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Research Article

Pattern of Presentations and Management of Esophageal Cancer in Tumor Therapy and Cancer Research Center 2024

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Abstract

Background: Esophageal cancer is a global health concern, ranking as the seventh leading cause of cancer-related deaths. In Sudan, the rising incidence, particularly of adenocarcinoma, presents a significant challenge. Limited treatment resources affect patient outcomes, despite surgical management for localized disease and systemic therapy for metastatic cases. Early detection is crucial for improving prognosis. This study investigates the presentation patterns and management strategies for esophageal cancer within a Sudanese context. *Methodology:* A retrospective, cross-sectional study was conducted at the Tumor Therapy and Cancer Research Center in Sudan, analyzing 120 esophageal cancer patient records from 2016 to 2023. Data encompassed demographics, clinical presentations, diagnostic findings, treatment modalities, and patient outcomes. Statistical analysis was performed using SPSS. Ethical approvals were obtained prior to data collection. *Results:* Among the 120 patients, 105 had squamous cell carcinoma (SCC) and 15 had adenocarcinoma (AC). The majority of patients were between 51–60 years (25.8%) and over 70 years (22.5%). More than half (61.7%) were female, and most resided in rural areas (77.5%). *Helicobacter pylori* infection (17.5%) was the most common risk factor, followed by smoking (10.8%). Other reported risk factors included gastroesophageal reflux disease, alcohol use, and a family history of esophageal cancer. Dysphagia was the most common presenting symptom, with most patients diagnosed at an advanced stage. *Conclusion:* SCC predominantly affected older females, while AC was more common in younger males. Dysphagia was the main presenting symptom. Low utilization of neoadjuvant therapy and higher mortality rates in AC patients (60% vs. 30.5% in SCC) highlight the need for improved screening, early diagnosis, optimized treatment protocols.

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Keywords

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1. Introduction

Esophageal cancer is a significant global health issue, with an incidence rate of 3.1% and a mortality rate of 5.5%. It is the seventh leading cause of cancer-related deaths worldwide, according to the World Health Organization's 2020 report. Among gastrointestinal malignancies, esophageal cancer ranks third after colorectal and gastric cancers [1].

Esophageal cancer primarily manifests in two histological subtypes: esophageal adenocarcinoma (AC) and squamous cell carcinoma (SCC). AC is strongly associated with smoking, gastroesophageal reflux disease (GERD), and Barrett's esophagus, whereas SCC is linked to smoking and alcohol consumption [2].

Barrett's esophagus, characterized by intestinal metaplasia of the lower esophagus, is responsible for 60% of esophageal adenocarcinoma cases and is considered a consequence of chronic GERD [3].

Sudan, the third largest country in Africa, has an estimated esophageal cancer incidence of 5.8% per 100 cases [4, 5]. Cancer ranks as the third leading cause of death in Sudan after infectious diseases such as malaria and viral pneumonia. Esophageal cancer ranks fourth in incidence among males and fifth among females [6]. The incidence of esophageal adenocarcinoma has increased significantly from 11% between 1986 and 1991 to 44% in 2010 [7].

Despite advancements in esophageal cancer treatment worldwide, prognosis remains poor, primarily due to delays in diagnosis and treatment. Most cases present at an advanced stage, emphasizing the importance of early detection of Barrett's esophagus and squamous dysplasia for improved outcomes [8].

Surgical resection remains the primary treatment for locally advanced esophageal cancer, while systemic therapy is used in metastatic cases [8, 9]. In developing countries like Sudan, despite a high disease burden, limited treatment facilities result in a resection rate of less than 50%, and available data on treatment outcomes remain scarce [7].

This retrospective study aims to analyze 120 cases of esophageal cancer to examine presentation patterns and management strategies at the Tumor Therapy and Cancer Research Center in Sudan.

