Original Research Article

Regional cancer burdens: a retrospective analysis of demographic and diagnostic patterns in Bangladesh

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ABSTRACT

Background: Regional cancer data from low and middle-income countries (LMICs) like Bangladesh remain limited, hindering evidence-based oncology planning. This study examines demographic and diagnostic patterns among cancer patients at two tertiary centers in northern Bangladesh to inform resource-sensitive cancer control strategies.
Methods: We conducted a retrospective analysis of 547 cancer cases diagnosed between 2019 and 2021 at two major tertiary care centers. Patient records were reviewed for age, sex, residential location and cancer type. Descriptive statistics were applied to explore demographic distributions and diagnostic trends over time.
Results: The 41–60 years age group consistently accounted for the majority of cases, followed by the 61–80 years group. Females represented a growing proportion of diagnoses, increasing from 60.64% in 2019 to 69.92% in 2021. Breast cancer was the most prevalent malignancy each year (37.35% in 2019; 45.71% in 2020; 42.28% in 2021). Colorectal, stomach, cervical and lung cancers followed in frequency, with lung cancer showing an upward trend in 2021 (12.20%). Geographic analysis showed the largest patient share from Sadar, with consistent contributions from Birgonj, Birol and Phulbari and steady representation from peripheral areas over the three years.
Conclusions: This study reveals stable demographic patterns and evolving cancer type distributions in a regional Bangladeshi population. The increasing female predominance and persistent burden of breast cancer highlight the need for gender-sensitive screening programs. The rising proportion of lung cancer and continued diagnostic insufficiency underscore the importance of strengthening cancer registries, decentralizing oncology services and improving access to care in remote areas of LMICs.

Keywords: Breast cancer, Bangladesh, Cancer epidemiology, Lung cancer, Retrospective study, Regional disparities

INTRODUCTION

Cancer continues to be one of the most pressing global public health challenges, accounting for an estimated 20 million new cases and 9.7 million deaths worldwide in 2022 alone. The World Health Organization projects a staggering 47% increase in global cancer incidence by 2040, reaching nearly 28.4 million cases annually, primarily due to population growth and aging in LMICs.[1] Among the most prevalent and lethal cancer types are breast, lung, colorectal and cervical cancers, which collectively contribute to the highest cancer-related morbidity and mortality across regions and income groups. The epidemiological landscape of these malignancies continues to evolve with lifestyle transitions, environmental exposures and disparities in access to early

detection and care.[2] South Asia, particularly Bangladesh, mirrors the rising global cancer burden but faces unique challenges due to limited infrastructure, fragmented registries and delayed diagnoses. According to the most recent GLOBOCAN data, the age-standardized incidence rate (ASIR) in Bangladesh is approximately 106.2 per 100,000 population, with a corresponding mortality rate (ASMR) of 72 per 100,000.[3]

The most commonly diagnosed cancers in the Bangladeshi population include breast, lung, cervical, colorectal and prostate cancers.[3] Site-specific data from Dhaka-based hospitals confirm this ranking, with breast cancer accounting for up to 31.2% of female cases and lung cancer dominating in males (28.5%), followed by colorectal and gastric malignancies.[4] However, these patterns remain inconsistently documented across the country, underscoring an urgent need for regionalized surveillance. The absence of a nationwide population-based cancer registry further complicates the cancer data landscape in Bangladesh. Most available evidence comes from Dhaka-centric, hospital-based studies, often cross-sectional in nature and limited to one-year data sets.

