ORIGINAL ARTICLE

Hospital-Based Descriptive Analysis of Surgically Treated Malignancies: A Single Center Four-Year Experience

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ABSTRACT

Objective: To describe the institutional pattern of histologically confirmed malignancies managed surgically at a tertiary care hospital in Gilgit-Baltistan (GB), Pakistan, and to identify the need for structured cancer surveillance in the region.

Study Design: Retrospective record-based descriptive analysis.

Place and Duration of Study: Department of General Surgery, Shaheed Saif ur Rehman Government Teaching Hospital, Gilgit, 1st January 2021 – 31st December 2024.

Materials and Methods: Records of patients with confirmed malignant tumors treated surgically during the study period were reviewed. Tumor sites were classified using ICD-10 codes and histological diagnoses verified from pathology reports. Descriptive statistics were applied to summarize demographic and tumor characteristics. Association between gender and tumor site was analyzed using the Chi-square test.

Results: One hundred twenty-one surgically managed malignancies were included (mean age 52.4 ± 14.8 years; male-to-female ratio 1.05:1). The most frequent tumor sites were stomach (18.1%), skin (15.7%), retroperitoneum/peritoneum (15.7%), colorectal (9%), breast (9%), and ovary (8.2%). Gastrointestinal malignancies collectively constituted 35.3% of cases. Adenocarcinoma was the predominant histological subtype in gastrointestinal cancers. The annual number of cases treated increased over the four-year period, reflecting expanding surgical capacity.

Conclusion: These findings represent hospital-based case distribution rather than population-level incidence. Establishment of a regional cancer registry is essential to generate reliable epidemiological data for health planning in Gilgit-Baltistan.

Introduction

With an estimated mortality rate of 10.0 million deaths worldwide, Cancer is the second leading cause of death among non-communicable diseases.[1] A total of 19.9 million new cancer cases occurred in 2022, and health experts project a 43% growth by 2040.[2] Countries with poor socioeconomic status, otherwise termed as low and middle-income countries (LMICs), lack basic diagnostic centers and treatment facilities, therefore, the disease burden can rise up to 57%.[3] Global and local data in Pakistan indicate that this life-threatening condition is growing exponentially, evident by the fact that 148,000 new cases were reported between 2015 to 2016, whereas 100,000 individuals succumb to this disease annually, as reported in the WHO country cancer profile.[4] Being an LMIC with an estimated population of 241.4 million, Pakistan cannot devote adequate resources to improving health infrastructure.[5] The Karachi Cancer Registry (KCR) and Punjab Cancer Registry (PCR) are currently the only major operational cancer registries in Pakistan. However, their ability to accurately reflect national trends in cancer incidence and epidemiology remains limited due to non-uniform data collection practices and inadequate financial support for large-scale epidemiological studies. This lack of standardized methodology and resource allocation in major metropolitan registries consequently extends to the underserved and remote regions such

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as Gilgit-Baltistan (GB), further compounding the gaps in national cancer surveillance.

Due to its rugged mountainous terrain, Gilgit-Baltistan, a small province with only 1.8 million inhabitants, faces a shortage of healthcare facilities.[6] Earlier, almost all patients were referred to other provinces for cancer treatment. Nowadays, many surgical procedures are being performed at local centers to meet regional healthcare needs. The aim of the study was to assess the incidence and patterns of cancer in Gilgit-Baltistan to inform evidence-based policy, optimize resource allocation, and support the establishment of a regional cancer registry, as cancer treatment is supported through the government endowment fund.

Materials and Methods

This retrospective hospital-based descriptive study was conducted at the Department of General Surgery, Shaheed Saif ur Rehman Government Teaching Hospital (SSGTH), Gilgit, Gilgit-Baltistan, Pakistan. Ethical approval was obtained from the Institutional Ethical Review Board (Ref No. 04/IRB/2025). The study was conducted in accordance with the Declaration of Helsinki.

All consecutive patients with **histologically confirmed malignant neoplasms** managed surgically between 1st January 2021 and 31st December 2024 were eligible for inclusion. Patients with incomplete medical records and those referred to other centers before definitive surgical management were excluded. The study population, therefore, represents surgically treated malignancies at this institution and does not reflect population-based incidence.

