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LETTER TO THE EDITOR

Distribution and antimicrobial resistance pattern of pathogens causing spontaneous bacterial peritonitis in patients with cirrhosis at Namazi hospital, southern Iran

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Spontaneous bacterial peritonitis (SBP) is defined as bacterial infection of previously sterile ascitic fluid by an unknown source of infection. This type of peritonitis is the most frequent bacterial infection in patients with cirrhosis, with a reported prevalence varying between 3.5% and 30% and the highest rates among hospitalized patients with cirrhosis and ascites (1). This most common complication of cirrhosis, SBP, is associated with a poor prognosis and may result in several fatal morbidities in these patients, including acute kidney injury, acute-on-chronic liver failure, variceal bleeding and encephalopathy. Furthermore, SBP per se or associated with the underlying disorder and related comorbidities is characterized by a high mortality rate which can be as high as 67% (2, 3).

We conducted this cross-sectional study to evaluate patients with cirrhosis and ascites hospitalized at Namazi Hospital from January 2019 to January 2020. Patients with cirrhosis and a diagnosis of SBP were included. Different ascitic fluid studies were done including preparing ascitic fluid specimens for cell count and differential count, culture, Gram staining, and biochemical workups. Specimens for culture which contained at least 10 mL of ascitic fluid were inoculated on blood agar, eosin methylene blue agar, nutrient agar and MacConkey agar. Then the plates were incubated for at least 24 hours (48 hours, if needed) for the preliminary results, followed by conventional biochemical identification tests or use of specific culture media such as mannitol salt agar if indicated. Afterwards, the disk diffusion method (Kirby-Bauer test) was used to determine antibiotic susceptibility patterns. SBP was diagnosed when the polymorphonuclear leukocyte count in ascitic fluid was above 250 cells/µl and the fluid culture was positive. Growth of multiple pathogens or *Staphylococcus epidermidis* on the culture medium was not considered as SBP, and patients with these cultures were excluded from the study. Patients were also excluded from the study if they had secondary bacterial peritonitis or if they had received any antibiotic regimen within the previous month.

Samples of ascitic fluid for Gram staining and culture were obtained from 1261 patients with ascites. Among the study participants, 114 patients (9%) were diagnosed with SBP including 68 men and 46 women with a mean age of 44.09 ± 27.32 and 42.63 ± 28.10 years, respectively, and ranging in age from 1 month to 87 years. The most common pathogen found in ascitic fluid cultures in these patients was *Escherichia coli* (39.5%), followed by *Klebsiella* species (19.3%) (Table 1). The resistance patterns of pathogens are shown in Table 1 (resistance patterns of bacteria with less than 5 cases are not shown). *E. coli* showed com-

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Table 1. Patterns of resistance to different antimicrobial medications in infectious agents found in 114 samples of ascitic fluid

Antimicrobial agent	Infectious organism (% prevalence)						
	Escherichia coli (39.5%)	*Klebsiella* spp. (19.3%)	*Enterococcus* spp. (15.8%)	*Staphylococcus aureus* (4.4%)	*Pseudomonas aeruginosa* (4.4%)	*Acinetobacter* spp. (4.4%)	Non-fermenting bacilli (4.4%)
Clindamycin	0	-	94	40	-	-	-
Ciprofloxacin	44	59	94	80	20	100	0
Vancomycin	-	-	88	0	-	-	-
Gentamicin	11	31	55	0	20	100	0
Cephalexin	42	63	72	66	60	80	60
Cotrimoxazole	57	68	100	20	100	100	0
Cloxacillin	-	-	100	0	-	-	-
Amikacin	4	31	-	-	0	100	0
Imipenem	8	40	-	-	20	100	0
Tetracycline	51	36	-	-	80	40	0
Cefixime	64	59	-	-	100	80	80
Cefotaxime	66	72	-	-	100	80	100
Colistin	4	18	-	-	0	0	20
Cefazolin	31	4	22	0	40	20	-
Erythromycin	-	-	66	66	-	-	-
Meropenem	0	0	-	-	20	20	-
Methicillin	-	-	-	40	-	-	-

plete sensitivity to clindamycin and meropenem, and its resistance to gentamicin was low (11%). *Klebsiella* species isolated from ascitic fluid samples in this study showed susceptibility to cefazolin and meropenem. In contrast, susceptibility tests showed that *Enterococcus* organisms had high rates of resistance to nearly all antibiotics used for them (94% to clindamycin and ciprofloxacin, 88% to vancomycin, and 100% to cotrimoxazole and cloxacillin). The lowest resistance rate of this pathogen was against cefazolin (22%); thus, treatment of SBP caused by enterococci is difficult. Based on the results, a combination of vancomycin and meropenem is appropriate for empiric antimicrobial therapy in patients suspected of SBP, and these antibiotics show close to 72.1% coverage for culprit pathogens.

To prevent the high morbidity and mortality rates associated with SBP, early detection and prompt administration of an appropriate empirical antibacterial regimen are crucial. A series of studies in addition to the present report suggest that pathogenic resistance to conventional antibiotics has increased; therefore, changes in conventional prophylaxis and treatment strategies will be needed to raise awareness of antibiotic resistance patterns and to prevent infections from spreading.

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REFERENCES

1. Marciano S, Díaz JM, Dirchwolf M, Gadano A. Spontaneous bacterial peritonitis in patients with cirrhosis: incidence, outcomes, and treatment strategies. *Hepat Med* 2019;11:13-22.
2. Rostkowska KA, Szymanek-Pasternak A, Simon KA. Spontaneous bacterial peritonitis - therapeutic challenges in the era of increasing drug resistance of bacteria. *Clin Exp Hepatol* 2018;4:224-231.
3. Gurusamy KS, Wilson P, Tsochatzis E. Antibiotic prophylaxis to prevent spontaneous bacterial peritonitis in people with liver cirrhosis: a network meta-analysis. *Cochrane Database Syst Rev* 2018;2018:CD013125.