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Original Article

Clinicopathological profile of gastrointestinal tract malignancies: A retrospective study.

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ABSTRACT

Objectives: Gastrointestinal (GI) tract malignancies are a major cause of morbidity and mortality worldwide. Most cases are diagnosed at advanced stages, making early detection essential for improving outcomes. This study aimed to examine the incidence, clinical characteristics, and trends of GI cancers in a tertiary care setting, with a focus on age and gender distribution, disease presentation, and metastasis patterns at diagnosis.

Material and Methods: A retrospective study was conducted in the Department of Medical Oncology over a 2-year period from January 2023 to December 2024, including 178 patients with histopathologically confirmed GI tract malignancies. Data were extracted from medical records and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA).

Results: Among 178 patients, biliary tract cancers were the most frequent (34.26%), followed by cancers of the large intestine (25.28%), esophagus (15.16%), stomach (10.11%), pancreas (8.98%), liver (5.05%), and small intestine (1.12%). The incidence of GI malignancies increased progressively with age; 84% of patients were above 40 years, predominantly in the 41–80 years age group. Males accounted for 57.3% of cases, while females represented 42.7%. The most common presenting symptom was abdominal pain, often associated with weight loss. At diagnosis, 57.86% of patients had localized disease, whereas 42.67% presented with metastatic disease.

Conclusion: This study highlights the increasing burden of GI tract malignancies in older age groups, with a considerable proportion presenting at advanced stages. Early detection in high-risk populations and greater awareness of early symptoms are crucial to reducing late-stage diagnoses. Public health strategies targeting modifiable risk factors, including dietary habits, tobacco, and alcohol use, are essential to curb the incidence and improve patient outcomes.

Keywords: Cancer distribution, Clinicopathological, Demographic trends, GI malignancies, Staging

INTRODUCTION

Cancer is among the leading causes of premature mortality worldwide and ranks first or second in most countries. Global incidence is projected to double by 2070 compared with 2020 levels.[1] According to Global Cancer Observatory (GLOBOCAN) 2022, there were 20 million new cancer cases and 9.7 million deaths, accounting for one in six deaths. By 2050, the burden is expected to increase by 77 percent, with low- and middle-income countries disproportionately affected due to inadequate diagnostic and therapeutic capacity.[2]

India contributes substantially to the global burden, ranking third with 1.46 million new cases and 0.92 million deaths in 2022. The incidence rate was 100.4 per 100,000, and projections suggest that one in nine Indians will develop cancer during their lifetime. Breast cancer is the most common malignancy overall, lung cancer is predominant in men, and breast cancer in women, while lymphoid leukemia is the leading pediatric cancer.[2,3]

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GI cancers, comprising esophageal, gastric, colorectal, liver, biliary tract, pancreatic, small bowel, and anal cancers, represent a major health burden. Their proportional incidence has shifted due to improved surveillance and diagnostic precision.[3] Data from the National Cancer Registry Programme (NCRP), through Population and Hospital-Based Cancer Registries, provide valuable epidemiological insights, though coverage remains limited.[4]

Risk factors for GI cancers are multifactorial, encompassing lifestyle, environmental, infectious, and genetic determinants. Tobacco and alcohol markedly increase the risk of esophageal, gastric, liver, and pancreatic cancers. Diets rich in salt, red or processed meat, and pickled foods elevate risk, while fiber, fruits, and vegetables are protective. Helicobacter pylori is central to gastric carcinogenesis, and chronic hepatitis B and C infections are major contributors to hepatocellular carcinoma. Hereditary syndromes such as Lynch syndrome and familial adenomatous polyposis, along with chronic inflammatory states, further predispose individuals.[5]

Clinicopathological features integrate demographics, presentation, histology, and molecular markers.[6] GI cancers occur mainly after the age of 50, though aggressive histologies such as signet ring cell carcinoma may present earlier. Symptoms are site-specific, including dysphagia in esophageal cancer, early satiety in gastric cancer, jaundice in pancreatic and biliary malignancies, and altered bowel habits or anemia in colorectal cancers. Histological variation is also evident: squamous cell carcinoma of the esophagus remains common in Asia, while adenocarcinoma is increasing in Western countries; gastric cancers are classified into intestinal and diffuse types; GI stromal tumors are KIT/DOG-1 positive; and colorectal adenocarcinoma remains a leading cause of mortality. Staging systems such as the American Joint Committee on Cancer Tumor-Node-Metastasis staging system (AJCCTNM) and the Barcelona Clinic Liver Cancer classification guide management.[2-4,7]

In India, late-stage presentation is frequent, making tertiary care centers vital for diagnosis, management, and research. Robust data from these centers are essential to strengthen evidence-based strategies for prevention and early detection. The present study evaluates the demographic profile, histological patterns, and staging of GI cancers in a tertiary care setting to contribute to a more comprehensive understanding of their epidemiology and to inform screening and management strategies.