Data were extracted from surgical registers and verified against histopathology records. Variables collected included age, gender, anatomical site of tumor (classified according to ICD-10), and histological subtype. Tumors coded under benign classifications were excluded from the final analysis. Continuous variables (e.g., age) were summarized as mean ± standard deviation, while categorical variables (tumor site, gender, histological type) were presented as frequencies and percentages. Missing data were documented but not imputed. No population denominator was available; therefore, incidence rates were not calculated.

Associations between tumor site and gender were evaluated using appropriate categorical statistical tests after verification of assumptions. All analyses were conducted using SPSS version 26, and a two-sided p-value < 0.05 was considered statistically significant. This study is reported in accordance with the STROBE guidelines for observational studies.

Results

A total of 121 patients with histologically confirmed malignancies were managed surgically during the study period. The mean age was 52.4 ± 14.8 years. Of these, 62 (51.2%) were male and 59 (48.8%) were female. The largest proportion of cases was observed in the 31–40-year age group (n = 39; 32.2%), followed by the 41–50-year and 51–60-year groups (each n = 21; 17.4%) (Table I).

The most frequently managed tumor sites overall were stomach (n = 22; 18.1%), skin (n = 19; 15.7%), retroperitoneum/peritoneum (n = 19; 15.7%), colorectal region (n = 11; 9%), breast (n = 11; 9%), and ovary (n = 10; 8.2%) (Table II). Gastrointestinal malignancies (stomach, esophagus, colorectal, and appendix) collectively accounted for 35.3% of cases.

Tumor distribution differed between genders. Among males, the most common malignancies were stomach (n = 16; 25.8%) and skin (n = 15; 24.1%), followed by retroperitoneum/peritoneum (n = 11; 17.7%) and esophagus (n = 7; 11.2%). In females, breast cancer was the most frequent site (n = 11; 18.6%), followed by the ovary (n = 10; 16.9%), the colorectal (n = 8; 13.5%), and the retroperitoneum/peritoneum (n = 8; 13.3%) (Table III). The retroperitoneal masses include only primary malignant tumors of the retroperitoneum. After regrouping tumor categories to satisfy statistical test assumptions, a statistically significant difference in tumor distribution between male and female patients was observed (Chi-square test, p < 0.001). This finding reflects variation in tumor site distribution within this hospital cohort.

Histologically, adenocarcinoma was the predominant subtype in stomach (n = 19; 86.4%), colorectal (n = 10; 90.9%), esophageal (n = 6; 75%), and gallbladder cancers (n = 4; 100%). Skin malignancies were distributed between squamous cell carcinoma (n = 10; 52.6%) and basal cell carcinoma (n = 9; 47.4%). Breast cancers were primarily invasive ductal carcinoma (n = 9; 81.8%), while ovarian tumors were predominantly epithelial

in origin (n = 7; 63.6%). Retroperitoneal/peritoneal tumors were mainly leiomyosarcoma (n = 9; 47.4%) and liposarcoma (n = 7; 36.8%) (Table IV).

An increase in the annual number of surgically treated malignancies was observed over the four-year period, with the highest number recorded in 2024 (n = 40), as illustrated in Figure 1.

Table I: Age- and Gender-Wise Distribution of Patients (n = 121)

Age Group (years)	Total n (%)	Male n (%)	Female n (%)
1–10	0 (0.0%)	0 (0.0%)	0 (0.0%)
11–20	4 (3.3%)	0 (0.0%)	4 (3.3%)
21–30	23 (19.0%)	9 (7.4%)	14 (11.6%)
31–40	39 (32.2%)	15 (12.4%)	24 (19.8%)
41–50	21 (17.4%)	11 (9.1%)	10 (8.3%)
51–60	21 (17.4%)	16 (13.2%)	5 (4.1%)
61–70	8 (6.6%)	7 (5.8%)	1 (0.8%)
71–80	5 (4.1%)	4 (3.3%)	1 (0.8%)
>80	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	121 (100%)	62 (51.2%)	59 (48.8%)

Table II: Leading Cancer Sites Overall (According to ICD-10 coding)

S.No	Site (ICD-10)	Number of Cases (n)	Percentage (%)
1	Stomach (C16)	22	18.1
2	Skin (C44)	19	15.7
3	Retroperitoneum / Peritoneum (C48)	19	15.7
4	Breast (C50)	11	9.0
5	Colorectal (C18)	11	9.0
6	Ovary (C56)	10	8.2
7	Esophagus (C15)	8	6.6
8	Salivary Gland (C07, C08)	7	5.7
9	Thyroid (C73)	4	3.3
10	Gall Bladder (C23)	4	3.3
11	Soft Tissue / Subcutaneous Lesion (C49)	4	3.3
12	Appendix (C18.1)	2	1.6
Total		121	100

