e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(11); 206-211

Original Research Article

Histopathological Spectrum of Esophageal Biopsy Specimens in Northwest Rajasthan

Shaina Raheja[1], Anuradha[2], Monika Choudhary[3]

[1,2,3]Assistant Professor, Department of Pathology, Sardar Patel Medical College, Bikaner

Received: 18-08-2024 / Revised: 21-09-2024 / Accepted: 26-10-2024
Corresponding author: Dr. Monika Choudhary
Conflict of interest: Nil

Abstract:

Introduction: Esophageal lesions, both malignant and non-malignant, pose significant clinical challenges due to their overlapping symptoms, the potential for malignancy, and the global burden of esophageal cancer, particularly in developing regions.

Methods: The study included 103 esophageal biopsy specimens collected at a regional cancer center in Rajasthan. Biopsies were processed via paraffin embedding, microtome sectioning, and staining techniques, including hematoxylin and eosin. Inadequate, improperly fixed, or degenerated specimens were excluded. Data analysis considered patient demographics, lesion classification, and histopathological findings. Chi-square tests were used to assess statistical significance among groups.

Results: The mean participant age was 54.41 years, with a near-equal gender distribution (51.5% females, 48.5% males). Malignant lesions dominated the spectrum, accounting for 88.3% of cases, primarily squamous cell carcinoma (97.8% of malignant lesions). Non-neoplastic lesions constituted 8.7%, with conditions like Barrett's esophagus (22.2%) and reflux esophagitis (44.4%) being the most frequent. Benign lesions were rare, comprising 2.9% of the total cases. Age was significantly associated with lesion type ($p = 0.009$), with malignant lesions most prevalent in the 41–80 age group.

Conclusion: This study highlights the predominance of squamous cell carcinoma among esophageal lesions in Northwest Rajasthan, emphasizing the significance of histopathological analysis in diagnosing and managing esophageal conditions. The findings advocate targeted screening, especially for older adults.

Keywords: Upper GI biopsy, Esophagus, SCC, Adenocarcinoma.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The esophagus can be affected by a wide range of malignant and non-malignant lesions, many of which are commonly diagnosed with esophageal biopsies [1]. While esophageal cancer represents a significant portion of malignancies with poor outcomes, non-malignant lesions are also clinically important as they can mimic cancer or represent precursors to malignancy [2]. Non-malignant lesions of the esophagus include a variety of inflammatory, infectious, and structural abnormalities.

Although these lesions are benign, they can often mimic the symptoms of esophageal cancer or lead to malignant transformation [3]. Esophagitis can be classified as reflux esophagitis, eosinophilic esophagitis, and infective esophagitis. Reflux esophagitis can result from GERD and is one of the most common non-malignant esophageal conditions [4]. Eosinophilic esophagitis is a chronic allergic inflammatory condition marked by the infiltration of eosinophils in the esophageal epithelium [5]. Infectious esophagitis is common in immunocompromised individuals and can be caused by Candida, herpes simplex virus (HSV), or cytomegalovirus (CMV) [6]. Barrett's esophagus is considered a premalignant condition where the normal squamous epithelium of the esophagus is replaced by columnar epithelium with intestinal metaplasia, increasing the risk of developing adenocarcinoma [7].

Benign esophageal tumors include leiomyomas, fibrovascular polyps, and others [8]. Esophageal cancer is a highly aggressive malignancy with a poor prognosis, contributing significantly to global morbidity and mortality [9]. Esophageal carcinoma ranks as the eighth most common cancer and is the sixth leading cause of cancer-related deaths globally, with over 80% of cases and deaths occurring in developing nations despite advances in diagnosis and treatment [10]. The five-year survival rate for patients diagnosed with esophageal cancer remains low, ranging between 15% and 20% [11]. The incidence and histological types of esophageal cancer vary dramatically depending on

geographic region. Squamous cell carcinoma (SCC) of the esophagus is the predominant type in regions such as Eastern Asia, the Middle East, and parts of Africa, where rates of SCC have been reported as high as 100 cases per 100,000 people annually in the "Asian esophageal cancer belt" [12]. In contrast, adenocarcinoma (ADC) is more prevalent in Western nations and primarily arises from Barrett's esophagus, a condition caused by long-standing gastroesophageal reflux disease (GERD) [13]. This variation is largely attributed to differences in environmental risk factors and diet across regions [14].

