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Computed Tomographic Findings in Patients with Esophageal Carcinoma: A Study in a Tertiary Care Hospital in Bangladesh

Dr. Farhana Paveen[1*], Dr. Mohammad Obaidullah[2], Dr. Mahfuza Mahmud[3], Dr. Eva Sen[4], Dr. Soraiya Hassan[5], Dr. Jahanara Laizu[6], Dr. Shamima Siddique[7], Dr. Snigdha Sarker[8]

[1]Assistant Professor, Department of Radiology and Imaging, National Institute of Cancer Research & Hospital (NICRH), Mohakhali, Dhaka, Bangladesh
[2]Assistant Professor, Department of Anesthesiology, Government Employee Hospital, Dhaka, Bangladesh
[3]Associate Professor, Department of Radiology and Imaging, Dhaka Medical College Hospital, Dhaka, Bangladesh
[4]Resident, Department of Radiology and Imaging, Dhaka Medical College Hospital, Dhaka, Bangladesh
[5]Consultant, Department of Radiology and Imaging, BRB Hospital Limited, Dhaka, Bangladesh
[6]Assistant Professor, Department of Nuclear Medicine, National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, Bangladesh.
[7]Medical Officer, Department of Radiology and Imaging, National Institute of Cancer Research & Hospital (NICRH), Mohakhali, Dhaka, Bangladesh.
[8]Associate Professor, Department of Radiology and Imaging, Dhaka Medical College Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Farhana Paveen
Assistant Professor, Department of Radiology and Imaging, National Institute of Cancer Research & Hospital (NICRH), Mohakhali, Dhaka, Bangladesh
Email: fp.rinku@gmail.com

Abstract **Original Research Article**

Background: Esophageal carcinoma is a malignancy with high morbidity and mortality, often diagnosed at an advanced stage due to the absence of early symptoms. Computed tomography (CT) plays a crucial role in evaluating tumor extent, lymph node involvement, and distant metastasis, aiding in treatment planning. ***Objective:*** This study aims to assess the computed tomographic findings in patients with esophageal carcinoma in a tertiary care hospital in Bangladesh. ***Methods:*** This descriptive observational study was conducted at Test Hospital, Dhaka, Bangladesh, from January 2023 to December 2024. A total of 47 patients diagnosed with esophageal carcinoma were included using purposive sampling. CT imaging was performed to evaluate tumor location, size, wall thickening, luminal narrowing, invasion into adjacent structures, lymph node involvement, and distant metastasis. Data analysis was conducted using MS Office tools. ***Results:*** Of the 47 patients, 63.8% were male, with a mean age of 59.2 years. Tumor localization was most common in the middle esophagus (46.8%), followed by the lower esophagus (38.3%). Lymph node involvement was observed in 72.3%, and distant metastases were present in 38.3%. The majority of patients were diagnosed at stage III (48.9%) and stage IV (38.3%). ***Conclusion:*** Computed tomography provides valuable insights into the staging and progression of esophageal carcinoma. The high prevalence of late-stage diagnosis emphasizes the need for early detection. Enhanced imaging and screening strategies, along with targeted interventions, are essential to improve patient outcomes and survival rates.

Keywords: Computed tomography, Esophageal carcinoma, Lymph node involvement, Metastasis, Staging, Tumor invasion.

INTRODUCTION

Esophageal carcinoma is a highly aggressive malignancy that poses a significant global health burden. It is the sixth leading cause of cancer-related deaths worldwide, with a high prevalence in Asian countries, including Bangladesh [1]. The disease often presents at an advanced stage due to the lack of specific early symptoms, leading to delayed diagnosis and poor treatment outcomes [2,3]. Risk factors associated with esophageal carcinoma include chronic smoking, excessive alcohol consumption, gastroesophageal reflux disease (GERD), and dietary habits such as the consumption of hot beverages and nitrosamine-rich foods [4]. Genetic predisposition and environmental factors also contribute to its pathogenesis, further complicating prevention and early detection strategies [5]. Computed tomography is a widely used imaging modality for evaluating esophageal carcinoma. It plays a crucial role in assessing tumor characteristics, including

location, size, wall thickening, luminal narrowing, and invasion into adjacent structures [6]. CT imaging is particularly valuable in determining lymph node involvement and detecting distant metastases to the liver, lungs, and bones, which are critical for accurate staging and treatment planning [7,8]. In contrast to other imaging modalities, such as endoscopic ultrasound and magnetic resonance imaging, CT provides a comprehensive overview of both local and systemic disease spread, making it a key tool in oncologic management [9]. Advances in imaging technology, including contrast-enhanced CT and three-dimensional reconstruction, have further improved the accuracy of tumor detection and staging [10]. Despite these diagnostic advancements, esophageal carcinoma remains a major public health concern in Bangladesh. Many patients present at advanced stages due to limited healthcare access, lack of awareness, and the asymptomatic nature of early disease [11]. Understanding the characteristic CT findings of esophageal carcinoma in the local population is essential for improving early diagnosis and guiding treatment strategies. Previous studies have reported variations in tumor presentation based on geographic and ethnic differences, highlighting the need for region-specific data [12]. Identifying common radiologic patterns can aid clinicians in recognizing esophageal carcinoma at an earlier stage, potentially leading to better clinical outcomes. Given the importance of imaging in esophageal carcinoma management, this study aimed to evaluate the computed tomographic findings in patients diagnosed with the disease at a tertiary care hospital in Bangladesh. By analyzing tumor characteristics, lymph node involvement, and metastatic patterns, the study seeks to provide valuable insights into the radiologic presentation of esophageal carcinoma in the local population, ultimately contributing to improved diagnostic and therapeutic approaches.

