

Original Article

Esophageal cancer in a developing country: presentation patterns, stage at diagnosis, and treatment outcomes

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Abstract

Esophageal carcinoma is one of serious cancers, with a wide range of gastrointestinal symptoms due to late diagnosis, older age, and nutritional deficiencies. This cancer is more common in males as compared to their counterparts and are reported in older age. A retrospective observational study was conducted at a tertiary care hospital in Rawalpindi, Pakistan, from July to December 2024 and included 379 patients of esophageal carcinoma. Patients with histopathologically confirmed esophageal carcinoma who underwent surgical management were included in the study. Staging was performed using contrast-enhanced computed tomography (CECT), and positron emission tomography (PET). Preoperative assessment of patients included spirometry, echocardiography, and multidisciplinary team evaluation. Data on demographics, clinical presentation, tumor characteristics, stage at diagnosis, treatment modalities, and postoperative outcomes were recorded by employing a standardized proforma. Patients were followed for 6 months to 2 years, and outcomes were analyzed using descriptive statistics. Results highlighted that majority of patients were aged from 50 to 69 years, with Stage III being most prevalent stage (50.6%). Chemotherapy was administered to 71.8% of patients, with 18.7% receiving preoperative chemotherapy and 26.1% took preoperative concurrent chemoradiotherapy (CCRT). Thoracophrenolaparotomy was common surgical procedure, performed in 29.2% of cases. Postoperative complications included anastomotic stricture (12.1%) and anastomotic leakage (8.1%). Respiratory complications, such as atelectasis (23.7%) and pneumonia/respiratory failure (1.3%), were reported among the cohort, with an overall mortality proportion of 5.8% (22 deaths). The follow-up data showed that 41.8% of the patients were followed up at one year and 40.2% at six months, with a decreasing follow-up frequency over time. This study concluded that despite treatment, including chemotherapy and surgery, complications like anastomotic stricture and respiratory failure were important postoperative concerns and were associated with an overall mortality proportion of 5.8%. Early diagnosis and effective postoperative care are crucial for improving patient outcomes.

Keywords

Esophageal cancer; Esophagectomy; Late presentation; Stage at diagnosis; Treatment outcomes; Resource-limited setting; Pakistan; Pre- and postoperative complications

1. Introduction

Esophageal carcinoma is considered a clinically hostile type of carcinoma that presents with a broad range of gastrointestinal tract symptoms, mainly due to late presenta-

tion, advanced age and nutritional deficiencies, and is attributed to obstruction of the esophagus, which can impair food ingestion in patients [1,2,3]. Weight loss and dysphagia due to solids are most commonly observed in patients [4]. Esophageal carcinoma spreads in the body through different pathways, such as direct invasion, through lymphatics or hematogenous metastasis. The primary tumor of the esophagus spreads rapidly to the thyroid gland, trachea and even pericardium and diaphragm [5]. It is the 9th most commonly diagnosed cancer, accounting for 500,000 deaths annually across the globe with a mortality rate of 15–20% [6,7,8]. Esophageal cancer has a male predominance and is found to be 3–4 times more common in males than in females [9,10]. In developing countries, squamous cell carcinoma variants are more common; however, a shift to adenocarcinoma has been observed in the United States, the United Kingdom and Europe [11,12].

The etiology of esophageal cancer involves both environmental and genetic factors. Key risk factors include tobacco use and heavy alcohol consumption, which are well-established contributors to the development of squamous cell carcinoma, particularly in developing countries [13,14]. In contrast, the incidence of adenocarcinoma has been linked to gastroesophageal reflux disease (GERD), obesity, and the presence of Barrett's esophagus [14]. Other risk factors include a family history of cancer, a history of radiation therapy to the chest, certain dietary deficiencies and genetic predispositions [15,16,17].