Table III: Gender-Wise Distribution of Cancer Sites with Overall P-Value

| S.No	Site (ICD-10)	Male (n)	% within Males (n = 62)	Female (n)	% within Females (n = 59)	Male % within Site	Female % within Site	Overall Significance (p-value)
1	Stomach	16	25.8 %	6	10.1 %	72.7 %	27.3 %	<0.01 *
2	Skin	15	24.1 %	4	6.7 %	78.9 %	21.1 %	—
3	Retroperitoneum / Peritoneum	11	17.7 %	8	13.3 %	57.9 %	42.1 %	—
4	Breast	0	0 %	11	18.6 %	0 %	100 %	—
5	Colorectal	3	4.8 %	8	13.5 %	27.3 %	72.7 %	—
6	Ovary	0	0 %	10	16.9 %	0 %	100 %	—
7	Esophagus	7	11.2 %	1	1.6 %	87.5 %	12.5 %	—
8	Salivary Gland	4	6.4 %	3	5.0 %	57.1 %	42.9 %	—
9	Thyroid	1	1.6 %	3	5.0 %	25.0 %	75.0 %	—
10	Gall Bladder	2	3.2 %	2	3.3 %	50.0 %	50.0 %	—
11	Soft Tissue / Subcutaneous	2	3.2 %	2	3.3 %	50.0 %	50.0 %	—
12	Appendix	1	1.6 %	1	1.6 %	50.0 %	50.0 %	—
Total		62	100 %	59	100 %	51.2 %	48.8 %	—
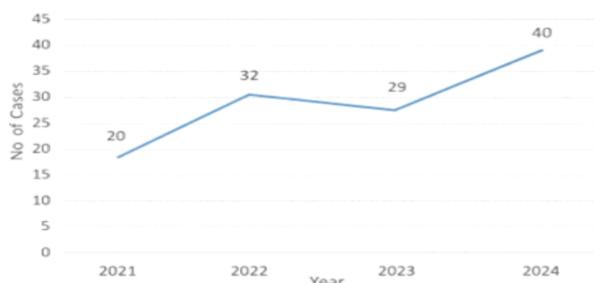
Figure 1: Surgically Treated Malignancies Over 4 Years at the Department of General Surgery, Shaheed Saif ur Rehman Government Teaching Hospital, Gilgit

Discussion

This four-year retrospective analysis describes the distribution of histologically confirmed malignancies managed surgically at a tertiary care hospital in Gilgit-Baltistan (GB). In the absence of a regional cancer registry, these institutional data provide an initial overview of the types of malignancies presenting for surgical management in this setting.

The mean age of patients was 52.4 years, with a nearly equal male-to-female distribution. The highest frequency of cases occurred in the 31–40-year age group. While this appears younger

Table IV: Distribution Of Histological Variants of Different Cancers

S.No	Site (ICD-10)	Histological Subtype	Count	% within Site
1	Stomach (C16)	Adenocarcinoma	19	86.4%
		Squamous Cell Carcinoma	2	9.1%
		GIST	1	4.5%
2	Skin (C44)	Squamous Cell Carcinoma	10	52.6%
		Basal Cell Carcinoma	9	47.4%
3	Retroperitoneum / Peritoneum (C48)	Leiomyosarcoma	9	47.4%
		Liposarcoma	7	36.8%
		Ewing Sarcoma	2	10.5%
		Synovial Sarcoma	1	5.3%
4	Breast (C50)	Invasive Ductal Carcinoma	9	81.8%
		Invasive Lobular Carcinoma	1	9.1%
		Malignant Phyllodes Tumor	1	9.1%
5	Colorectal (C18)	Adenocarcinoma	10	90.9%
		Myofibroblastic Tumor	1	9.1%
6	Ovary (C56)	Epithelial Tumors	7	63.6%
		Germ Cell Tumors	3	27.3%
		Sex Cord Stromal Tumor	1	9.1%
7	Esophagus (C15)	Adenocarcinoma	6	75.0%
		Squamous Cell Carcinoma	2	25.0%
8	Thyroid (C73)	Papillary Carcinoma	3	75.0%
		Hurthle Cell Carcinoma	1	25.0%
9	Gall Bladder (C23)	Adenocarcinoma	4	100%
10	Soft Tissue / Subcutaneous (C49)	Dermatofibrosarcoma Protuberans	2	50%
		Extraskeletal Ewing Sarcoma	2	50%
11	Salivary Gland (C07, C08)	Mucoepidermoid Carcinoma	5	71.4%
		Adenocarcinoma	2	28.5%
12	Appendix (C18.1)	Mucinous Neoplasm	2	100%