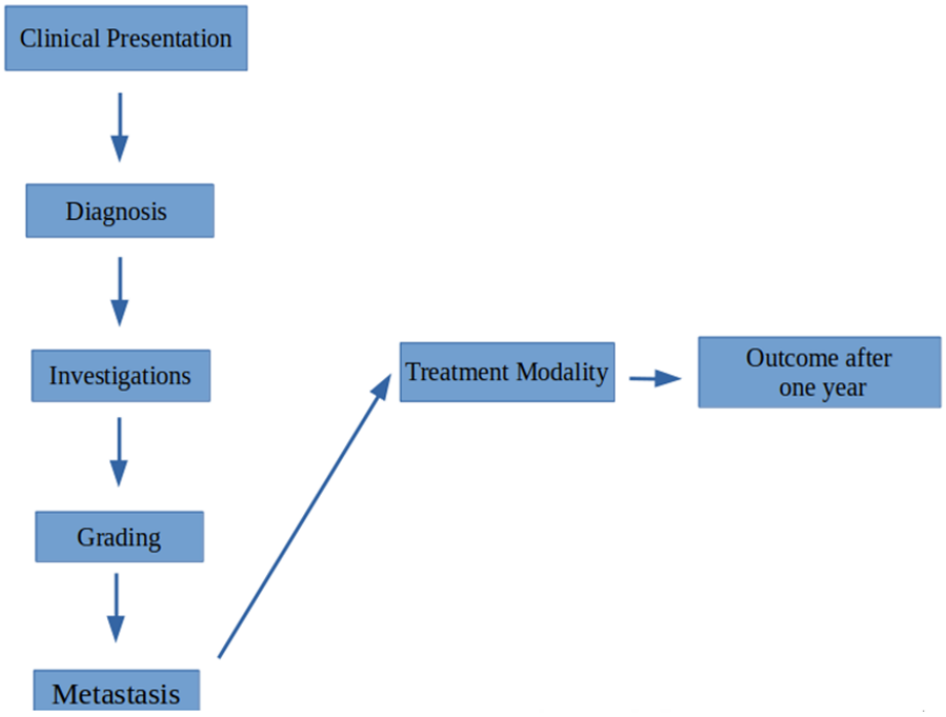

Figure 1. *Conceptual framework describes variables of the study.*

2. Research Methodology

2.1. Study Design and Population

A retrospective, cross-sectional facility-based study was conducted from January to June 2024 to investigate the presentation patterns and management of esophageal cancer. The study was conducted at the Tumor Therapy and Cancer Research Center in Shendi, River Nile State, Sudan. Established in 2016, the center provides specialized cancer services, including chemotherapy, radiotherapy, atomic survey, early breast cancer screening, and radioactive iodine therapy. The study reviewed all records of patients diagnosed with esophageal cancer at the center from 2016 to 2023, totaling 120 cases.

2.2. Data Collection

Data were collected in English using a checklist designed by the authors to extract relevant patient information from medical records. The collected data included patient demographics (age, sex, residence), clinical presentations, diagnostic tests, pathological findings, treatment modalities, and outcomes. *Figure 1* illustrates the conceptual framework of the study.

2.3. Statistical Analysis

Statistical Package for the Social Sciences (SPSS) was used to summarize the data numerically and graphically providing clear depiction of the results. Inferential statistical tests were used to assess the relationships between tissue types and patients' characteristics. A binary logistics regression to assess the association between presence of metastasis and tumor characteristics of the participants. *P value* < 0.05 is considered statistically significant.

2.4. Ethical Considerations

Ethical approval was obtained from the University of Shendi, and the Tumor Therapy and Cancer Research Center in Shendi. Confidentiality and privacy were maintained during the process of data collection, analysis and reporting. All data was used for research purposes only with assurance of confidentiality and all rights.

3. Results

Among the 120 patients with esophageal cancer, most were aged 51–60 years (31, 25.8%) and over 70 years (27, 22.5%). More than half of the patients were female (74, 61.7%). The majority resided in rural areas (93, 77.5%). The most common risk factor among patients was a history of *Helicobacter pylori* (*H. pylori*) infection (21, 17.5%), followed by smoking (13, 10.8%), a family history of esophageal cancer (4, 3.3%), frequent alcohol use (3, 2.5%), and gastroesophageal reflux disease (GERD) (2, 1.7%), as shown in *Table 1*.

