

ORIGINAL ARTICLE

Pattern and Risk Factors of Upper Gastrointestinal Endoscopy Associated Bacterial Infections in Suez Canal University

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ABSTRACT

Key words:

Pattern, Risk factors, Bacterial Infection, Upper Gastrointestinal endoscopy

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Background: Recent years showed marked changes in the incidence rate of upper gastroendoscopy associated infections as well as resistance to common antimicrobial agents denoting change in the pattern and possibility of emergence of resistant strains or change in the common causative agents of these infections. **Objectives:** To assess the prevalence of upper endoscopy associated bacterial infections as well as the most risk factors among patients underwent this procedure in Suez Canal University Hospital. **Methodology:** This study included patients with upper gastrointestinal symptoms eligible for diagnostic and/or therapeutic interventions upper gastrointestinal endoscopies after giving written consent. Routine hematological investigations such as TLC, ESR and CRP along with blood culture tests which were done on Day zero and after endoscopy on day three and were performed for every patient. **Results:** The current study involved 125 patients. The incidence rate of bacterial infection was 4% estimated by blood culture. All patients with positive blood cultures were significantly associated with patients who have chronic liver disease ($p=0.015$). Moreover, all patients with positive blood cultures had hematemesis and /or melena. All patients with positive blood cultures had an intervention, where 40% had band ligation and 60% had sclerotherapy. **Conclusion:** Diagnostic and therapeutic upper gastrointestinal endoscopies still associated with occurrence of bacterial infection. Therefore, endoscopies should undergo high level of disinfectants.

INTRODUCTION

Gastrointestinal endoscopies showed revolutions in diagnostic and interventional therapeutic propose and they became easier and more flexible. Despite the dazzling endoscopic triumphs, flexibility has its own risks, and with fiberoptic gastrointestinal tract endoscopy becoming more common over the last ten years, it was impossible to ignore the rising incidence of difficulties¹.

When an endoscope is inserted, microscopic tissue damage might cause momentary bacteremia. In this instance, bacteria from blood cultures are often low pathogenicity members of the oropharyngeal commensal microflora. Less than 8% of cases of bacteremia after diagnostic upper GIT endoscopy, with or without biopsies, were recorded. Follow-up research conducted 6 months to 2 years following endoscopy on patients with bacteremia found no evidence of infectious consequences².

Compared to diagnostic upper GIT endoscopy, therapeutic upper GIT endoscopy—including esophageal sclerotherapy, variceal ligation, and esophageal dilatation—is linked with much higher tissue damage. The risk of bacteremia after these endoscopic operations is greater (30%) than those following diagnostic procedures (12.5%). After

esophageal sclerotherapy, endoscopic variceal ligation, and esophageal dilatation, the rate of transitory bacteremia varies between 0% and 53%, 1% to 25%, and 2% to 54%, respectively³.

Following upper GIT endoscopy, endocarditis of both natural and artificial valves, meningitis and/or brain abscess, and bacterial peritonitis have all been documented as additional infection complications. *Staphylococcus spp.* and *Streptococcus viridans* made up the bulk of the isolated organisms⁴.

Although extremely low, the mortality and morbidity rates associated with upper GIT endoscopy should not be disregarded. According to reports, there are errors in 0.1% to 0.2% of upper GIT endoscopies, including medication responses, and there are 0.14 to 0.65 reported fatalities for every 1000 surgeries⁵.

Endogenous or exogenous infections connected to endoscopy may be distinguished: During endoscopic operations, *Escherichia coli*, *Klebsiella spp.*, *Enterobacter spp.*, and *enterococci* from the patient's own microbial flora most often cause endogenous infections. *Pseudomonas aeruginosa* and *Salmonella spp.* are the foreign bacteria that are most commonly linked to transmission during GI endoscopy⁶.

Our rational was assessment of the prevalence of upper endoscopy associated bacterial infections as well

as the most risk factors among patients underwent this procedure in Suez Canal University Hospital.

METHODOLOGY

This prospective descriptive research was carried out between May 2021 and October 2022 at the Suez Canal University Hospital's Gastro-Intestinal Endoscopy Unit. Before beginning fieldwork, the research protocol was authorized by the Suez Canal University, Faculty of Medicine Research Ethics Committee. All participants gave their permission after being properly informed. **Reference:** Research 4419#.

This study included 125 patients had upper gastrointestinal symptoms underwent diagnostic and therapeutic upper gastrointestinal endoscopy. All adult patients aged more than 18 years, of both gender eligible for upper gastrointestinal endoscopy. All patients with manifestations suggestive of any type of community acquired infection in the form of fever and any symptoms of localization during the previous three days or with hospital related infections during admission with history of hospital admission more than two days previous to this new one or received antimicrobials during the previous 7 days were excluded.

