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Prognostic Factors of Short-Term Mortality in Spontaneous Bacterial Peritonitis Patients

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ABSTRACT

Introduction: In cirrhotic individuals, spontaneous bacterial peritonitis (SBP) is one of the most frequent side effects. 1-year mortality is up to 50% even with strong prevention, early diagnosis, and effective care.

Aim: To analyze prognostic factors of short-term mortality in SBP individuals.

Patients and Methods: In our study, 92 SBP patients were involved. Prothrombin time, international normalized ratio (INR), liver enzymes, serum albumin, total bilirubin, complete blood count, and serum creatinine were all evaluated. A sample of ascitic fluid was collected for chemical analysis. Follow up of the patients was done during hospital admission for complications and mortality.

Results: Significantly correlated with mortality were Child score (P=0.02), MELD score (P=0.003), hepatic encephalopathy (P=0.009), and hepatorenal syndrome (P<0.001) in SBP patients. Patients who died had considerably higher WBCs (P=0.003), serum creatinine levels: basal creatinine (P<0.001), maximum creatinine (P<0.001) and last creatinine (P<0.001), ascitic fluid WBCs (P<0.001) and PMNL count (P<0.001) while platelets (P<0.001), ALT (P<0.001), Serum total bilirubin (P<0.001), ascitic fluid protein (P<0.001) and ascitic fluid albumin (P=0.007) were higher in survivors.

Conclusion: In SBP patients, WBCs, serum creatinine, ascitic fluid WBCs and PMNL count, MELD score, Child-Pugh score, hepatic encephalopathy and hepatorenal syndrome were all strongly linked to mortality.

Keywords: Liver cirrhosis, Mortality, Spontaneous bacterial peritonitis.

INTRODUCTION

In cirrhotic individuals, spontaneous bacterial peritonitis (SBP) is one of the most frequent side effects. It affects roughly 10-30% of patients with ascites owing to cirrhosis at the time of admission, and nearly 50% develop during the stay, with a mortality incidence of about 20-30%[(1)]. SBP recurrence is roughly 69 percent likely after a year, and the median survival time for SBP patients is 9 months. Patients with SBP should be evaluated for liver transplantation as soon as possible. 1-year mortality is up to 50% even with strong prevention, early diagnosis, and effective care [(2)].

Complications of SBP (gastrointestinal hemorrhage, renal dysfunction, encephalopathy, ileus, bacteremia, or septic shock at presentation), non-response to initial empirical antibiotic [(3)], hospital acquired infection [(4)], and delayed diagnosis are all associated with a higher rate of mortality [(5)]. Furthermore, these consequences account for half of all deaths after SBP eradication [(6)]. SBP caused by multidrug-resistant bacteria increases the risk of death by four times [(7)].

SBP is affected by a number of parameters, including age, Child score, serum bilirubin, serum creatinine and Model for End-Stage Liver Disease (MELD) score [(8)].

In this study, we sought to identify potential risk factors for short-term mortality in SBP patients.

PATIENTS AND METHODS

Our prospective study involved 92 cirrhotic ascitic patients who were diagnosed as SBP and admitted in the Tropical Medicine and Gastroenterology Department at Sohag University Hospital from October 2019 to March 2020.

- **Inclusion criteria:**

- Patients with liver cirrhosis and ascites.
- SBP patients who had ascitic polymorphonuclear leukocytes (PMN) count≥250 cells/mm^3[(9)].

- **Exclusion criteria:**

- Other etiologies of ascites, as tuberculosis (TB), peritoneal carcinomatosis and pancreatitis.
- Other causes of peritonitis such as TB or malignancy; surgical peritonitis.

Methodology:

The following procedures were performed:

1. Entire history taking and clinical examination.
2. Investigations:
   a) Complete Blood Count (CBC).
   b) Liver enzymes.
   c) Serum albumin and total bilirubin.
   d) Prothrombin time (PT) and international normalized ratio (INR). e) Serum creatinine: at admission and before discharge.
   f) Serum sodium and potassium
3. MELD Score was calculated:
   MELD = (0.957 x log (Serum Creatinine) + 0.378 x log (Total Bilirubin) + 1.120 x log (INR) + 0.643) x 10 (for dialysis, Creatinine = 4) [(10)].

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4. The Child-Pugh score was calculated using: serum bilirubin, serum albumin, ascites, neurological disorder, and prothrombin time[11]:

- Encephalopathy: None = 1 point, Grade 1 and 2 = 2 points, Grade 3 and 4 = 3 points
- Ascites: None = 1 point, slight = 2 points, moderate = 3 points
- Bilirubin: under 2 mg/ml = 1 point, 2 to 3 mg/ml = 2 points, over 3 mg/ml = 3 points
- Albumin: greater than 3.5mg/ml = 1 point, 2.8 to 3.5mg/ml = 2 points, less than 2.8mg/ml = 3 points
- Prothrombin Time (sec prolonged): less than 4 sec = 1 point, 4 to 6 sec = 2 points, over 6 sec = 3 points

5. Abdominal ultrasonography.

6. Ascitic fluid sample was taken under strict aseptic condition for ascitic fluid analysis.

SBP patients were given cefotaxime intravenously (2 g twice daily) for 5 days. Follow up of the patients was done during hospital admission for complications and mortality.

