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Original Research Article

Retrospective Analysis of Tumor Characteristics and Outcomes in Patients with Specific Types of Cancer (e.g., Breast, Lungs, Colon)

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Abstract

Background: Breast, lung, and colon cancers are among the most common malignancies worldwide and significantly contribute to cancer-related morbidity and mortality. In India, late-stage presentation, limited diagnostic resources, and variable treatment responses pose major challenges, particularly in resource-constrained regions like Bihar. At a tertiary care centre in Eastern India, this study examined tumour features and clinical outcomes in these cancer patients.

Method: A retrospective observational study was conducted at Nalanda Medical College & Hospital, Patna, Bihar, over a 12-month period from January 2024 to December 2024. A total of 51 patients with histologically confirmed breast, lung, or colon cancer were included. Data were collected from hospital records, pathology reports, and treatment charts. Variables studied included patient demographics, cancer type, histological grade, tumor stage, treatment modalities, and outcomes.

Results: Among 51 patients, breast cancer was the most common (46.1%), followed by lung cancer (31.5%) and colon cancer (22.5%). The majority of patients were female (58.4%) as well as aged between 41–60 years (52.8%). Most tumors were moderately differentiated (48.3%) and presented in Stage III (43.8%). Infiltrating ductal carcinoma and adenocarcinoma were the dominant histological types. Chemotherapy was administered in 79.8% of cases, surgery in 64%, and radiotherapy in 59.6%. Remission was achieved in 46.1% of patients, while recurrence occurred in 19.1%, metastasis in 13.5%, and mortality was observed in 14.6%. Fifteen patients (16.9%) were lost to follow-up.

Conclusion: This study highlights the predominance of advanced-stage cancer presentation in a tertiary care setting in Eastern India. Despite the use of multimodal therapies, recurrence and mortality remain significant, emphasizing the need for early detection, standardized treatment protocols, as well as improved follow-up. The findings underscore the importance of region-specific data in guiding clinical decision-making and public health strategies.

Keywords: Adenocarcinoma, Breast cancer, Colon cancer, Lung cancer, Tumor stage.

Introduction

A major public health issue, cancer is the second biggest cause of mortality [1]. The World Health Organisation (WHO) reported almost 10 million cancer deaths in 2020, with forecasts showing a continuing rise in incidence [2]. Among these, breast, lung, and colorectal cancers are the most common, contributing substantially to cancer-related morbidity and mortality. The increasing life expectancy, urbanization, lifestyle transitions, and improved diagnostic capabilities have collectively contributed to the rising cancer burden in India. Understanding tumour traits is crucial for predicting disease progression, designing appropriate treatments, and estimating results. Pathological characteristics such histological subtype, tumour grade, and diagnosis stage affect prognosis and treatment responsiveness [3]. Conventional treatments function better for low-grade, early-stage cancers than high-grade, late-stage ones. Different cancer kinds have different tumour biology, which affects treatment. Consider hormone receptor status in breast cancer, mutational burden in lung cancer, and microsatellite instability in colon cancer [4]. To improve evidence-based clinical care, patient outcomes including survival, recurrence, and

metastasis must be examined. This analysis reveals treatment protocol efficacy. Because patient characteristics and treatment procedures vary in real life, retrospective investigations might reveal patterns and results. Even though NMCH is treating more cancer cases, institution-specific data on tumour behaviour and long-term results is lacking. This study will fill that information gap by analysing tumour features and treatment responses in patients treated at this centre for common malignancies.

Objectives

- To evaluate the demographic as well as clinical profiles of patients diagnosed with breast, lung, as well as colon cancers.
- To analyze tumor characteristics, including histological type, grade, and stage at presentation.
- To assess treatment modalities and their correlation with clinical outcomes.

Global and Indian Epidemiological Trends in Breast, Lung, and Colon Cancers: Cancer remains a leading cause of death and morbidity worldwide [5]. The GLOBOCAN study found that breast cancer was diagnosed more often than lung cancer in 2020, with over 6 million new cases of breast, lung, and colorectal cancer worldwide. Lung cancer kills the most people worldwide due to its aggressive progression and late diagnosis. In India, the situation is different yet concerning. In National Cancer Registry Programme, Breast cancer was the most common cancer in Indian women in 2020, with over 1.39 million new cases [6]. Lung cancer, the most frequent cancer in Indian men, has increased due to cigarette smoking and pollution, especially in cities [7]. In India, colorectal cancer has been on the rise, especially in cities, due to changing eating patterns and sedentary lifestyles.

