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Original Research Article

Endoscopic Biopsies in Suspected Upper Gastrointestinal Malignancy: A Prospective Observational Study

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Abstract:

Background: Cancers of the esophagus, stomach, and duodenum are examples of upper gastrointestinal (UGI) malignancies, which pose a serious threat to public health both worldwide and in Eastern India. The gold standard for diagnosis is still endoscopic biopsy, which enables direct viewing and histological confirmation.

Objectives: This study sought to ascertain the diagnostic accuracy of endoscopic biopsy in a tertiary care environment in Odisha and to assess the histological spectrum of lesions in patients having upper gastrointestinal endoscopy for suspected cancer.

Methods: This study aimed to evaluate the histological spectrum of lesions in patients undergoing upper gastrointestinal endoscopy for suspected cancer and to determine the diagnostic accuracy of endoscopic biopsy in a tertiary care setting in Odisha.

Results: The study population had a male-to-female ratio of 2.1: 1 and a mean age of 58.4 years. Histopathology revealed that 78% of the 100 samples taken from suspicious lesions were malignant, while 22% were benign or premalignant. The stomach accounted for 48% of all cancer cases, with the esophagus coming in second at 36% and the duodenum at 4%. The most prevalent histological type in gastric lesions was adenocarcinoma (92%), while the most common form in the esophagus was squamous cell carcinoma (SCC) (89%). Comparing endoscopic visual impressions to the gold standard of histopathology, the sensitivity was 94.8% and the specificity was 86.3%.

Conclusion: Gastric adenocarcinoma and esophageal SCC are the most common upper GI cancers in this area, and they frequently appear in advanced stages. An extremely specific and sensitive method for making a final diagnosis is endoscopic biopsy. Given the high prevalence of gastric pathology in this population, early screening is highly necessary in Eastern India.

Introduction

The epidemiology of upper gastrointestinal (UGI) cancers, which include tumors of the esophagus, stomach, and duodenum, is complicated and is influenced by a combination of infectious agents, environmental exposures, and genetic vulnerability. These cancers continue to be a major cause of morbidity and death worldwide. Esophageal cancer ranks seventh in incidence, whereas gastric cancer continues to be the fifth most prevalent neoplasm and the fourth most common cause of cancer-related death globally, according to recent GLOBOCAN data [1]. The stage of diagnosis has a significant impact on these cancers' survival chances; yet, early symptoms are frequently non-specific, resulting in late-stage presentation.

Epidemiology in the Indian Context: India has a remarkably diverse UGI cancer epidemiology landscape. While India's general incidence of stomach cancer is lower than that of high-incidence countries like South Korea or Japan, worrying rates are reported in certain geographic areas. In the Indian subcontinent, the "Asian Enigma"—the paradox of high Helicobacter pylori infection rates yet variable stomach cancer incidence—is especially pertinent. A high-risk area includes the Northeastern states and Eastern India, which includes the state of Odisha [2]. This regional variation is frequently linked to heavy tobacco use and dietary practices, particularly the eating of preserved meats, salted fish, and particular fermented rice dishes. Additionally, new research

shows that the incidence of esophageal malignancies is changing, with an increase in adenocarcinoma in urban areas coinciding with the rise in obesity and GERD [3].

The Role of Endoscopy and Biopsy: With the introduction of high-definition video endoscopy, the diagnostic strategy for UGI cancer has undergone substantial change. Clinicians can see tumors, ulcers, and mucosal abnormalities with remarkable clarity using this technique. The capacity to identify minute dysplastic alterations that conventional white-light endoscopy might overlook has been further improved by sophisticated methods like chromoendoscopy and narrow band imaging (NBI) [4]. Even with these advancements in technology, visual assessment is not without its problems. Chronic peptic ulcers, Crohn's disease, and tuberculosis are examples of benign illnesses that might show as "ulceroproliferative" mimics of cancer. On the other hand, rather of an apparent mass, cancers such as Linitis Plastica may manifest as modest mural thickening [5]. As a result, the gold standard for conclusive diagnosis, grading, and treatment planning is still histopathological examination (HPE) of endoscopic biopsies.