MATERIAL AND METHODS

Study site, design, and duration

This retrospective study was conducted in the Department of Medical Oncology, National Institute of Medical Science and Research (NIMS) University, Jaipur, India, over a period of 2 years from January 2023 to December 2024. A total of 178 consecutive cases of GUI tract malignancies with relevant clinical features and histopathological confirmation were included.

Selection and description of participants

All patients with a histopathologically confirmed diagnosis of GI tract malignancy during the study period were eligible. Inclusion criteria were complete availability of clinical, imaging, and histopathological records. Patients with incomplete documentation or inconclusive biopsy results were excluded.

Data collection

A predesigned proforma was used to capture demographic details, clinical characteristics, tumor site, and histopathological findings. Medical records and hospital databases were reviewed, and extracted data were cross-verified independently by two investigators to ensure accuracy and minimize transcription errors.

Ethical considerations and patient consent

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision), Good Clinical Practice (GCP) guidelines, and the standards of the Indian Council of Medical Research (ICMR). As this was a retrospective study utilizing anonymized patient records, the requirement for informed consent and ethical approval was formally waived off by the Institutional Ethics Committee of NIMS University, Jaipur, India. Patient anonymity and confidentiality were maintained throughout the study.

Statistical analysis

Data were analyzed using descriptive statistics. Categorical variables, including age groups and tumor sites, were presented as frequency and percentage [n (%)]. Cross-tabulation was performed to evaluate the distribution of tumor sites across different age categories, and percentages were calculated column-wise. Continuous variables, where applicable, were summarized as mean ± standard deviation (SD). Statistical significance was assessed using chi-square tests for categorical variables, with $p < 0.05$ considered statistically significant. Graphical representation and statistical analysis were carried out using Microsoft Excel (Microsoft Corp., Redmond, WA, USA) and IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA).

RESULTS

Distribution of GI malignancies

A total of 178 patients with GI tract malignancies were

included. Biliary tract cancer (BTC) was the most frequent, representing 34.3% (n=61), followed by large intestine cancers (25.3%, n=45), esophageal cancer (15.2%, n=27), gastric cancer (10.1%, n=18), pancreatic cancer (9.0%, n=16), liver cancer (5.1%, n=9), and small intestinal cancer (1.1%, n=2). Hepatopancreatobiliary (HPB) tract cancers accounted for the largest subgroup, followed by lower and upper GI malignancies [Figure 1].

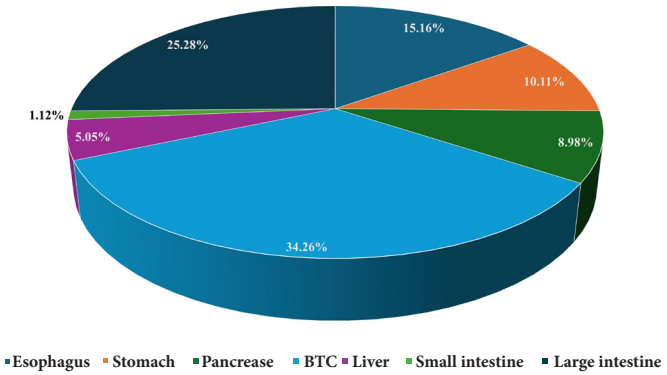

Figure 1: Distribution of gastrointestinal tract malignancies by site among study participants.

Age distribution

The majority of patients were diagnosed in the 41–60 years (39.3%) and 61–80 years (42.7%) age groups. Younger patients were less common, with 11.8% between 21–40 years and only 3.4% below 20 years. Biliary tract cancer (BTC) predominated in patients aged 41–80 years, while large intestinal cancers were distributed across all age groups, peaking in middle age. Esophageal and pancreatic cancers also increased with advancing age [Table 1].

(74%), gastric (66.7%), pancreatic (81.3%), liver (55.6%), and large intestinal cancers (64.4%). Conversely, BTC showed female predominance (65.6%; 40/61 cases). Small intestinal cancers were equally distributed [Figure 2].