Table 1. *Baseline Characteristics of Esophageal Cancer Patients (n=120).*

Characteristics	Frequency	Percent
Age:		
20-30 years	1	0.8
31-40 years	17	14.2
41-50 years	18	15.0
51-60 years	31	25.8
61-70 years	26	21.7
more than 70 years	27	22.5
Sex:		
Male	46	38.3
Female	74	61.7
Residence:		
Urban	27	22.5
Rural	93	77.5
Occupation:		
Housewife	71	59.2
Employee	8	6.7
Free worker	38	31.7
Unemployed	3	2.5
Marital:		
Single	14	11.7
Married	79	65.8
Divorced	6	5.0
Widow	21	17.5
Risk factors:		
Gastroesophageal reflex	2	1.7
History of H. Pylori infection	21	17.5
Frequent use of alcohol	3	2.5
Family history	4	3.3
Smoking	13	10.8

Of the 120 patients, 105 (87.5%) were diagnosed with squamous cell carcinoma, while 15 (12.5%) had adenocarcinoma, *Figure 2*.

Most squamous cell carcinoma patients were aged more than 70 years (27, 25.7%) and 51–60 years (24, 22.9%). Conversely, most adenocarcinoma patients belonged to the 51–60 (7, 46.6%) and 61–70 (7, 46.6%) age groups. A higher proportion of squamous cell carcinoma patients were female (70, 66.7%) compared to adenocarcinoma patients (4, 26.7%), *Table 2*.

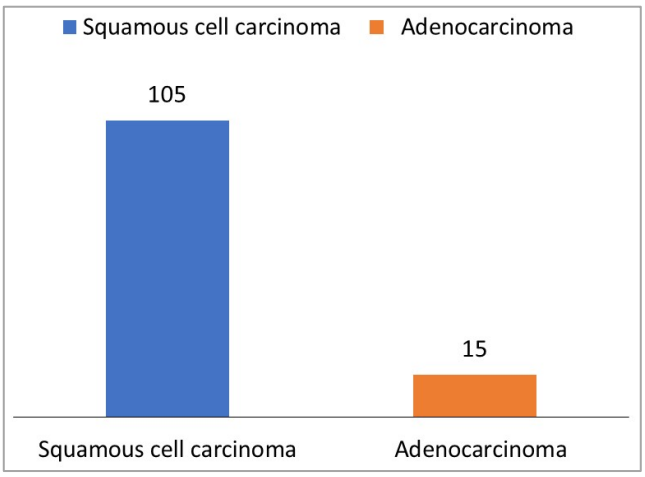

Figure 2. *Histological type of esophageal cancer among the surveyed patients (n=120).*

The majority of patients resided in rural areas, with 81 (77.1%) squamous cell carcinoma patients and 12 (80%) adenocarcinoma patients. Regarding marital status, most squamous cell carcinoma patients were married (65, 61.9%), whereas 93.3% (14) of adenocarcinoma patients were married. Among risk factors, *H. pylori* infection was the most common in both groups—13.3% (14) in squamous cell carcinoma patients and 46.7% (7) in adenocarcinoma patients. Smoking was reported in 10.5% (11) of squamous cell carcinoma patients and 13.3% (2) of adenocarcinoma patients. Other risk factors included family history, alcohol use, and GERD, *Table 2*.

The most frequent symptom in both groups was dysphagia, affecting 97 (92.4%) squamous cell carcinoma patients and 13 (86.7%) adenocarcinoma patients. Additional symptoms among squamous cell carcinoma patients included weight loss (34, 32.4%), vomiting (12, 11.4%), epigastric pain (10, 9.5%), and odynophagia (9, 8.6%). Among adenocarcinoma patients, vomiting (5, 33.3%) and weight loss (5, 33.3%) were also prevalent.

Squamous cell carcinoma was predominantly located in the lower esophagus (43, 41%), followed by the middle (39, 37.1%) and upper esophagus (23, 21.9%). Adenocarcinoma was also most commonly found in the lower esophagus (14, 93.3%). Most squamous cell carcinoma patients were diagnosed at Stage II (46, 43.8%), whereas adenocarcinoma patients were primarily diagnosed at Stage I (7, 46.5%).