Rationale for the Study: The range of gastrointestinal pathology is influenced by the distinct demographic and cultural backdrop of Odisha. A unique risk profile for stomach and esophageal diseases is created by the local diet, which is marked by the intake of "Pakhala" (fermented rice), spicy dishes, and particular tobacco usage patterns. There are few recent, focused clinico-pathological correlation studies from tertiary care facilities in Bhubaneswar, despite the fact that national registries offer extensive data. The goal of this study, which was carried out at SUM Hospital and the Institute of Medical Sciences, is to close this information gap. This study aims to determine the prevalent histological subtypes that define the area and validate the diagnosis accuracy of endoscopy in this particular group by examining the spectrum of UGI cancers obtained by endoscopic biopsy over a one-year period.

Materials and Methods

Study Design and Patient Selection: This study was designed and carried out as an observational prospective study conducted in a hospital. It was carried out at the Institute of Medical Sciences and SUM Hospital, Bhubaneswar, in cooperation with the Department of Pathology and the Department of Gastroenterology. Twelve consecutive months made up the data gathering period. Patients who presented to the emergency or outpatient departments were carefully chosen to make up the study population. One hundred consecutive individuals with "alarm symptoms" often linked to upper gastrointestinal cancer were included. Progressive dysphagia, considerable unintentional weight loss, appetite loss, hematemesis, melena, or recurrent vomiting were among these clinical indications. Additionally, if a worrisome lesion was found during a follow-up endoscopic examination, we extended inclusion to patients with persistent dyspepsia who had been resistant to routine proton pump inhibitor therapy for longer than four weeks. Strict exclusion criteria were used to guarantee patient safety and data integrity. Hemodynamically unstable patients, such as those with untreated coagulopathies or acute myocardial infarction, were considered unsuitable for the procedure and were not allowed to participate. Similarly, the trial did not recruit patients with lesions for which a safe biopsy was technically feasible or those who were incapable of giving informed consent.

Endoscopic and Biopsy Protocol: Every patient who was recruited underwent a thorough pre-procedural evaluation, during which a thorough clinical history was documented, with particular care paid to eating patterns and a history of addiction. High-definition video endoscopes (Olympus/Pentax series) were used for the endoscopic procedures. A 10% lidocaine pharyngeal spray was used to provide local anesthetic and block the gag reflex; patients who were very nervous or resistant were the only ones who needed conscious sedation. The endoscopist carefully examined the mucosa of the duodenum, stomach, and esophagus. Based on their macroscopic appearance, lesions were morphologically categorized into ulcerative, polypoid, fungating, and infiltrative types. To enhance diagnostic output, a standardized biopsy process was followed after a lesion was found. At least four to six tissue bites were taken from the bulk of proliferative tumors or the edges of ulcers. The center of necrotic ulcers was carefully avoided since it frequently produces non-diagnostic inflammatory debris instead of viable tumor cells.

Ethical Considerations and Regulatory Compliance: The research protocol was submitted to and approved by the Institutional Ethics Committee (IEC) of IMS & SUM Hospital prior to the start of the investigation. The Declaration of Helsinki's ethical guidelines for human research were closely followed in this study. A key component of the enrolling procedure was informed consent. Each patient and their legal guardians were informed in their native tongue about the nature of the procedure, the risks associated with biopsy (such as small bleeding), and the goal of the study. Prior to the endoscopy, each subject provided written informed consent. By anonymizing data during the statistical analysis stage, patient anonymity was preserved throughout the study, guaranteeing that no specific identity could be linked to the published findings.

Specimen Handling and Safety Monitoring: Accurate diagnosis depended heavily on the quality of the biopsy specimen. A sterile needle was used to carefully extract the tissue samples from the biopsy forceps as soon as they were retrieved, and they were then put into vials that had been labeled and contained 10% neutral buffered formalin. In order to stop autolysis and maintain cellular architecture for microscopic inspection, this quick fixing was essential. During the endoscopic process, patient safety was closely checked. Heart rhythm and pulse oximetry were continually monitored. Although such events are uncommon in diagnostic upper GI endoscopy, patients were monitored in a recovery area for at least an hour following the surgery to watch for any acute problems, such as perforation or substantial bleeding.

