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Antibiotic Resistance Patterns in Cirrhotic Patients with Spontaneous Bacterial Peritonitis: A Microbial Spectrum Analysis

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ABSTRACT

Objective: Recent studies have highlighted shifts in the microbial composition of ascitic fluid in spontaneous bacterial peritonitis (SBP) and the growing resistance of these bacteria to commonly used antibiotics. This study aimed to identify the microorganisms responsible for SBP and assess their antibiotic sensitivity profiles. The current observational study was done in the department of medicine at PIMS hospital Islamabad from March to November 2022. Forty-five cirrhotic patients with ascites were admitted in ward for various reasons and having positive ascitic fluid culture were included in the study. The current study results show that the mean age of these 35 patients was 48.94 ± 13.51 years with a range of 19 to 80 years. Twenty-five (67.1 %) patients were male and 20 (42.9 %) were female. Bacteria that had caused SBP were E. coli (62.9 %), staph aureus (11.4 %), klebsiella (8.6 %), streptococci (8.6 %), gram positive cocci (5.7 %) and pseudomonas aeruginosa (2.8 %). Imipenem had a high sensitivity rate (100 %) along with amikacin (82.9 %) and cefoperazone-sulbactam (68.6 %). The sensitivity of these organisms to other commonly used antibiotics were ciprofloxacin 57.1 %, ofloxacin 40 %, norfloxacin 37.1 %, ceftazidime 34.3 %, ceftriaxone 31.4 % and piperacillin-tazobactam 25.7 %. Conclusion: We found that E. coli was the

commonest bacteria causing SBP, and ceftriaxone and ciprofloxacin have significantly high resistance rate in these patients. Key words: cirrhosis, ascitic fluid, spontaneous bacterial peritonitis, antibiotic sensitivity.

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INTRODUCTION

Spontaneous bacterial peritonitis (SBP) usually occurs in cirrhotic patients with ascites. The higher the Model for End stage Liver Disease (MELD) score, greater is the risk of SBP (1) If diagnosis is delayed, there is a risk of developing shock and multi-organ failure (2). It is associated with higher mortality rate (3).If a patient has an attack of SBP, there is increased risk of recurrence (4) Total protein in ascitic fluid correlates inversely with the risk of SBP (5). Diagnosis of SBP is made if ascitic fluid culture is positive and/or fluid neutrophil count is more than 250/cmm and there is no evidence of secondary (surgical) peritonitis (6). Immediate inoculation of culture bottle increases the sensitivity of positive culture result (7). All cases of SBP are caused by monomicrobial infection. Polymicrobial infection favors the diagnosis of secondary peritonitis. Most common pathogen is E. coli (8). Other common organisms are Klebsiella, enterococci and streptococci. If there is clinical suspicion of SBP, antibiotic should be started immediately after paracentesis (9). Third generation cephalosporin is a reasonable choice, especially cefotaxime or ceftriaxone. (10,11) Flouroquinolones like ciprofloxacin or ofloxacin can also be given (12). In resistant cases piperacillin/tazobactam or carbapenem should be used (13). We normally give ceftriaxone or ciprofloxacin to our patients who are suspected to be suffering from SBP. As there are reports of increasing resistance to ceftriaxone and quinolones,(14).we planned this study to find out types of organisms in culture positive ascitic fluid in our SBP patients and their sensitivity to various antibiotics. It would help us to choose the most appropriate antibiotic in SBP patients.

MATERIALS AND METHODS

The study was done in the department of medicine at PIMS hospital Islamabad from March to November 2022 It was a descriptive study. Study protocol was approved from Institutional Review Board and Ethical Committee. Thirty-five cirrhotic patients with ascites were admitted in medical department suffering from spontaneous bacterial peritonitis having positive ascitic fluid culture

was included in the study. Inclusion was regardless of whether SBP had been classical (culture positive and neutrophil count > 250 cells/cmm) orbacterascites (culture positive but neutrophil count < 250 cells/cmm). Patients were excluded from the study if they had intra-abdominal surgically treatable disease, if ascitic fluid culture showed polymicrobial growth as it indicated secondary peritonitis. Peritoneal paracentesis was done using standard technique in cirrhotic patients with ascites who had been admitted due to fever, abdominal pain/tenderness, hematemesis or melena, hepatic encephalopathy or decreased urine output. Five ml fluid was sent for albumin, total leucocyte count and differential count. Ten ml fluid was inoculated immediately in 100 ml TSB tryptic soy broth and sent to our hospital's laboratory for culture/sensitivity test. Blood tests like complete blood count, liver function test, prothrombin time, albumin, sodium and creatinine were also performed. SPSS software version 25 was used for analysis of data. The qualitative variables like gender, types of organisms and antibiotic sensitivity were described as frequency and percentage and analyzed by Chi square test. The quantitative variables like age of patient were expressed as mean ± SD and range and analyzed by Student's t test. A p value of < 0.05 was considered statistically significant.

