

Original Research Article

A STUDY OF ETIOLOGY, CLINICAL PROFILE AND PREDICTIVE FACTORS FOR DEVELOPMENT OF SPONTANEOUS BACTERIAL PERITONITIS AMONG PATIENTS WITH CIRRHOSIS OF LIVER IN A TERTIARY CARE HOSPITAL IN CHENNAI

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Received: 09-01-2024 / Revised: 13-01-2024 / Accepted: 14-02-2024

ABSTRACT

Background

This study was conducted to evaluate the clinical profile and predictive markers for the development of spontaneous bacterial peritonitis, as well as the frequent etiological reasons producing it in patients with decompensated liver disease.

Methods

In the general medicine wards of Government Stanley Hospital in Chennai, 82 patients with a history of decompensated chronic liver disease and ascites diagnosed as spontaneous bacterial peritonitis participated in this hospital-based prospective observational study. The study was conducted from June 2019 to June 2020 and was approved by the institutional ethics committee. The participants written informed consent was obtained.

Results

When previous SBP and outcome are compared using Pearson's chi-squared test, a statistically significant correlation is found between the two. It was statistically significant to compare total bilirubin with the outcome using the unpaired t-test. Serum albumin and the outcome by unpaired t-test comparison were statistically significant. Serum creatinine and outcome were compared using an unpaired t-test, and the results were statistically significant. According to the unpaired t-test, serum sodium and the outcome were highly statistically

significant. The INR and unpaired outcome comparisons show a statistically significant difference. The unpaired t-test comparison of the ascitic fluid PMN and the outcome reveals a highly statistically significant difference. Ascitic protein and outcome are compared using an unpaired t-test, which reveals statistical significance. A statistically significant comparison was made between Child Pugh and the outcome using Pearson's chi-squared test. High statistical significance was seen when the HE grade and Pearson's chi-squared outcome were compared.

Conclusion

In the study population, alcoholic cirrhosis was the most common cause of cirrhosis, followed by Budd-Chiari syndrome. Abdominal distension was the most frequent clinical presentation, and it was followed by GI bleeding, fever, hepatic encephalopathy, and abdominal discomfort.

Keywords: Etiology, Clinical Profile, Predictive Factors, Spontaneous Bacterial Peritonitis, Cirrhosis of Liver.

INTRODUCTION

Unexpected bacterial peritonitis is among the potentially fatal consequences of cirrhosis. In 1907, Krenker initially reported it as a peritonitis and bacteraemia condition in a patient who had micronodular cirrhosis but no obvious infection source. Conn first used the phrase "spontaneous bacterial peritonitis" in 1964.^[1] An infection of ascitic fluid without an intra-abdominal cause of infection necessitating surgical intervention is called spontaneous bacterial peritonitis.^[2] Other spontaneous infections, such as spontaneous bacteremia and spontaneous bacterial empyema are frequently linked to cirrhosis. Despite more recent developments in antibiotic technology and early diagnosis, the mortality rate for patients with SBP has remained high. The British Society of Gastroenterology has nevertheless released new guidelines that emphasize the significance of early prediction factor detection for early diagnosis and timely treatment in reducing hospital mortality from 90% to less than 20%.^[3,4] The old theory that colonic bacteria migrate to extraintestinal locations over the course of a spontaneous ascitic fluid infection is no longer valid. Ten to thirty-three percent of hospitalized SBP patients die. Nine months is the average survival time for a patient with SBP. It happens to 69% of patients. In outpatients, the incidence of spontaneous bacterial peritonitis is 1-3%, whereas in hospitalized patients, it is 10-30%.^[5,6] At the time of hospital admission, half of the cases of spontaneous bacterial peritonitis occur.

AIMS AND OBJECTIVES

- To identify the common etiological factors causing spontaneous bacterial peritonitis among patients with decompensated liver disease admitted to a tertiary care hospital in Chennai, Tamil Nadu, India.
- To determine the clinical profile and predictive factors for the development of spontaneous bacterial peritonitis.

MATERIALS & METHODS

In the general medicine wards of Government Stanley Hospital in Chennai, 82 patients with a history of decompensated chronic liver disease and ascites diagnosed as spontaneous bacterial peritonitis participated in this hospital-based prospective observational study. The study was conducted from June 2019 to June 2020 and was approved by the institutional ethics committee. The participants written informed consent was obtained.

Inclusion Criteria

- Patient who gave consent for the study.
- Patients over 18 years of age of both sexes was included in the study.
- Patients with decompensated chronic liver disease admitted with complaints of fever, abdominal pain, or any other complication of cirrhosis were included in the study after confirming the diagnosis of spontaneous bacterial peritonitis.
- Patients with a previous history of spontaneous bacterial peritonitis were admitted with recurrent pancreatitis.

Exclusion Criteria

- Patient who did not consent to the study.
- Patients less than 18 years of age.
- Patients with ascites due to any cause, like malignancy or cardiac cirrhosis.
- Patients with decompensated chronic liver disease and ascites not satisfying the criteria of spontaneous bacterial peritonitis.
- The patient should not be on any antibiotic prophylaxis.
- The patient should not have received antibiotics in the past week.
- Pregnant women.

