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Original Research Article

FREQUENCY AND BACTERIOLOGICAL SPECTRUM OF SPONTANEOUS BACTERIAL PERITONITIS IN PATIENTS PRESENTING WITH DECOMPENSATED CIRRHOSIS TO A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: *Spontaneous bacterial peritonitis (SBP) is a severe and common infection in patients with decompensated cirrhosis, contributing significantly to morbidity and mortality. Early identification and understanding of causative organisms are crucial for targeted therapy and better patient outcomes.* ***Objective:*** *To assess the frequency of spontaneous bacterial peritonitis and the distribution of bacterial pathogens in patients presenting with decompensated cirrhosis.* ***Study:*** *Cross-sectional study.* ***Setting:*** *The study was conducted at the Department of General Medicine, MTI-Lady Reading Hospital, Peshawar.* ***Duration of Study:*** *13 December 2024 to 13 March 2025.* ***Methods:*** *A total of 101 patients with decompensated cirrhosis were enrolled. Ascitic fluid analysis was performed to diagnose SBP based on polymorphonuclear leukocyte (PMN) count ≥250 cells/mm³ and positive bacterial cultures. Patient demographics, clinical history, and ascitic fluid findings were recorded in a standardized proforma. Data were analyzed using SPSS version 22.0. Frequencies and percentages were calculated for categorical variables, and associations were explored descriptively.* ***Results:*** *SBP was diagnosed in 21 patients (20.8%) with elevated PMN counts. The most commonly isolated organisms were Escherichia coli (52.4%), Klebsiella species (19.0%), Streptococcus pneumoniae (14.3%), and Enterococcus species (9.5%). Males represented 58.4% of the study population and had a higher incidence of SBP. The age group 36–50 years and patients with symptom duration >6 months showed a higher prevalence of SBP.* ***Conclusion:*** *The prevalence of spontaneous bacterial peritonitis among patients with decompensated cirrhosis was 20.8%. E. coli was the most frequently isolated pathogen, followed by Klebsiella and Enterococcus. These findings highlight the importance of prompt diagnostic paracentesis and pathogen-specific antibiotic therapy in cirrhotic patients to improve outcomes.*

Keywords: Spontaneous Bacterial Peritonitis, Decompensated Cirrhosis, Bacteriological Profile, Antibiotic Resistance, Tertiary Care Hospital

INTRODUCTION

Decompensated cirrhosis is defined by the development of complications related to cirrhosis, including variceal bleeding, ascites, and hepatic encephalopathy, as well as bacterial infections. Approximately 30% of patients advance to extrahepatic organ failures along with acute-on-chronic liver failure (ACLF). Mortality rates following 90 days are significant, varying from 14% in instances of acute decompensation to 50% in ACLF, primarily due to a lack of effective therapies to halt disease progression. Acute decompensation frequently arises from precipitates that trigger a series of pathomechanistic processes; nevertheless, the initiating event remains unidentified in around 40% of instances. The unpredictable onset of this disease, along with the wide range in disease dynamics from rapid resolution of small-scale acute decompensation to swift development to multi-organ failure, as well as ACLF and the diverse types of extrahepatic organ dysfunction in ACLF patients, underscores the complexity of the condition (1-4).

Spontaneous bacterial peritonitis symbolizes the most common bacterial infection among people with cirrhosis, followed by urinary tract infections, pneumonia, infections of the skin and soft tissues, as well as spontaneous bacteremia (5-7). SBP may present as either culture-positive or culture-negative. Jafri et al. conducted a study revealing that the vast majority of cases of SBP are culture-negative (78.5%), while the remaining cases are culture-positive (21.5%) (8). Another study showed the culture-positive SBP, i.e, Escherichia coli, was the most frequently isolated pathogen (54.11%), followed by Klebsiella (16.47%), pneumococci (9.41%), enterococci (7%), and other organisms (12.94%) (9).