There is a conspicuous lack of multi-year observational studies from tertiary care centers outside the capital, which restricts policymakers' ability to generalize national estimates or allocate resources effectively.[5] For instance, while breast cancer is repeatedly observed as the leading cancer among Bangladeshi women, the proportion ranges widely across reports highlighting inconsistencies due to variations in reporting practices, catchment demographics and follow-up capabilities.[6]

Retrospective hospital-based analyses present a cost-effective and operationally feasible approach to bridge these knowledge gaps, particularly in resource-limited contexts. They allow researchers to utilize existing paper or electronic case logs to map diagnostic patterns, patient demographics and in some cases treatment interventions over extended periods.[7]

When designed carefully, such studies can offer valuable insights into cancer site distribution using standardized systems like the International Classification of Diseases for Oncology (ICDO), while also revealing age- and sex-stratified trends vital for screening and prevention strategies.[8] This study was conducted at two district-level tertiary care hospitals in Tangail, Bangladesh: Alok Foundation Hospital in Ghatail and Digital Hospital in Sabania. These centers serve as referral hubs for a catchment population exceeding several hundred thousand, including rural and semi-urban communities with limited cancer screening access.

The institutional records used in this study included both histopathologically confirmed diagnoses and partial treatment documentation, providing a rare opportunity to examine site distribution trends along with demographic insights.[7] This dual-site, multi-year dataset allows us to generate evidence beyond the capital and evaluate the real-world cancer burden in underrepresented populations. Previous reports from tertiary hospitals in Dhaka and other cities have consistently shown breast cancer to be the most prevalent cancer among women, while lung and head-and-neck cancers dominate among men; however, regional discrepancies persist.[4,9]

METHODS

This retrospective cross-sectional study was conducted at Dinajpur Medical College Hospital and Day Care Unit and Popular Diagnostic Center, Dinajpur two major tertiary care facilities in northern Bangladesh that serve a broad catchment area, including multiple districts within the Rangpur division.

The study included all cancer patients diagnosed and documented between January 1, 2019 and December 31, 2021, yielding a total sample of 547 cases. Patient records were accessed from the hospital's oncology registry and archived medical files. Extracted variables included patient age, sex, residential address (categorized by upazila or region) and primary cancer diagnosis. Diagnoses were grouped into major cancer types, including breast, cervix, lung, prostate, hematologic malignancies and others. A critical note on cancer staging: While initial data collection sought information on cancer stage at diagnosis, this data was found to be inconsistently available and highly heterogeneous in the source documents.

The absence of standardized staging information across records is itself a significant finding, reflecting systemic challenges including the lack of appropriate investigative facilities for comprehensive staging (e.g., advanced imaging, molecular diagnostics) inherent limitations in the quality and standardization of data within the local cancer registry and the likelihood of patients presenting with more advanced disease due to the absence of organized screening programs. Consequently, a formal analysis of staging could not be reliably performed. This limitation is further discussed in the context of our findings and recommendations.

All data were entered and processed using Microsoft Excel. Descriptive statistics were applied, with categorical variables presented as frequencies and percentages and continuous variables such as age summarized using means and standard deviations. Year-wise comparisons were made to observe demographic and diagnostic shifts over the three years.

To ensure confidentiality, all patient identifiers were removed prior to analysis. Institutional permission for data usage was obtained from the hospital authority. As the study involved the analysis of retrospective, anonymized data without direct patient involvement, formal ethical approval was deemed unnecessary.

RESULTS

Figure 1 displays the annual distribution of cancer patients over the study period (2019–2021), based on a total of 547 cases. The highest number of diagnoses occurred in 2019 (n=249, 45.52%), followed by 2020 (n=175, 31.99%) and 2021 (n=123, 22.49%). This indicates a consistent year-on-year decline in reported cases throughout the three-year period.

Table 1 summarizes the age distribution of cancer patients. Across all three years, the majority of patients were in the 41–60 years age group, comprising 45.78% in 2019, 56.57% in 2020 and 43.09% in 2021. The 61–80 years group was the second largest, accounting for 32.93% in 2019, 25.71% in 2020 and 38.21% in 2021. Patients aged 0–20 years consistently represented a very small proportion across the study years. The mean age remained relatively consistent, with 51.29±13.65 years in 2019, 50.33±11.28 years in 2020 and 53.10±12.65 years in 2021.
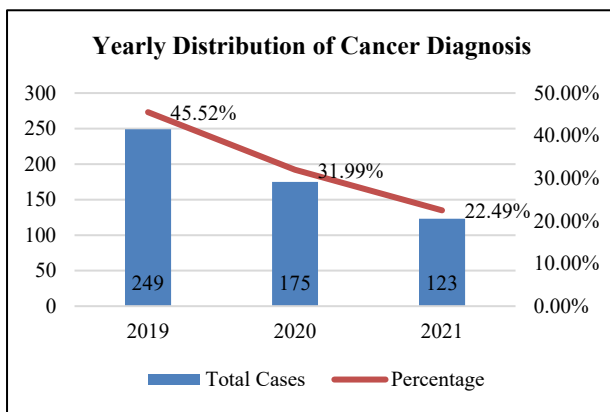