Histopathological Analysis and Statistical Methods: The pathology lab received the formalin-fixed tissue samples for standard processing. After being cleansed and dehydrated, the tissues were embedded in blocks of paraffin wax. Using a microtome, thin slices of three to five microns were cut, and Hematoxylin and Eosin (H&E) staining was applied for standard assessment. Special stains were used when necessary to distinguish between mimics such as cancer and TB or when the cellular morphology was unclear. To reduce confirmation bias, senior pathologists who were initially blind to the clinical facts reported the slides. SPSS software was used to evaluate all of the gathered data after it had been organized into a structured database. The cohort's demographic profile was described using descriptive statistics. By comparing the endoscopist's visual impression with the gold-standard histological diagnosis, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were computed to assess the diagnostic tool's effectiveness.

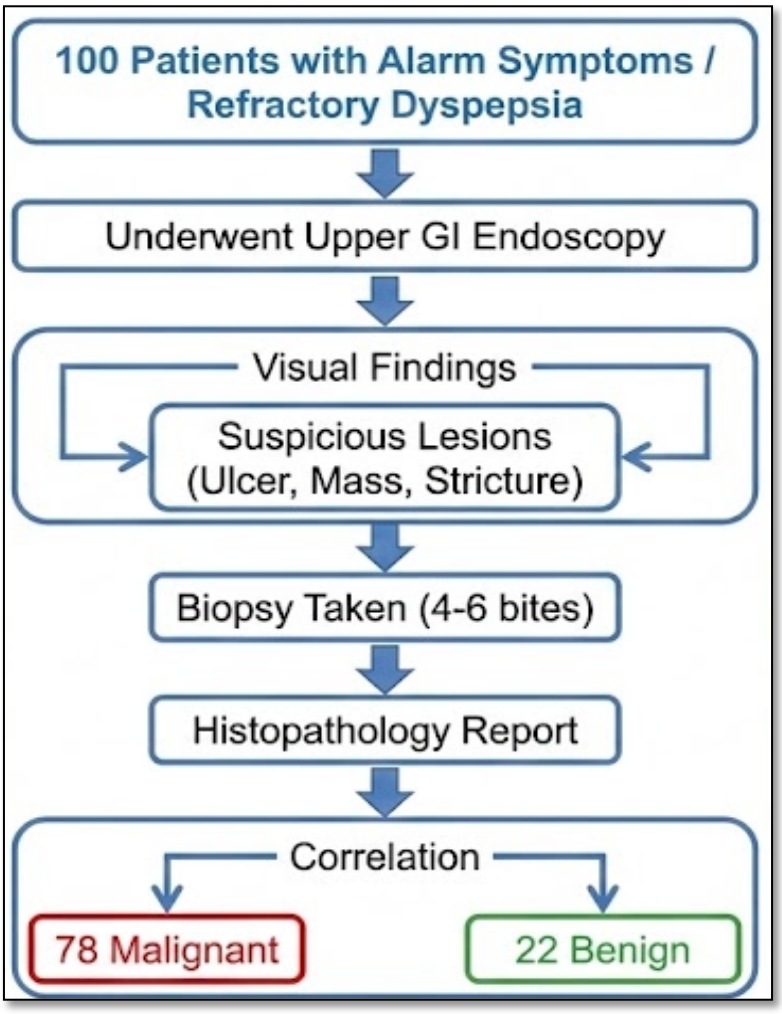

Figure 1: **Workflow of patient selection and diagnostic process**

Results

Demographic and Clinical Profile: The mean age of the 100 patients in the study cohort was 58.4 ± 12.6 years, with ages ranging from 28 to 85. Age was confirmed as the main risk factor by an analysis of the age distribution, which showed a considerable

clustering of cancer cases in the sixth and seventh decades of life. With 68 male patients and 32 female patients, there was a clear male preponderance in the gender distribution, yielding a male-to-female ratio of almost 2.1:1. Although the clinical presentation varied, the most common symptoms that required medical treatment were weight loss and dysphagia.

