e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(3); 860-866

Original Research Article

Clinical Profile and Risk Factors of Esophageal Carcinoma: A Retrospective Study from a Tertiary Care Teaching Hospital in Rajasthan, India

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Received: 01-12-2025 / Revised: 15-01-2026 / Accepted: 21-02-2026

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Conflict of interest: Nil

Abstract

Background: Esophageal carcinoma remains an important cause of cancer-related morbidity and mortality, with considerable geographic variation in incidence and risk-factor patterns. Understanding regional clinicodemographic patterns and exposure profiles is important for improving prevention strategies and facilitating earlier diagnosis. The present retrospective study evaluated the clinicodemographic characteristics, risk factor distribution, tumor location, and histopathological patterns of esophageal carcinoma among 103 patients presenting to a tertiary care teaching hospital in Rajasthan, India.

Methods: This retrospective hospital record-based study included 103 histopathologically confirmed cases of esophageal carcinoma diagnosed between January 2025 and December 2025 at a tertiary care teaching hospital in Rajasthan, India. Data on demographic characteristics, presenting symptoms, tobacco chewing, smoking, alcohol consumption, tumor location, and histological subtype were collected. Diagnosis was established using upper gastrointestinal endoscopy with biopsy confirmation. Categorical variables were analyzed using Chi-square or Fisher's exact test, and $p<0.05$ was considered statistically significant.

Results: Among the 103 patients, 68 (66.01%) were males and 35 (33.98%) were females. The highest incidence occurred in the 51-60-year age group (26.21%), and 69% of patients were older than 50 years. Dysphagia was the most common presenting symptom (87.37%). Tobacco chewing was the predominant exposure (63.11%), followed by smoking (42.72%) and alcohol use (35.92%). The lower third of the esophagus was the most frequently involved site (50.48%). Squamous cell carcinoma was the predominant histological subtype (72.81%). Alcohol exposure was significantly more common among male cases than female cases.

Conclusion: Esophageal carcinoma in this cohort predominantly affected males older than 50 years and was strongly associated with tobacco exposure. Squamous cell carcinoma remained the dominant histological subtype, and most patients presented with dysphagia, suggesting late symptomatic presentation. These findings highlight the need for strengthened tobacco control measures, targeted risk-factor counseling, and prompt endoscopic evaluation of alarm symptoms to facilitate earlier diagnosis and improved outcomes.

Keywords: Alcohol, Dysphagia, Esophageal Carcinoma, Smoking, Squamous Cell Carcinoma, Tobacco Chewing.

DOI: 10.25258/ijcpr.18.3.136

Introduction

Esophageal carcinoma is a highly aggressive malignancy characterized by rapid disease progression and poor survival outcomes. Globally, it represents one of the leading causes of cancer-related mortality and remains a major public health challenge.

According to global cancer statistics, esophageal cancer ranks among the most common malignancies worldwide and is associated with significant mortality due to late presentation and limited therapeutic options [1,2]. Esophageal carcinoma is associated with aggressive biological behavior and poor long-term survival despite advances in treatment modalities [3]. The global distribution of esophageal carcinoma demonstrates marked geographic variation. High-incidence regions include East and Central Asia, parts of Africa, and certain areas of the Middle East, collectively described as the "esophageal cancer belt" [4].

India lies within this region of elevated incidence, and the epidemiological patterns of the disease show considerable regional heterogeneity influenced by lifestyle factors, socioeconomic conditions, dietary habits, and access to healthcare services [5,6]. Histologically, esophageal carcinoma is broadly categorized into two major subtypes: squamous cell carcinoma and adenocarcinoma. Squamous cell carcinoma remains the predominant subtype in developing countries and is strongly associated with environmental and lifestyle exposures such as tobacco consumption and alcohol use [7]. In contrast, the incidence of adenocarcinoma has increased in many Western populations, largely attributed to obesity, gastroesophageal reflux disease, and Barrett's esophagus [8,9].

Several risk factors have been implicated in the pathogenesis of esophageal carcinoma. Tobacco exposure, both smoked and smokeless forms, is a well-established etiological factor, particularly in regions such as India where tobacco chewing is common. Alcohol consumption, nutritional deficiencies, and certain dietary practices have also been linked to increased disease risk [10-15]. These exposures contribute to chronic mucosal irritation and carcinogenic transformation of the esophageal epithelium.