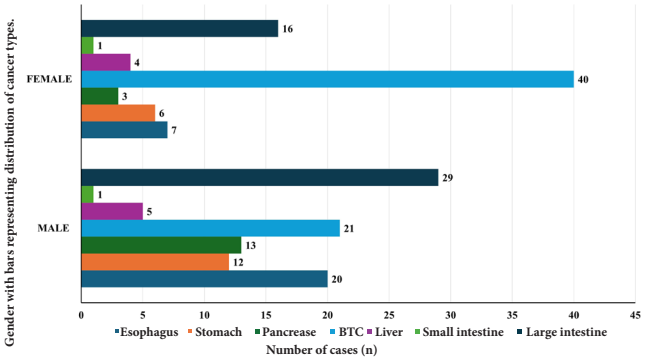

Figure 2: Gender wise patient distribution of gastrointestinal tract malignancies

Risk factors

Tobacco use (smoking/chewing) was reported in 58.4% (n=104), alcohol abuse in 45% (n=80), and obesity in 38% (n=68). Dietary risk factors (high salt and spice intake, pickled vegetables, hot beverages, red meat, and low fruit/vegetable consumption) were present in 52% (n=92). Chronic gallbladder, liver, or pancreatic diseases were observed in 16% (n=29), indicating multifactorial etiology.

Clinical presentation

The presenting symptoms varied by tumor site [Table 2]. Among upper GI malignancies (n=47), esophageal cancers most frequently presented with dysphagia (88.8%), weight loss (81.4%), and anorexia (44.4%). Gastric cancers were primarily characterized by abdominal pain (83.3%)

Table 1: Age-specific distribution of GI tract malignancies

Age group (years), n (%)	Esophagus (n=27)	Stomach (n=18)	Small intestine (n=2)	Liver (n=9)	Pancreas (n=16)	Biliary tract cancer (BTC) (n=61)	Large intestine (n=45)	Total (n=178)
0–20	0 (0.0)	2 (11.1)	0 (0.0)	1 (11.1)	0 (0.0)	0 (0.0)	3 (6.7)	6 (3.4)
21–40	1 (3.7)	2 (11.1)	1 (50.0)	0 (0.0)	2 (12.5)	7 (11.5)	8 (17.8)	21 (11.8)
41–60	11 (40.7)	6 (33.3)	1 (50.0)	1 (11.1)	3 (18.8)	27 (44.3)	21 (46.7)	70 (39.3)
61–80	14 (51.9)	7 (38.9)	0 (0.0)	7 (77.8)	11 (68.8)	24 (39.3)	13 (28.9)	76 (42.7)
>81	1 (3.7)	1 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.9)	0 (0.0)	5 (2.8)

BTC: Biliary tract cancer; GI: Gastrointestinal; n: Number of cases. Percentages are shown as column percentages.

Gender distribution

Overall, males constituted 57.3% (n=102) and females 42.7% (n=76). Male predominance was observed in esophageal and weight loss (77.7%), with vomiting (55.5%) and hematemesis (33.3%) also reported. Both small intestinal cancers manifested with abdominal pain and weight loss.

Table 2: Clinical presentation of patients with GI tract malignancies, upper GI malignancies (n=47)

Presentation, n (%)	**Esophagus n=27)**	**Stomach (n=18)**	**Small intestine (n=2)**
Abdominal pain	6 (22.0)	15 (83.0)	2 (100.0)
Weight loss	22 (81.0)	14 (78.0)	2 (100.0)
Vomiting	6 (22.0)	10 (56.0)	1 (50.0)
Loss of appetite	12 (44.0)	0 (0.0)	1 (50.0)
Dysphagia	24 (89.0)	2 (11.0)	0 (0.0)
Hematemesis	1 (4.0)	6 (33.0)	0 (0.0)
Hepato-pancreato-biliary cancers (n=86)			
Presentation, n (%)	Pancreas (n=16)	BTC (n=61)	Liver (n=9)
Abdominal pain	14 (87.0)	55 (90.0)	4 (44.0)
Lump abdomen	8 (50.0)	34 (55.0)	2 (22.0)
Vomiting	9 (56.0)	40 (65.0)	1 (11.0)
Weight loss	9 (56.0)	52 (85.0)	4 (44.0)
Jaundice at presentation	5 (31.0)	12 (20.0)	1 (11.0)
Hematemesis	1 (6.0)	0 (0.0)	2 (22.0)
Lower GI malignancies (n=45)			
Presentation, n (%)	Colorectal (n=41)		Anal canal (n=4)
Abdominal/local pain	36 (88.0)		4 (100.0)
Altered bowel habits	28 (68.0)		3 (75.0)
Rectal bleeding	14 (34.0)		4 (100.0)
Weight loss	16 (39.0)		2 (50.0)
Intestinal obstruction	18 (43.0)		1 (25.0)