Statistical Methods

Data was entered in MS Excel and analyzed using SPSS software. The results were presented as tables.

RESULTS

Previous SBP		Outcome		Total	χ^2 -Value	P-Value
		Survived	Expired			
Yes	Count	13	5	18	8.508	0.011*
	%	17.6%	62.5%	22.0%		
No	Count	61	3	64		
	%	82.4%	37.5%	78.0%		
Total	Count	74	8	82		
	%	100.0%	100.0%	100.0%		
<i>Comparison between Previous SBP with Outcomes</i>						
Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Total	Survived	74	4.1	2.0	2.148	0.035*

Bilirubin	Expired	8	5.7	2.0		
* Statistical Significance at P< 0.05 Level						
<i>Comparison of Total Bilirubin with Outcome by Unpaired T-Test</i>						
Table 1						

Five of the 18 patients in the research group who experienced an infection recurrence also passed away. The aforementioned table compares the outcome of the previous SBP with the results of Pearson's chi-squared test. The results indicate a statistically significant association between the two, with $\chi^2 = 8.508$ and $p = 0.011 < 0.05$.

The mean bilirubin level in the study population was 4.9 mg/dl. The aforementioned table compares total bilirubin to outcome using an unpaired t-test; the results indicate a statistically significant difference between total bilirubin and outcome (t-value = 2.148, $p = 0.035 < 0.05$).

Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Serum Albumin	Survived	74	2.9	0.4	2.563	0.012 *
	Expired	8	2.5	0.5		
* Statistical Significance at P < 0.05 Level						
<i>Comparison of Serum Albumin with Outcome by Unpaired T-Test</i>						
Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Serum Creatinine	Survived	74	1.2	0.7	2.832	0.023 *
	Expired	8	2.2	0.9		
* Statistical Significance at P < 0.05 Level						
<i>Comparison of Serum Creatinine with Outcome by Unpaired T-Test</i>						
Table 2						

Serum albumin levels were 2.5 mg/dl in the deceased and 2.9 mg/dl in the survivors on average. The results indicate a statistically significant difference between serum albumin and outcome (t-value = 2.563, $p = 0.012 < 0.05$). For survivors, the mean serum creatinine level was 1.2, while for expired patients, it was 2.2. The unpaired t-test comparison of serum creatinine and outcome in the preceding table yielded a statistically significant difference between the two variables (t-value = 2.832, $p = 0.023 < 0.05$).

Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Serum Sodium	Survived	74	134.5	8.1	3.893	0.001 **
	Expired	8	139.6	2.6		
**Highly Statistical Significance at P < 0.01 Level						
<i>Comparison of Serum Sodium with Outcome by Unpaired t-test</i>						
Variable	Outcome	N	Mean	S.D	T-Value	P-Value
INR	Survived	74	1.8	0.6	3.234	0.013 *
	Expired	8	3.2	1.2		
*Statistical Significance at P < 0.05 Level						
<i>Comparison of INR with Outcome by Unpaired T-Test</i>						
Table 3						

Serum sodium and outcome were compared using the unpaired t-test, and the results showed a very statistically significant difference (t-value = 3.893, p = 0.001<0.01).

When comparing INR and outcome using an unpaired t-test, the results showed a statistically significant difference (t-value = 3.234, p = 0.013<0.05) between the two variables.

Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Ascitic fluid pmn	Survived	74	263.1	60.0	2.871	0.005 **
	Expired	8	329.4	80.0		
**Highly Statistical Significance at P < 0.01 Level						
<i>Comparison of Ascitic fluid PMN with Outcome by Unpaired T-Test</i>						
Variable	Outcome	N	Mean	S.D	T-Value	P-Value
Ascitic Protein	Survived	74	1.6	0.6	4.196	0.005
	Expired	8	0.7	0.2		
Statistical Significance at P < 0.05 Level						
<i>Comparison of Ascitic Protein with Outcome by Unpaired T-Test</i>						
Table 4						

When ascitic fluid PMN and outcome were compared using an unpaired t-test, the results showed a highly statistically significant difference (t-value = 2.871, p = 0.005<0.01). Ascitic protein levels ranged from 0.6 mg/dl in the deceased to 1.6 mg/dl in the survivors. The results indicate a statistically significant difference between ascitic protein and outcome (t-value = 4.196, p = 0.005<0.05).