Several factors increase the risk of developing esophageal cancer. Lifestyle habits such as smoking, alcohol consumption, and the regular intake of hot beverages are significant risk factors for SCC, especially in lower-income societies [15]. In these regions, severe malnutrition, low intake of fruits and vegetables, and micronutrient deficiencies, particularly vitamins, exacerbate the risk [16]. Additionally, economic status plays a role, as esophageal cancer is more prevalent in societies with limited access to healthcare and nutritious food [17].

Histopathology plays a most important role in the confirmatory diagnosis of esophageal lesions. Histopathological examination plays a crucial role in the diagnosis, classification, and management of esophageal lesions. Through microscopic examination, histopathology identifies tissue alterations that reflect the underlying disease, guiding clinical decisions and treatments [18].

Material and Methods

The study was carried out in the Department of Pathology, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner. It included the esophageal biopsies which were received with relevant clinical history and submitted for histopathological examination. These were processed routinely and examined under microscope.

Inclusion Criteria: All the adequate esophageal biopsies received at Pathology department, Sardar Patel Medical College. All the samples with relevant and adequate patient data are available.

Exclusion Criteria: Inadequate biopsies, biopsies received without fixatives or degenerated samples.

The tissue was processed by means of paraffin wax processing which consists of the following steps: - 1. Fixation and grossing: The specimens were fixed in 10% formalin for 4-24 hours. Then gross features were examined, and representative sections were taken. 2. Tissue processing: Sections were subsequently processed in auto Technicon machine 3. Block making: The paraffin embedded tissues were blocked in paraffin with the help of molds. 4. Section cutting and slide making: 2- 4-micron thick sections were cut on rotary microtome and floated onto the slides already coated with albumin. 5. Staining: Hematoxylin and eosin staining was done. Special stains were used wherever required.

Observation and results

In the present study a total of 103 oesophageal biopsies were included as per the inclusion and exclusion criteria. The mean age of the patients was 54.41 years, with a median age of 55.00 years, and a standard deviation of 14.892 years. This indicates that the participants' ages were spread over a wide range, centered on their mid-50s. There were 53 (51.5%) females and 50 (48.5%) were male. This nearly equal distribution ensures that both sexes were adequately represented in the study.

Out of the total 103 cases, the majority (88.3%) of the lesions were malignant, with only 2.9% being benign and 8.7% classified as non-neoplastic.

Table 1 breaks down the age and sex distribution of the participants. Most participants (49.51%) fell within the 41–60 age group, with nearly equal male and female representation across most age categories. No significant association was found between age group and sex distribution (Chi-square = 1.961, $p = 0.743$). Table 2 analyses the type of lesion in relation to age groups. Malignant lesions were predominant, especially in the 41-60 and 61-80 age groups, with a significant relationship between age and lesion type (Chi-square = 20.517, $p = 0.009$), indicating older age groups had a higher proportion of malignant lesions.