Clinically, patients often present with progressive dysphagia, which typically develops when the tumor has already caused significant luminal obstruction. Consequently, many patients are diagnosed at advanced stages of disease, which adversely affects prognosis and limits curative treatment options [16-18]. Early identification of high-risk individuals and understanding regional clinicodemographic patterns are therefore essential for improving prevention strategies and facilitating earlier diagnosis.

Despite the substantial burden of esophageal carcinoma in India, regional data describing the clinicodemographic profile, risk factors, tumor location, and histopathological characteristics remain limited in many parts of the country. Understanding these patterns is important for guiding preventive measures and improving diagnostic strategies in high-risk populations.

The present study was conducted to evaluate the clinicodemographic characteristics, exposure profile, anatomical distribution, and histopathological patterns of esophageal carcinoma among patients presenting to a tertiary care teaching hospital in Rajasthan during the period from January 2025 to December 2025.

Materials and Methods

Study Design and Setting: This retrospective observational hospital record-based study was conducted in the Department of Medical Gastroenterology at Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan, India. The institution is a tertiary care teaching hospital that serves as a referral center for patients from Jaipur and surrounding districts of Rajasthan. The study aimed to evaluate the clinicodemographic characteristics, risk factor profile, tumor location, and histopathological patterns of patients diagnosed with esophageal carcinoma presenting to this center.

Study Period: The study included patients diagnosed with carcinoma of the esophagus between January 2025 and December 2025. All eligible cases identified during this period were reviewed and included in the analysis.

Study Population: The study population consisted of patients with histopathologically confirmed carcinoma of the esophagus who presented to the Department of Medical Gastroenterology during the study period. Patients were identified through hospital medical records and endoscopy registers. Only those cases that fulfilled the predefined eligibility criteria were included. A total of 103 patients met the inclusion criteria and were included in the final analysis.

Inclusion Criteria: Patients were eligible for inclusion if they were older than 18 years of age and had a diagnosis of carcinoma of the esophagus confirmed by histopathological examination of biopsy specimens obtained during upper gastrointestinal endoscopy. Patients diagnosed during the study period with adequate clinical documentation and complete medical records were included in the study.

Exclusion Criteria: Patients were excluded if biopsy specimens were negative for malignancy or if histopathological confirmation of esophageal carcinoma was not available. Patients with incomplete clinical records that did not contain essential demographic or clinical information were also excluded. In addition, patients with recurrent carcinoma of the esophagus or those with secondary metastatic involvement of the esophagus from another primary malignancy were not included in the study.

Data Collection: Data were obtained retrospectively from hospital medical records and endoscopy documentation.

The collected variables included demographic details such as age and gender, clinical characteristics including presenting symptoms, and information regarding potential risk factors such as tobacco chewing, smoking, and alcohol consumption. Details regarding tumor characteristics were also recorded, including the anatomical location of the tumor within the esophagus and the histopathological subtype.

Tumor location was determined based on endoscopic findings and was categorized according to the anatomical third of the esophagus involved. Tumors were classified as involving the upper third, middle third, or lower third of the esophagus.

Histopathological diagnosis was obtained from pathology reports based on biopsy specimens taken during endoscopy.

Diagnostic Evaluation: The diagnosis of esophageal carcinoma was established using upper gastrointestinal endoscopy followed by histopathological confirmation from biopsy specimens. Endoscopic evaluation allowed direct visualization of the esophageal mucosa, identification of suspicious lesions, and assessment of tumor location. Biopsy samples obtained during endoscopy were examined by experienced pathologists to confirm the presence of malignancy and determine the histopathological subtype.

No proprietary diagnostic scales, licensed questionnaires, or commercial scoring systems were used in the present study. The diagnosis and classification of tumors were based on routine clinical evaluation, standard endoscopic findings, and histopathological examination.

Statistical Analysis: Data were compiled and analyzed using standard statistical methods. Categorical variables were summarized as frequencies and percentages to describe the distribution of demographic characteristics, presenting symptoms, and risk factors among the study population.

Comparisons of exposure distributions by gender among cases were analyzed using Fisher's exact test. Odds ratios and 95% confidence intervals were calculated where appropriate to estimate the strength of association between exposure variables and gender. Associations between tumor location, histological subtype, and gender were evaluated using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study was conducted in accordance with accepted ethical principles for medical research involving human participants. Institutional ethical approval was obtained from the institutional ethics committee of Mahatma Gandhi Medical College and Hospital, Jaipur.