Figure 1: Distribution of cancer patients by year (n=547).

Among the total study participants, the majority (65.27%) were female, while only 34.73% were male. Table 2 outlines the gender distribution of cancer patients. Across all years, female patients consistently outnumbered males, representing 60.64% in 2019, 68.57% in 2020 and 69.92% in 2021. The proportion of male patients showed a gradual decline from 39.36% in 2019 to 30.08% in 2021, demonstrating a persistent female predominance in cancer diagnoses during the study period.
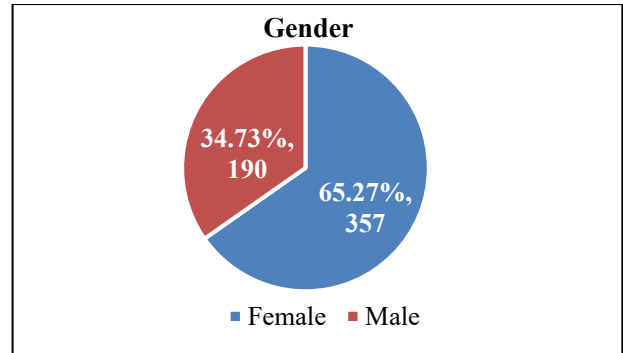

Figure 2: Gender distribution of the participants (n=547).

Table 3 presents the geographic distribution of patients. Sadar consistently had the highest representation across all three years, with 32.53% in 2019, 37.14% in 2020 and 32.52% in 2021. Birgonj and Birol followed, contributing 14.46% and 12.85% in 2019, 14.29% and 13.14% in 2020 and 14.63% and 12.20% in 2021, respectively. Other regions, such as Phulbari, Thakurgoan, Kaharol and Bochaganj, accounted for moderate proportions, generally between 4% and 10% across all years. The distribution indicates a consistent referral pattern from these geographic areas over the three-year study period.

Table 4 illustrates the year-wise distribution of cancer diagnoses. Breast cancer remained the most prevalent diagnosis, comprising 37.35% of cases in 2019, 45.71% in 2020 and 42.28% in 2021. Colorectal cancer was the second most common in 2019 (13.25%) but decreased slightly to 8.13% by 2021. Stomach cancer remained relatively stable, accounting for 9.64%, 9.14% and 8.94% across the three years, respectively.

Lung cancer increased from 8.03% in 2019 to 12.20% in 2021, indicating a rising trend. Cervical cancer was consistently reported, ranging between 7.23% and 8.94%. Other diagnoses including ovary, bladder, hematological and prostate cancers each represented smaller but significant proportions, generally between 0.8% and 6.5%. Rare cancers such as esophageal, liver, germ cell, metastatic adenocarcinoma, sarcoma and kidney cancers together contributed a minor proportion of cases. Some patients presented with multiple diagnoses, which were documented accordingly.

Table 1: Distribution of cancer patients by age distribution (n=547).

Age group (in years)	2019 (n=249)		2020 (n=175)		2021 (n=123)	
	N	%	N	%	N	%
0–20	3	1.20	0	0.00	1	0.81
21–40	46	18.47	30	17.14	20	16.26
41–60	114	45.78	99	56.57	53	43.09
61–80	82	32.93	45	25.71	47	38.21
81–100	3	1.20	1	0.57	2	1.63
100+	0	0.00	0	0.00	0	0.00
Mean±SD	51.29±13.65		50.33±11.28		53.10±12.65	

Table 2: Distribution of cancer patients by gender (n=547).

