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Original Research Article

BLOODSTREAM INFECTIONS IN CIRRHOTIC PATIENTS: EPIDEMIOLOGY, ANTIMICROBIAL RESISTANCE TRENDS, AND CLINICAL OUTCOMES

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ABSTRACT

Background: Cirrhosis is associated with immune dysfunction and increased susceptibility to bloodstream infections (BSIs), which significantly contribute to morbidity and mortality. Rising antimicrobial resistance (AMR) further complicates management, especially in resource-limited settings. **Objectives:** To evaluate the epidemiology, microbial profile, antimicrobial resistance patterns, and clinical outcomes of BSIs in cirrhotic patients at a tertiary care center.

Materials and Methods: This retrospective observational study included 43 adult cirrhotic patients with culture-proven BSIs admitted between January and July 2020. Demographic data, etiology of cirrhosis, laboratory parameters, Child-Pugh and MELD scores, microbial isolates, and antibiotic sensitivity profiles were analyzed. Infections were classified as community-acquired or nosocomial.

Results: The mean patient age was 52.3 ± 9.6 years, with a male predominance. Hospital-acquired infections accounted for 53.5% of cases. Gram-negative organisms were most common, with *E. coli* (37.2%) and *Klebsiella* spp. (27.9%) being predominant. High resistance was noted to third-generation cephalosporins and fluoroquinolones, whereas carbapenems and amikacin retained moderate effectiveness. *Acinetobacter* spp. exhibited multidrug resistance, remaining largely sensitive only to colistin and tigecycline. Overall in-hospital mortality was 34.9%, with most patients classified as Child-Pugh C.

Conclusion: BSIs in cirrhotics are primarily caused by multidrug-resistant Gram-negative pathogens. Early recognition, adherence to local antibiograms, and robust antimicrobial stewardship are essential to improve outcomes.

Keywords: Cirrhosis, Bloodstream infection, Antimicrobial resistance.

INTRODUCTION

Cirrhosis predisposes patients to bloodstream infections (BSIs) due to immune dysfunction, altered gut permeability, and frequent invasive procedures. Such infections contribute substantially to morbidity and mortality in advanced liver disease. Recent data suggest rising antimicrobial resistance (AMR) among Gram-negative pathogens, posing therapeutic challenges globally. Similar studies from India and abroad have demonstrated increasing resistance trends in cirrhotic cohorts.[1,2]

Objectives: To determine the epidemiologic profile, etiological agents, antimicrobial resistance patterns, and outcomes of bloodstream infections among cirrhotic patients at a tertiary care centre.

MATERIALS AND METHODS

In this hospital based retrospective study, we reviewed the case records of all consecutive patients admitted, between January to July 2020, in the Department of Gastroenterology, of a tertiary care center in Northern India.

A total of 43 consecutive patients (>18 years) with culture-proven BSIs were identified. All the details of patients were collected including Patients Age, Sex, Date of admission, Date of discharge, Diagnosis of patient including etiology, various Co morbidities and Addictions. Information regarding laboratory parameters including Complete blood counts (CBC), Liver function tests (LFT), Blood urea, Serum creatinine, Serum electrolytes, INR, fasting blood sugar, Chest x ray, Urine routine / microscopy, Ultrasound abdomen, AscItic fluid analysis (tlc, dlc, protein and albumin), Blood , Urine & Ascitic fluid culture results were recorded. Any other site specific culture eg Sputum, Skin to detect bacterial infection if done were also recorded. Patients with complete work up and a definite diagnosis were included in the study. Child-Pugh scoring (CTP SCORE) and Model for End stage Liver Disease (MELD) was also recorded for all patients. The study protocol conformed to the ethical guidelines and was approved by the institutional review board. Patients with incomplete medical records, any solid organ transplantation, any malignancy , pt with retroviral disease or on immunosuppressive medications were not included in this study. All patients who had a positive blood culture were considered to have a definitive infection. Further infection was differentiated between Community acquired and Nosocomial. Community acquired infection was defined when the infection was present at admission or within 48 hrs of admission. Results for continuous variables were expressed as means and standard deviation. Variables with non normal distribution were described by median. Categorical variables were expressed as percentages. Bivariate analysis was carried out using pearsons coefficient of correlation. Odds Ratio (OR) was used to ascertain the strength of relationship between two variables. A p value of less than 0.05 was considered statistically significant. SPSS 23 software was used for statistical analysis.

Cirrhosis was defined as diffuse hepatic fibrosis and nodule formation with distortion of hepatic architecture, confirmed by clinical, biochemical, or radiological evidence.[3] Community-acquired infection was defined as infection present on admission or within 48 hours of hospitalization,[4] whereas nosocomial infection was defined as infection developing after 48 hours of admission.[5] Continuous variables were expressed as mean ± standard deviation (SD), categorical variables as percentages, and $p < 0.05$ was considered statistically significant.