compared to national registry data, this observation likely reflects referral patterns, surgical selection bias, and the exclusion of non-surgical cases rather than true age-specific population incidence. Without age-standardized rates or population denominators, comparisons with national or global incidence trends should be interpreted cautiously.

Gastrointestinal malignancies collectively constituted the largest group (35.3%) of surgically managed cases, with stomach cancer being the most frequent single site (18.1%). Adenocarcinoma was the predominant histological subtype in stomach, colorectal, and esophageal tumors, consistent with established pathological patterns. These findings align with hospital-based reports from certain regions of Pakistan, where gastrointestinal malignancies contribute substantially to the surgical

oncology workload[7] while national studies reported breast malignancies to be the most common overall [8,9]. However, this distribution reflects cases managed at this institution rather than population-based cancer epidemiology.

Non-melanoma skin cancers accounted for 15.7% of cases and represented the second most frequent category overall. Both squamous cell carcinoma and basal cell carcinoma were observed in comparable proportions. Although high-altitude ultraviolet exposure has been described as a potential risk factor in mountainous regions, the current study was not designed to assess environmental or etiological associations.[10,11] Therefore, causal inferences cannot be drawn from these findings.

Among female patients, breast cancer was the most commonly managed malignancy, followed by ovarian cancer. These findings are consistent with national and global trends, where breast cancer remains the leading malignancy among women.[12,13] Due to late-stage diagnoses, often stemming from cultural taboos and limited awareness about available surgical treatments, Pakistan records one of the highest breast cancer mortality rates in the world.[7,13] Breast cancer continues to be the most common malignancy among women across all four provinces and Azad Jammu & Kashmir (AJK), exerting a profound emotional, physical, and financial toll on affected individuals and their families.[7] However, only surgically treated cases were included in our analysis; patients managed primarily with chemotherapy, radiotherapy, or referred to higher centers were not captured in this dataset.

Colorectal cancer emerged as a significant malignancy in both sexes, accounting for 4.8% of male and 13.5% of female cancer cases. These results are consistent with several national studies identifying colorectal cancer as a leading malignancy in Pakistan.[14,15] To enhance prognosis and mitigate the emotional and economic burden associated with its management, early detection through screening is essential for identifying precancerous lesions. Therefore, strengthening and expanding colonoscopy facilities at major hospitals across Gilgit-Baltistan is imperative for improving early diagnosis and patient outcomes

The observed increase in the number of surgically treated cases over the four-year period likely reflects

improved institutional surgical capacity, diagnostic services, and patient access rather than a quantified rise in cancer incidence. The limitations of this study included a small sample size, and It is a single-center, hospital-based analysis. It includes only surgically managed malignancies, thereby excluding hematological cancers, advanced inoperable tumors, and patients referred elsewhere. Data on tumor staging, grading, and long-term outcomes were unavailable. Consequently, these findings should not be interpreted as representing the overall cancer burden or incidence in Gilgit-Baltistan.

Despite these limitations, this study provides baseline institutional data from a geographically remote and underserved region. The findings underscore the need for systematic cancer surveillance through the establishment of a regional cancer registry. Such a registry would enable accurate estimation of incidence, facilitate resource planning, and support future population-based epidemiological research in Gilgit-Baltistan.

Conclusion

This single-center, hospital-based study describes the distribution of surgically managed malignancies in Gilgit-Baltistan over a four-year period. Gastrointestinal and skin cancers constituted a substantial proportion of cases, with gender-specific differences in tumor distribution. However, these findings reflect institutional surgical data and should not be interpreted as population-based cancer incidence or regional burden.

The observed increase in treated cases likely represents improved local surgical capacity and patient access rather than a quantified rise in disease occurrence. The absence of comprehensive population-based data highlights a critical gap in cancer surveillance in the region. Establishment of a structured regional cancer registry is essential to determine true incidence, guide preventive strategies, facilitate resource allocation, and support future epidemiological research in Gilgit-Baltistan.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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