Gender	2019 (n=249)	%	2020 (n=175)	%	2021 (n=123)	%
Female	151	60.64	120	68.57	86	69.92
Male	98	39.36	55	31.43	37	30.08

Table 3: Distribution of cancer patients by address (n=547).

Address	2019 (n=249)		2020 (n=175)		2021 (n=123)	
	N	%	N	%	N	%
Sadar	81	32.53	65	37.14	40	32.52
Birgonj	36	14.46	25	14.29	18	14.63
Birol	32	12.85	23	13.14	15	12.20
Phulbari	24	9.64	16	9.14	13	10.57
Thakurgoan	22	8.84	14	8.00	13	10.57
Kaharol	15	6.02	9	5.14	5	4.07
Bochaganj	14	5.62	8	4.57	5	4.07
Nawabgonj	10	4.02	7	4.00	4	3.25
Hakimpur	8	3.21	5	2.86	3	2.44
Parbatipur	7	2.81	3	1.71	2	1.63
Total	249	100	175	100	123	100

Table 4: Distribution of cancer patients by cancer diagnosis (n=547)*.

Diagnosis	2019 (n=249)		2020 (n=175)		2021 (n=123)	
	N	%	N	%	N	%
Breast cancer	93	37.35	80	45.71	52	42.28
Colorectal cancer	33	13.25	17	9.71	10	8.13
Stomach cancer	24	9.64	16	9.14	11	8.94
Lung cancer	20	8.03	11	6.29	15	12.20
Cervical cancer	18	7.23	13	7.43	11	8.94
Ovary cancer	10	4.02	11	6.29	8	6.50
Bladder cancer	9	3.61	5	2.86	5	4.07
Hematological malignancy	8	3.21	9	5.14	1	0.81
Prostate cancer	7	2.81	4	2.29	2	1.63
Esophageal cancer	6	2.41	2	1.14	2	1.63
Liver cancer	5	2.01	2	1.14	2	1.63
Germ cell cancer	5	2.01	4	2.29	1	0.81
Metastatic adenocarcinoma	4	1.61	0	0.00	1	0.81
Sarcoma	4	1.61	0	0.00	0	0.00
Kidney cancer	3	1.20	1	0.57	2	1.63

Multiple diagnosis was observed in some patients.

DISCUSSION

This retrospective analysis of 547 cancer patients across two tertiary care centers in northern Bangladesh namely Dinajpur Medical College Hospital and Day Care Unit, Popular Diagnostic Center, Dinajpur offers important insights into regional cancer epidemiology in a LMIC setting. A noteworthy finding in this study was the progressive decline in documented cancer cases across the study period, from 249 cases in 2019 to 175 in 2020 and further down to 123 in 2021. While this downward trend might suggest a reduction in incidence, the more plausible explanation lies in the pandemic-related disruptions to healthcare access, including lockdowns, reduced outpatient services and patient hesitancy in seeking care. Similar findings have been reported across Bangladesh, where oncologists reported significant delays in diagnosis, reduced patient volume and triaging disruptions during the COVID-19 surge in 2020.[1] Additionally, screening activities such as cervical cancer programs in Bangladesh saw a 14.1% decline in 2020 compared to the previous year, with screening volumes dropping to just 5.1% of prior levels during the peak outbreak, indicating nationwide diagnostic interruption.[2] Across all three years, the age group most affected by cancer was 41–60 years, followed by the 61–80 years group, consistent with

patterns reported in other hospital-based studies in Bangladesh.

For instance, breast and stomach cancer studies conducted at BSMMU and Dhaka Medical College report similar mid-life peaks with mean ages of 51–57 years.[3,4] Pediatric and elderly cases were rare, reflecting the lower age-standardized incidence reported among the 0–20 and 81+ age groups. The mean patient age in the current study remained relatively stable around the 51–53-year range, supporting a consistent middle-aged peak in the cancer burden.