RESULTS

The mean age of 35 included patients was 48.94 ± 13.51 years and age range were 19 to 80 years. Twenty (57.1 %) patients were male and 15 (42.9 %) were female. HCV was the cause of cirrhosis in 30 (85.7 %) patients, HBV in 3 (8.6 %) and both HCV and HBV in 2 (5.7 %). The presenting illness was hepatic encephalopathy in 22 (62.9 %), abdominal pain plus fever in 8 (22.8 %), variceal bleeding in 3 (8.6 %) and abdominal distension with fever in 2 (5.7 %) patients.

E. coli was the most common organism causing SBP as shown in Table 1 while gram positive organisms was responsible for SBP in 9 patients. There was culture positive neutrocytic ascites in 24. (68.6 %) and culture positive non-neutrocytic (bacterascites) ascites in 11 (31.4 %) patients. Figure 1 shows overall sensitivity/resistance pattern of commonly used antibiotics in our SBP patients. Imipenem has 100 % sensitivity, and amikacin has sensitivity of 82.9 %. The most used antibiotic, ceftriaxone, had only 31.4 % sensitivity. The sensitivity of these antibiotics to various organisms found in our patients is shown in Table 2. E. coli, which is the most common organism, is sensitive to imipenem, amikacin and cefoperazone- sulbactam

combination but resistant to ceftriaxone and quinolones.

Table 1: Frequency of ascitic fluid organisms in SBP

Organism	Frequency (percentage)
E.coli	22 (62.9 %)
Klebsiella	3 (8.6 %)
Gram positive cocci	2 (5.7 %)
Streptococcus	3 (8.6 %)
Staph aureus	4 (11.4 %)
Pseudomonas aeruginosa	1 (2.8 %)

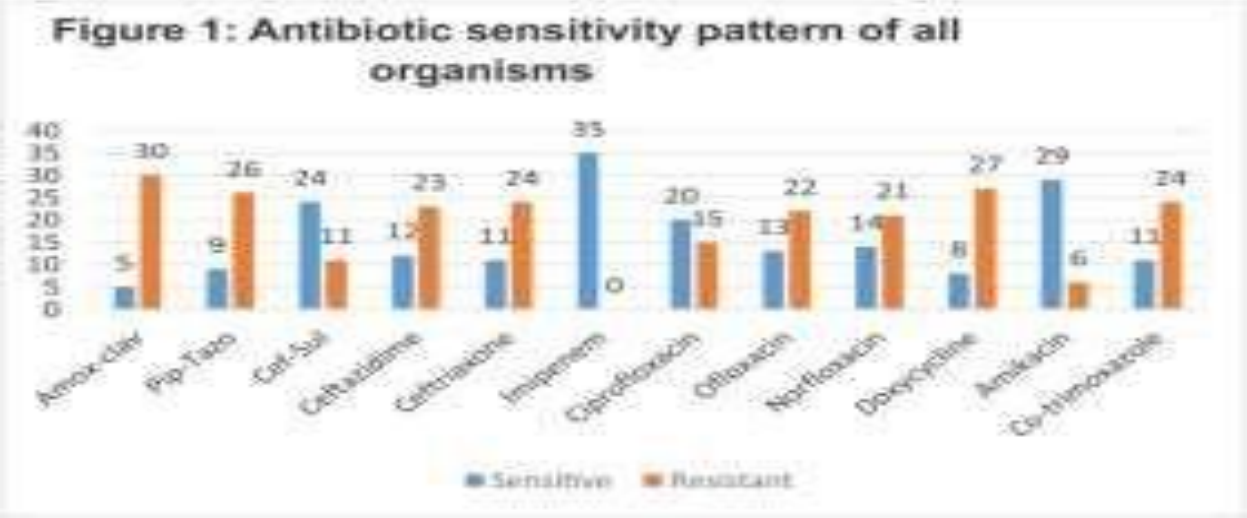

Table 2: Sensitivity pattern of ascitic fluid organisms in SBP to various antibiotics