Table 2. *Baseline Demographic Characteristics of Esophageal Squamous Cell Carcinoma and Adenocarcinoma Patients (n=120).*

Patients' characteristics	Squamous cell carcinoma	Adenocarcinoma
Age groups:		
20-30 years	1.0 (1.0%)	0.0 (0.0%)
31-40 years	16.0 (15.2%)	1.0 (6.7%)
41-50 years	18.0 (17.1%)	0.0 (0.0%)
51-60 years	24.0 (22.9%)	7.0 (46.7%)
61-70 years	19.0 (18.1%)	7.0 (46.7%)
More than 70 years	27.0 (25.7%)	0.0 (0.0%)
Sex:		
Male	35.0 (33.3%)	11.0 (73.3%)
Female	70.0 (66.7%)	4.0 (26.7%)
Residence:		
Urban	24.0 (22.9%)	3.0 (20.0%)
Rural	81.0 (77.1%)	12.0 (80.0%)
Occupation:		
Housewife	68.0 (64.8%)	3.0 (20.0%)
Employee	6.0 (5.7%)	2.0 (13.3%)
Free worker	28.0 (26.7%)	10.0 (66.7%)
Unemployed	3.0 (2.9%)	0.0 (0.0%)
Marital status:		
Single	14.0 (13.3%)	0.0 (0.0%)
Married	65.0 (61.9%)	14.0 (93.3%)
Divorced	5.0 (4.8%)	1.0 (6.7%)
Widow	21.0 (20.0%)	0.0 (0.0%)
Risk factors:		
GEARD	2.0 (1.9%)	0.0 (0.0%)
History of Pylori infection	14.0 (13.3%)	7.0 (46.7%)
Frequent use of alcohol	2.0 (1.9%)	1.0 (6.7%)
Family history	3.0 (2.9%)	1.0 (6.7%)
Smoking	11.0 (10.5%)	2.0 (13.3%)

Metastases were observed in (27, 25.7%) squamous cell carcinoma patients and (8, 53.3%) adenocarcinoma patients. The lungs (17, 45.9%) and liver (16, 43.2%) were the most common metastatic sites for squamous cell carcinoma, while the lungs (4, 50%) and liver (3, 37.5%) were frequent sites for adenocarcinoma, *Table 3*.

On esophagogastroduodenoscopy (ODG) mass was observed in (60, 57.1%) squamous cell carcinoma patients and

(8, 53.3%) adenocarcinoma patients whereas fungating mass was detected in (32, 30.5%) squamous cell carcinoma patients and (4, 26.7%) adenocarcinoma patients as presented in *Table 3*.

Table 3. *Tumor Characteristics of Esophageal Cancer Patients (n=120).*

Tumor characteristics	Squamous cell carcinoma	Adenocarcinoma
Clinical presentation:		
Dysphagia	97.0 (92.4%)	13.0 (86.7%)
Hoarseness of voice	3.0 (2.9%)	0.0 (0.0%)
Odynophagia	9.0 (8.6%)	0.0 (0.0%)
Vomiting	12.0 (11.4%)	5.0 (33.3%)
Hematemesis	4.0 (3.8%)	0.0 (0.0%)
Weight loss	34.0 (32.4%)	5.0 (33.3%)
Neck swelling	1.0 (1.0%)	0.0 (0.0%)
Recurrent chest infection	8.0 (7.6%)	0.0 (0.0%)
Excessive salivation	2.0 (1.9%)	0.0 (0.0%)
Epigastric pain	10.0 (9.5%)	5.0 (33.3%)
Site of mass:		
Upper third	23.0 (21.9%)	0.0 (0.0%)
Middle third	39.0 (37.1%)	1.0 (6.7%)
Lower third	43.0 (41.0%)	14.0 (93.3%)
Grade at presentation:		
Stage I	38.0 (36.2%)	7.0 (46.7%)
Stage II	46.0 (43.8%)	5.0 (33.3%)
Stage III	17.0 (16.2%)	2.0 (13.3%)
Stage IV	4.0 (3.8%)	1.0 (6.7%)
Metastasis:		
yes	27.0 (25.7%)	8.0 (53.3%)
no	78.0 (74.3%)	7.0 (46.7%)
Site of metastasis:		
Lung	17.0 (45.9%)	4.0 (50.0%)
Bone	2.0 (5.4%)	0.0 (0.0%)
Liver	16.0 (43.2%)	3.0 (37.5%)
Brain	0.0 (0.0%)	1.0 (12.5%)
Others	2.0 (5.4%)	0.0 (0.0%)
O. G. D findings:		
Mass	60.0 (57.1%)	8.0 (53.3%)
Fungating mass	32.0 (30.5%)	4.0 (26.7%)
Ulcerative mass	7.0 (6.7%)	1.0 (6.7%)
Stricture	6.0 (5.7%)	2.0 (13.3%)