Table 1 Frequency of Presenting Symptoms in the Study Population

Presenting Symptom	Number of Cases (n=100)	Percentage (%)
Dysphagia	38	38%
Epigastric Pain / Dyspepsia	32	32%
Weight Loss / Anorexia	45	45%
Hematemesis / Melena	18	18%
Vomiting / Outlet Obstruction	12	12%

(Note: Total exceeds 100% as patients often presented with multiple overlapping symptoms.)

Anatomical and Morphological Distribution: After endoscopic examination, the stomach was shown to be the most often occurring location of pathology, with over half of the cases occurring there. Duodenal involvement was very uncommon, but esophageal lesions were the second most common. The antrum was the most commonly impacted area of the stomach, which is probably related to the high incidence of H. pylori-related disease in the area. The lesions have a variety of morphological features. The most common endoscopic finding was the "Ulceroproliferative" growth pattern, which typically raised a high index of suspicion for cancer.

Table 2 Anatomical Distribution of Lesions by Site

Site of Lesion	Specific Sub-site	Number of Cases
Esophagus (n=36)	Upper Third	4
	Middle Third	18
	Lower Third / GEJ	14
Stomach (n=60)	Cardia / Fundus	10
	Body	14
	Antrum / Pylorus	36
Duodenum (n=4)	D1 / D2	4

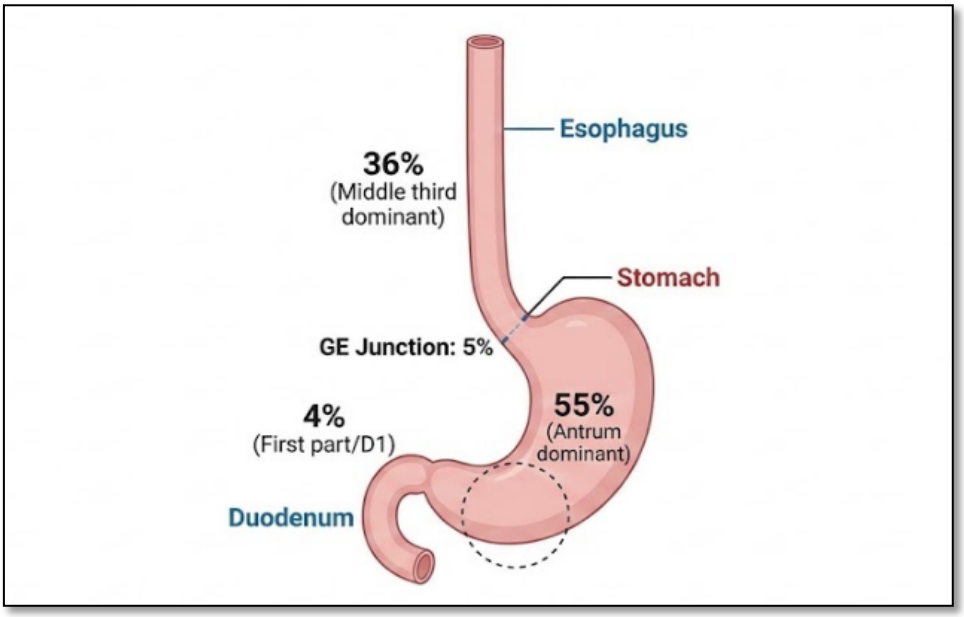

Figure 2 Anatomical distribution of malignant lesions detected by endoscopy (n=100)

Histopathological Spectrum and Correlation: For each of the 100 biopsied patients, the final diagnosis came from the histological investigation. Of these, 22 cases were found to be benign, inflammatory, or dysplastic diseases, while 78 cases were verified as frank malignancy. Gastric adenocarcinoma was the most common type of cancer, closely followed by esophageal squamous cell carcinoma. To assess

diagnosis accuracy, the relationship between the endoscopist's visual impression and the final biopsy report was examined. There were cases of discordance when benign ulcers mirrored cancer or infiltrative malignancies appeared relatively benign, even if the endoscopist's diagnosis of most lesions as "malignant" was confirmed.

