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Spectrum of Benign and Malignant Diseases in Patients Operated at A Tertiary Care Thoracic Surgery Center

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ABSTRACT

Objective: Thoracic surgery addresses a wide range of benign and malignant conditions, and understanding their epidemiological patterns is vital for effective healthcare planning, particularly in low- and middle-income countries. This study aimed to determine the frequency and spectrum of thoracic diseases among surgically managed patients at a major tertiary care center in Pakistan. **Methods:** A prospective observational study was conducted in the Department of Thoracic Surgery at Jinnah Postgraduate Medical Center (JPMC), Karachi. Histopathological records of patients who underwent thoracic surgical procedures between 2018 and 2024 were reviewed. A total of 286 biopsy specimens fulfilling the inclusion criteria were analyzed. Data were collected using structured questionnaires and analyzed using the Statistical Package for the Social Sciences (SPSS). **Results:** Malignant pathologies constituted a substantial proportion of thoracic diseases. Esophageal squamous cell carcinoma was the most common malignancy, representing 79% of esophageal biopsies, with a notable female predominance. Lung squamous cell carcinoma accounted for 20% of pulmonary biopsies and was strongly associated with smoking. Common benign conditions included bronchiectasis (20%), hydatid cysts (16%), and pleural tuberculosis (50%). Chest wall malignancies, such as Ewing's sarcoma and chondrosarcoma, comprised 50% of cases, while small cell carcinoma was the most frequent mediastinal malignancy (36.4%). **Conclusion:** The study demonstrates a significant burden of thoracic malignancies and benign diseases in Pakistan. The high prevalence of esophageal and lung cancers highlights the need for enhanced diagnostic capabilities, early detection programs, and targeted public health interventions. Strengthening thoracic surgical services and conducting larger epidemiological studies are essential for improving patient outcomes.

INTRODUCTION

Thoracic surgery is a highly specialized field addressing a broad spectrum of benign and malignant diseases of the lungs, esophagus, trachea, pleura, mediastinum, and chest wall[1,2]. It requires a multidisciplinary approach due to the complex nature of thoracic pathologies and their overlap with multiple organ systems[1,18]. Understanding the burden and distribution of these diseases is essential for healthcare planning, resource allocation, and service delivery, particularly in low- and middle-income countries (LMICs) such as Pakistan, where access to specialized thoracic care remains limited[3,15].

Cancer remains a significant global health challenge, contributing to substantial morbidity and mortality[5,6]. In 2022, an estimated 20 million new cancer cases were diagnosed worldwide, resulting in approximately 9.7 million deaths[6]. One in five individuals is projected to develop cancer in their lifetime, with lung, breast, and colorectal cancers being the most prevalent[3,5]. Lung cancer is the leading cause of cancer-related mortality globally, particularly among men, whereas breast cancer predominates among women[3,6,7].

Thoracic malignancies, particularly lung and esophageal cancers, contribute substantially to this global burden[5,7,9]. Lung cancer alone accounts for 1.22 million new cases and 1.8 million deaths annually, representing roughly 25% of all cancer-related mortality[5,7,9]. Incidence and mortality vary by region, with higher detection rates in high-income countries due to advanced diagnostic facilities, and higher mortality in LMICs due to limited access to healthcare services[2,3,17]. Key risk factors include tobacco smoking, secondhand smoke, air pollution, occupational exposures, and genetic predisposition, with smoking remaining the dominant contributor[1,5].

In Pakistan, GLOBOCAN 2022 reports 0.18 million new cancer cases and 0.11 million cancer-related deaths annually[11]. Frequent use of smokeless tobacco products, including areca nuts, has been strongly linked to increased

risk of lung, oral, and gastrointestinal cancers[4,13]. These findings highlight the urgent need for early detection programs, public health interventions, and strengthened diagnostic and treatment infrastructure[14,16]. Accurate histopathological examination of biopsies is critical for diagnosis, staging, and treatment planning in thoracic surgery[7,10,14].

However, epidemiological data on thoracic conditions in Pakistan remain limited, obscuring the true disease burden[15]. This study utilizes data from Jinnah Postgraduate Medical Center (JPMC), the largest teaching and referral hospital in Sindh, to analyze the distribution and frequency of thoracic diseases. The results aim to inform healthcare resource allocation, prioritize management of prevalent and severe conditions, refine diagnostic and treatment strategies, and improve patient outcomes[1,9,14]. Additionally, this study will support the training of future healthcare professionals and strengthen thoracic surgical services, laying a foundation for research and policy planning tailored to the local population[2,15,18].