Although surgery was not performed in any patient, neo-adjuvant therapy was administered to (3, 2.9%) patients with squamous cell carcinoma and (1, 6.7%) patient with adenocarcinoma. Most patients received adjuvant therapy: (96, 91.4%) with squamous cell carcinoma and (14, 93.3%) with adenocarcinoma. Nutritional support was not provided to the majority of patients.

One year after diagnosis, (62, 59%) squamous cell carcinoma patients and (4, 26.7%) adenocarcinoma patients remained under treatment. Mortality was reported in 32 (30.5%) squamous cell carcinoma patients and 9 (60%) adenocarcinoma patients, *Table 4*.

Table 4. *Treatment modalities and follow up of the esophageal cancer patients (n=120).*

Variables	Squamous cell carcinoma	Adenocarcinoma
Neo-Adjuvant Therapy:		
Received neo-adjuvant therapy	3.0 (2.9%)	1.0 (6.7%)
Did not receive neo-adjuvant therapy	102.0 (97.1%)	14.0 (93.3%)
Surgical Intervention:		
No surgery performed	105.0 (100.0%)	15.0 (100.0%)
Nutritional Support:		
Percutaneous endoscopic gastrostomy (PEG) tube	1.0 (1.0%)	0.0 (0.0%)
Open gastrostomy	2.0 (1.9%)	0.0 (0.0%)
Open jejunostomy	6.0 (5.7%)	0.0 (0.0%)
Nasogastric (NG) tube	4.0 (3.8%)	1.0 (6.7%)
No nutritional support provided	92.0 (87.6%)	14.0 (93.3%)
Adjuvant Therapy:		
Received adjuvant therapy	96.0 (91.4%)	14.0 (93.3%)
Did not receive adjuvant therapy	9.0 (8.6%)	1.0 (6.7%)
One-Year Outcome		
Cured	1.0 (1.0%)	1.0 (6.7%)
Under treatment	62.0 (59.0%)	4.0 (26.7%)
Developed metastasis	10.0 (9.5%)	1.0 (6.7%)
Death	32.0 (30.5%)	9.0 (60.0%)

Cross-tabulation analysis showed significant associations between metastasis and sex (p = 0.021), occupation (p = 0.007), tissue type (p = 0.028), tumor grade at presentation (p = 0.009), and tumor site (p = 0.035). However, no significant associations were found with age (p = 0.095), neo-adjuvant therapy (p = 0.351), or adjuvant therapy (p = 0.164), as displayed in *Table 5*.

Table 5. *Association Between Metastasis and Demographic/Tumor Characteristics (n =120).*

Variable	Metastasis Present (n=35)	Metastasis Absent (n=85)	p-value
Age Group (Years)			
20-30	0.0 (0.0%)	1.0 (1.2%)	
31-40	6.0 (17.1%)	11.0 (12.9%)	