As previously thought, Escherichia coli is not the sole pathogen responsible for SBP. Gram-positive cocci are also emerging as a major cause of SBP. A look into the changing frequency of pathogens causing SBP is necessary. By knowing the frequencies of different pathogens causing SBP, effective antibiotic guidelines can be formulated that will lead to better patient outcomes and prevent unnecessary and ineffective use of antibiotics. This becomes more important in Pakistan due to high antibiotic resistance. Hospital administrators can use the frequency of spontaneous bacterial peritonitis to reshape preventive strategies, including educational programs for high-risk patients, and potentially improve the quality of care provided to these patients by conducting further follow-up studies. This study aims to determine the frequency of SBP, clinical and microbiological profile of its variants, in patients presenting with decompensated cirrhosis to a tertiary care teaching hospital.

METHODOLOGY

We initiated a cross-sectional research at the Department of General Medicine, MTI-Lady Reading Hospital, Peshawar, which was conducted [13-December-2024 to 13-March-2025] after getting ethical approval from the hospital. One hundred and one patients were enrolled for this study; their sample was assessed by taking the prior frequency of SBP, which was caused by Enterococci, 7%, with a 95% confidence interval and a 5% margin of error. Consecutive non-probability sampling was utilized. Patients aged 18 to 50 years, irrespective of gender, who were presented with decompensated cirrhosis as defined by the presence of complications such as ascites, variceal hemorrhage, or hepatorenal syndrome. Individuals suspected of secondary peritonitis due to surgically treatable causes, such as perforated viscera, were dropped from the study.

Demographic details, which included age, gender, and duration of symptoms, were recorded. Each participant underwent a comprehensive clinical evaluation, laboratory investigations, and abdominal ultrasonography. Diagnostic paracentesis was performed

on all patients to obtain ascitic fluid, which was analyzed for polymorphonuclear leukocyte (PMN) count ≥250 cells/mm³ and cultured to confirm the bacterial etiology—all the information is documented on a proforma.

SPSS 22 was used to analyze the data. Culture results and PMN elevation were presented as frequencies and percentages, while age and symptom duration were reported as mean ± standard deviation. Subgroup analyses stratified by age, gender, and symptom duration were conducted with a Chi-square test; a P value < 0.05 was considered significant.

RESULTS

The mean age of our patients was 34.39 ± 9.843 years. The duration of complaints before presentation averaged 6.39 ± 2.263 months.

When examining gender distribution, males were 59 (58.4%), while females were 42 (41.6%), showing a slight predominance of men in this sample (Figure 1). Spontaneous bacterial peritonitis was confirmed by an elevated ascitic fluid polymorphonuclear (PMN) count. SBP was present in 21 (20.8%) patients (Table 1).

Among the 21 patients diagnosed with SBP ascitic fluid, their cultures revealed that Escherichia coli was present in 11 (52.4%) cases, which was followed by Klebsiella 4 (19.0%) cases, Pneumococci 3 (14.3%), Enterococci in 2 (9.5%) and other pathogens in 1 (4.8%) highlighting a predominance of gram-negative organisms in this setting (Table 2)

We compared characteristics between patients with and without SBP with various demographic and clinical factors, such as duration of complaints. We found that SBP was more prevalent in males gender (P = 0.01). SBP was more common in patients aged 36 to 50 (P = 0.04). Lastly, we compared SBP with duration of complaints, and we observed that patients with prolonged duration of complaint had a higher frequency of SBP (P = 0.001) (Table 3).

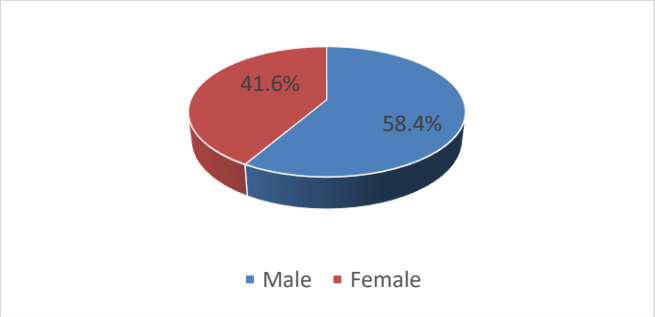

Figure 1: Gender wise distribution of the patients

Table 1: Frequency of spontaneous bacterial peritonitis

SBP based on the Ascitic fluid PMN count rise	Frequency	Percent
Yes	21	20.8
No	80	79.2
Total	101	100.0