The gender distribution in this study showed a clear and progressively increasing female predominance, from 60.64% in 2019 to 68.57% in 2020 and 69.92% in 2021. This skew is not incidental and reflects national trends where breast and cervical cancers are leading contributors to the female cancer burden. These findings underscore geographic disparities in cancer care access and highlight the need to decentralize oncology services, particularly to peripheral districts underserved by national screening programs.[6,10]

In addition to demographic and diagnostic variables, the present study also examined geographic trends in patient origin. Sadar consistently contributed the highest proportion of cases each year, accounting for 32.53% in 2019, 37.14% in 2020 and 32.52% in 2021, likely reflecting its role as an urban hub with easier access to tertiary care. Other frequently represented locations included Birgonj, Birol and Phulbari, with modest year-to-year variations. The distribution pattern highlights consistent referral pathways from these subdistricts across the study years, emphasizing the role of accessibility in cancer diagnosis and treatment uptake.[7] In a tertiary hospital-based analysis, breast and cervical cancers collectively represented over half of the female cases.[5]

This trend aligns with the findings, where breast cancer alone accounted for 37.35% of cases in 2019, 45.71% in 2020 and 42.28% in 2021. The figures closely mirror those from studies by Bellah et al and Arman et al who observed breast cancer as the most frequently diagnosed malignancy among females in both urban and semi-urban regions.[1,6] Cervical cancer also showed consistent representation across the three years, ranging from 7.23% in 2019 to 8.94% in 2021, suggesting either improved detection efforts or a growing disease burden among underserved populations. Arman et al reported similar trends with cervical cancer accounting for 22.4% of female cases, indicating a high but variable prevalence across regions.[1] Uddin et al also highlighted cervical cancer as a continuing public health concern in Bangladesh.[13] Lung cancer incidence demonstrated an increase, from 8.03% in 2019 and 6.29% in 2020 to 12.20% in 2021, indicating a possible emerging trend.

Nationally, lung cancer remains a dominant male malignancy, with studies reporting 9.6%–28.5% of male

cases attributed to it, which aligns with the variation observed in the findings.[5,8] Prostate cancer remained relatively uncommon in our study, accounting for only 2.81% in 2019, 2.29% in 2020 and 1.63% in 2021, corroborating data from hospital-based registries that prostate cancer ranks lower among male malignancies in Bangladesh compared to lung, colorectal and liver cancers.[8]

This low frequency may reflect either a true reduction or diagnostic limitations during the pandemic. Another notable feature of the current study was the representation of less common cancers. These diagnoses collectively comprised a small but significant proportion of cases each year, reflecting a diverse oncologic burden and underscoring the need for comprehensive diagnostic capacity and accurate registry documentation. Operational constraints and resource reallocation during the COVID-19 outbreak likely contributed to occasional data inconsistencies and underreporting, as highlighted by Basu et al.[2] Overall, the findings of this study are aligned with previously published national-level data and contribute to filling the gap in multi-year, hospital-based observational data from regions outside Dhaka.[9,12] The strong female predominance, mid-life peak in age and breast cancer dominance underscore the pressing need for gender and age-specific cancer screening policies.

Additionally, the pandemic's impact on case documentation and diagnostic services emphasizes the importance of data resilience and continuity planning in public health crises. From a global oncology perspective, these findings reaffirm the need for LMIC cancer control strategies that are responsive to local demographic and geographic realities. Decentralizing services, strengthening regional registries and prioritizing high-burden groups such as mid-aged women with breast and cervical cancer are essential steps toward equitable cancer care delivery in Bangladesh and similar settings.[6,11]

This study was based on retrospective data from only two tertiary centers in northern Bangladesh, which may not fully reflect the national cancer burden. Treatment data were incomplete or missing in most records, limiting the analysis of therapeutic outcomes. Additionally, the high proportion of "Other" diagnoses in 2020 raises concerns about data entry consistency and classification accuracy during pandemic-related disruptions. The absence of histopathological verification for some records and lack of staging information further restricts the depth of clinical analysis.