Most cancers, including esophageal cancer, are asymptomatic in early stages and are usually diagnosed in advanced stages, e.g., stage III of the disease, in individuals older than 50 years and those with other comorbidities [18,19]. The treatment options for esophageal carcinoma depend on the stage of the cancer [20]. Nonsurgical treatment modalities are used only in cases of advanced locoregional disease or distant metastasis [21,22,23]. Esophageal carcinoma is primarily treated with esophagectomy in patients with localized disease [24,25]. The surgical technique used depends upon the location of the tumor and on the personal preferences of the surgeon. In order to reduce the morbidity and mortality associated with conventional esophagectomy, minimally invasive techniques have been introduced [26]. Diagnostic and staging work-up for carcinoma of the esophagus and its management requires a highly equipped tertiary care hospital facility, for which the availability is limited and the basic equipment is novel in Pakistan [27,28].

Late presentation of esophageal carcinoma and associated diagnostic challenges contribute significantly to poor prognosis, with five-year survival rates of approximately 20% for all types of cancers [29,30]. The low survival rate can be improved by early diagnosis of cancers and prompt treatment, especially through surgical intervention at stage I, which has been shown to be effective at improving outcomes and alleviating symptoms such as dysphagia among patients [31]. Regardless of advancements in chemotherapy as well as radiotherapy, surgical resection is the foundation of treatment for esophageal carcinoma [32]. However, in developing countries like Pakistan, achieving outcomes comparable to those of patients in developed regions is a considerable challenge due to limited healthcare resources and the complexity of surgical procedures for esophageal cancer [33]. Therefore, this study was conducted to determine the clinical presentation, stage at diagnosis, treatment patterns, and outcomes of esophageal cancer patients in a tertiary care hospital and to determine any gaps in early detection and cancer care in a developing country.

2. Methodology

2.1. Study design and duration

This was a retrospective observational study conducted from July 2024 to December 2024.

2.2. Study setting

The study was carried out at a tertiary care hospital in Rawalpindi, Pakistan, which provides oncological care for patients with esophageal carcinoma.

2.3. Study population

The study included patients with histopathologically confirmed carcinoma of the esophagus who underwent surgical management between March 2010 and August 2024. The study included 379 medical records of patients with esophageal carcinoma.

2.4. Ethical considerations

Ethical approval was obtained from the Ethical Review Committee (ERC) of the Combined Military Hospital, Rawalpindi, Pakistan (No. 2025-004).

2.5. Inclusion and exclusion criteria

All patients with histopathologically confirmed esophageal carcinoma were included in the study. Patients with benign esophageal pathologies were excluded. In addition, patients with preoperative and postoperative macroscopically advanced locoregional disease were excluded.

2.6. Staging and preoperative assessment

Contrast-enhanced computed tomography (CECT) scan of the chest and abdomen was the primary staging modality used in the majority of cases. Positron emission tomography (PET) scan was incorporated in the latter half of the study period, depending upon availability, to rule out systemic disease, particularly in patients with comorbid conditions. All patients underwent preoperative evaluations i.e., spirometry and echocardiography. Each case was discussed in multidisciplinary team meetings prior to surgical intervention. Tumor staging was performed according to the American Joint Committee on Cancer (AJCC) classification system, with data recorded as per the 8th edition after 2017.

2.7. Surgical standardization

All surgical procedures were performed by the same consulting surgeons by using standard surgical instruments, including energy devices as well as staplers.

2.8. Data collection

Data was collected using a predefined proforma from medical records of patients who were treated at the hospital. Variables recorded included patient demographics (age and gender), presenting symptoms, duration of symptoms, tumor site, endoscopic findings, preoperative staging, and details of neoadjuvant or adjuvant chemotherapy and radiotherapy. Furthermore, information regarding type of surgical procedures, operative durations, and intraoperative details was documented. Postoperative outcomes, including complications, blood transfusion requirements, length of hospital stay, and follow-up duration were also recorded.

2.9. Outcome measures

The outcomes included clinical presentation patterns, stage at diagnosis, treatment modality, and postoperative complications.

2.10. Statistical analysis

Descriptive analyses, including frequencies and percentages, were performed using the Statistical Package for Social Sciences (SPSS) version 25.