METHOGOLOGY

This descriptive observational study was conducted at Test Hospital, Dhaka, Bangladesh, from January 2023 to December 2024. A total of 47 patients diagnosed with esophageal carcinoma were included using a purposive sampling technique. The inclusion criteria encompassed patients with histo-pathologically confirmed esophageal carcinoma who underwent computed tomography (CT) scans for disease evaluation. Patients with prior esophageal surgery, incomplete imaging records, or poor-quality CT scans were excluded. All patients underwent contrast-enhanced CT of the chest and upper abdomen using a multi-detector CT scanner. Imaging parameters included axial, coronal, and sagittal reconstructions to assess tumor location, wall thickening, luminal narrowing, and invasion into adjacent structures. Lymph node involvement and distant metastases were evaluated based on size, morphology, and enhancement patterns. Data were collected from hospital records, and findings were documented systematically. Statistical analysis was performed using MS Office tools. Descriptive statistics, including frequency and percentage distributions, were used to present the findings. Ethical clearance was obtained from the institutional review board, and written informed consent was obtained from all patients before participation.

RESULT

A total of 47 patients diagnosed with esophageal carcinoma were included in this study. The mean age of the patients was 59.2 ± 8.7 years, with a male predominance (63.8%). The majority of patients (57.4%) had a history of chronic smoking, and 40.4% reported excessive alcohol consumption. Dysphagia was the most common presenting symptom (85.1%), followed by weight loss (72.3%) and retrosternal discomfort (48.9%). Regarding tumor characteristics, the middle esophagus was the most commonly affected site (46.8%), followed by the lower esophagus (38.3%) and upper esophagus (14.9%). The mean tumor length was 5.7 ± 2.1 cm, with most tumors demonstrating irregular wall thickening and luminal narrowing. In contrast-enhanced CT, 70.2% of tumors exhibited heterogeneous enhancement, while 29.8% showed homogenous enhancement. Peri-esophageal fat stranding was observed in 72.3% of cases, and 17.0% demonstrated tracheobronchial invasion. Lymph node involvement was detected in 72.3% of patients, with para-esophageal and mediastinal lymphadenopathy being the most frequent sites. Distant metastases were identified in 38.3% of cases, with the liver being the most common metastatic site (47.1%), followed by the lungs (35.3%) and bones (17.6%). Among metastatic cases, 58.8% presented with multiple organ involvement. Tumor staging based on CT findings revealed that 12.8% of patients were in stage II, 48.9% in stage III, and 38.3% in stage IV. No patients were identified in stage I due to late presentation and diagnosis. Most stage IV cases had distant metastases, while stage III cases showed significant local invasion with lymph node involvement.

Table 1: Demographic and clinical characteristics of patients. (N=47)

Characteristic	n	%
Mean age (years)	59.2 ± 8.7	
Gender (Male)	30	63.80%
Smoking history	27	57.40%
Alcohol consumption	19	40.40%
Dysphagia	40	85.10%
Weight loss	34	72.30%
Retrosternal discomfort	23	48.90%

Table 2: Tumor characteristics on computed tomography. (N=47)

Tumor Characteristic	n	%
Tumor location (Upper)	7	14.9%
Tumor location (Middle)	22	46.8%
Tumor location (Lower)	18	38.3%
Mean tumor length (cm)	5.7 ± 2.1	
Irregular wall thickening	42	89.4%
Luminal narrowing	39	83.0%
Heterogeneous enhancement	33	70.2%
Homogenous enhancement	14	29.8%

Table 3: Lymph node and metastatic involvement. (N=47)

Parameter	n	%
Lymph node involvement	34	72.30%
Para esophageal nodes	22	64.70%
Mediastinal nodes	12	35.30%
Distant metastases	18	38.30%
Liver metastases	8	47.10%
Lung metastases	6	35.30%
Bone metastases	3	17.60%