Objective

To assess the spectrum of benign and malignant diseases in patients operated at a Tertiary Care Thoracic Surgery center.

METHODOLOGY

A prospective observational study was conducted in the Thoracic Surgery Department of Jinnah Postgraduate Medical Center (JPMC), Karachi, from July 2018 to June 2024. The study enrolled patients who underwent either excision or incision biopsies for thoracic pathologies. Patients with incomplete records or non-diagnostic biopsy reports were excluded. Histopathological reports of all included cases were reviewed to confirm diagnosis and classify conditions according to anatomical site and histopathological type.

A minimum sample size of 200 was determined based on reference to an internationally conducted study (7) to ensure adequate statistical power. Data were collected using a structured questionnaire after obtaining informed written consent from all participants. Collected information included demographic details, clinical presentation, biopsy site, and final histopathological diagnosis.

Data were entered and analyzed using the latest version of SPSS software. Descriptive statistics were used to summarize patient characteristics, disease distribution, and frequency of diagnoses. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Ethical approval for the study was obtained from the Institutional Review Board of JPMC, and the study was conducted in accordance with the Declaration of Helsinki.

RESULTS

A total of 286 biopsies met the inclusion criteria from 821 specimens submitted to the Histopathology Department between 2018 and 2024. Of these, 106 (37%) were from female patients and 180 (63%) from male patients, with a median age of 38 years (interquartile range-IQR: 26–51 years) (Table 1).

Table1

Gender Distribution of Biopsies

Gender	Number of Biopsies	Percentage (%)
Female	106	37
Male	180	63
Total	286	100

Distribution of Biopsies by Anatomical Site

Biopsies were obtained from 14 anatomical sites. The esophagus was the most frequently biopsied site (78 cases, 27.3%), followed by the chest wall (52 cases, 18.2%), lung (50 cases, 17.5%), pleura (24 cases, 8.4%), mediastinum (22 cases, 7.7%), thymus (14 cases, 4.9%), bronchus (12 cases, 4.2%), and other sites (34 cases, 11.8%) (Table 2).

Table 2

Distribution of Biopsy Samples by Anatomical Sites

Anatomical Sites	Number Of Biopsies	Percentage (%)
Esophagus	78	27.3
Chest Wall	52	18.2
Lung	50	17.5
Pleura	24	8.4
Mediastinum	22	7.7
Thymus	14	4.9
Bronchus	12	4.2
Other sites	34	11.8
Total	286	100

Distribution of Diagnoses by Anatomical Site

The esophagus was predominantly affected by squamous cell carcinoma (SCC) in 79% of cases (62/78), while 10% were adenocarcinoma (AC) and 11% other diagnoses. The median age of patients with AC was 55 years, compared to 38 years for SCC. Female predominance was noted among SCC cases (44 females vs. 18 males).

In the chest wall, 50% of biopsies (26/52) were diagnosed as either Ewing's sarcoma or chondrosarcoma, with patient ages ranging from 14 to 70 years (mean: 32, median: 25 years).

Among lung biopsies, 20% were SCC, 20% bronchiectasis, and 16% hydatid cysts. Median age for lung SCC cases was 65 years, with males representing 80% of cases.

Pleural biopsies (n=24) were primarily tuberculosis (50%) and adenocarcinoma (16%), with a median patient age of 41 years.

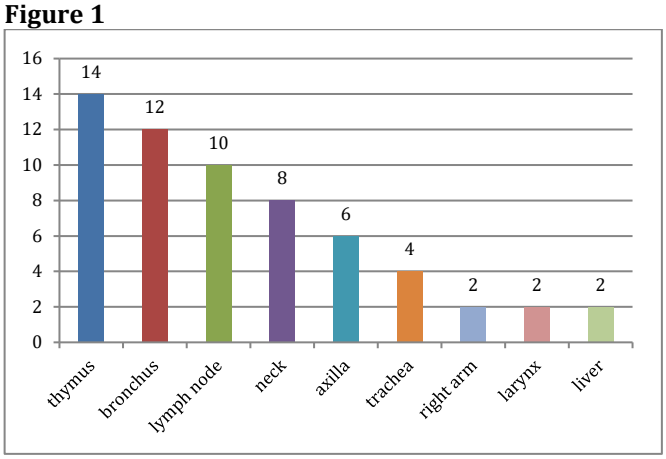
Of the mediastinal biopsies (n=22), 36.4% were small cell carcinomas, with a median age of 50 years and a male predominance (16 males vs. 6 females).