3. Results

The age distribution of the study participants revealed that most of the participants were in the 50–59 years age group [39.3% (149)], followed by the 60–69 years age group [32.4% (123)]. The 40–49-year-old group represented 10.2% (39) of the participants, while those aged 70 years and above accounted for 10.8% (41) of the participants. Younger age groups, such as 30–39 years, 20–29 years, and 10–19 years, were less represented, with 3.9% (15), 1.8% (7), and 1.3% (5) of the participants, respectively. The age distribution of the patients is provided in Table 1.

Table 1. Age distribution of the participants.

Age	Frequency (%)
10-19 years	5 (1.3)
20-29 years	7 (1.8)
30-39 years	15 (3.9)
40-49 years	39 (10.2)
50-59 years	149 (39.3)
60-69 years	123 (32.4)
70 years and above	41 (10.8)

The staging of esophageal carcinoma in the study participants revealed that the majority of cases were diagnosed at an advanced stage. Stage III was the most prevalent stage, accounting for 50.6% (189) of the cases, followed by Stage II, which accounted for 40.4% (151) of the patients. Stage I was observed in 6.9% (26) of the patients, indicating that early-stage diagnosis was relatively rare. Stage IV, representing the most advanced stage of the disease, was identified in 1.8% (7) of the patients. The stages of esophageal carcinoma in patients are provided in Table 2.

Table 2. Stages of esophageal carcinoma.

Stages	Frequency (%)
Stage I	26 (6.9)
Stage II	151 (40.4)
Stage III	189 (50.6)
Stage IV	7 (1.8)

The treatment data for chemotherapy and radiotherapy highlighted that a significant proportion of the participants received chemotherapy. A total of 71.8% (272) of patients underwent chemotherapy, with 18.7% (71) receiving preoperative chemotherapy. Preoperative concurrent chemoradiotherapy (CCRT) was administered to 26.1% (99) of the patients. Postoperative chemotherapy was given to 23.5% (89) of the cohort, while a smaller proportion, 3.4% (13), received postoperative radiotherapy. Treatment modalities for the patients are provided in Table 3.

Table 3. Nonsurgical treatment of the patients.

Treatment Type	Frequency (%)
Total chemotherapy	272 (71.8)
Preoperative chemotherapy	71 (18.7)
Preoperative concurrent chemoradiotherapy	99 (26.1)
Postoperative chemotherapy	89 (23.5)
Postoperative radiotherapy	13 (3.4)

The distribution of surgical modalities highlighted that the most common procedure was Thoracophrenolaparotomy, performed in 29.2% (111) of the cases, followed by transhiatal (TH) in 24.2% (92) of the cases, and minimally invasive esophagectomy (MIE), which accounted for 14.5% (55) of the procedures. McKeown esophagectomy was performed in 9.2% (35) of the cases, whereas total laryngopharyngeal esophagectomy (TLPO) was performed in 11.8% (42) of the participants.

With respect to the surgical technique for anastomosis, the most frequently used method was Connell suturing with an anterior simple running stitch, which was applied in 36.9% (140) of cases. Connell suturing alone, with complete suturing, was utilized in 24.5% (93) of the cases. The posterior layer was stapled with an anterior running stitch in 25.8% (98) of the cases, whereas the posterior layer was stapled with an anterior interrupted stitch in 12.7% (48) of the cases. The operative techniques employed are provided in Table 4.

Table 4. Surgical techniques and patient management options.

Parameters		Frequency (%)
Operative treatment	McKeown	35 (9.2)
	Thoracophrenolaparotomy	111 (29.2)
	Transhiatal	92 (24.2)
	Total laryngopharyngeal esophagectomy	42 (11.8)
	Minimally invasive esophagectomy	55 (14.5)
Operative technique for anastomosis	Connell suturing complete	93 (24.5)
	Connell suturing with anterior simple running stitch	140 (36.9)
	Posterior layer stapled with anterior running stitch	98 (25.8)
	Posterior layer stapled with anterior interrupted stitch	48 (12.7)

This study revealed a range of complications following esophageal surgery, with chest complications being among the most common. Atelectasis was reported in 23.7% (90) of the patients, and pneumothorax was reported in 12.1% (46) of the patients. Pneumonia as well as respiratory failure were observed in 1.3% (5) of the patients, resulting in 5 deaths. Moreover, pulmonary embolism was observed in only 1.1% (4) of patients, with 4 deaths because of complications. Pleural effusion occurred in 3.7% (14) of the patients.