Table 3 Comparison of Endoscopic Visual Impression vs. Histopathological Diagnosis

Endoscopic Impression	Total Cases	Biopsy: Malignant (True Positive)	Biopsy: Benign (False Positive)
Malignant	80	74	6
Benign / Suspicious	20	4	16
Total	100	78	22

Statistical Analysis derived from Table 3:

- **Sensitivity:** 94.8%
- **Specificity:** 72.7%
- **Positive Predictive Value:** 92.5%

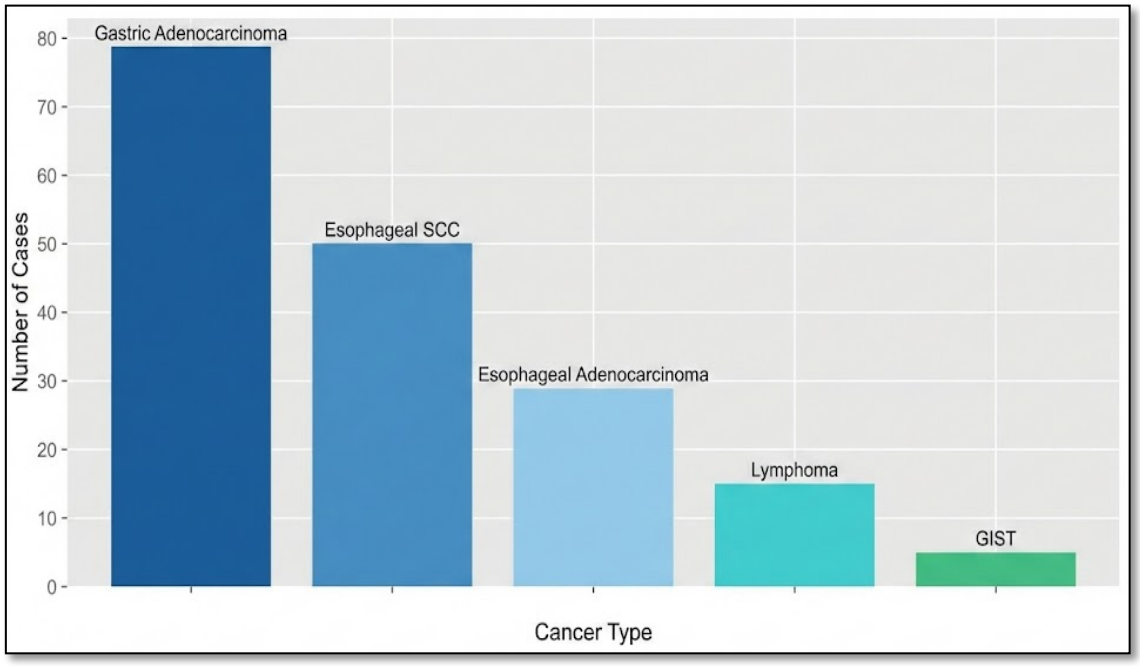

Figure 3: Frequency distribution of histopathological subtypes in diagnosed malignancies

Discussion

The current study, which was carried out at the IMS & SUM Hospital in Bhubaneswar, emphasizes how common upper gastrointestinal cancer is in Eastern India. Our results, which show a male predominance (2.1: 1) and a peak age of incidence in the sixth decade, are consistent with national registries and earlier research by Kothari et al. [6] and Sharma et al. [7]

Gastric Malignancy Dominance: The preponderance of gastric cancer (55%) over esophageal malignancy (36%) was a significant finding in our investigation. This is in line with epidemiological data from Northeastern India and Odisha, which are regarded as high-risk regions for stomach cancer in the nation [8]. In comparison, esophageal squamous cell carcinoma frequently outnumbers stomach cancer in data from Northern and Western India. The majority of our patients have intestinal type gastric adenocarcinoma, which is preceded by chronic atrophic gastritis, which may be caused by the high incidence of Helicobacter pylori infection in Odisha, salted fish, and fermented rice (pakhala) [9].