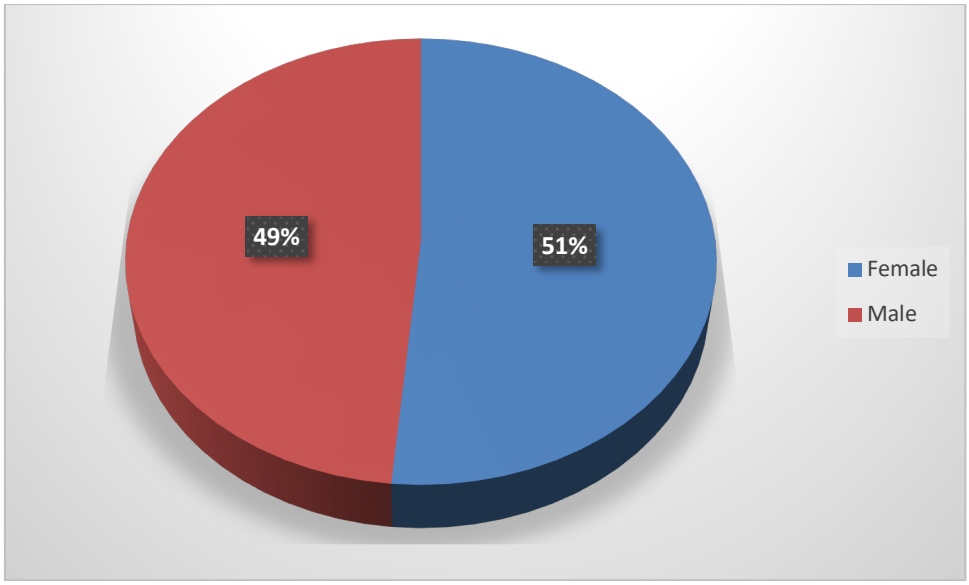

Figure 1: Gender wise distribution of cases

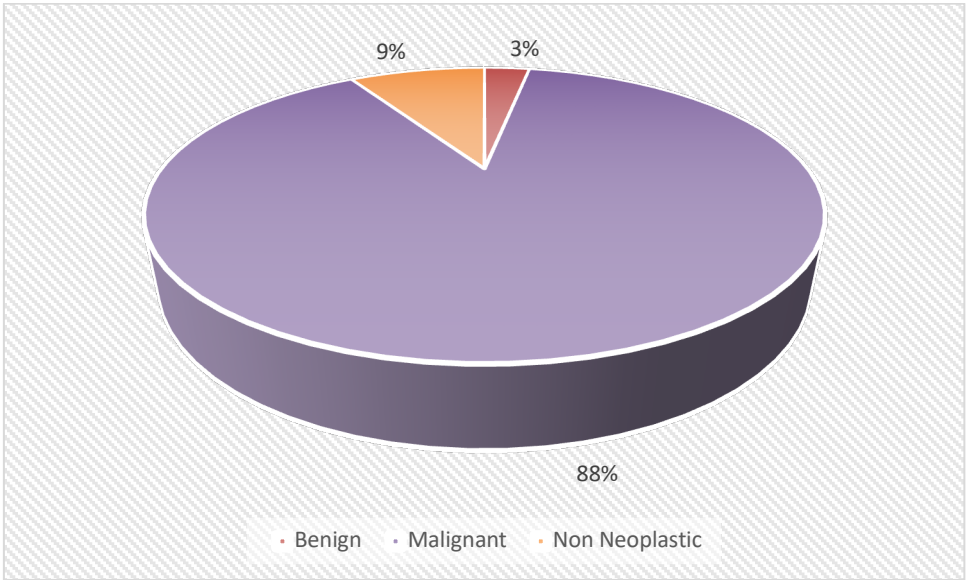

Figure 2: Distribution of cases according to type of lesion.

Table 1: Age groups and gender wise distribution of cases

	Sex					
Age Group	**Female**		**Male**		**Total**	
	Count	**%**	**Count**	**%**	**Count**	**%**
1 - 20	1	33.3%	2	66.7%	3	2.91%
21 - 40	9	60.0%	6	40.0%	15	14.56%
41 - 60	28	54.9%	23	45.1%	51	49.51%
61 - 80	14	45.2%	17	54.8%	31	30.10%
81- 90	1	33.3%	2	66.7%	3	2.91%
Total	53	51.5%	50	48.5%	103	100.0%
Chi-square	1.961					
df	4					
Sig.	0.743					

Table 2: Age group and type of lesion wise distribution of cases

	Type of lesion							
Age Group	**Benign**		**Malignant**		**Non-Neoplastic**		**Total**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**%**	**Count**	**Percent**
1 - 20	0	0.0%	2	66.7%	1	33.3%	3	2.91%
21 - 40	0	0.0%	11	73.3%	4	26.7%	15	14.56%
41 - 60	1	2.0%	47	92.2%	3	5.9%	51	49.51%
61 - 80	1	3.2%	29	93.5%	1	3.2%	31	30.10%
81- 90	1	33.3%	2	66.7%	0	0.0%	3	2.91%
Total	3	2.9%	91	88.3%	9	8.7%	103	100.0%
Chi-square	20.517							
df	8							
Sig.	0.009							

Table 3: Histopathological diagnosis in the present study.

