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Comparative Analysis of Healthcare-Associated Infections in Gastroenterology and Gastro surgery: A Two-Year Retrospective Study at GB Pant Hospital, New Delhi

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ABSTRACT

Background: Healthcare-associated infections (HAIs) pose significant challenges in gastroenterology and gastrosurgery. This study aimed to compare infection characteristics between these two patient populations at a tertiary care center in India, focusing on gastro-specific samples.
Methods: We conducted a retrospective observational study of 824 patients (412 each in gastroenterology and gastrosurgery) over 24 months at GB Pant Hospital, New Delhi. Infections were defined using CDC criteria. Microbiological identification and antimicrobial susceptibility testing were performed on gastro-specific samples. Risk factors were analyzed using multivariate logistic regression.
Results: Infection rates were significantly higher in gastrosurgery patients (18.4% vs. 7.5%, $p<0.001$). *Escherichia coli* was the predominant pathogen in both groups (gastroenterology: 30.6%, gastrosurgery: 28.9%). Antimicrobial resistance was more prevalent in gastrosurgery isolates, with 48.7% ESBL-producing Enterobacteriaceae compared to 27.3% in gastroenterology. Independent risk factors for infection differed between groups, with proton pump inhibitor use significant in gastroenterology (OR 2.3, 95% CI 1.5-3.5) and prolonged operative time in gastrosurgery (OR 2.8, 95% CI 1.9-4.2).
Conclusion: Significant differences in infection profiles between gastroenterology and gastrosurgery patients necessitate tailored prevention and treatment strategies.

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Introduction

Healthcare-associated infections (HAIs) remain a significant challenge in both gastroenterology and gastrosurgery settings, contributing to increased morbidity, mortality, and healthcare costs (1, 2). While both specialties focus on the gastrointestinal tract, the nature of interventions and patient populations differ, potentially leading to distinct infection profiles (3). The global burden of HAIs is substantial, with an estimated prevalence of 7.6% in high-income countries and 15.5% in low- and middle-income countries (4). In India, limited data suggest HAI rates ranging from 11% to 26%, highlighting the need for robust surveillance and prevention strategies (5, 6).

Previous studies have largely focused on either gastroenterology or gastrosurgery infections in isolation, with limited comparative data (7, 8). This research gap hinders the development of specialty-specific infection control strategies. Our study aims to address this by providing a comprehensive comparison of infection characteristics across both specialties, including prevalence, risk factors, microbial etiology, and antimicrobial susceptibility patterns, with a focus on gastro-specific samples.

The objectives of this study were to compare the prevalence of HAIs between gastroenterology and gastro surgery patients. Also, it was important to identify and compare risk factors for HAIs in both patient groups. Determination of the microbial etiology and antimicrobial susceptibility patterns of HAIs in each specialty was the other issue considered in this research. Finally, evidence-based recommendations provided for tailored infection prevention strategies.

Materials and Methods

Study Design and Setting

A retrospective observational study was conducted at GB Pant Hospital, a 714-bed tertiary care center in New Delhi, India, from August 1, 2022, to August 31, 2024. The hospital has dedicated gastroenterology and gastrosurgery departments.

Study Population and Sample Size

The study included adult patients (≥18 years) admitted to the gastroenterology and gastrosurgery departments for more than 48 hours. Patients with infections present at admission were excluded. We included 412 consecutive eligible patients from each department, totaling 824 patients.

Ethical Considerations

The requirement for informed consent was waived due to the retrospective nature of the study.

Data Collection

We extracted patient demographics, clinical data, and potential risk factors from electronic medical records using standardized data collection forms. Infections were defined according to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) criteria (9).

Microbiological Analysis

We analyzed the following gastro-specific clinical samples i.e Bile, Pancreatic fluid, Peritoneal fluid, Intra-abdominal abscess aspirates, Liver abscess aspirates, ERCP-related samples (e.g., biliary stent cultures), Fistula tract swabs, Surgical site swabs (for gastro surgery patients). Samples were processed using standard microbiological culture methods (10). Identification of bacterial isolates was performed using the VITEK 2 System (11).

Antimicrobial Susceptibility Testing

Antimicrobial susceptibility testing was conducted using the disk diffusion method and interpreted according to the Clinical and Laboratory Standards Institute (CLSI) guidelines (12). Extended-spectrum β-lactamase (ESBL) production was confirmed using the combination disk method as per CLSI recommendations (13).

Statistical Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables were compared using Chi-square or Fisher's exact tests, and continuous variables using Student's t-test or Mann-Whitney U test, as appropriate. Multivariate logistic regression was performed to identify independent risk factors for infection. Variables with $p<0.1$ in univariate analysis were included in the multivariate model. P-values <0.05 were considered statistically significant.