Ethical consideration:

Sohag University's Academic and Ethical Committee gave its support to the project. Acceptance of the trial was contingent on each patient signing an informed written permission form. This research was conducted keeping with the World Medical Association's Code of Ethics (Declaration of Helsinki) for human studies.

Statistical analysis

It was done by the Statistical Package for the Social Sciences (SPSS, version 17; SPSS Inc., Chicago, IL, USA) software. To represent quantitative data, the mean and standard deviation were utilized. The Student T-test was used to contrast quantitative data. Comparing qualitative data, presented as numbers and percentages, was done using the Chi square test. P values under 0.05 were regarded as statistically significant.

RESULTS

Patient characteristics: 92 SBP patients were involved: most of them were females 52 (56.5%). Their mean age was 57.1 years**.** 14 (15.2%) of them died in hospital while 78 (84.8%) survived (**Table 1)**.

Table (1) Characteristics of included SBP patients

		N=92 (100%) or Mean ±SD
Age (year)		57.1± 12
Sex	**Male**	40 (43.5)
	Female	52 (56.5)
Mortality rate		14 (15.2)

Mortality in SBP: 14 patients of 92 of SBP patients (15.2%) died during admission. Age and sex didn't differ significantly between survivors and non survivors. Also, clinical presentation of abdominal pain, tenderness or fever didn't affect mortality. Hepatic encephalopathy, hepatorenal syndrome, and Child-Pugh score were all substantially linked with death in SBP patients **(Table 2).**

Table (2) Clinical predictors of mortality in SBP case

		Non-survivors (N=14)	Survivors (N=78)	P value
Age in years (Mean ± SD)		60± 14.4	56.9±10.6	0.344
Sex	**Male**	4 (28.6)	36 (46.2)	0.222
	Female	10 (71.4)	42 (53.8)	
Hepatic encephalo-pathy	**No**	14 (100)	50 (64.1)	**0.009***
Amount of ascites	**Mild**	0 (0)	8 (10.3)	0.28
	Moderate	12 (85.7)	52 (66.7)	
	Marked	2 (14.3)	18 (23)	
Child-Pugh score	**B**	0 (0)	26 (33.3)	**0.020***
	C	14 (100)	52 (66.7)	
Abdominal pain		8 (57.1)	28 (35.9)	0.133
Fever		4 (28.6)	28 (35.9)	0.596
Abdominal tenderness		6 (42.9)	14 (17.9)	0.222
Refractory ascites		14 (100)	52 (66.7)	**0.020***
Hepatorenal syndrome		6 (42.9)	2 (2.6)	**<0.001***
Ascites Turbidity		6 (42.9)	30 (38.5)	0.756

SD: standard deviation, *: significant

Patients who died had considerably higher WBCs, MELD score, serum creatinine levels: basal creatinine, maximum creatinine, and last creatinine, ascitic fluid WBCs and PMNL count, while platelets, ALT, serum total bilirubin, ascitic fluid protein and ascitic fluid albumin were higher in survivors **(Table 3).**

Table (3) Laboratory predictors of mortality in SBP cases

Mean ±SD	Non-survivors (N=14)	Survivors (N=78)	P value
WBCs (10^3 cells/ mm^3)	10.7± 2.5	9.13± 1.61	**0.003***
Platelets (10^3 cells/ mm^3)	70.1± 15.2	138.8±27.7	**<0.001***
RBCs (10^6 cells/ mm^3)	3.2±0.6	3.37±0.85	0.476
Hb (g/dL)	9.86± 1.41	9.6± 2.17	0.667
Serum Na (mmol/L)	130.3±13.5	126.1±9.4	0.153
Serum K (mmol/L)	3.87±0.69	4.05±0.98	0.513
Serum total bilirubin (mg/dL)	2.81± 0.39	4.6± 0.33	**<0.001***
Serum protein (g/dL)	4.84± 1.18	5.1± 1.15	0.440
Serum albumin (g/dL)	2.3±0.51	2.2±0.5	0.494
Serum ALT (U/L)	28± 6.95	38.8± 4.8	**<0.001***
PT (seconds)	18.6± 4.2	17.1± 2.7	0.085
INR	1.51±0.32	1.39±0.21	0.075
Basal serum creatinine (mg/dL)	2.38± 0.5	1.51± 0.32	**<0.001***
Serum creatinine before discharge (mg/dL)	2.46± 0.7	1.31± 0.31	**<0.001***
Maximum serum creatinine (mg/dL)	2.41±0.64	1.71±0.27	**<0.001***
MELD	20.57± 4.95	17.36± 3.4	**0.003***
Ascitic fluid WBCs count (cells/ mm^3)	2411±499.8	1373±206	**<0.001***
Ascitic fluid PMNL count (cells/ mm^3)	2043±322	1068±116	**<0.001***
Ascitic fluid protein (g/dL)	1.04±0.2	1.31±0.2	**<0.001***
Ascitic fluid albumin (g/dL)	0.37±0.1	0.45±0.1	**0.007***