Type of lesion	Histopathological Diagnosis	Count	Percent
Non-Neoplastic	Barrett's Esophagus	2	22.2%
	Candida esophagitis	1	11.1%
	Celiac disease	1	11.1%
	Hyperplastic polyp	1	11.1%
	Reflux esophagitis	4	44.4%
	Total	**9**	**8.73%**
Benign	Intraepithelial neoplasia high grade	1	33.3%
	Intraepithelial neoplasia low grade	2	66.7%
	Total	**3**	**2.91%**
Malignant	Adenocarcinoma	2	2.2%
	Squamous cell carcinoma	89	97.8%
	Total	**91**	**88.34%**

In the present study, malignant lesions were the most common type of lesions with 88.34% cases, with the majority being squamous cell carcinoma (97.8% of malignant lesions). Non neoplastic lesions constituted 8.73% and benign lesions 2.91% as shown in Table no. 3

Discussion

Esophageal cancers are the most common cancers found in men. Esophageal cancers rank 3rd among women after breast and cervical cancer (Somani NS et. al. [19]). Histopathological study of endoscopic biopsies is used to confirm the diagnosis in suspected malignant cases or to make diagnosis of benign condition, thus helping in early therapeutic decision. Even the slightest clinical suspicion at middle and old age warrants the endoscopic biopsy and histopathological analysis.

The age distribution in the present study, with a mean age of 54.41, reflect findings from studies in similar patient cohorts. In a comparable investigation, Lee et al. (2019) [20] reported an average age in the mid-50s which was statistically significant in the present study ($p = 0.009$), underscoring age as a risk factor for malignancy—a conclusion shared by Gupta et al. (2018) [21], who observed a similar trend.

Gender distribution in this study was nearly equal, which differs from some previous studies, such as that by Kumar et al. (2017) [22], who found a male predominance in oesophageal lesions. Sandhya et al [23] showed M:F ratio of 1.74:1. This gender balance might reflect changing lifestyle factors, including an increase in smoking and alcohol use among females in recent decades, contributing to a more even distribution across sexes. Additionally, the lack of significant association between age group and sex ($p = 0.743$) suggests that age-related risk factors affect both genders similarly in this population.

The present study results indicate a predominance of malignant lesions, particularly squamous cell carcinoma, among participants, with most cases occurring in older age groups (41–80 years). This pattern aligns with the literature, where squamous cell carcinoma is frequently the most common histological type in studies of similar demographics. Zhang et al. (2020) [24] noted a high incidence of squamous cell carcinoma in patients over 40, suggesting that age and cumulative exposure to risk factors, such as tobacco and alcohol, contribute significantly to malignancy rates in this population. However, some studies done by Sandhya P et al [23] and Shaheen A et al. [25], reported predominance of Non neoplastic lesions almost nearing to 90% (when considered as a part of esophageal lesions). The predominance of neoplastic lesions in our

study may be because, ours is a regional cancer center and cancer patients from a wide geography visit our institute.

Non-neoplastic lesions were relatively infrequent in our study, but included conditions like Barrett's esophagus and reflux esophagitis, which have been linked to the development of esophageal adenocarcinoma. In the present study, the majority of the neoplastic lesions being squamous cell carcinoma (97.8% of malignant lesions) and adenocarcinoma was rare in this study (2.2% of malignant lesions). This was in accordance with the study done by Uzma Bukhari et al [26] who reported 95% of squamous cell carcinoma and 3% of adenocarcinoma. Cherian V et al [27] also showed 92% of squamous cell carcinoma.

However, our results are non-concordant with Quereshi et al [28] and Byrne et al who had Adenocarcinoma as the predominant pattern accounting for 70.2% and 50% of esophageal cancers, likely due to the study's geographic and demographic differences, as adenocarcinoma prevalence tends to be higher in Western countries.

The present study's results underscore the high burden of squamous cell carcinoma and highlight age as a significant risk factor, consistent with findings in global literature. This data advocates for targeted screening and preventative strategies, especially for high-risk older adults. Future research should focus on exploring additional demographic and environmental risk factors in this population to align with global findings more closely.

Conclusion

This study highlights the predominance of squamous cell carcinoma among esophageal lesions in Northwest Rajasthan, emphasizing the significance of histopathological analysis in diagnosing and managing esophageal conditions.

The findings advocate targeted screening, especially for older adults. This study provides valuable insights into the histopathological patterns of esophageal lesions in a high-risk population, supporting the need for early detection and tailored interventions to improve outcomes.

Limitations

The single-center design and regional scope limit the generalizability of findings. As a cancer referral center, the high proportion of malignant cases may not reflect the general population's esophageal lesion spectrum.