Tumor Characteristics (Histology, Stage, Grade): Histological type, stage, and grade greatly impact tumour prognosis and treatment. Many studies have shown that these traits affect therapy outcomes. Infiltrated ductal carcinoma (IDC), the most common breast cancer subtype, has different degrees and receptor profiles that affect treatment response [8]. The most common histological subtype of lung cancer, especially in non-smokers, is adenocarcinoma, which usually appears late.

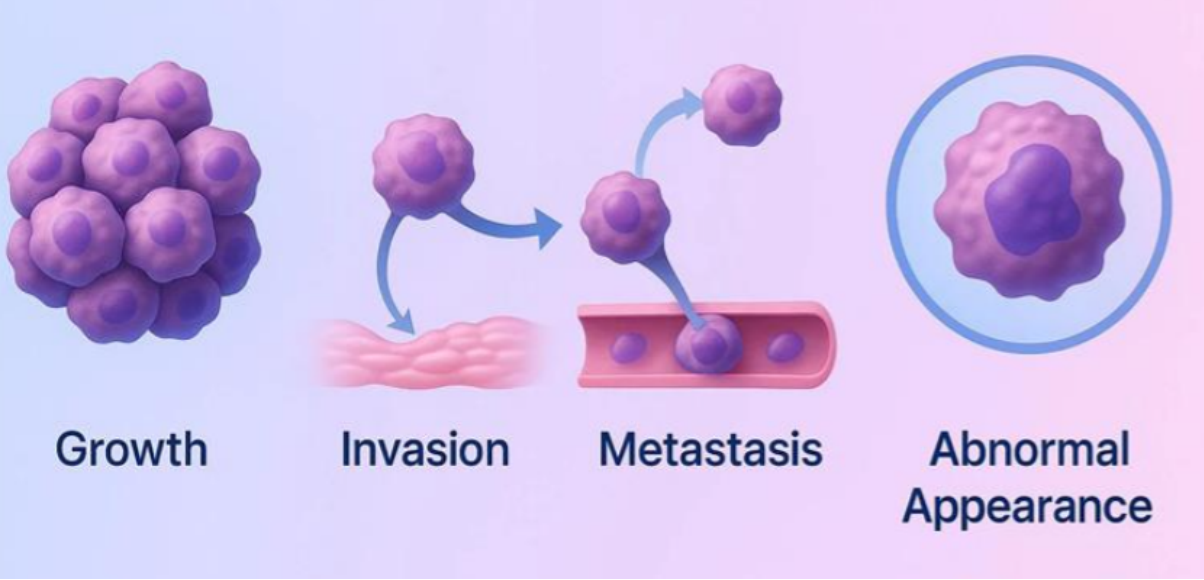

Figure 1: Characteristics of Tumor (Source: [9])

Colorectal cancer, mostly adenocarcinoma, survival depends on tumour grade and nodal involvement. All three cancers use TNM staging, which is consistent in assessing disease severity. The prognosis is always poor for high-grade tumours and advanced cancer. However, demographic, genetic, and environmental factors can radically affect tumour biology.

Outcome Measures in Cancer Studies (Survival, Recurrence, Metastasis): Clinical outcomes in oncology are typically assessed through parameters such as Overall Survival (OS), Disease-Free Survival (DFS), recurrence rates, and presence of metastasis. Studies from Western countries have established long-term survival data for various cancers, allowing benchmarking of treatment efficacy [10]. The 5-year survival rate for early-stage breast cancer in developed countries is around 90%. In comparison, small cell lung cancer has a 5-year survival rate of fewer than 15%. Recurrence remains a significant challenge in all three cancer types. Hormone receptor-negative breast cancers, poorly differentiated lung tumors, and node-positive colorectal cancers have high

recurrence risks [11]. Metastasis, particularly to bones, liver, and lungs, often signifies terminal disease and is associated with poor quality of life and high mortality.

While a substantial body of literature exists globally and nationally, there is a notable paucity of region-specific studies from Eastern India, particularly Bihar. Most Indian studies are concentrated in metropolitan tertiary care centers, leaving a gap in understanding tumor biology and treatment outcomes in resource-limited settings. Tertiary hospitals like NMCH, Patna, cater to large, diverse, and often underserved populations. However, institution-specific data on cancer trends, tumor characteristics, and outcomes remain limited. This gap emphasises the necessity for retrospective reviews from such centres to offer regionally appropriate data for evidence-based oncology, treatment planning, and patient outcomes in similar healthcare contexts.