RESULTS

A total of 43 cirrhotic patients were analyzed. The mean age was 52.3 ± 9.6 years, with a male-to-female ratio of 30:13. Hospital-acquired infections were present in 23 (53.5%) patients, while 20 (46.5%) had community-acquired infections. The in-hospital mortality rate was 34.9%.

Table 1: Pathogen Distribution

Pathogen	Number (%)
E. coli	16 (37.2%)
Klebsiella spp.	12 (27.9%)
Acinetobacter spp.	9 (20.9%)
Enterococcus spp.	3 (7.0%)
Staphylococcus spp.	2 (4.7%)
Candida spp.	1 (2.3%)

All had SUI 20 (100%), and none had urge incontinence. The mean symptom duration was 3.50 ± 0.25 years. According to the Salem SUI score, 6 (30%) had mild severity, 4 (20%) had moderate severity, and 10 (50%) had severe symptoms. [Table 2]

Table 2: Etiology of Cirrhosis

Etiology	Number (%)
Alcohol	19 (44.2%)
HBV	6 (14.0%)
HCV	5 (11.6%)
NAFLD	10 (23.3%)
Idiopathic/Cryptogenic	3 (7.0%)

Table 3: Child-Pugh Classification

Class	Number (%)
C	30 (69.8%)
B	13 (30.2%)
A	0

Table 4: Antibiotic Sensitivity Pattern (with counts and percentages)

Pathogen (n)	Sensitive to (n/total, %)	Resistant to (n/total, %)
E. coli (n=16)	Meropenem 14/16 (87.5%), Amikacin 11/16 (68.8%), Piperacillin–Tazobactam 10/16 (62.5%)	Ceftriaxone 12/16 (75%), Ciprofloxacin 11/16 (68.8%)
Klebsiella spp. (n=12)	Meropenem 7/12 (58.3%), Amikacin 8/12 (66.7%)	Ceftriaxone 10/12 (83.3%), Piperacillin–Tazobactam 7/12 (58.3%), Ciprofloxacin 8/12 (66.7%)
Acinetobacter spp. (n=9)	Colistin 8/9 (88.9%), Tigecycline 7/9 (77.8%)	Meropenem 8/9 (88.9%), Cefepime 8/9 (88.9%)
Enterococcus spp. (n=3)	Linezolid 3/3 (100%), Vancomycin 3/3 (100%)	Ampicillin 2/3 (66.7%), Gentamicin 2/3 (66.7%)
Staphylococcus spp. (n=2)	Linezolid 2/2 (100%), Vancomycin 2/2 (100%)	Oxacillin 1/2 (50%), Ciprofloxacin 1/2 (50%)
Candida spp. (n=1)	Fluconazole 1/1 (100%), Amphotericin B 1/1 (100%)	Voriconazole 0/1 (0%)

DISCUSSION

Our study demonstrates that Gram-negative pathogens, particularly E. coli and Klebsiella, were predominant in bloodstream infections among cirrhotic patients.[10,12] This is consistent with previous studies from India and abroad, which highlight translocation of enteric bacteria across compromised gut barriers as a key mechanism. Alcohol-related cirrhosis (44.2%) was the leading etiology, comparable to national data from Singh et al,[6] and international reports by Moreau et al.[7]

Most patients were Child-Pugh class C (69.8%), similar to studies by Choudhury et al,[11] and Piano et al,[8] reflecting that decompensated cirrhotics have impaired immunity, increased bacterial translocation, and higher risk of nosocomial infections. Our antibiotic sensitivity data (Table 4) showed carbapenems and aminoglycosides retained moderate efficacy, while third-generation cephalosporins and fluoroquinolones had high resistance rates. This aligns with ICMR AMR surveillance and other Indian and European studies.[8,9,10]

Acinetobacter species displayed extensive multidrug resistance, being sensitive mainly to colistin and tigecycline. Linezolid and vancomycin remained universally effective against Gram-positive organisms. These findings are consistent with prior observations by Fernandez et al,[2] and Kumar et al.[10] Rational antibiotic selection based on local antibiograms, infection control, and antimicrobial stewardship programs are critical to improving outcomes in cirrhotic patients with BSI

CONCLUSION

Gram-negative organisms, mainly E. coli and Klebsiella, were predominant pathogens in bloodstream infections among cirrhotics. Most patients were decompensated (CTP-C) and exhibited multidrug-resistant infections. Empirical therapy should consider local resistance trends and prioritize antibiotic stewardship.

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