Patient confidentiality and anonymity were maintained throughout the study. As the study was retrospective and based on analysis of existing medical records, the requirement for informed consent was waived.

Results

A total of 103 patients with histopathologically confirmed esophageal carcinoma were included in the study. The demographic characteristics, presenting symptoms, risk factor distribution, tumor location, and histopathological findings were analyzed.

Table 1: summarizes the age and gender distribution of patients with esophageal carcinoma included in the study.

Age group (years)	Male n (%)	Female n (%)	Total n (%)
18–30	1 (1.47%)	0 (0.00%)	1 (0.97%)
31–40	6 (8.82%)	9 (25.71%)	15 (14.56%)
41–50	15 (22.06%)	7 (20.00%)	22 (21.36%)
51–60	20 (29.41%)	7 (20.00%)	27 (26.21%)
61–70	15 (22.06%)	8 (22.86%)	23 (22.33%)
>70	11 (16.18%)	4 (11.43%)	15 (14.56%)

Table 2: presents the distribution of presenting symptoms among patients with esophageal carcinoma at the time of diagnosis.

Symptom	Number	Percentage
Dysphagia	90	87.37%
UGIB	9	8.73%
Anemia	4	3.88%
Melena	2	1.94%

Table 3: summarizes the distribution of major risk factors, including tobacco chewing, smoking, and alcohol consumption, among the study population.

Risk factor	Number	Percentage
Tobacco chewing	65	63.11%
Smoking	44	42.72%
Alcohol	37	35.92%

Table 4: shows the anatomical distribution of tumors according to the upper, middle, and lower thirds of the esophagus.

Location	Number	Percentage
Upper third	8	7.76%
Mid third	43	41.74%
Lower third	52	50.48%

Table 5: presents the distribution of histopathological subtypes of esophageal carcinoma observed in the study population.

Histology	Number	Percentage
Squamous cell carcinoma	75	72.81%
Adenocarcinoma	19	18.44%
Undifferentiated carcinoma	9	8.73%

Table 6: compares the distribution of major exposures between male and female patients and provides the corresponding odds ratios, confidence intervals, and p-values.

Exposure	Male yes/68	Female yes/35	OR (M vs F)	95% CI	p-value
Tobacco chewing	44	21	1.22	0.53–2.83	0.6707
Smoking	26	18	0.58	0.26–1.33	0.2145
Alcohol	31	6	4.05	1.49–11.01	0.0049

Table 7: shows the association between gender and tumor characteristics, including tumor location and histological subtype.

Variable	Chi-square (df)	p-value
Tumor location vs gender	0.098 (2)	0.9521
Histology vs gender	0.066 (2)	0.9674

Discussion

Esophageal carcinoma remains a major contributor to cancer-related morbidity and mortality worldwide. Despite advances in diagnostic and therapeutic strategies, the disease continues to carry a poor prognosis, largely because most patients present at advanced stages. The present study evaluated the clinicodemographic characteristics, risk factor distribution, tumor location, and histopathological patterns of esophageal carcinoma among patients presenting to a tertiary care teaching hospital in Rajasthan.

In the present study, a clear male predominance was observed, with males accounting for approximately two-thirds of the total cases. Similar findings have been reported in several epidemiological studies of esophageal carcinoma worldwide. Male predominance is commonly attributed to the higher prevalence of behavioral risk factors such as tobacco use and alcohol consumption among men [4,6,7,9]. Previous studies from India have demonstrated a similar gender distribution, highlighting the role of lifestyle-related exposures in the development of esophageal malignancy.

The age distribution in our study showed that the majority of patients were older than 50 years, with the highest number of cases occurring in the 51-60-year age group. This observation is consistent with the established understanding that esophageal carcinoma is more common in middle-aged and elderly populations due to cumulative exposure to carcinogenic risk factors over time [4,8]. Comparable age patterns have been reported in other Indian and international studies, where the peak incidence typically occurs in the fifth to seventh decades of life [7].

