobacco-specific nitrosamines are among the carcinogens found in tobacco smoke that encourage the growth and spread of tumours.[6] Additionally, smoking slows the healing of wounds after cancer surgery and raises the chance of wound infection.7. According to a meta-analysis, cancer

patients' overall survival is decreased and their health-related quality of life is negatively impacted by ongoing tobacco use.[8]

It is believed that when someone is diagnosed with cancer, they are more likely to think about changing their habit, including quitting smoking. It is common for the significance of quitting smoking to be underestimated. Numerous cancer patients have a history of tobacco consumption, and prevalence rates of ongoing tobacco use after receiving a cancer diagnosis vary greatly between studies and environments, ranging from 20% to over 60%. According to an Indian study, tobacco use was present in over 40% of individuals with head and neck cancer. Additionally, it have been noted that individuals who quit smoking after receiving a diagnosis frequently pick it up again during follow-up visits. Tumour patients' continued tobacco use is mostly caused by their ignorance of the risks, their lack of drive and support, and frequently their nicotine dependence. Another risk factor for Indians is the sociocultural normalisation of tobacco use.[8]

METHODOLOGY

Search Strategy

To choose the pertinent papers, two researchers independently searched the Virtual Health Library (VHL), PubMed, and Embase databases for manuscripts on tobacco-associated malignancies issued between the databases' launch and April 30, 2022. The Data Supplement provides specifics on the search phrase and search approach utilised for each database.

Aside for date filter, human research and English language, there were no restrictions on the queries. There was adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses standards. In order to find any more pertinent studies, we additionally examined the cross-references of every publication that was included.

Selection Criteria

These investigations were chosen because they Research that only reported cancer-related mortality results; investigations that offered cancer patterns and stages without risk statistics; investigations that covered populations outside of India; experiments that focused on public understanding and earlier detection, studies that examined cancer polymorphisms or genetics; systematic reviews, case series, reports of incidents, and other fundamental research efforts; and papers released in a language other than English were eliminated.

Included case-control and cohort analyses that examined any location of cancer occurrence in relation to smoking and non-smoking tobacco use, had adequate quantitative data, included both males and females of every age category in researched population, and focused solely at tobacco use-specific outcomes from investigations that reported various risk factors.

Data Extraction and Quality Assessment

The data collected from the included selected studies are (1) first author's name and publication year, (2) title of the study, (3) gender and age of population, (4) geographical region, (5) study type (case-control or cohort) and the corresponding data, (6) year of the study, (7) site of cancer, (8) definition of tobacco use and tobacco type (bidi, cigarette, gutkha, betel quid, hookah), (9) effect size (odds ratio/relative risk) and CI, (10) confounding factors, and (11) International Classification of Diseases code for particular site of cancer.

To facilitate analysis, we have categorized the site of cancers into the following groups:

1. Head and neck cancers: include cancers affecting the mouth, gums, tongue, hypopharynx, nasopharynx, oropharynx, larynx, and upper aerodigestive tract.
2. Respiratory system cancers: comprise bronchogenic and lung cancers.

3. Digestive system cancers: include cancers of the colon, colorectal region, gall bladder, esophagus, stomach, pancreas, and rectum.
4. Other system cancers: encompass breast, urogenital, leukemia, lymphoma, ovarian, and prostate cancers.

Grouping the cancers in this manner allows for a comprehensive analysis of similarities and patterns within each category.

Two independent authors conducted screening of titles and abstracts to determine which studies met the inclusion criteria. They also handled the data abstraction and quality assessment through text searches. Any discrepancies that arose during these processes were resolved through discussion and consensus with a third investigator. The quality assessment of the studies was done using the Newcastle Ottawa Scale, evaluating three quality parameters (selection, comparability, and outcome).

Statistical Analysis

Statistical analyses were conducted using G power software. Cancer is a rare disease, making the odds ratio (OR) comparable with the relative risk (RR) when the desired outcome is unlikely. We focused on OR/RR to assess the effect of tobacco use on cancer incidence risk. Risk estimates, accompanied by 95% CIs from selected studies, were pooled to determine the overall risk estimate. Since cancer is rare, ORs were presented without conversion as they are equivalent to RRs.[14,15]

For different cancer sites, the I^2 values revealed heterogeneity across the studies, supported by a Cochrane Q test with statistical significance.[17] A funnel plot, a visual assessment tool, was used to measure bias in the meta-analysis after applying the models for various subgroups. Sensitivity analysis was conducted by excluding cancer sites lacking robust evidence on associations.

RESULTS

Around 5,655 publications were found in the PubMed, Embase, and VHL datasets after duplicates were removed. 135 relevant studies were discovered when the abstracts and names of those papers were evaluated according to the inclusion and exclusion criteria. 67 manuscripts participated in a meta-analysis when the full texts of these 130 publications were accessed (the other five were not accessible).

