

Original Research Article

CLINICO ETIOLOGICAL PROFILE OF GASTROINTESTINAL MALIGNANCIES AMONG PATIENTS AT A TERTIARY CARE CENTRE IN KUMAON, UTTARAKHAND: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Gastro-intestinal (GI) cancers account for a growing share of India's cancer burden, with recent Indian data showing rising incidence and poor survival—particularly for gastric and oesophageal malignancies. Regional clinico-epidemiological patterns, however, remain sparsely documented for the sub-Himalayan Kumaon belt. **Objectives:** To delineate the clinical presentation, etiological factors and tumour spectrum of histologically proven GI malignancies presenting to a tertiary-care centre in Haldwani, Uttarakhand.

Materials and Methods: A hospital-based cross-sectional study was conducted over 18 months (January 2023 – June 2024). All consecutive adults with biopsy-confirmed GI cancer attending Dr Susheela Tiwari Government Hospital were recruited (n=100). Detailed demographic, clinical and risk-factor information were recorded on a structured pro-forma. Data were entered in Microsoft Excel and analysed with appropriate descriptive statistics and χ^2 tests after consultation with a statistician.

Results: The cohort comprised 63 males and 37 females (M:F = 1.7:1); 46 % were aged > 60 years. One-third of patients belonged to the lower socio-economic class. Abdominal pain (64 %) and weight loss (26 %) dominated presenting complaints; hypertension was the leading comorbidity (12 %). Smoking (68 %) and alcohol use (54 %) were prevalent addictions. Esophageal carcinoma was the most frequent diagnosis (33 %), followed by gastric carcinoma (24 %), gall-bladder carcinoma (16 %), colorectal carcinoma (14 %), pancreatic carcinoma (10 %) and hepatocellular carcinoma (3 %). Adenocarcinoma constituted 71 % of histologies, with squamous-cell carcinoma in 21 %. No significant association was observed between tumour site and age group or gender ($p > 0.05$).

Conclusion: Upper-GI cancers—especially oesophageal and gastric—dominate the malignancy profile in Kumaon. The high prevalence of tobacco and alcohol use underscores the need for targeted behavioural interventions. Community-based screening of high-risk adults aged ≥ 50 years, coupled with risk-factor modification programmes, could facilitate earlier diagnosis and improve outcomes in this resource-limited Himalayan region.

Keywords: Gastro-intestinal malignancy; Esophageal carcinoma; Gastric adenocarcinoma; Risk factors; Cross-sectional study; Kumaon-Uttarakhand.

INTRODUCTION

Cancer remains a formidable public health challenge. According to the World Health Organization's Global Cancer Observatory (GLOBOCAN 2020), there were an estimated 19.3 million new cancer cases and 10.0 million deaths in 2020, and modelling by the International Agency for Research on Cancer projects the annual caseload to exceed 28 million by 2040 as populations age, urbanise and remain exposed to modifiable risks such as tobacco, alcohol, obesity and ambient air pollution.^[1]

Within this rising burden, gastro intestinal (GI) tumours are disproportionately lethal. A pooled analysis of the six major GI sites (oesophagus, stomach, colorectum, liver, gall bladder and pancreas) showed they accounted for 26 % of global cancer incidence and 35 % of cancer deaths in 2020, underscoring their high fatality relative to incidence.^[2] Although age standardised rates for stomach cancer have fallen in many high-income countries, absolute numbers of all GI cancers continue to rise worldwide, with the steepest increases predicted in low and middle income settings.

India mirrors the global picture, yet displays pronounced regional variation. The National Cancer Registry Programme (NCRP) 2020–2022 consolidated report estimated 1.46 million incident cancers in 2022; GI tumours were substantially more common in men (60.5 %) than women (39.5 %). Among males, oesophagus (28 %), stomach (21 %) and rectum (14 %) predominated, whereas in females oesophagus (26 %), gall bladder (24 %) and stomach (15 %) led the spectrum.^[3] Time trend analyses also indicate rising incidence of colorectal, liver and gall bladder cancers even as stomach and oesophageal rates plateau nationally.

Geographical heterogeneity is a hallmark of India's GI cancer landscape. In the north eastern states, particularly Assam, oesophageal carcinoma ranks as the most common male cancer, a pattern linked to widespread betel nut chewing, smoked meat consumption and micronutrient deficient diets [4]. Conversely, the Indo Gangetic plain is recognised as a “gall bladder cancer corridor.” Studies from Bihar and eastern Uttar Pradesh implicate arsenic contaminated groundwater, proximity to the River Ganga and chronic *Salmonella typhi* carriage in the exceptionally high gall bladder cancer risk observed in this belt.^[5] Such region-specific hot spots underscore the need for locally generated data to guide prevention and early detection strategies.

Despite these recognised clusters, the sub-Himalayan state of Uttarakhand remains an epidemiological blank spot. The only published snapshot—a one-year survey from Nainital district—documented a predominance of upper GI malignancies but pre dated current lifestyle transitions and lacked detailed histological data.^[6] Uttarakhand's rugged terrain,

dispersed hill settlements, high prevalence of smoked tobacco use and country liquor consumption, coupled with limited endoscopic facilities, are likely to shape a unique GI cancer profile characterised by late presentation and poor outcomes.