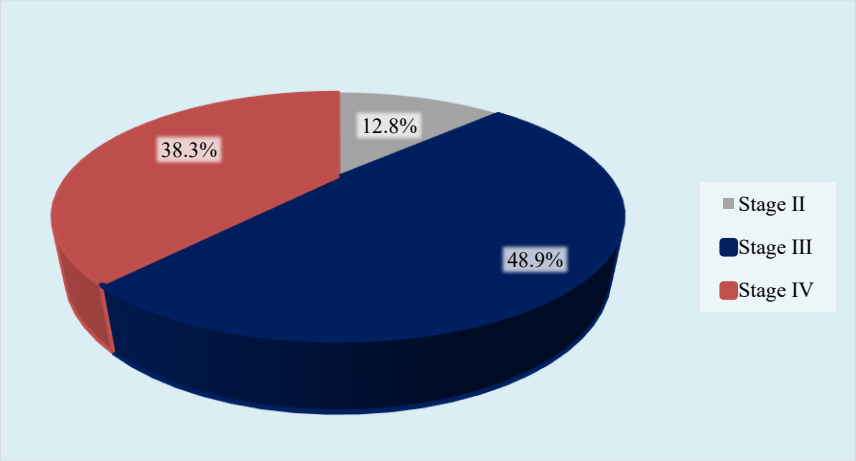

Figure 1: Tumor Staging Based on Computed Tomography Findings

Table 4: Local invasion patterns observed on CT. (N=47)

Invasion Pattern	n	%
Peri-esophageal fat stranding	34	72.3%
Tracheobronchial invasion	8	17.0%
Aortic invasion	5	10.6%
Pericardial involvement	3	6.4%

DISCUSSION

Esophageal carcinoma remains a significant global health concern, with a high mortality rate due to late-stage diagnosis and aggressive disease progression [1]. In this study, we assessed the computed tomographic (CT) findings of esophageal carcinoma in a Bangladeshi population, focusing on tumor characteristics, lymph node involvement, and metastatic patterns. Most patients in our study were male (63.8%) with a mean age of 59.2 years, consistent with global epidemiological trends showing higher incidence rates in older males [13,14]. Smoking and alcohol consumption were major risk factors, as observed in 57.4% and 40.4% of patients, respectively. These findings align with previous reports that highlight tobacco and alcohol use as key contributors to esophageal squamous cell carcinoma [15,16]. Tumor localization was most common in the middle esophagus (46.8%), followed by the lower esophagus (38.3%) and upper esophagus (14.9%). This distribution is comparable to findings from studies in Asian populations, where mid-esophageal involvement is frequently reported [6]. CT findings revealed that 89.4% of tumors exhibited irregular wall thickening, while

83.0% had luminal narrowing. These imaging characteristics are well-documented indicators of advanced disease [17,18]. Contrast enhancement patterns showed that 70.2% of tumors had heterogeneous enhancement, a feature associated with necrotic or infiltrative tumors [9]. Lymph node involvement was present in 72.3% of patients, with paraesophageal (64.7%) and mediastinal (35.3%) lymphadenopathy being the most commonly affected regions. Lymphatic spread is a crucial determinant of disease progression, and its high prevalence in our cohort is in line with studies emphasizing the role of nodal metastases in prognosis [19]. Distant metastases were observed in 38.3% of cases, with the liver being the most frequent metastatic site (47.1%), followed by the lungs (35.3%) and bones (17.6%). This metastatic pattern is consistent with previous research indicating hepatic and pulmonary involvement as common in esophageal carcinoma [20,21]. Tumor staging based on CT findings showed that no patients were diagnosed in stage I, with the majority being classified as stage III (48.9%) and stage IV (38.3%). This reflects the late presentation of esophageal carcinoma in our setting, a challenge also reported in other studies conducted in South Asian countries [22]. The absence of early-stage detection highlights the need for improved screening strategies and early diagnostic approaches, such as endoscopic ultrasound and PET-CT, which have shown promise in detecting early lesions and assessing treatment response [23,24]. The presence of peri-esophageal fat stranding (72.3%) and tracheobronchial invasion (17.0%) suggests extensive local disease, which significantly impacts surgical planning and prognosis [25]. Invasion into the aorta (10.6%) and pericardium (6.4%) further underscores the aggressive nature of esophageal carcinoma and the importance of preoperative imaging for assessing resectability [26].

LIMITATIONS

Our study provides valuable insights into the CT characteristics of esophageal carcinoma in a tertiary care hospital in Bangladesh. However, its limitations include a relatively small sample size and the lack of histopathological correlation for certain imaging findings.

CONCLUSION

This study highlights the key computed tomographic findings in patients with esophageal carcinoma, emphasizing tumor localization, morphological characteristics, lymph node involvement, and metastatic patterns. The predominance of late-stage presentation underscores the need for early detection strategies. Improved screening, advanced imaging modalities, and timely interventions are essential to enhance patient outcomes. Future studies incorporating multimodal imaging and molecular diagnostics may further refine diagnostic accuracy and treatment planning.

RECOMMENDATION

Early screening for esophageal carcinoma, especially in high-risk populations, should be prioritized. Enhanced diagnostic techniques, including endoscopic ultrasound and PET-CT, can aid in early detection. Additionally, public health initiatives focusing on reducing tobacco and alcohol consumption may help lower the incidence of esophageal cancer.

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