Variable	Metastasis Present (n=35)	Metastasis Absent (n=85)	p-value
41-50	5.0 (14.3%)	13.0 (15.3%)	
51-60	12.0 (34.3%)	19.0 (22.4%)	0.095
61-70	10.0 (28.6%)	16.0 (18.8%)	
> 70	2.0 (5.7%)	25.0 (29.4%)	
Sex			
Male	19.0 (54.3%)	27.0 (31.8%)	
Female	16.0 (45.7%)	58.0 (68.2%)	0.021
Occupation			
Housewife	14.0 (40.0%)	57.0 (67.1%)	
Employee	1.0 (2.9%)	7.0 (8.2%)	
Free worker	19.0 (54.3%)	19.0 (22.4%)	0.007
Unemployed	1.0 (2.9%)	2.0 (2.4%)	
Histological Type			
Squamous cell carcinoma	27.0 (77.1%)	78.0 (91.8%)	
Adenocarcinoma	8.0 (22.9%)	7.0 (8.2%)	0.028
Tumor Stage at Presentation			
Stage I	9.0 (25.7%)	36.0 (42.4%)	
Stage II	13.0 (37.1%)	38.0 (44.7%)	
Stage III	9.0 (25.7%)	10.0 (11.8%)	0.009
Stage IV	4.0 (11.4%)	1.0 (1.2%)	
Tumor Location			
Upper third	5.0 (14.3%)	18.0 (21.2%)	
Middle third	7.0 (20.0%)	33.0 (38.8%)	0.035
Lower third	23.0 (65.7%)	34.0 (40.0%)	
Neo-Adjuvant Therapy			
Received	2.0 (5.7%)	2.0 (2.4%)	
Not received	33.0 (94.3%)	83.0 (97.6%)	0.351
Adjuvant Therapy			
Received	34.0 (97.1%)	76.0 (89.4%)	
Not received	1.0 (2.9%)	9.0 (10.6%)	0.164

A binary logistic regression model was used to predict the presence of metastases based on patients' demographic characteristics and tumor features. The model revealed that for every one-year increase in age, the odds of metastases increased by 22.3%, although this effect was not statistically significant (p=0.257). Other factors such as sex (p=0.792), occupation (p=0.232), marital status (p=0.203), type of tissue (p=0.201), and site of mass (p=0.334) did not have statistically significant effects on the presence of metastases. However, the grade at presentation emerged as a significant predictor (p=0.006), with lower grades being associated with higher odds of metastases (54.6%). These results are summarized in *Table 6*.

Table 6. *Binary Logistic Regression Predicting Presence of Metastasis Based on Demographic and Tumor Characteristics (n=120).*

Predictor	B	S. E.	Wald	df	Sig.	Exp (B)	95% confidence level	
							lower	upper
Age	0.201	0.178	1.286	1	0.257	1.223	0.864	1.732
Sex	-0.277	1.047	.070	1	0.792	0.758	0.097	5.908
Occupation	-0.624	0.522	1.428	1	0.232	0.536	0.193	1.491
Marital status	0.406	0.319	1.619	1	0.203	1.501	0.803	2.807
Histological Type	0.836	0.654	1.633	1	0.201	2.308	0.640	8.324
Tumor Grade at Presentation	-0.789	0.289	7.469	1	0.006	0.454	0.258	0.800
Tumor Location	-0.309	0.319	0.935	1	0.334	0.735	0.393	1.373
Constant	1.501	3.066	0.240	1	0.624	4.486		

4. Discussion

This is a retrospective study that included 120 patients with esophageal cancer, 87.5% of which have squamous cell carcinoma and 12.5% adenocarcinoma. The study highlights the demographic, histologic, risk factors, prognosis and mortality in esophageal cancer patients. Various comparable studies have been done in different populations.

Histologically, white men are more likely to have adenocarcinoma (AC), while black women and men are more likely to have squamous cell carcinoma (SCC) [10]. Esophageal squamous-cell carcinoma (ESCC) typically affects more men, especially black men [11], which contrasts partially with our results, where SCC is more common in females (66%) and AC is more common in males (73.3%).

Bollschweiler et al. demonstrated a strong correlation between poor vitamin C and E intake and the development of esophageal squamous cell carcinoma and adenocarcinoma in men [12].

A multicenter retrospective study on esophageal cancer conducted in Malaysia found that 56.8% of patients were diagnosed at later stages (stage IV), compared to our study where patients were predominantly diagnosed at stage II. The survival rates in the Malaysian study were lower (35.8%, 13.8%, and 11.0% at one, three, and five years, respectively), and surgical resection showed the best outcomes, especially in stage IV AC patients, compared to SCC [13], whereas our findings indicated a better prognosis for SCC.

A study in Brunei Darussalam found that the mean age at diagnosis was 66.9 ± 12.9 years, which was substantially younger for AC (57.2 ± 16.0) than for SCC (68.1 ± 12.0, $p<0.05$), which aligns with our study's finding. The gender ratio was 2.25: 1 (male: female) [14].