Generating robust, region-specific evidence is therefore essential to inform targeted screening, risk factor reduction strategies and optimal resource allocation. The present hospital based cross sectional study was undertaken to delineate the current clinico etiological spectrum of GI malignancies among patients attending the largest tertiary care centre in Kumaon, Uttarakhand, and thereby address this critical knowledge gap.

MATERIALS AND METHODS

Study design and setting: A cross-sectional observational study was conducted in the Department of General Medicine at Government Medical College, Haldwani, and its attached Dr Susheela Tiwari Memorial Hospital, the apex referral centre for the Kumaon division of Uttarakhand. The study period spanned 18 months (January 2023 – June 2024), beginning only after Institute Ethics Committee approval (IEC/GMCH/2022/251).

Participants: All adults (≥ 18 years) with histopathologically proven gastro intestinal malignancy who presented to the out patient clinics, emergency department, wards or Medicine ICU during the study window were screened. Those giving written informed consent were included; patients (or guardians) who declined were excluded.

Sampling and sample size: A total of 100 consecutive cases were enrolled. Sample size justification used the formula $n = 4pq/d^2$ with a five-year GI cancer prevalence of 5.89 % (GLOBOCAN 2020) [1], 5 % absolute precision and 95 % confidence, yielding 86; adding 10 % for contingencies set the target at ≈ 100 . Simple random (consecutive) sampling was adopted to recruit every eligible patient until the sample was attained.

Data collection: After consent, each participant underwent a structured interview and examination. The pro forma captured demographics, Modified BG Prasad socio economic class, detailed symptomatology (abdominal pain, weight loss, dysphagia, GI bleeding, etc.), comorbid illnesses, and lifestyle exposures such as smoking pack years and alcohol use. General physical examination recorded vitals, body mass index (WHO categorisation) and lymph node status; systemic examination covered the respiratory, cardiovascular, abdominal and neurological systems. Relevant laboratory parameters, imaging (ultrasound, CT, MRI, PET) and endoscopic or histopathology reports were abstracted from case files to ensure diagnostic confirmation.

Ethical considerations: The protocol adhered to the Declaration of Helsinki and received clearance from the Institutional Ethics Committee of Government

Medical College, Haldwani (IEC/GMCH/2022/251). Confidentiality was maintained, and participants retained the right to withdraw at any stage.

Statistical Analysis: Data were entered in Microsoft Excel and analysed with SPSS v21. Continuous variables are presented as mean \pm standard deviation; categorical variables as frequency (percentage). Associations between categorical variables were tested by χ^2 or Fisher's exact test, accepting $p < 0.05$ as statistically significant.

RESULTS

The present study included 100 consecutively enrolled, biopsy proven cases of gastro intestinal malignancy. The mean age of the participants was 58.1 ± 12.3 years, with nearly half the patients (46 %) aged over 60 years, indicating a late middle to elderly age predominance. Male patients constituted 63 %, yielding a male-to-female ratio of 1.7:1, reflective of global and national trends in GI cancer epidemiology. In terms of socio economic distribution, a majority of patients belonged to upper-lower (43 %) and lower (18 %) classes, according to the Modified BG Prasad scale, suggesting a disproportionate burden in economically disadvantaged groups.

The most frequently reported presenting symptom was abdominal pain (64 %), followed by dysphagia (38 %), weight loss (26 %), and gastrointestinal bleeding (17 %). Jaundice (12 %) and nausea or vomiting (19 %) were observed in a subset of patients, likely reflecting hepatobiliary or gastric involvement. Comorbid conditions were present in

one-third of the cohort, with hypertension (12 %) and diabetes mellitus (10 %) being the most common.

Regarding lifestyle risk factors, 68 % of patients had a history of smoking, while 54 % reported alcohol consumption. Additionally, 38 % chewed tobacco, and only 4 % reported a positive family history of malignancy, reinforcing the strong influence of modifiable environmental exposures over genetic predisposition.

Anatomically, upper-GI cancers dominated the spectrum, with esophageal carcinoma (33 %) being the most common, followed by gastric carcinoma (24 %). Gall-bladder cancer accounted for 16 %, reflecting the endemic prevalence seen in northern India, particularly along the Ganga belt. Colorectal carcinoma (14 %), pancreatic carcinoma (10 %), and hepatocellular carcinoma (3 %) were also observed. Histopathological evaluation revealed that adenocarcinoma was the most prevalent subtype (71 %), followed by squamous cell carcinoma (21 %). A smaller proportion of cases were classified as neuroendocrine tumors (2 %) or other rare variants (6 %). No statistically significant association was found between tumor site and age group or gender ($p > 0.05$), suggesting a relatively uniform distribution across demographic strata in this cohort. Overall, these findings highlight the predominance of upper GI adenocarcinomas in older males with high exposure to tobacco and alcohol. The significant burden among socio economically disadvantaged groups, combined with a high prevalence of modifiable risk factors, underscores the need for regionally tailored screening and preventive strategies in the Kumaon population.