Table 2: Ascitic culture report

Ascitic culture report	Frequency	Percent
Escherichia coli	11	52.4
Klebsiella	4	19.0
Pneumococci	3	14.3
Enterococci	2	9.5
Other pathogens	1	4.8
Total	21	100.0

Table 3: Association of SBP with various parameters

Parameters		SBP				P value
		Yes		No		
		Frequency	Percentage	Frequency	Percentage	
Age distribution (Years)	18 to 35	7	33.3%	46	57.5%	0.04
	36 to 50	14	66.7%	34	42.5%	
Gender	Male	17	81.0%	42	52.5%	0.01
	Female	4	19.0%	38	47.5%	
Duration of complaints (Months)	3 to 6	3	14.3%	43	53.8%	0.001
	> 6	18	85.7%	37	46.2%	

DISCUSSION

In our study, SBP was diagnosed in 20.8% of patients. Pimentel et al. reported that MDR bacteria were detected in 31.7% of cirrhotic patients (10). Soothar et al. found a frequency of 56.49% in HCV cirrhotic patients (9). These variations in prevalence may be attributed to differences in patient populations, diagnostic criteria, and regional healthcare practices. For example, delayed hospital presentation or differences in the sensitivity of ascitic fluid analysis protocols could affect detection rates.

A notable finding in our study was the predominance of gram-negative bacteria (76.2%), particularly Escherichia coli (52.4%), followed by Klebsiella (19%) and Pneumococci (14.3%). This aligns with the study by Pimentel et al., where gram-negative bacteria accounted for 56.9% of isolates, with E. coli being the most common pathogen (33.8%) (9). Similarly, Soothar et al. reported that E. coli was the most common pathogen (54.11%) in HCV cirrhotic patients (10). Pimentel et al. also observed that 43.1% of isolates were gram-positive with Streptococcus spp. and Staphylococcus. Being common (9). This shift underscores the importance of local microbiological surveillance in guiding empirical antibiotic therapy. In our study, Enterococcus accounted for 9.5% of isolates, consistent with other studies' findings. Pimentel et al. reported in their study that Enterococcus spp. Constituted 10.8% of isolates in their cohort (9). Soothar et al. also found Enterococcus spp. in 7.0% of cases (10). Enterococcus is a notable issue because these organisms are often associated with healthcare-associated infections and resistance to commonly used antibiotics such as third-generation cephalosporins. This emphasizes the need to carefully consider antibiotic regimens, especially in patients with risk factors for gram-positive infections such as recent hospitalization or antibiotic use.

The demographic profile of our study participants revealed a mean age of 34.4 ± 9.8 years, which is younger than that of other studies. Samonakis et al., in their study, reported a median age of 67.5 years, while Mohan et al. found a mean age of 51.5 years (11, 12). This discrepancy may reflect differences in the etiology of cirrhosis. The male predominance (58.4%) in our study is at par with global studies; It's known that cirrhosis and SBP are more prevalent in males due to higher rates of alcohol use and viral hepatitis (9, 10).

Age and duration of complaints emerged as significant risk factors for SBP in our study. Patients aged above 35 years had a higher incidence of SBP. Samonakis et al. report that advanced age correlated with SBP

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due to prolonged cirrhosis duration (11). Although the ages of our cohort were relatively lower than the study above, we can attribute this difference to a delay in healthcare access in younger patients, leading to advanced disease at presentation. Prolonged symptom duration as a risk factor aligns with studies that showed that untreated or suboptimally managed cirrhosis increases the risk of SBP (9, 10). Our study's high prevalence of E. coli and Klebsiella supports using third-generation cephalosporins as initial empirical therapy in this population. However, the presence of *Enterococcus* spp. and the potential for resistance to cephalosporins indicate that local antimicrobial susceptibility testing must be done to guide further therapy. Future studies should explore the resistance pattern of antibiotics.