CONCLUSION

This study provides important insights into the demographic and diagnostic characteristics of cancer patients treated at two tertiary hospitals in northern Bangladesh from 2019 to 2021. Breast cancer consistently emerged as the most prevalent malignancy, particularly among women, accounting for 37.35% of cases in 2019,

45.71% in 2020 and 42.28% in 2021. Colorectal, stomach, cervical and lung cancers also contributed substantially, with lung cancer cases rising to 12.20% in 2021. The "Other" category remained a notable component of the cancer burden, reflecting the diversity of malignancies encountered.

A consistent mid-life age peak and the growing female predominance further emphasize the need for targeted screening and prevention strategies. The observed decline in recorded cases during the pandemic years reflects disruptions to health services and highlights the importance of maintaining diagnostic continuity during public health emergencies. Strengthening regional cancer registries, improving documentation quality and decentralizing oncology services are essential steps toward equitable, data-informed cancer care delivery in resource-limited settings like Bangladesh.

REFERENCES

1. Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer J Clin. 2024;74(3):229-63.
2. Basu P, Lucas E, Zhang L, Muwonge R, Murillo R, Nessa A. Leveraging vertical COVID-19 investments to improve monitoring of cancer screening programme–a case study from Bangladesh. Preventive Med. 2021;151:106624.
3. Chowdhury FA, Islam MF, Arefin MK. Demographic characteristics of patients with breast cancer in Bangladesh: A single-centre study. Mymensingh Med J. 2023;32(3):764–8.
4. Mahamud M, Islam MS, Wahed F, Karim A. Trend of carcinoma of the stomach in relation to site, age and aetiology: study of 112 cases in a tertiary level hospital. Mymensingh Med J. 2021;30(2):395-401.
5. Sharmin T, Nikhat N, Rayna SE, Khalequzzaman M. Types and distribution of cancer patients attending in a tertiary care hospital of Bangladesh. Bangabandhu Sheikh Muj Med University J. 2022;15(1):43-9.
6. Bellah SF, Salam MA, Karim MR, Hossain MJ, Ashrafudoulla M. Epidemiology of breast cancer among the female patients in Bangladesh. Orient Pharm Experimen Med. 2016;16(2):85-95.
7. Arman KA, Hossain KA, Banik R, Dowel IJ. The Incidence Pattern of Cancer Patients Visiting a Tertiary Level Hospital in Dhaka, Bangladesh. SAS J Med. 2025;1:90-5.
8. Sarker MA, Harun-Or-Rashid M, Hirosawa T. Trends and distributions of common types of cancer in Bangladesh: Results from the cancer registry data of 2008-10. Ann Cancer Res Ther. 2012;20(1):32-8.
9. Rahman MM, Siddique MK, Rahim MM. Cancer registry in Bangladesh: challenges and opportunities. International J Transl Med Res Publ Heal. 2024;8:45.
10. Chowdhury AR, Banu PA, Rahman MA, Trapani D. Pattern of Practices of Oncologists of Bangladesh in the COVID-19 Era. Bengal J Can. 2021;1(2):53-7.
11. .Siddika A, Chowdhury S, Hasan MR, Moniruzzaman M, Sayeed SJ, Tabassum T. Clinicopathological patterns of malignant solid tumors in adult patients: A Hospital-Based Study From Bangladesh. Cureus. 2023;15(2):34935.
12. Uddin AK, Sumon MA, Pervin S, Sharmin F. Cervical cancer in Bangladesh. South Asian J Cancer. 2023;12(01):036-8.
13. Bray F, Jemal A, Grey N, Ferlay J, Forman D. Global cancer transitions according to the Human Development Index (2008–2030): a population-based study. Lancet Oncol. 2012;13(8):790-801.

Cite this article as: Kundu S, Chakrabarty S, Chakrabortty P, Nirob MH, E-Elahi MM. Regional cancer burdens: a retrospective analysis of demographic and diagnostic patterns in Bangladesh. Int J Res Med Sci 2025;13:4609-14.