BTC: Biliary tract cancer; n: number of cases; GI: gastrointestinal. Percentages are shown as row percentages.

In HPB malignancies (n=86), abdominal pain was the leading symptom (84.8%), followed by weight loss (75.6%), vomiting (58.1%), and palpable abdominal mass (51.1%); jaundice was observed in 20.9% of patients, while hematemesis occurred mainly in liver cancers due to portal hypertension. Lower GI malignancies (n=45) most often presented with abdominal or local pain, reported in nearly all cases of colorectal (87.8%) and anal canal cancers (100%). Altered bowel habits (68.3%) and intestinal obstruction (43.9%) were common in colorectal cancers, while rectal bleeding was seen in 34.1% of colorectal and all anal cancers.

Stage distribution

Most patients presented with advanced disease [Table 3]. In the upper GI tract, 78% of esophageal cancers were stage III/IV, and 77% of gastric cancers were stage IV, while both small intestinal cancers were advanced. In the HPB group, biliary tract cancers were predominantly stage IV (47%) or stage III (37%), and 87.5% of pancreatic cancers presented at stage IV. Among lower GI tract malignancies, 51% of colorectal cancers were diagnosed at stage IV and 35.5% at stage III, with all anal cancers presenting at advanced stages. Liver cancers, staged using the barcelona clinic liver cancer (BCLC) system, included two intermediate, three advanced, and three terminal stage hepatocellular carcinoma (HCC) cases, along with one hepatoblastoma at PRETEXT stage IV. Overall, 57.9% of patients had localized disease, while 42.7% presented with metastasis, with pancreatic and biliary tract cancers showing the highest rates of advanced presentation [Figure 3].

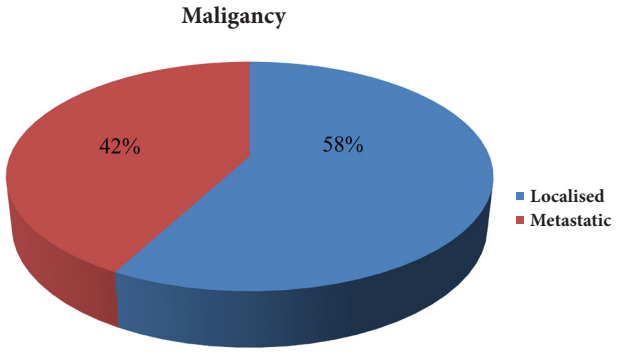

Figure 3: Metastatic distribution of gastrointestinal tract malignancies

Histopathological profile

Histological subtypes varied across sites [Table 4]. In the upper GI tract (n=47), esophageal cancers were predominantly squamous cell carcinoma (SCC, n=21), mostly moderately differentiated (n=13), while gastric cancers were mainly adenocarcinomas, with moderately differentiated adenocarcinoma (MD-AC) (n=8) and signet ring cell type (n=3) being common. Small intestinal tumors included one MD-AC and one neuroendocrine tumor, with rare cases of gastrointestinal stromal tumor (GIST), diffuse large B cell lymphoma (DLBCL), and carcinoma NOS. In the HPB tract (n=77), adenocarcinoma was the dominant subtype (96%); BTC cases were largely MD-AC (n=34) or well differentiated adenocarcinoma (WD-AC) (n=16), pancreatic cancers were mostly adenocarcinoma with two mucinous variants, and liver

cancers comprised eight hepatocellular carcinomas [Hepatitis B virus (HBV) = 4, Hepatitis C virus (HCV) = 1, seronegative = 3] and one hepatoblastoma (PRETEXT IV). In the lower GI tract (n=45), adenocarcinoma was the most frequent histology, with rectal cancers (53%) more common than colon cancers (38%). MD-AC predominated, followed by mucinous and signet ring subtypes, while all anal cancers (n=4) were SCC.