Dysphagia was the most common presenting symptom in the present study and was observed in the majority of patients. This finding aligns with existing literature indicating that progressive dysphagia is the most characteristic clinical feature of esophageal carcinoma [10-12]. Unfortunately, dysphagia often develops when the tumor has already caused significant luminal narrowing, which contributes to delayed diagnosis and advanced disease at presentation. This highlights the importance of early recognition of alarm symptoms and timely endoscopic evaluation.

With regard to risk factors, tobacco chewing was the most frequently observed exposure in our study population. Tobacco use is widely recognized as a major etiological factor in esophageal squamous cell carcinoma, particularly in developing countries [13,14]. In India, smokeless tobacco products such as gutka, khaini, and betel quid are commonly used and have been strongly associated with upper aerodigestive tract cancers [15,16]. Smoking and alcohol consumption were also common exposures in the present cohort.

Previous studies have demonstrated that the combined use of tobacco and alcohol significantly

increases the risk of esophageal carcinoma because of synergistic carcinogenic effects [17,18].

The anatomical distribution of tumors in this study showed that the lower third of the esophagus was the most commonly involved site, followed by the middle third. Although squamous cell carcinoma has historically been associated with tumors in the middle third of the esophagus, recent studies have reported increasing involvement of the distal esophagus in several populations [19-21]. These variations may reflect differences in etiological factors, lifestyle patterns, and referral characteristics among different regions.

Histopathological analysis in the present study demonstrated that squamous cell carcinoma was the predominant subtype of esophageal cancer. This finding is consistent with epidemiological patterns reported in many developing countries, including India, where squamous cell carcinoma continues to account for the majority of esophageal malignancies [7,21-24]. Western countries have reported a rising incidence of esophageal adenocarcinoma, largely attributed to increasing prevalence of obesity, gastroesophageal reflux disease, and Barrett's esophagus [19,20,24,25]. Several epidemiological studies have also documented regional variations in histological patterns of esophageal carcinoma [26,27].

In the analysis of exposure patterns by gender, alcohol consumption was significantly more common among male patients compared to female patients. This observation likely reflects sociocultural differences in alcohol use patterns. However, tobacco chewing and smoking did not demonstrate statistically significant differences between male and female patients in this cohort, suggesting that these exposures are prevalent across both genders in this population.

The findings of this study emphasize the continuing importance of modifiable lifestyle factors in the pathogenesis of esophageal carcinoma. Public health interventions aimed at reducing tobacco consumption, promoting awareness of early symptoms, and improving access to diagnostic endoscopy may play a crucial role in reducing disease burden and improving outcomes.

The findings of this study have important public health implications, particularly in regions where tobacco use remains highly prevalent. The high proportion of patients with a history of tobacco chewing highlights the need for strengthened tobacco control measures, community-based awareness programs, and targeted screening strategies for high-risk individuals. Early identification of patients presenting with alarm symptoms such as dysphagia may facilitate timely endoscopic evaluation and earlier diagnosis of esophageal carcinoma, which is essential for improving survival outcomes.

Overall, the present study provides valuable insight into the clinicodemographic characteristics and risk factor profile of esophageal carcinoma in a tertiary care center in Rajasthan and highlights the need for strengthened preventive strategies and early diagnostic interventions.

Limitations: Nevertheless, the present study has certain limitations. Being a retrospective single-center study, the findings may not be fully generalizable to the broader population. In addition, the absence of a control group limits the ability to estimate population-level risk associated with specific exposures. Future multicenter prospective studies with larger sample sizes and detailed exposure assessment would provide stronger evidence for understanding regional epidemiological patterns.

Conclusions

Esophageal carcinoma remains a significant health problem with substantial morbidity and mortality. In the present study, the disease predominantly affected males older than 50 years and most commonly presented with dysphagia. Tobacco chewing emerged as the most frequent exposure among patients, followed by smoking and alcohol consumption, highlighting the important role of modifiable lifestyle-related risk factors in the development of the disease.

The lower third of the esophagus was the most commonly involved anatomical site, and squamous cell carcinoma was the predominant histological subtype in this cohort. These findings emphasize the need for strengthened public health strategies aimed at reducing tobacco use, improving awareness of early symptoms such as dysphagia, and promoting timely endoscopic evaluation for earlier diagnosis. Further multicenter studies with larger populations are required to better define regional epidemiological patterns and guide preventive and screening strategies for esophageal carcinoma.

Additional Information

Author Contributions: All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

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