Table 3

Distribution of Diagnoses by Anatomical Site

Anatomical Site	Diagnosis	Number of cases	%age
Esophagus	Squamous Cell Carcinoma	62	79
	Adenocarcinoma	8	10
	Others	8	11
Chest Wall	Ewing Sarcoma/Chondrosarcoma	26	50
Lung	Squamous cell carcinoma	10	20
	Bronchiectasis	10	20
	Hydatid Cysts	8	16
	Others	22	44
Pleura	Tuberculosis	12	50
	Adenocarcinoma	4	16
	Others	8	34
Mediastinum	Small cell carcinoma	8	36.4
	Others	14	63.6

Figure 1



DISCUSSION

This study provides a comprehensive overview of the spectrum of thoracic diseases encountered in a major tertiary care thoracic surgery center in Pakistan, including both benign and malignant conditions. The findings underscore a substantial burden of thoracic malignancies, particularly esophageal squamous cell carcinoma (SCC), lung SCC, and mediastinal tumors, which together represent a significant proportion of cases[14,16].

Esophageal SCC was the most frequent malignancy in this cohort, accounting for the majority of esophageal biopsies and showing a notable female predominance. This pattern aligns with global data demonstrating that SCC constitutes the predominant histologic type of esophageal carcinoma in LMICs[8,18]. Region-specific sociocultural, environmental, and dietary factors, including tobacco and areca nut use, likely contribute to these trends[4,12,13]. Early detection efforts and targeted public health interventions are needed to address these modifiable risk factors[8,11].

Lung pathologies were also prominent, with SCC representing a considerable fraction of pulmonary malignancies. The gender distribution and age profile of lung SCC cases in this study reflect known global trends linked to smoking exposure and socioeconomic disparities[5,6,8]. However, disparities in lung cancer screening eligibility and healthcare access continue to challenge early diagnosis in resource-limited settings[13].

In addition to malignancies, benign pulmonary diseases such as bronchiectasis and hydatid cysts accounted for a significant proportion of lung biopsies, consistent with patterns observed in other LMIC populations where infectious and parasitic diseases remain prevalent[7,9,21]. Local data on surgical outcomes for benign lung diseases further support these observations[9].

Chest wall malignancies, including Ewing's sarcoma and chondrosarcoma, comprised a noteworthy proportion of biopsies, indicating the need for specialized surgical approaches and multidisciplinary care[1, 2]. Pleural tuberculosis was also frequently encountered, reflecting its endemicity in the region and emphasizing the importance of accurate histopathological differentiation from malignant pleural lesions[10, 23, 24]. Solitary fibrous tumors of the pleura highlight the heterogeneity of pleural pathology and the diagnostic challenges involved[10].

Mediastinal tumors, particularly small cell carcinoma and germ cell tumors, comprised a significant subset of mediastinal biopsies[11, 12]. These conditions often require multimodal management, including surgery and chemotherapy, and reinforce the role of multidisciplinary treatment models[18, 25].

Collectively, these findings illustrate persistent gaps in healthcare infrastructure, public awareness, and access to early diagnostic services, which adversely impact patient outcomes[2, 13, 15]. Targeted efforts to expand screening, enhance public health education, and strengthen diagnostic and therapeutic facilities are essential for improving the management of thoracic malignancies and complex benign diseases in Pakistan and similar LMIC settings[11, 13, 16].

CONCLUSION

This study highlights the significant burden of thoracic malignancies alongside diverse benign thoracic conditions in a tertiary care setting in Pakistan. Esophageal SCC, lung SCC, and mediastinal small cell carcinoma were the most prevalent malignancies, while bronchiectasis, hydatid cysts, and pleural tuberculosis represented common benign pathologies. The findings emphasize the crucial role of thoracic surgery in managing complex diseases and underscore the need for early detection, strengthened diagnostic capabilities, and optimized therapeutic protocols. These results provide a foundation for targeted public health strategies, efficient resource allocation, and future research to enhance patient outcomes and inform region-specific thoracic disease management.

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