Hb: hemoglobin, RBCs: red blood cells, WBCs: white blood cells, K: potassium, Na: sodium, ALT: alanine aminotransferase, RBS: random blood sugar, AST: aspartate aminotransferase, PMNL: polymorphnuclear cells, INR: international normalized ratio, PT: prothrombin time, SD: standard deviation, *: Significant

DISCUSSION

SBP is one of the most prevalent and deadly cirrhosis consequences [(11)]. We set out to research SBP patients' short-time mortality rate and mortality determinants. This study involved 92 SBP patients. Most of them were females 52 (56.5%) versus 40 males (43.5%). Their mean age was (57.1 ± 12) years. 14 (15.2%) of them died during admission while 78 (84.8%) survived.

In-hospital mortality rate was 15.2%, which was near it in ***Kim et al.*** study (18%)[(5)], less than ***Iliaz et al.*** study (26%) [(12)] and ***Poca et al.*** study (28%) [(13)], and much less than ***Alexopoulou et al.*** study (37.7%) [(14)]. Our study's reduced mortality rate could be attributed to the patients' younger age (57 years) and the absence of hepatocellular cancer patients.

There was no significant relationship between age or sex and mortality. This goes with ***Popoiag et al.*** [(15)], ***Nasereslami et al.*** [(16)], ***Melcarne et al.*** [(17)] and ***Musskopf et al.***[(18)] studies. Also, clinical presentation of abdominal pain, tenderness or fever were not associated with mortality which agrees with ***Popoiag et al.*** [(15)] results apart from fever which was significantly associated with mortality. We found that Child-Pugh score significantly affect mortality in SBP patients, like ***Iliaz et al.*** [(12)], ***Nasereslami et al.*** [(16)], ***Elzouki et al.*** [(19)] and ***Tsung et al***. [(20)] results. That was unlike what ***Wiesner et al.*** [(21)] and ***Morsy et al.*** [(22)]found. Similarly, hepatic encephalopathy was highly associated with mortality as stated by ***Popoiag et al.*** [(15)], ***Melcarne et al.*** [(17)] and ***Morsy et al.*** [(22)].

Also, hepatorenal syndrome was highly associated with mortality in SBP patients as reported by ***Popoiag et al.*** [(15)] and ***Hassan and Abdel Rehim*** [(23)].

We found that platelets were significantly higher in survivors. ALT was significantly higher in survivors while ***Morsy et al.*** [(22)] found it less in survivors and ***Hassan and Abdel Rehim*** [(23)] found no significant difference. We found serum total bilirubin significantly higher in survivors while ***Musskopf et al.*** [(18)] and ***Hassan and Abdel Rehim*** [(23)] found it less in survivors.

WBCs were significantly higher in patients who died as reported by ***Iliaz et al.*** [(12)] and ***Melcarne et al.*** [(17] but against ***Morsy et al.*** [(22)] and ***Hassan and Abdel Rehim*** [(23)] result who found no significant difference. Also, creatinine was higher in patients who died than in survivors as in ***Melcarne et al.*** [(17)] finding and in ***Musskopf et al.*** [(18)] finding. ***Tandon et al.*** [(24)] reported that renal impairment was associated with poor prognosis in SBP.

Ascitic fluid protein was significantly higher in survivors which was like what ***Nasereslami et al.*** [(16)]found, but against ***Morsy et al.*** [(22)] and ***Hassan and Abdel Rehim*** [(23)] who found it insignificant. Ascitic fluid WBCs and PMNL were significantly associated with mortality which goes with ***Nasereslami et al.*** [(16] finding but ***Iliaz et al.*** [(12)] , ***Musskopf et al.*** [(18)] and ***Morsy et al.*** [(22)] didn't find that.

Our study had some limitations. We had relatively small sample size. So, we will need larger samples. Also, we studied only short-term mortality (in-hospital mortality). So, we recommend following up patients after discharge to study long-term mortality.

CONCLUSION

WBCs, serum creatinine, ascitic fluid WBCs and PMNL count MELD score, Child-Pugh score, hepatic encephalopathy and hepatorenal syndrome were significantly associated with mortality in SBP patients.

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Conflict of interest: The authors declare no competing interests.

ABBREVIATIONS

ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
CBC	Complete Blood Count
Hb	Haemoglobin
INR	international normalized ratio
K	Potassium
MELD	Model For End-Stage Liver Disease
Na	Sodium
PMNs	Polymorphonuclear leukocytes
PT	Prothrombin time
RBCs	Red blood cells
RBS	Random blood sugar
SBP	Spontaneous bacterial peritonitis
SD	Standard Deviation
TB	Tuberculosis
WBCs	White blood cells

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