Results

A total of 824 patients (412 in each group) were included in the study. Table 1 shows the demographic and clinical characteristics of the study participants.

The demographic and clinical characteristics of the study participants are detailed in Table 1. Notably, gastrosurgery patients had a significantly higher prevalence of malignancy (23.1% vs. 11.7%, $p<0.001$) and longer median length of stay (8 vs. 6 days, $p<0.001$).

HAI rates were significantly higher in the gastrosurgery group (18.4% vs. 7.5%, $p<0.001$). The types of infections observed are summarized in Table 2.

Multivariate analysis identified independent risk factors for infection, with proton pump inhibitor use being significant in gastroenterology and prolonged operative time in gastrosurgery (Table 3).

Escherichia coli was the most common pathogen in both groups (Figure 1). However, gastrosurgery patients had a higher prevalence of *Pseudomonas aeruginosa* (18.4% vs. 9.7%).

Gastrosurgery isolates showed higher resistance rates, particularly in ESBL-producing *E. coli* (54.5% vs. 30.0%) and carbapenem-resistant *Klebsiella pneumoniae* (26.7% vs. 16.7%) (Figure 2).

Table 1. Demographic and Clinical Characteristics of Study Participants.

Characteristic	Gastroenterology (n=412)	Gastro surgery (n=412)	p-value
Age, mean ± SD	53.7 ± 16.2	56.4 ± 15.1	0.012
Male, n (%)	241 (58.5%)	255 (61.9%)	0.318
BMI, mean ± SD	24.9 ± 4.5	25.5 ± 4.8	0.067
Diabetes, n (%)	92 (22.3%)	108 (26.2%)	0.201
Hypertension, n (%)	118 (28.6%)	143 (34.7%)	0.059
Malignancy, n (%)	48 (11.7%)	95 (23.1%)	<0.001
Length of stay, median (IQR)	6 (4-9)	8 (5-13)	<0.001

Table 2. Distribution of healthcare-associated infection types.

Infection Type	Gastroenterology (n=31)	Gastro surgery (n=76)
Biliary tract infections	12 (38.7%)	18 (23.7%)
Intra-abdominal abscesses	7 (22.6%)	25 (32.9%)
Surgical site infections	N/A	22 (28.9%)
ERCP-related infections	8 (25.8%)	N/A
Pancreatic infections	3 (9.7%)	7 (9.2%)
Others	1 (3.2%)	4 (5.3%)

Table 3. Risk Factors: Multivariate logistic regression analysis identified the following independent risk factors.

Category	Factor	Odds Ratio	95% Confidence Interval
Gastroenterology	Proton pump inhibitor use	2.3	(1.5 - 3.5)
	Recent antibiotic exposure	2.9	(1.9 - 4.4)
	Biliary stent placement	2.5	(1.6 - 3.9)
Gastro surgery	Prolonged operative time (>3 hours)	2.8	(1.9 - 4.2)
	Emergency surgery	3.3	(2.2 - 5.0)
	Preoperative hospital stay >2 days	2.1	(1.4 - 3.1)