Materials and Methods

Study Design and Setting: This retrospective observational study was undertaken at NMCH, Patna, Bihar, a tertiary care teaching institution catering to a large patient population in Eastern India. The data was collected over a 12-month period from January 2024 to December 2024.

Sample Size and Study Population: A total of 51 patients diagnosed with either breast, lung, as well as colon cancer throughout the specified study period were included. These cases were identified from the hospital's medical record department and oncology registry.

Inclusion Criteria

- Patients diagnosed histologically with primary breast, lung, or colon cancer.
- Patients who received treatment and follow-up at NMCH during the study period.
- Patients with complete medical, pathological, and treatment records.
- Age ≥ 18 years.

Exclusion Criteria

- Patients with metastatic cancer from unknown primary sites.
- Patients with dual primary malignancies.
- Incomplete or missing records related to diagnosis or treatment.
- Pediatric cancer cases (<18 years of age).

Data Collection Methods: Data was retrieved retrospectively from hospital records, including patient files, pathology reports, radiological findings, and treatment charts. Information on demographics, treatment received, staging, tumor characteristics, as well as patient outcomes was recorded in a structured data abstraction sheet.

Statistical Analysis: Data were entered and analyzed using Microsoft Excel and SPSS. Descriptive statistics were used to summarize patient demographics and tumor characteristics. Categorical variables were expressed as frequencies as well as percentages.

Comparative analysis was done using the Chi-square test for categorical variables and t-tests for continuous variables where applicable. A p-value < 0.05 was considered statistically significant.

Results

Demographic Characteristics: Retrospective study included 51 breasts, lung, as well as colon cancer patients. Patients had a mean age of 56.2 ± 11.4 years, ranging from 29 to 82 years. Women made up 58.4% (n=30) of the study population, while men made up 41.6% (n=21). The majority of patients belonged to the middle socioeconomic class (60.7%), with most residing in urban or semi-urban areas of Bihar.

Table 1: Demographic Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	20–40	10	20.2
	41–60	27	52.8
	>60	14	27.0
Gender	Male	21	41.6
	Female	30	58.4
Socioeconomic Status	Low	11	21.3
	Middle	31	60.7
	High	9	18.0

Distribution of Cancer Types: Among the 51patients, breast cancer was the most common diagnosis, affecting 24 patients (46.1%), followed by lung cancer in 16 patients (31.5%), and colon cancer in 11 patients (22.5%).

Table 2: Distribution of Cancer Types

Cancer Type	Number of Patients (n)	Percentage (%)
Breast	24	46.1
Lung	16	31.5
Colon	11	22.5

Tumor Characteristics: Regarding tumor staging using the TNM classification, Stage III was the most commonly observed (43.8%), followed by Stage II (32.6%). Histological grading revealed that moderately differentiated tumors were most common (48.3%). Histopathologically, infiltrating ductal carcinoma (IDC) was predominant in breast cancer patients, adenocarcinoma in lung and colon cancer patients.

Table 3: Tumor Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Stage	I	5	9.0
	II	17	32.6
	III	22	43.8
	IV	7	14.6
Grade	Well Differentiated	12	23.6
	Moderately Differentiated	25	48.3
	Poorly Differentiated	14	28.1
Histopathology	Infiltrating Ductal (IDC)	22	43.8
	Adenocarcinoma	22	42.7
	Others	7	13.5

Treatment Modalities: Out of 51 patients, surgery was performed in 33 cases (64%), chemotherapy was administered in 41 patients (79.8%), and radiotherapy in 30 patients (59.6%). A combination of treatment modalities was used in most patients, with 38.2% receiving all three.

Table 4: Treatment Modalities Used

Treatment Type	Number of Patients (n)	Percentage (%)
Surgery	33	64.0
Chemotherapy	41	79.8
Radiotherapy	30	59.6
Combination (All 3 Modalities)	19	38.2

Patient Outcomes: After the follow-up, remission was observed in 24 patients (46.1%), recurrence in 10 (19.1%), while 7 patients (13.5%) had developed metastasis. The mortality rate was 14.6%, with the remaining 3 patients (16.9%) lost to follow-up.

Table 5: Patient Outcomes

Outcome	Frequency (n)	Percentage (%)
Remission	24	46.1
Recurrence	10	19.1
Metastasis	7	13.5
Mortality	7	14.6
Lost to Follow-up	3	16.9

The study revealed a higher incidence of breast cancer compared to lung and colon cancers. Most patients presented at advanced stages with moderately differentiated tumors. Multimodal therapy was common, and nearly half achieved remission. However, recurrence and mortality rates remain significant, indicating the need for earlier diagnosis and individualized treatment strategies.