The examination that was rejected is shown in Informative Supplement. The flow chart in the Data Supplement shows the search strategy used and total quantity of articles that were eventually included for meta-analysis.

The systematic review comprised 67 investigations in total. A lower percentage of the included research were cohort studies (7, 10.4%), while most of it (60, 89.6%) were case-control models. Geographically, a wide variety of regions were covered; the more often examined state was Maharashtra (19, 28.4%), followed by Kerala (18, 26.9%). Almost fifty percent of the studies were published between 2011 and 2020, indicating an ongoing rise in the dispersion of articles over time (24, 32.8%). The majority of research looked at all age groups (34, 50.8%) and both sexes (41, 61.2%).

The most commonly researched cancer kind was found to be oral cancer (23, 34.3%), subsequent to stomach (5, 7.5%), esophageal cancer (14, 21.0%), and lung cancer (10, 14.9%). A considerable number of research examined both smoked and smokeless tobacco use (63, 94.0% and 60, 89.6%, respectively), with 56 studies (83.4%) assessing both types of tobacco use.

Regardless of gender, tobacco users had a 3.22 (95% CI, 2.81 to 3.64) risk of developing any type of cancer. Accordingly, the risk was 2.19 (95% CI, 1.22 to 3.17) for females and 2.73 (95% CI, 2.41 to 3.05) for males.

Considering the site-specific cancers, respiratory system cancers had a higher risk of 4.97 (95% CI, 3.62 to 6.32; followed by head and neck cancers (3.95; 95% CI, 3.48 to 4.42;. There were only two studies reporting the association of smoked tobacco with head and neck cancers among females. Similarly, there were very minimal number of studies performed among females for association of

smoking with any specific site of cancer. Cancer locations with weak associations were excluded in order to perform sensitivity analysis. Following excluding places where the risk of cancer was insignificant, further analysis showed that both the magnitude and direction of the link with tobacco use (in any form, including smoked and smokeless tobacco) remained constant. Furthermore, the analysis showed no signs of publication bias.

DISCUSSION

To determine approximate points for the relationship between tobacco use and any type of cancer, a review of all research done in the Indian population was done. According to investigation, smoking tripled the risk of developing any type of cancer. Regarding tobacco users, the risk of cancer is doubled for both men and women, according to gender stratification. This study also showed that tobacco smoking raised the incidence of cancers of respiratory system, including lung cancer, which is perhaps the most frequent type, as well as cancers of the head, neck, and digestive systems. Furthermore, this meta-analysis made clear that using smokeless or smoked tobacco had no bearing on one's chance of developing cancer.

A tobacco user's risk of developing any cancer was shown to be 3.22 (95% CI, 2.81 to 3.64). According to additional research, tobacco usage is more closely linked to cancer, with a chance of developing the disease varying from 2.10 to 15.[10–12]. This disparity was mostly caused by specific analysis, which included links between smoking and lung cancer, smoking and oral cancer, smoking and laryngeal cancer, and other specific forms of tobacco use, whether smokeless or smoked, and specific locations. Furthermore, only a very small percentage of these investigations got included in the meta-analysis.[13] All case-control and cohort studies that found a link between tobacco use—whether smoked or smokeless—and cancer of any kind in the Indian population were included.[14,15]

The association of tobacco use with cancer was found to be 2.73 (95% CI, 2.41 to 3.05) for males and 2.19 (95% CI, 1.22 to 3.17) for females. Other studies have similarly reported higher cancer risks for males, particularly lung and oral cancers, compared with females.[16,17] Our review pooled data from various case-control and cohort studies, regardless of the type of tobacco use or cancer site, and found a consistent association between tobacco use and cancer for both genders. The limited number of studies on female smoking and cancer in India, where smoking is culturally less accepted among females, may have introduced reporting bias, masking the true association.[18] Stratified analysis for smoked and smokeless tobacco use among males and females yielded similar results.

Cancer incidence in India has been steadily increasing with 14,61,427 patients estimated in 2022, projected to 15,69,793 by 2025, with notable shifts in the types and distribution of patients with cancer over recent decades.[3] Factors such as population demographics, lifestyle changes, and environmental exposures contribute to this evolving landscape. Common cancers in India include those of the lung, oral cavity, and esophagus, where tobacco use, both in smoked and smokeless forms, is a leading risk factor. Our study contributes to this understanding by elucidating the specific link between tobacco use and cancer incidence in the Indian context, highlighting the urgent need for targeted prevention and cessation efforts to mitigate the growing effect of tobacco-related cancers in the population.[19]

CONCLUSION

The study emphasizes the need for continued public health interventions to combat tobacco use and reduce cancer rates in India. Strengthened tobacco control strategies, increased awareness, and promotion of healthier lifestyles are crucial. Future research should explore the association of tobacco use with noncancerous and precancerous lesions to fully understand its impact.

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