Assessment of adult patients presented by upper gastro-intestinal manifestations was done using close ended questionnaire including individual socio-demographic characteristics, comorbid chronic illness and GIT symptoms, clinical evidence of current infections, drug history regarding recent used of antimicrobials and history of hospital admission within 48 hours before. Routine hematological investigations such as TLC, ESR and CRP tests along with blood cultures which were done on Day zero and after endoscopy on day three.

Statistical analysis was performed utilizing SPSS program. Data was presented as tables and graphs as appropriate. Quantitative data was expressed as mean and standard deviation while qualitative data was expressed as number and percentage. Comparisons were performed utilizing T test (for quantitative data) and chi square (for qualitative data). Significance was considered at p value of < 0.05 .

RESULTS

The current study involved 125 patients; their mean age was 50.16 ± 16.57 years. The majority of the patients were males (64%). We found that about 48% of

patients had at least one chronic illness, where the most frequent one was chronic liver disease (44%), hypertension (12%) and diabetes mellitus (12%) as shown in table (1).

Table 1. Baseline and clinical characteristics of the patients

Variables	n= 125
Age (years),	
mean \pm SD	50.16 ± 16.57
median (range)	55 (16 - 90)
Gender	
Male	80 (64)
Female	45 (36)
Chronic illness	
Absent	60 (48)
Present	65 (52)
Chronic liver disease	55 (44)
Hypertension	15 (12)
Diabetes mellitus	15 (12)
Cancer	5 (4)
Presenting symptoms	
Hematemesis and/or melena	75 (60)
Dyspepsia	35 (28)
Persistent vomiting	10 (8)
Anemia	5 (4)
Intervention	
No intervention	45 (36)
Intervention	80 (64)
Biopsy	50 (40)
Ligation	25 (20)
Sclerotherapy	5 (4)

Data are presented as number (%) or mean and SD.

The most frequent presentations were hematemesis and melena (60%), dyspepsia (28%), persistent vomiting (8%) and anemia (94%). Endoscopic interventions were done in 64% of the patients where the most frequent procedures were biopsies intake and ligation.

The endoscopic intervention had elicited a significant increase in all inflammatory markers including ESR, CRP and total leucocyte count ($p < 0.001$) as shown in table (2).

Table 2. Comparison between laboratory measures of the participants before and after endoscopy

Variables	Pre-intervention mean ± SD	Post-intervention mean ± SD	p-value
1 st hour ESR	11.400± 5.722	28.000± 26.9737	<0.001* ^a
2 nd hour ESR	19.600± 10.1917	46.320± 29.7147	<0.001* ^a
CRP	3.840± 0.7870	6.800± 4.3068	<0.001* ^a
TLC	5.936± 1.9518	6.352± 2.8320	0.035* ^a

^a p-values are based on paired t-test. Statistical significance at P < 0.05

The incidence rate of bacterial infection among patients who had gastrointestinal endoscopy was 4% using blood culture as shown in figure (1).

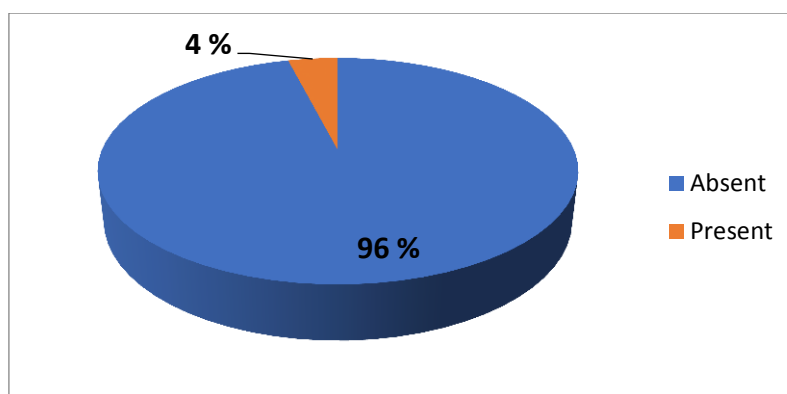


Fig. 1. Incidence of bacterial infection among participants

All patients with positive blood cultures had hematemesis. Moreover, all patients with positive blood cultures had an intervention, where 40% had band ligation and 60% had sclerotherapy (p<0.001) (Table 3).

Table 3. Association between bacterial infection after endoscopy and baseline characteristics of the participants

Clinical characteristics	Bacterial infection by culture		P -value
	Absent (n= 120)	Present (n= 5)	
Age (years), mean ± SD	50.16 ± 16.92	50.00 ± 0.00	0.983 ^a
Gender			
Male	75 (62.5)	5 (100)	0.159 ^b
Female	45 (37.5)	0 (0)	
Chronic illness			
Chronic liver disease	50 (41.7)	5 (100)	0.015* ^b
Hypertension	15 (12.5)	0 (0)	0.399 ^b
Diabetes mellitus	15 (12.5)	0 (0)	0.399 ^b
Cancer	5 (4.2)	0 (0)	0.641 ^b
Presenting GIT symptoms			
Hematemesis and/or melena	70 (58.3)	5 (100)	0.121 ^b
Dyspepsia	35 (29.2)	0 (0)	0.395 ^b
Persistent vomiting	10 (8.3)	0 (0)	0.586 ^b
Anemia	5 (4.2)	0 (0)	0.219 ^b
Intervention			
Ligation	5 (4.2)	2 (40)	0.039*
Sclerotherapy	50 (41.7)	3 (60)	