Antibiotic	Sensitivity	Organism						Total
		E.coli	Klebsiella	Gram + cocci	Streptococci	Staph aureus	P.aeroginosa	
Amoxclav	Sensitive	2	1	0	0	2	0	5
	Resistant	20	2	2	3	2	1	30
Pip-Tazo	Sensitive	2	1	2	2	1	1	9
	Resistant	20	2	0	1	3	0	26
Cef-Sul	Sensitive	16	2	1	2	2	1	24
	Resistant	6	1	1	1	2	0	11

Ceftazidme	Sensitive	4	3	2	1	1	1	12
	Resistant	18	0	0	2	3	0	23
Ceftriaxone	Sensitive	6	0	2	3	0	0	11
	Resistant	16	3	0	0	4	1	24
Imipenem	Sensitive	22	3	2	3	4	1	35
	Resistant	0	0	0	0	0	0	0
Ciprofloxacin	Sensitive	9	2	2	3	3	1	20
	Resistant	13	1	0	0	1	0	15
Ofloxacin	Sensitive	7	2	2	1	1	1	14
	Resistant	15	1	0	2	3	0	21
Norfloxacin	Sensitive	7	2	1	1	1	1	13
	Resistant	15	1	1	2	3	0	22
Doxycycline	Sensitive	5	1	1	1	0	0	8
	Resistant	17	2	1	2	4	1	27
Amikacin	Sensitive	21	2	1	1	3	1	29
	Resistant	1	1	1	2	1	0	6
Co-trimoxazo	Sensitive	4	1	2	2	2	0	11
	Resistant	18	2	0	1	2	1	24

DISCUSSION

To reduce morbidity and mortality in spontaneous bacterial peritonitis treatment should be started early (9). As culture and sensitivity report of ascitic fluid takes few days, empirical antibiotic therapy must be given. Gram negative organisms like E. coli are the most common cause of SBP but recent trends show that gram positive organisms are increasingly causing SBp (10) For empirical treatment, cefotaxime, ceftriaxone (11) and fluoroquinolones have been recommended but over last few years there is concern about resistance to these antibiotics. Spontaneous bacterial peritonitis is caused by a single organism and E. coli has been the most common bacteria (12). There are reports of an increasing number of gram-positive bacteria like staphylococcus and streptococcus, but E. coli remains in the commonest organism. The frequency of E. coli detection in our study is 62.9 %. Similar reports have been shown by many other investigators with E.coli detection rate of 55 to 73 % [8, 17-22]and this trend remained same over past two decades. The other common organisms were Klebsiella, staphylococcus aureus, streptococci, acinetobacter and pseudomons (13). Iqbal S, et al (2004) found that all organisms involved in SBP were sensitive to third generation cephalosporin and fluoroquinolones.[18] It had been recommended that cefotaxime, ceftriaxone and fluoroquinolones should be given empirically when there is suspicion of SBp (14). Over the last few years, resistance to these antibiotics have been described. Bibi S, et al (2015) found that resistance to third generation cephalosporin was 78 % and to fluoroquinolone was 69.6 %. Other studies found 35 %, 76 % and 62 %sensitivity to ceftriaxone,[17, 26, 27] 65 % to cefotaxime,[27] and 31% and 35 % to ciprofloxacin (15).Our study revealed 31 % sensitivity with ceftriaxone and 57 % with ciprofloxacin. During recent years, sensitivity of ascitic fluid bacteria to imipenem, amikacin and cefoperazone-sulbactam has been found high (16). results were sensitivity of 100 % to imipenem, 83 %

to amikacin and 69 % to cefoperazone-sulbactam. The reason for increasing gram positive bacteria in ascitic fluid in patients with SBP and increasing resistance previously commonly used antibiotics may be longer survival of cirrhotic patients with repeated use of antibiotics, multiple hospital admissions and emergence of nosocomial infection. Now there is enough evidence that recommendations for empirical antibiotic treatment of SBP patients have changed.

CONCLUSION

In our study E. coli was found to be the most common organism causing SBP. Gram positive bacteria were responsible for about one quarter of cases. Organisms causing SBP had shown significant resistance to ceftriaxone and ciprofloxacin which are commonly used for this purpose while imipenem, amikacin and cefoperazone-sulbactam had high sensitivity. In the light of these findings' empirical antibiotic treatment for SBP should be changed accordingly.

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