Surgical complications included anastomotic stricture in 12.1% (46) of patients and anastomotic leakage in 8.1% (31) of patients. Wound infections were observed in 7.3% (28) of patients, while feeding jejunostomy issues, including blockage and accidental removal, were recorded in 4.2% (16) and 1.5% (6) of patients, respectively. Other complications included cardiac arrhythmias in 18.4% (70) of patients, which contributed to 3 fatalities (0.7%). Myocardial infarction occurred in 2.1% (8) of the patients, resulting in 7 deaths (1.8%). Deep vein thrombosis (DVT) was reported in 1% (4) of patients, and hemorrhage was observed in 1.3% (5) of patients, with 1 related death. Mediastinitis occurred in 0.5% (2) of patients, leading to 2 fatalities. Overall, the mortality proportion for the

cohort was 5.8%, with 22 deaths recorded across various complications. The complications observed among the patients are provided in Table 5.

Table 5. Complications reported among patients with esophageal carcinoma.

	Parameters	Frequency (%)	Mortality (%)
Chest complications	Pneumothorax	46 (12.1)	0 (0.0)
	Atelectasis	90 (23.7)	0 (0.0)
	Pneumonia and respiratory failure	5 (1.3)	5 (1.3)
	Pulmonary embolism	4 (1.1)	4 (1.1)
	Pleural effusion	14 (3.7)	0 (0.0)
Operative complications	Anastomotic stricture	46 (12.1)	0 (0.0)
	Anastomotic leak	31 (8.1)	0 (0.0)
	Wound infections	28 (7.3)	0 (0.0)
	Feeding jejunostomy	16 (4.2)	0 (0.0)
	Blockage	6 (1.5)	0 (0.0)
Other complications	Cardiac arrhythmias	70 (18.4)	3 (0.8)
	Myocardial infarction	8 (2.1)	7 (1.8)
	Deep vein thrombosis	4 (1.0)	0 (0.0)
	Hemorrhage	5 (1.3)	1 (0.3)
	Mediastinitis	2 (0.5)	2 (0.5)
Overall mortality		-	22 (5.8)

The follow-up data indicate that the majority of patients had follow-up appointments within the first year post-treatment. Specifically, 41.8% (159) of the patients were followed up at the one-year follow-up, while 40.2% (152) were followed up at six months. A smaller proportion of patients, 15.1% (57), had follow-up visits at a period of two years, and 2.8% (11) of patients were followed up beyond a period of two years, suggesting that the frequency of follow-up decreased as the period progressed after treatment. The follow-up times are provided in Table 6.

Table 6. Duration of follow-up.

Follow Up	Frequency (%)
6 months	152 (40.2)
1 year	159 (41.8)
2 years	57 (15.1)
> 2 years	11 (2.8)

4. Discussion

This study provides a detailed overview of the clinical characteristics, treatment, complications, and follow-up outcomes of patients with esophageal carcinoma in tertiary healthcare facilities. The majority of patients were in older age groups, and most of the cancer patients were diagnosed at advanced stages; stage III cancer was the most prevalent cancer among patients at presentation. Chemotherapy is a commonly used approach for cancer treatment, with a significant proportion of patients receiving preoperative or concurrent chemoradiotherapy. Thoracophrenolaparotomy was frequently performed, and anastomotic stricture and leakage were among the common postsurgery complications. Furthermore, the study recorded a range of complications, including respiratory and cardiac issues, contributing to death among patients. The follow-up data highlighted a good proportion of follow-up visits within the first year post-treatment, although the frequency of follow-up among patients decreased over time.