^a p-values are based on independent t- test. Statistical significance at P < 0.05

^b p-values are based on Fisher exact test. Statistical significance at P < 0.05

DISCUSSION

Endoscopy is now a treatment that patients may tolerate and a reliable diagnostic tool for their doctors because of flexibility. Flexibility did not come without risks, however. Flexible endoscopies are particularly susceptible to contamination from blood, fluids, and pathogens while being used. The intricate and challenging cleaning is caused by the many interior passages and small lumens⁷.

In our study socio-demographic results show male patients were about 64 % of the patients while females formed 36% which nearly similar to Puttarajue and Sreramaseshadri⁸ who revealed males were significantly predominant (60%) compared to females (40%). This might be due to smoking and lifestyle factors are more common in males compared to females.

In the current study, about 48% of patients had at least one chronic illness, whereas the most frequent one was chronic liver disease (44%), hypertension (12%), diabetes mellitus (12%) and cancer (5%). Similar data was revealed by Zucherman et al.⁹ who showed Patients who have had endoscopic treatment for esophageal varices and chronic liver disease are more likely to develop bacteremia and infections.

This study showed that the most frequent presentations was hematemesis and melena (60%) and dyspepsia (28%), persistent vomiting (8%) and anemia (4%), as gastrointestinal bleeding was a most critical emergency symptoms for seeking medical advice and doing endoscopy.

On our mirror side, Aldujayn et al.¹⁰ described that Gastrointestinal hemorrhage, dyspepsia, and reflux symptoms were the most frequent indications for upper gastrointestinal endoscopy (26.8%, 19.6%, and 10.7%, respectively).

In the far way, Gomaa et al.¹¹ revealed epigastric pain and heart burn with percentage of 31.9%, followed by 14.2% for follow up varices, then 12.7% for vomiting, and 10.3% for Hematemesis and melena, 9.3% for Screening for varices, and 32.9% of them had combine complains.

This differs from the study of Agyei-Nkansahet et al.¹² that revealed the most frequent symptom, dyspepsia, was experienced by 75% of patients. Upper GI bleeding symptoms, such as hematemesis and melena, were experienced by 18.9% of patients.

The current study showed that all patients with positive blood cultures had an intervention (4%), whereas 40% had band ligation and 60% had sclerotherapy which is nearly similar to Shaukat et al.¹³ who showed the rate of bacteremia after endoscopic sclerotherapy that is reported in a systemic review to be ranged from 5% to 55% and also who

found the reported rates of bacteremia with band ligation ranged from 0% to 25%. In another comprehensive review, the reported rate of bacteremia after sclerotherapy ranged from 0% to 50%, with the majority of research indicating a rate of 5-7%. Schembre and Bjorkman¹⁴ showed that esophageal dilatation (45%) and variceal sclerotherapy (31%) were associated with a greater mean incidence of bacteremia¹⁵.

Another study showed that bacteremia was documented in 6.7% patients undergoing simple gastroscopy and 4% patients who also had gastric biopsy¹⁶.

In a different research, 3.5% of patients had bacteremia that persisted after endoscopic procedures, and the lowest mean bacteremia rates were seen after esophagogastric-duodenoscopy (4.2%), endoscopic retrograde cholangiopancreatography (5.6%), colonoscopy (2.2%), and sigmoidoscopy (4.9%)¹⁵.

Shaukat et al.¹³ reported that investigators have reported bacteremia rates that range from 0% to 8%. In the study of Baltch et al.¹⁷, the incidence of bacteremia is less than 2 % in most studies, but may be as high as 15 % in another study.

In Kovaleva⁷ trial; after diagnostic upper GI endoscopy, the reported prevalence of transitory bacteremia varies from 0% to 8%; after therapeutic upper GI endoscopy, the reported prevalence ranges from 0% to 54%. (e.g., variceal ligation, esophageal sclerotherapy and dilatation).

In the recent study, all the patients had normal ESR, CRP and total leucocyte count (TLC) before the endoscopy and Laboratory results after endoscopic interventions showed that endoscopic intervention had elicit a statistically significant increase in all inflammatory markers including ESR, CRP and total leucocyte count.

CONCLUSION

The current study revealed that diagnostic and therapeutic upper gastrointestinal endoscopies still associated with occurrence of bacterial infection. Therefore, endoscopies should undergo high level of disinfectants.

Consent for publication: Not applicable

Availability of data and material: Data are available upon request

Competing interests: The author(s) declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article none.

Funding: Authors did not receive any grants from funding agencies

Acknowledgment

We acknowledged the help of all staff in endoscopic unit and infection control unit of Suez Canal University hospital.

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