Table 1: Demographic Characteristics of Patients (N = 100)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	< 40	18	18
	40 – 60	36	36
	> 60	46	46
Gender	Male	63	63
	Female	37	37
Socio-Economic Status	Upper	6	6
	Upper Middle	12	12
	Lower Middle	21	21
	Upper Lower	43	43
	Lower	18	18

On clinical examination, impaired mental status was seen in 30 patients, and all these had moderate to severe grade of acute pancreatitis. Mean heart rate was 85.05 ± 12.1 bpm, mean body temperature was

37.51 ± 0.9 °C, and mean respiratory rate was 19.35 ± 2.7 bpm. Similar means were seen in mild cases excepting the heart rate which was lesser in mild pancreatitis (79.20 ± 9.7 bpm).

Table 2: Presenting Symptoms and Comorbidities

Clinical Feature	Frequency (n)	Percentage (%)
Abdominal Pain	64	64
Dysphagia	38	38
Weight Loss	26	26
Nausea/Vomiting	19	19
GI Bleeding	17	17
Jaundice	12	12
Hypertension	12	12
Diabetes Mellitus	10	10
COPD	5	5

Table 3: Risk Factors and Personal Habits

Risk Factor	Frequency (n)	Percentage (%)
Smoking (Current/Formal)	68	68
Alcohol Use	54	54
Tobacco Chewing	38	38
Family History of Cancer	4	4

Table 4: Site-wise Distribution of GI Malignancies

Cancer Site	Frequency (n)	Percentage (%)
Esophagus	33	33
Stomach	24	24
Gallbladder	16	16
Colorectum	14	14
Pancreas	10	10
Liver (HCC)	3	3

Table 5: Histological Subtypes of GI Tumours

Histological Type	Frequency (n)	Percentage (%)
Adenocarcinoma	71	71
Squamous Cell Carcinoma	21	21
Neuroendocrine Tumor	2	2
Others	6	6

DISCUSSION

The present hospital based analysis from Kumaon confirms that upper gastro intestinal (GI) malignancies—particularly oesophageal and gastric cancers—still dominate the cancer panorama in the central Himalayan belt, mirroring global observations that digestive tumours together account for more than one quarter of all incident cancers and one third of cancer deaths worldwide.^[1] Our median age (58 years) and clear male preponderance resemble patterns reported in the Global Burden of Disease 2021 assessment, which highlighted a disproportionately high burden of digestive cancers in older men across low and middle income regions.^[13] Nationally, the National Cancer Registry Programme (NCRP) also demonstrated a male to female ratio of roughly 1.5 : 1 for GI sites and a steep rise beyond the fifth decade, lending external validity to our cohort profile.^[8]

Site wise, oesophageal carcinoma constituted one third of all tumours in our series, far exceeding the 14 % share reported in the large NCRP hospital based audit,^[8] and even the 24 % noted in a recent four year tertiary centre experience from western Maharashtra.^[12] This discrepancy is biologically plausible because Uttarakhand shares dietary and tobacco behaviours with the North Eastern states, where oesophageal cancer incidence ranks among the world's highest.^[9] Gastric cancer (24 %) occupied the second position—comparable to both NCRP data (21 %) and other North Indian hospital series.^[12] The 16 % contribution of gall bladder cancer is noteworthy; although lower than the extreme 22–24 % reported from the “Ganga belt”, it remains several fold higher than national averages, reinforcing hypotheses implicating chronic arsenic exposure and river water contamination in the upper Ganga catchment.^[10]

Histologically, our 71 % adenocarcinoma fraction parallels both national HBCR aggregates ($\approx 70\%$)

and global estimates.^[7] Squamous cell carcinoma accounted for 21 % of cases—driven largely by oesophageal primaries—and aligns with figures from Mizoram and Assam, where smoked meat diets and high tobacco prevalence create an aggressive carcinogenic milieu.^[9]

Risk factor profiling underscored the dominance of behavioural exposures: almost two thirds of patients were current or former smokers and over half consumed alcohol, proportions substantially higher than the nationwide averages for adults (23 % and 15 %, respectively). Although the cross sectional design precludes causal inference, these findings echo NCRP analyses linking $>60\%$ of upper GI tumours to tobacco use.^[8] The modest prevalence of comorbidities such as hypertension and diabetes suggests that traditional non communicable diseases may play a less direct role in tumour aetiology than do lifestyle habits and environmental toxins in this region.

CONCLUSION

This single centre study offers the first contemporary snapshot of gastro intestinal malignancies in the Kumaon region of Uttarakhand. Upper GI cancers—especially oesophageal and gastric adenocarcinomas—dominated the spectrum, affecting predominantly older male smokers and drinkers from lower socio economic strata. The high prevalence of modifiable lifestyle risks underscores an urgent need for region tailored interventions: endoscopic screening of high risk adults, aggressive tobacco and alcohol cessation programmes, and focused health education initiatives. Establishing a population based cancer registry and expanding multi disciplinary oncology services in the Himalayan belt will be pivotal for earlier diagnosis, improved survival, and evidence driven resource allocation.

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