Shin *et al*. analyzed data from the Korea Central Cancer Registry from 1999 to 2013, reporting a significant decrease in age-standardized incidence rates, from 8.8 to 5.9 per 100,000 population, with squamous cell carcinoma being the predominant histological type. This is compatible with our findings, and the study also highlighted an improvement in five-year relative survival rates for squamous cell carcinoma, rising from 12.1% to 34.6% over two decades, attributed to better early-stage detection and treatment strategies [15].

Similarly, a study examining trends in the incidence of esophageal adenocarcinoma in Akita Prefecture, Japan, from 2007 to 2014 found that, among 2,527 esophageal cancer patients, only 43 (1.8%) were diagnosed with adenocarcinoma. However, the number of adenocarcinoma cases increased significantly, from one case in 2007 to 14 cases in 2014. As a result, the proportion of adenocarcinoma cases among all esophageal cancer diagnoses rose from 0.66% to 2.5% during the study period ($P < 0.01$) [16].

Furthermore, trends in esophageal cancer (EC) incidence in Uzbekistan from 2000 to 2018 were analyzed using data from 17,144 patients. The highest incidence was observed in individuals aged 61 to 70 years, with squamous cell carcinoma (SCC) being the most common diagnosis (80%), similar to our findings. However, most patients presented with stage III EC, which had a low five-year survival rate of approximately 15% (2000–2009), improving to around 25% (2012–2018). In contrast, patients in our study presented at an earlier stage [17].

A study conducted at Tata Memorial Hospital in Mumbai, India, similarly found that SCC was the predominant histological type, accounting for 81.4% of cases, with no significant changes in histological patterns over time. The median age of patients was 57 years, and a notable proportion (27.7%) reported no history of tobacco or alcohol use. The study

highlighted that female sex and substance abuse were associated with higher odds of SCC, whereas comorbidities and lower esophageal cancers were linked to adenocarcinoma (AD) [18].

Similarly, a study investigating histological changes in esophageal cancer over a 25-year period in eastern Turkey found that SCC constituted 75.86% of cases, while AD accounted for 19.56% [19].

A retrospective analysis from Zambia reported a high age-standardized incidence rate of EC at 5.5 per 100,000 people, with a predominance of female patients (66%) and a mean age of 55 years. Dysphagia was the most common symptom (83%), and a significant proportion of patients (35%) were diagnosed at stage IV, particularly among those aged 40–49 years, which partially differs from our findings [20].

More recently, a retrospective study on esophageal cancer (EC) was conducted at the Garissa Regional Cancer Center (GRCC) in northern Kenya, highlighting that the most significant risk factor identified was hot beverage consumption. The majority of patients presented at advanced stages (stages III and IV), in contrast to our patients, with squamous cell carcinoma (SCC) being the most common histological type [21].

Ortiz *et al*. found that 66% of cases were SCC, primarily located in the upper and middle thirds of the esophagus, while 34% were adenocarcinomas, predominantly found in the distal third, which is comparable to our findings. The most common symptom of diagnosis was dysphagia, often accompanied by weight loss. The overall survival rate was low, averaging 1.1 years for SCC and 8 months for adenocarcinoma, with half of the patients presenting with metastatic disease [22].

Similarly, Fagundes *et al*. investigated trends in histological types of esophageal cancer over a 20-year period in the central region of Rio Grande do Sul, Brazil. The study found that SCC was the predominant type, accounting for 93.3% of cases, while adenocarcinoma represented only 6.7%. The prevalence rates of both SCC and AD remained stable over two decades, with a male-to-female ratio of approximately 3.1: 1 for SCC cases [23].

Another long-term study conducted in the United States reported comparable findings. Notably, while the incidence of esophageal SCC has significantly decreased, the incidence of esophageal adenocarcinoma has sharply increased, particularly among men [24].

Additionally, an analysis of long-term survival trends for EC in the United States from 1973 to 2009 highlighted a significant improvement in survival rates, particularly for esophageal adenocarcinoma. Surgical treatment rates increased from 49% to 64%, leading to an improvement in median survival from 6 months to 10 months and an increase in the 5-year survival rate from 9% to 22% [25].