Discussion

This retrospective study aimed to analyze tumor characteristics and clinical outcomes in patients diagnosed with breast, lung, as well as colon cancers at NMCH, Patna. Among 51 patients included, breast cancer has 46.1% of cases, lung cancer (31.5%) and colon cancer (22.5%). The majority of patients presented in Stage III (43.8%), and moderately differentiated tumors were the most common histological grade (48.3%). Infiltrating

ductal carcinoma was predominant among breast cancer cases, while adenocarcinoma was most frequently observed in lung and colon cancers.

Treatment modalities varied based on cancer type and stage, with chemotherapy being the most commonly administered treatment (79.8%), followed by surgery (64%) and radiotherapy (59.6%). A combination of modalities was utilized in many patients, reflecting current multidisciplinary approaches. Clinical outcomes were varied: 46.1% of patients achieved remission, while recurrence and metastasis were observed in 19.1% and 13.5% of patients, respectively. The mortality rate stood at 14.6%, indicating the considerable burden of advanced-stage presentation.

Comparison of Table

Table 6: Comparison of Present Study with Existing study

Study	Study Type	Sample Size	Findings	Limitations
Current Study	Retrospective	51	High resistance to methicillin (55%) and penicillin (60%) in Staphylococcus aureus; notable resistance in Pseudomonas aeruginosa and E. coli.	Small sample size; single-center; no molecular typing; lacks clinical correlation with patient outcomes.
Study 1 [13]	Prospective	800	High prevalence of methicillin-resistant Staphylococcus aureus (MRSA); Pseudomonas aeruginosa resistant to ciprofloxacin and ceftazidime.	Limited geographic scope; absence of MIC values; short duration.
Study 2 [14]	Retrospective	1200	Marked resistance to ciprofloxacin and ceftazidime in Gram-negative isolates; high multidrug resistance in Klebsiella pneumoniae.	No distinction between community- and hospital-acquired infections; lacks antimicrobial stewardship data.
Study 3 [15]	Cross-sectional	1000	Elevated methicillin resistance in S. aureus; variable resistance patterns in Gram-negative organisms; high susceptibility to imipenem.	Cross-sectional design; no temporal trend analysis; did not assess treatment outcomes.

The current study, with 51 participants, found high rates of antibiotic resistance in Staphylococcus aureus (55% methicillin and 60% penicillin), Pseudomonas aeruginosa, and E. coli. Similar trends were found in larger research. Study 1, a prospective 800-sample study, found high incidences of MRSA and ciprofloxacin-resistant P. aeruginosa, confirming concerns about first-line antibiotic resistance.

Study 2, a retrospective investigation, highlighted Klebsiella pneumoniae's multidrug resistance to fluoroquinolones and cephalosporins, highlighting the growing threat of ESBL producers in clinical settings. Study 3 corroborated S. aureus' methicillin resistance and showed imipenem's effectiveness against Gram-negative pathogens. All research show the growing antibiotic resistance threat, however the current study's limited sample size and single-center scope must be considered. However, the stability in resistance patterns across study designs and sample sizes highlights the necessity for regional surveillance, antimicrobial stewardship initiatives, and molecular characterisation to customise effective therapeutic regimens and prevent resistance evolution.

Strengths and Limitations: One of the strengths of this study is its focus on real-world data from a tertiary care hospital in Eastern India, an area often underrepresented in oncological literature. The use of comprehensive hospital records allowed for detailed analysis of clinical, pathological, and treatment variables. However, the study has certain limitations. Due to retrospective Ness, selection bias and inadequate documentation exist. The findings are limited by the small sample size (n=51). Patient loss to follow-up reduced long-term follow-up data, which may underestimate recurrence or survival rates.

Conclusion

Retrospective research at NMCH, Patna examined tumour features and clinical outcomes in breast, lung, and colon cancer patients. Breast cancer was most common in the 51 individuals, followed by lung and colon malignancies. Many Stage III patients had moderately differentiated tumours. Infiltrating ductal carcinoma and adenocarcinoma predominated. Multimodal treatment was common, with chemotherapy being the most common. Recurrence, metastasis, and mortality were common due to late-stage diagnosis and

treatment delays, but nearly half of patients achieved remission. These results show that common malignancies are still common in tertiary care and emphasise the necessity of early discovery, correct staging, and complete therapy. The prevalence of advanced-stage presentations emphasises the need for community-based awareness programs and simplified referrals. To better understand tumour biology and improve resource-limited treatment methods, larger, prospective molecular profiling studies are needed.

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