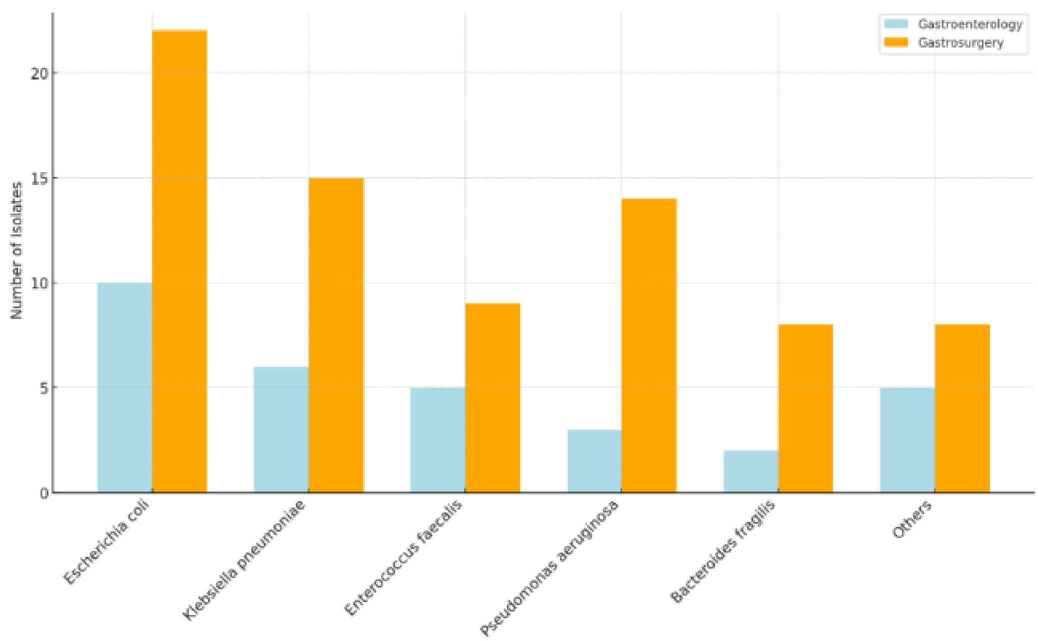

Fig 1. Diversity of causative organisms.

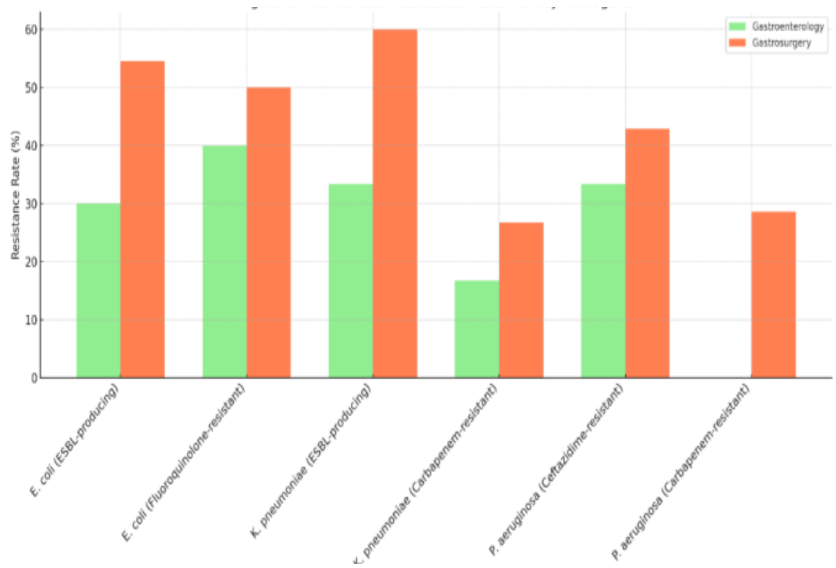

Fig 2. Antimicrobial resistance rates for key pathogens.
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Discussion

Our study reveals significant differences in HAI characteristics between gastroenterology and gastrosurgery patients at a tertiary care center in India. The higher infection rate in gastrosurgery patients (18.4% vs. 7.5%) is consistent with previous studies and likely attributed to the invasive nature of surgical procedures (14, 15).

The microbial etiology differed between the two groups, with E. coli being the predominant pathogen in both specialties. This finding aligns with global trends in HAIs, particularly in low- and middle-income countries (16). However, the higher prevalence of P. aeruginosa in gastrosurgery patients (18.4% vs. 9.7%) is noteworthy and may be related to the higher rate of surgical site infections and intra-abdominal abscesses in this group (17).

Antimicrobial resistance patterns were concerning in both groups but more pronounced in gastrosurgery isolates. The high rates of ESBL-producing Enterobacteriaceae (54.5% in E. coli from gastrosurgery patients) are alarming and higher than those reported in some European studies (18, 19). This highlights the need for judicious use of broad-spectrum antibiotics and enhanced infection control measures in our setting.

The identified risk factors provide valuable insights for developing targeted prevention strategies. In gastroenterology, our findings support the implementation of antimicrobial stewardship programs focusing on appropriate PPI use and antibiotic prescribing (20). The association between biliary stent placement and infections underscores the importance of proper stent management and timely removal (21). For gastrosurgery, interventions aimed at reducing preoperative hospital stay and optimizing operative times may prove beneficial, as suggested by other studies (22, 23).

The strengths of our study include its large sample size, comprehensive microbiological analysis of gastro-specific samples, and the comparison between two closely related but distinct specialties. However, some limitations should be acknowledged. First, this is a single-center study, which may limit the generalizability of our findings. Second, the retrospective nature of the study may have led to some missing data or potential biases in data collection.

Conclusion

This study demonstrates distinct infection profiles in gastroenterology and gastrosurgery patients, encompassing differences in prevalence, risk factors, causative organisms, and antimicrobial susceptibility patterns. These findings underscore the need for specialty-specific approaches to infection prevention and management.

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Ethics approval and consent to participate

Not Needed.

Conflict of interest

None.

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