malignancies offers comprehensive insight into demographic trends, clinical presentations, histopathology, and stage distribution within a tertiary care setting in eastern Rajasthan. The increasing burden of GI cancers in India reflects population aging alongside lifestyle and dietary changes associated with urbanization, Westernized diets,

Table 3: Stage-wise distribution of gastrointestinal tract malignancies

Stage, n (%)	Esophagus (n=27) Number (Percentage) n (%)	Stomach (n=18)	Small intestine (n=2)	Liver (n=9)	BTC (n=61)	Pancreas (n=16)	Large intestine (n=45)
I	1 (3.7)	0	0	0	2 (3.3)	0	1 (2.2)
II	4 (14.8)	2 (11.1)	0 (0.0)	0	8 (13.1)	0	5 (11.1)
III	10 (37.0)	2 (11.1)	1 (50.0)	0	20 (32.8)	2 (12.5)	16 (35.6)
IV	11 (40.7)	14 (77.8)	1 (50.0)	0	28 (45.9)	14 (87.5)	23 (51.1)
PRETEXT IV	0	0	0	1 (11.1)	0	0	0
BCLC B	0	0	0	2 (22.2)	0	0	0
BCLC C	0	0	0	3 (33.3)	0	0	0
BCLC D	0	0	0	3 (33.3)	0	0	0
Localized	21 (77.8)	7 (38.9)	1 (50.0)	6 (66.7)	32 (52.5)	4 (25.0)	32 (71.1)
Metastatic	6 (22.2)	11 (61.1)	1 (50.0)	3 (33.3)	29 (47.5)	12 (75.0)	13 (28.9)

BTC: Biliary tract cancer; PRETEXT: Pretreatment extent of disease (pediatric liver cancer); BCLC: Barcelona clinic liver cancer staging; GI: Gastrointestinal

Table 4: Stage-wise distribution of gastrointestinal tract malignancies

Histopathology, n (%)	Esophagus (n=27)	Stomach (n=18)	Small Intestine (n=2)	Colon (n=17)	Rectum (n=24)	Anal Canal (n=4)	Pancreas (n=16)	BTC (n=61)	Liver n=9)
WD-SCC	8 (30%)	0	0	0	0	2 (50%)	0	0	0
MD-SCC	13 (48%)	0	0	0	0	1 (25%)	0	0	0
Adeno (MD)	3 (11%)	8 (44%)	1 (50%)	8 (47%)	12 (50%)	0	8 (50%)	34 (56%)	0
Adeno (WD)	0	1 (5%)	0	1 (6%)	4 (17%)	0	3 (19%)	16 (26%)	0
Adeno (Mucinous)	0	0	0	5 (29%)	6 (25%)	0	2 (12%)	0	0
Adeno (Signet ring)	0	3 (17%)	0	2 (12%)	1 (4%)	0	0	0	0
NET	0	0	1 (50%)	0	0	0	0	0	0
GIST	0	1 (5%)	0	0	0	0	0	0	0
Lymphoma	0	1 (5%)	0	0	0	0	0	0	0
Carcinoma NOS	2 (7%)	1 (5%)	0	0	0	0	0	0	0
HCC	0	0	0	0	0	0	0	0	8 (89%)
Hepatoblastoma	0	0	0	0	0	0	0	0	0

SCC: Squamous cell carcinoma; WD: Well-differentiated; MD: Moderately differentiated; PD: Poorly differentiated; AC: Adenocarcinoma; UD: Undifferentiated; GIST: Gastrointestinal stromal tumor; NET: Neuroendocrine tumor; DLBCL: Diffuse large B-cell lymphoma; NOS: Not otherwise specified; HCC: Hepatocellular carcinoma; BTC: Biliary tract cancer. Values are expressed as n (%)

DISCUSSION

This clinicopathological study of 178 patients with GI

and rising metabolic risk factors. Over the two-year study period, GI cancers accounted for 12.8% (178/1390) of all malignancies, consistent with prior Indian reports, including

Sharma RG *et al*., with 14.4% incidence and NCRP 2012–2016 reporting 11–15%.[8,9] Recent regional data, such as Thombare M *et al*., similarly confirm rising admissions for GI cancers in Indian tertiary centers, highlighting the growing oncological workload.[10]

The male-to-female ratio in this cohort was 1.3 : 1, slightly lower than previous reports in India of ~2.2 : 1 but is in line with other reports around ~1.5 : 1.[11,12] This trend suggests improved diagnostic access for women, heightened health awareness, and evolving risk exposures, including persistent tobacco use and metabolic disorders.