Furthermore, a comparative study by Henry et al. included 100 patients, 50 diagnosed with adenocarcinoma and 50 with SCC. In both histological categories, the majority of patients were in stages III and IV. The average survival time was 7.7 ± 9.5 months for SCC and 8.0 ± 10.9 months for adenocarcinoma, indicating no significant difference between the two [26].

Matz *et al*. analyzed survival rates of esophageal cancer across 60 countries, focusing on anatomical sub-sites and morphological sub-types to understand international disparities. Data from adults diagnosed between 2000 and 2014 revealed that lower third esophageal tumors were the most prevalent. There were significant regional differences in cancer types: SCC was more common in Asia (50%–90%), while adenocarcinoma predominated in Europe, North America, and Oceania (50%–60%) [27].

Additionally, prognostic trends in esophageal adenocarcinoma and SCC in Swedish patients from 1990 to 2013, with an emphasis on surgical intervention outcomes, showed that relative 5-year survival rates improved for both cancer types. Survival rates increased from 12% to 15% for adenocarcinoma and from 9% to 12% for SCC. Notably, post-surgical survival significantly improved, rising from 27% to 45% for adenocarcinoma and from 24% to 43% for SCC [28].

Sridhar *et al*. investigated the impact of hospital safety-net burden on the presentation, treatment, and outcomes of patients with esophageal cancer. While overall survival rates were significantly lower at high-burden hospitals (HBH), no increased mortality risk was identified for patients with adenocarcinoma. However, those with squamous cell carcinoma faced an increased risk of mortality [29].

Kim N. Du *et al*. explored the effects of intraoperative opioid use on survival outcomes in patients undergoing surgery for esophageal cancer, specifically comparing adenocarcinoma and squamous cell carcinoma. Their findings indicate that high doses of intraoperative opioids are associated with improved recurrence-free survival (RFS) and overall survival in patients with squamous cell carcinoma, while no significant association was found for those with adenocarcinoma. These results suggest that the impact of opioids on oncological outcomes may vary by cancer histology, highlighting the need for further research to understand the underlying mechanisms and optimize pain management strategies in this patient population [30].

5. Conclusion

In conclusion, our study revealed that SCC patients were predominantly older and female, while AC patients were younger and more often male. Dysphagia was the most common symptom, and most patients were diagnosed at advanced stages, particularly in the case of SCC. The study found a low percentage of neoadjuvant therapy use and higher mortality rates in AC patients (60%) compared to SCC patients (30.5%). These findings emphasize the need for tailored screening and treatment strategies to improve outcomes for both cancer types.

Abbreviations

AC	Adenocarcinoma
ADC	Adenocarcinoma
EC	Esophageal Cancer
ESCC	Esophageal Squamous-cell Carcinoma
GERD	Gastroesophageal Reflux Disease
GRCC	Regional Cancer Center
HBH	High-burden Hospitals
ODG	Esophagogastroduodenoscopy
RFS	Recurrence-Free Survival
SSC	Squamous Cell Carcinoma

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Author Contributions

Ahmed Mahjoub: Reviewed and edited the study protocol, study tool, supervised the field implementation of the research and all data management processes. Participated in proofread and edited the final manuscript.

Hiba Salah: Designed and implemented the study protocol, study tool, conducted the data analysis, participated in writing the research draft, and drafted the final manuscript.

Maram Mohamed and Maram Elnair: Participated in research implementation, data collection, and research writing.

Hind Salah, Afra K., Mohammed Hammad, Aymen Khalid, Lea Nohra and Fatima Abdallh: Participated in manuscript preparation.

All authors approved the final version of the manuscript before submission.

Ethical Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki. Ethical clearance was obtained from Shendi university Institutional Review Board (IRB), and the Tumor Therapy and Cancer Research Center in Shendi city. Data was collected for research purposes only. The purpose of the study was addressed briefly. Confidentiality and privacy have been maintained during data collection, analysis, and reporting. Informed consent was taken from all patents or their legal guardians. The study was performed in accordance with relevant guidelines and regulations.

Consent to Publish

Not applicable.

Availability of Data and Material

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflicts of Interest

The authors declare no conflicts of interest.

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