CONCLUSION

In conclusion, we found a 20.8% prevalence of SBP in cirrhotic patients, with E. coli (52.4%) and Klebsiella (19%) being the most frequent pathogens, along with Enterococcus (9.5%). The findings underscore the need for early diagnosis with tailored antibiotic therapy and local microbiological surveillance to address the bacteriological spectrum and improve outcomes in decompensated cirrhosis.

DECLARATIONS

Data Availability Statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned. (IRB-REF NO - 850/LRH/MTI)
Consent for publication
Approved
Funding
Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

MUHAMMAD SALMAN (Trainee Medical Officer)
Conception of Study, Data Collection, Development of Research Methodology Design, Study Design, manuscript Review, and final approval of manuscript, and manuscript drafting.
YASEEN KHAN (Professor)
Conception of Study, Final approval of manuscript. Manuscript revisions, critical input.

REFERENCES

1. Moreau R, Jalan R, Gines P, Pavesi M, Angeli P, Cordoba J, et al. Acute-on-chronic liver failure is a distinct syndrome that develops in patients with acute decompensation of cirrhosis. Gastroenterology. 2013;144(7):1426-37.
2. Arroyo V, Moreau R, Jalan R. Acute-on-chronic liver failure. N Engl J Med. 2020;382(22):2137-45.
3. Gustot T, Fernandez J, Garcia E, Morando F, Caraceni P, Alessandria C, et al. Clinical course of acute-on-chronic liver failure syndrome and effects on prognosis. Hepatology. 2015;62(1):243-52.
4. Trebicka J, Fernandez J, Papp M, Caraceni P, Laleman W, Gambino C, et al. The predictive study uncovers three clinical courses of acutely decompensated cirrhosis that have distinct pathophysiology. J Hepatol. 2020;73(4):842-54.
5. Piano S, Singh V, Caraceni P, Maiwall R, Alessandria C, Fernandez J, et al. Epidemiology, predictors, and outcomes of multidrug-resistant (MDR) bacterial infections in patients with cirrhosis worldwide. Final results of the "Global study". Dig Liver Dis. 2018;50(1):2-3.
6. Shizuma T. Spontaneous bacterial and fungal peritonitis in patients with liver cirrhosis: A literature review. World J Hepatol. 2018;10(2):254.
7. Oliveira AM, Branco JC, Barosa R, Rodrigues JA, Ramos L, Martins A, et al. Clinical and microbiological characteristics associated with mortality in spontaneous bacterial peritonitis: a multicenter cohort study. Eur J Gastroenterol Hepatol. 2016;28(10):1216-22.
8. Jafri S, Awan RH, Nayab SE, Awan KH. Spontaneous bacterial peritonitis; frequency of culture-positive (SBP) and culture-negative spontaneous bacterial peritonitis (neutrocytic ascites) in the cirrhotic population. Professional Med J. 2019;26(03):404-8.
9. Soothar G, Seerani NL, Akram R. Spontaneous Bacterial Peritonitis and its Common Pathogens in HCV Cirrhotic Patients. J Islamabad Med Dent Coll. 2018 ;7(1):12-7.
10. Pimentel R, Leitão J, Gregório C, Santos L, Carvalho A, Figueiredo P. Spontaneous bacterial peritonitis in cirrhotic patients: a shift in the microbial pattern? GE Port J Gastroenterol. 2022;29(4):256-266.
11. Samonakis DN, Gatselis N, Bellou A, Sifaki-Pistolla D, Mela M, Demetriou G, et al. Spontaneous bacterial peritonitis: a prospective Greek multicenter study of its epidemiology, microbiology, and outcomes. *Ann Gastroenterol.* 2022;35(1):80-87.
12. Mohan G, Kumar P, Singh P. A study of spontaneous bacterial peritonitis in liver cirrhosis with ascites at a tertiary care hospital in North India: Prevalence, clinical, and microbiological profile. *Apollo Med.* 2024;21(2):107-112.

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