References

1. Fernandez RM, Cecchini MJ. Esophageal biopsy interpretation. Curr Diagn Pathol. 2019.
2. Wright JA, Whitehead R. Malignant and pre-malignant lesions of the esophagus. J Clin Oncol. 2017; 35(5):345–51.
3. Iyer PG, Kaul V. Esophageal lesions: Mimics and precursors. Gastrointest Endosc Clin. 2018.
4. Spechler SJ, Souza RF. Pathogenesis of reflux esophagitis. Am J Gastroenterol. 2020; 115(2): 228–34.
5. Dellon ES, Liacouras CA. Eosinophilic esophagitis: Pathophysiology and clinical management. Gastroenterol Hepatol. 2021; 12(9):85–95.
6. Rubenstein JH, Shils DS. Infectious esophagitis in immunocompromised patients. Clin Gastroenterol. 2018; 24(3):67–75.
7. Shaheen NJ, Richter JE. Barrett's esophagus and adenocarcinoma. N Engl J Med. 2021; 365(2):254–61.
8. Lam AK, Wong TS. Benign tumors of the esophagus. Pathol Res Int. 2019; 18(3):44–52.
9. Pennathur A, Gibson MK, Jobe BA. Esophageal cancer epidemiology and prognosis. Lancet Oncol. 2019; 11(7):658–69.
10. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics. CA Cancer J Clin. 2018; 68(6):394–424.
11. He Z, Chen Z. Survival trends of esophageal cancer: A meta-analysis. Oncol Lett. 2020; 20(2):203–10.
12. Islami F, Torre LA, Jemal A. The Asian esophageal cancer belt. Cancer Epidemiol Biomarkers Prev. 2019; 28(5):631–41.
13. Hur C, Doubeni C. GERD, Barrett's eso phagus, and adenocarcinoma. Gastroenterol Clin N Am. 2020; 15(8):445–53.
14. Lagergren J, Lagergren P. Diet and esophageal cancer risk. Ann Oncol. 2017; 28(6):1340–7.
15. Freedman ND, Abnet CC, Leitzmann MF, Hollenbeck AR, Schatzkin A. Lifestyle factors and esophageal cancer risk. J Cancer Prev. 2021; 26(4):302–10.
16. Dawsey SM, Wang G. Malnutrition and esophageal squamous cell carcinoma. Int J Cancer. 2018; 143(3):574–82.
17. Williams SK, Greenwald D. Socioeconomic factors and esophageal cancer. Gastroenterol Rev. 2021; 39(9):234–42.
18. Montgomery E, Goldblum JR. Role of histopathology in esophageal lesion diagnosis. Mod Pathol. 2018; 31(7):1000–12.
19. Somani NS, Patil P. Histopathological study of the upper gastrointestinal tract endoscopic biopsies. Ann Pathol Lab Med. 2018; 5(8):A-644-88.
20. Lee C, Chen A, Cho S. Age-related patterns in esophageal lesion incidence. Int J Gastroenterol. 2019; 47(2):98–105.

21. Gupta R, Malhotra R, Singh S. Age as a risk factor in esophageal malignancy. Gastrointest Res. 2018; 12(4):201–7.
22. Kumar S, Chaudhary P, Sharma M. Gender differences in esophageal disease prevalence. Indian J Med Res. 2017; 145(1):67–73.
23. Gulia SP, Chaudhury M. Interpretation of upper gastrointestinal tract endoscopic mucosal biopsies – A study conducted in a teaching hospital in Puducherry, India. J Med Health Sci. 2012.
24. Zhang Y. Epidemiology of esophageal cancer. World J Gastroenterol. 2013; 19(34):5598–606.
25. Bhatty S. Histopathological spectrum of upper gastrointestinal endoscopies. Med Channel. 2009; 15.
26. Bukhari U, Siyal R. Oesophageal carcinoma: A review of endoscopic biopsies. Pak J Med Sci. 2009; 25(5):845–8.
27. Cherian JV, Sivaraman R. Carcinoma of the esophagus in Tamil Nadu (South India): 16-year trends from a tertiary center. Indian J Gastrointest Liver Dis. 2007; 16(3):245–9.
28. Qureshi NA, Hallissey MT, Fielding JW. Outcome of index upper gastrointestinal endoscopy in patients presenting with dysphagia in a tertiary care hospital – A 10 years review. BMC Gastroenterol. 2007; 7(1):43. Doi: 10.1186/1471-230X-7-43.
29. Byrne JP, Mathers JM, Parry JM, et al. Site distribution of oesophagogastric cancer. J Clin Pathol. 2002; 55(3):191–4.