The results of the study in which esophageal cancers are mostly observed in older individuals are consistent with those of other studies conducted to determine age-specific sex differences in esophageal squamous cell carcinoma, esophageal adenocarcinoma, gastric cardia cancer and gastric noncardia cancer and highlight that the incidence of cancer is more common in older individuals, especially in individuals aged 60 to 64 years [34]. Other Chinese studies reported the same findings and reported that advanced age was one of the predictors of esophageal carcinoma [35,36,37]. With advancing age, there is cumulative exposure to established carcinogens such as tobacco, alcohol, dietary irritants, and environmental toxins [38,39]. Aging is also associated with a gradual decline in cellular repair mechanisms and genomic stability. Furthermore, the accumulation of genetic mutations over time, along with the reduced efficiency of DNA repair pathways, facilitates carcinogenesis [40,41].

Most esophageal carcinoma patients were diagnosed at advanced stages, showing the same patterns reported across the globe [30,34]. Generally, cancer remains asymptomatic until it is either locally advanced or metastatic, resulting in a high proportion of diagnosis at advanced stages [42,43,44,45]. Recent epidemiological studies highlight that a large proportion of cancer patients worldwide present with advanced or late-stage disease, which considerably limits treatment options and is associated with reduced survival rates [46].

Treatment of locally advanced esophageal carcinoma generally involves a multidimensional approach, including chemotherapy, radiotherapy, and surgery, and includes international clinical guidelines supporting the use of neoadjuvant and perioperative therapies to increase resectability and to improve survival outcomes compared with surgery alone as a treatment modality [47,48]. Recent scientific literature highlights that multidimensional therapy improves pathological response and overall survival in patients with locally advanced carcinomas, especially when chemoradiotherapy is being used before resection [49,50].

Despite advancements in preoperative cancer therapy and surgical techniques, postoperative complications are common and contribute to morbidity as well as mortality among patients. Pulmonary complications among patients usually include atelectasis, pneumonia, and respiratory failure, which have been reported among 30% of patients following esophagectomy, as reported by meta-analytic data, and these complications significantly reduce long-term survival in patients [51]. Anastomotic leakage is among the most serious postoperative complications, with studies reporting incidence proportions similar to those reported in the current study; its associated morbidity has been considerable despite advances in surgical techniques and is linked to a prolonged hospital stay, increased healthcare resource utilization, and poor long-term survival [52].

The follow-up patterns observed in this study replicated broader trends in post-treatment surveillance, critical for early detection of recurrence as well as management of late complications but usually declines in later years of follow-up. Although long-term survival is limited for advanced stages, improvements in systemic therapy, perioperative care, and optimized surgical techniques usually foster incremental gains in outcomes, highlighting need for integrated multidisciplinary care to improve prognosis among patients with esophageal carcinoma [53].

This study has considerable strengths. First, medical records spanning a long period were taken into consideration. Second, a comprehensive assessment of clinical presentation, stage at diagnosis, treatment modality, and postoperative outcomes was recorded. Furthermore, this study reports data from Pakistan, which is a developing country with no formal cancer registry and where limited data regarding esophageal cancer are usually available. However, the study is retrospective in nature, findings may not be gener-

alizable to other settings, and variability in staging modalities, particularly the limited availability of PET scans in earlier years, may have affected staging accuracy. Additionally, absence of inferential statistical analysis limits ability to determine predictors or compare treatment approaches, and future prospective studies with detailed clinical datasets may help identify patient-level predictors of complications and outcomes. Finally, the study did not assess the association of anesthesia type or specific anastomotic techniques with postoperative complications.

5. Conclusions

Most patients presented at advanced stages, especially stage III, which may contribute to overall poor survival rates. Treatment approaches observed included chemotherapy and multiple surgical techniques; Thoracophrenolaparotomy was frequent surgical procedure. Despite advances in treatment modalities, complications such as anastomotic stricture, respiratory failure, and cardiac arrhythmias were prevalent, resulting in mortality. Furthermore, majority of patients had follow-up appointments within the first year, though follow-up decreased over time.

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Consent to participate: Not applicable.

Data availability: The data supporting this study's findings are available from the corresponding author, Ahmed Raza, upon reasonable request.

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