A key finding was the predominance of hepatobiliary cancers, comprising 34.3% (n=61), followed by colorectal (25.3%, n=45), esophageal (15.2%, n=27), gastric (10.1%, n=18), pancreatic (9.0%, n=16), liver (5.1%, n=9), and small bowel tumors (1.1%, n=2). This distribution underscores the regional epidemiology of GI cancers, with hepatobiliary malignancies disproportionately high in northern India, consistent with NCRP data and prior studies along the Ganga belt.[9,13]

Age distribution showed that most patients were between 41 and 60 years (39.3%) and 61 and 80 years (42.7%), with only 3.4% under 20 years and 11.8% between 21 and 40 years. These findings align with global trends in which GI cancer incidence peaks in older populations due to cumulative environmental exposures and comorbidities.[14,15] Early-onset GI cancers (<50 years) were observed in a minority, reflecting the need for region-specific screening strategies, as also noted by Danpanichkul P *et al*. (2025).[16]

Lifestyle and dietary factors were prominent contributors to disease burden: tobacco use was reported in 58.4%, alcohol consumption in 45%, obesity in 38%, and diets high in salt and spices and low in fruits and vegetables in 52% of patients. These results mirror Indian and global evidence identifying tobacco, alcohol, high-salt diets, and red meat consumption as significant risk factors for GI cancers, while fruit and vegetable intake provides a protective effect.[17-20] Chronic inflammatory and infectious conditions further contributed to oncogenesis, including gallstones (4–6× risk for gallbladder carcinoma), cirrhosis from HBV/HCV (15–20× risk for hepatocellular carcinoma), and chronic pancreatitis (2–5× risk for pancreatic cancer).[21-23] These findings highlight the multifactorial nature of GI malignancies, involving environmental, infectious, metabolic, and dietary determinants.

Clinically, site-specific symptom patterns were observed. Dysphagia, weight loss, and anorexia predominated in esophageal cancer; abdominal pain, vomiting, and GI bleeding were common in gastric and HPB tumors; and lower GI malignancies presented primarily with abdominal or local pain. Notably, 20% of esophageal cancer patients required enteral feeding access (feeding jejunostomy or PEG), reflecting delayed presentation and advanced disease at diagnosis.

Histopathological evaluation revealed adenocarcinoma as the dominant subtype (75.8%), with squamous cell carcinoma (SCC) predominating in the esophagus (78%). Pancreatobiliary tumors were predominantly differentiated adenocarcinomas (96%), while colorectal cancers included a significant proportion of mucinous and signet-ring variants, associated with poor prognosis. Anal cancers were exclusively SCC, consistent with HPV-related pathogenesis.[24-31]

Stage at presentation was concerning: 42.7% of patients presented with metastatic disease, while only 57.9% had localized disease. Pancreatobiliary malignancies demonstrated particularly aggressive behavior with high metastatic rates. These findings are consistent with national and global reports showing late-stage presentation, particularly among populations with lower socioeconomic status, reflecting systemic delays in early detection, referral, and access to care.[32,33]

Despite certain limitations, including its single-center, hospital-based design, two-year retrospective duration, and potential reporting biases for lifestyle and dietary exposures, this study provides valuable insights into the epidemiology and clinicopathological patterns of GI cancers in eastern Rajasthan. Although the short study period may limit broader generalizability, the data capture critical trends, including a high prevalence of hepatobiliary malignancies, significant lifestyle-related risk factors, and advanced-stage presentation at diagnosis. These findings are both clinically and public health–relevant, underscoring the need for region-specific early detection strategies, targeted screening programs, and preventive interventions addressing modifiable risks such as tobacco use, alcohol consumption, obesity, and dietary habits. By delineating population- and region-specific patterns, this study lays the foundation for evidence-based public health initiatives and policy measures aimed at reducing the burden of GI cancers in India.

CONCLUSION

This study emphasizes the substantial burden of GI cancers in eastern Rajasthan, with hepatobiliary malignancies predominating and advanced-stage presentation common. Identification of lifestyle, dietary, and metabolic risk factors highlights opportunities for targeted preventive strategies. While single-center, retrospective limitations exist, these findings provide a foundation for larger, prospective studies aimed at improving early detection, risk stratification, and

outcomes in the Indian context.

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