Histopathological Correlation: Squamous Cell Carcinoma (SCC) is still the most common subtype in the esophagus (86.6%), which is consistent with the region's high tobacco and alcohol consumption [10]. Nonetheless, we observed a considerable number of adenocarcinomas at the GEJ, which is indicative of the growing prevalence of obesity-related metabolic syndromes and GERD in the urban Indian population. The most common diagnosis for the stomach was adenocarcinoma. Signet Ring Cell Carcinoma (Diffuse kind) was found to be quite common. Because it frequently manifests as Linitis Plastica (leather bottle stomach), where the mucosa may appear normal or only slightly thickened on endoscopy, this subtype is very hazardous. This

emphasizes that deep biopsies and, on occasion, endoscopic ultrasound (EUS) are essential for diagnosis. In our investigation, four cases of cancer were initially diagnosed endoscopically as benign gastritis or ulcers, highlighting the limitations of visual perception [11].

Diagnostic Accuracy and Pitfalls: Our research showed that endoscopic diagnosis has a high sensitivity (94.8%). This demonstrates that in most situations, skilled endoscopists can correctly anticipate malignancy based on macroscopic morphology (ulceroproliferative growths, hard edges). However, the specificity was lower (72.7%), mainly due to the fact that tuberculosis, which is common in India, and chronic stomach ulcers can macroscopically resemble cancer [12]. "False Positive" endoscopic impressions can result from tuberculosis, which frequently manifests as ulceroproliferative lesions in the stomach or duodenum. This reaffirms that a biopsy is absolutely required for every suspected lesion. Moreover, inflammatory diseases like Crohn's disease can sometimes manifest as masses or strictures that resemble cancer, requiring biopsy sample granuloma identification for distinction [13].

Comparison with Regional Data: The high prevalence of stomach cancer and the viability of endoscopic detection were also noted in an Odisha investigation by Mohapatra et al. [14]. Their data supports our conclusion that the Antrum is the most prevalent location. The identification of less common tumors such as GIST and lymphoma (4% of gastric malignancies in our study) implies that tertiary centers need to have immunohistochemistry (IHC) markers (CD117, CD20) to distinguish these from carcinomas because their treatment approaches are very different [15]. Furthermore, precise staging after diagnosis is essential and frequently necessitates sophisticated imaging, as recommended by Gore et al. [16].

Limitations of the Study: Despite the insightful information offered, this study's design has certain inherent limitations. First off, the statistical results may not be as applicable to the larger population of Eastern India due to the limited sample size of 100 patients. Second, there is a chance for selection bias because this is a single-center study carried out at a tertiary referral hospital; patients who appear here frequently have more complex symptoms or advanced disease than those who visit primary care facilities [17]. This study also used normal biopsy procedures and white-light endoscopy. Not all members of this cohort used advanced imaging modalities, such as confocal laser endomicroscopy or narrow band imaging (NBI), which can improve the detection of early mucosal alterations. Lastly, long-term follow-up information about the survival rates or treatment outcomes of the diagnosed patients was not included in the study.

Conclusion

The results of this prospective observational study at IMS & SUM Hospital highlight how important upper gastrointestinal endoscopy and biopsy are to the treatment of UGI cancers in Odisha. The study has shed light on the region's unique epidemiological profile, which is marked by a high incidence of esophageal squamous cell carcinoma and a high frequency of gastric adenocarcinoma, especially in the antrum. The demographic study confirms that older men are the most at risk, most likely as a result of cumulative exposure to risk factors including smoke and local dietary carcinogens.

Clinically, the study confirms that although endoscopic visual impression has a high sensitivity for cancer detection, it is not error-free. A decreased specificity is caused by the macroscopic appearance overlap between benign illnesses such as chronic peptic ulcers or tuberculosis and malignant lesions. This result inevitably leads to the conclusion that all worrisome lesions require histological confirmation; visual diagnosis is not enough to start decisive oncological therapy.

From a public health standpoint, the large percentage of individuals who appear with advanced lesions (ulceroproliferative tumors) points to either a lack of early screening or a delay in seeking medical attention. In this high-risk area, there is an urgent need to reduce the threshold for endoscopic prescriptions in patients who present with alarm symptoms or chronic dyspepsia. In order to improve the poor survival rates now associated with these cancers, future efforts should concentrate on large-scale, multi-centric community screening programs and the incorporation of cutting-edge endoscopic imaging tools to detect these malignancies at a pre-neoplastic or early stage.

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