		Survived	Expired		χ^2 -Value	P-Value
Grade I	Count	29	0	29	19.09	0.000
	%	39.1%	0.0%	35.3%		
Grade II	Count	27	0	27		
	%	36.5%	0.0%	32.9%		
Grade III	Count	18	8	26		
	%	24.4%	100.0%	31.8%		
Total	Count	74	8	82		
	%	100.0%	100.0%	100.0%		
Statistical Significance at P < 0.05 Level						
<i>Comparison between Child Pugh with Outcome</i>						
HE Grade		Outcome		Total	χ^2 -Value	P-Value
		Survived	Expired			
Grade I	Count	12	0	12	82.000	0.0005 **
	%	16.2%	0.0%	14.6%		
Grade II	Count	11	0	11		
	%	14.9%	0.0%	13.4%		

Grade III	Count	0	6	6		
	%	0.0%	75.0%	7.3%		
Grade IV	Count	0	2	2		
	%	0.0%	25.0%	2.4%		
No HE	Count	51	0	51		
	%	68.9%	0.0%	62.2%		
Total	Count	74	8	82		
	%	100.0%	100.0%	100.0%		
** Highly Statistical Significance at P < 0.01 Level						
<i>Comparison between HE Grade with Outcome</i>						
Table 5						

By using Pearson's chi-squared test, the comparison of Child Pugh and outcome yielded $\chi^2 = 19.09$, $p = 0.000 < 0.05$, indicating a statistically significant correlation between the two.

Using Pearson's chi-squared test, the comparison between HE grade and outcome revealed $\chi^2 = 82.000$, $p = 0.0005 < 0.01$, indicating a highly significant statistical correlation between the two.

DISCUSSION

The irreversible scarring of the liver parenchyma is a characteristic of the chronic liver disease, cirrhosis. Chronic liver injury causes scar fibrous tissue to take the place of functioning liver tissue. Due to decreased protein synthesis, phagocyte activity in the reticuloendothelial system, and the translocation of germs from the portal system to the systemic circulation through porto caval shunts, patients with cirrhosis of the liver are more susceptible to bacterial infections. A potentially fatal condition known as spontaneous bacterial peritonitis is characterized by an infection of the ascitic fluid without any visible areas of inflammation. Therefore, early detection of the illness is crucial since, if treatment is delayed, the disease's fatality rate is very high.

Over the course of a year, researchers at Government Stanley Hospital examined the etiology, risk factors, and clinical characteristics of individuals who had spontaneous bacterial peritonitis. Eighty-two patients who met the requirements for inclusion were chosen. Strict confidentiality was maintained during the analysis of the samples, and the outcomes were regarded as identical.

Of the 82 patients in the study, 60 (or 73%) were men and 22 (or 27%) were women. In a Mane et al. investigation, there were 12 (12%) and 88 (88%) men.^[7] There were 22 girls (34%) and 49 males (66%) in a Purohit et al. study.^[8] As a result, all Indian studies show a male majority. There was no variation in the incidence of SBP based on gender in a study by Oladimeji et al.^[9] There may be a gender distribution discrepancy because drinking is more prevalent in men than in women.

The study population's mean age was 47 years, and the age group of 31 to 40 years had the highest number of patients (22 patients, or 27%), followed by 41 to 50 years (26%). In a research by Mane et al., the patients' ages ranged from 20 to 80 years, with most of them

falling between 30 and 60 years old. The age distribution in the two trials was remarkably comparable.

In our study, the cause of cirrhosis was found in 41 patients (49%), Wilson disease in 9 patients (11%), Budd-Chiari syndrome in 9 patients (13.4%), HCV in 7 patients, and 3 patients had a cryptogenic diagnosis of cirrhosis.

Six of the nine patients in the study by Nadagouda SB et al. had alcoholic cirrhosis, two had DCLD associated with HBV, and one was cryptogenic.^[10] Alcoholic cirrhosis accounted for 81% of the cases in a study by Andreu et al. from Spain, 70% in a study by Guarner et al., and 67% in a study by Baheti R et al. from Jodhpur. As a result, it was discovered that drinking alcohol was the most prevalent risk factor for cirrhosis development worldwide and SBP as a complication.

In our analysis, the most prevalent presentation was abdominal distension (26%), followed by abdominal pain (19%), altered mental status (18%), fever (15%), and GI bleeding (14.6%). The remaining 2.4% of patients were asymptomatic or had other nebulous symptoms. In a study by Nadagouda SB et al., 7 patients (77.78%) reported having abdominal pain, 6 patients (66.67%) reported having fever, 6 patients (66.67%) reported having hepatic encephalopathy, 5 patients (55.55%) reported rebound tenderness, 3 patients (33.33%) reported having absent bowel sounds, 3 patients (33.33%) reported having upper gastrointestinal bleeding, and 2 patients (22.22%) reported hypotension. In both investigations, the clinical presentation was comparable.

The patient's outcome was evaluated using the ascites grade. Of the patients, 41 (50%) had grade 3 ascites, 30 (36.6%) had grade 2 ascites, and 11 (13.4%) had grade 1 ascites. In grade 2 ascites, there was 37.5% mortality, and in grade 3 ascites, there was 50% mortality. However ($p = 0.996$) it is not statistically significant.

Eight individuals (10%) died and 74 patients (90%) survived among the study population. In a research by Kawale JB et al., 22 patients (44%) died and 28 patients (56%) survived.

18 patients (22%) in the study group had a history of SBP, whereas 64 patients (78%) had no prior history of ascites, a difference that was statistically significant.

The mean albumin level was 2.7 mg/dl and the mean bilirubin level was 4.9 mg/dl. In ascitic fluid, the highest protein concentration was 2 mg/dl, while the lowest protein concentration was 0.6 mg/dl. Ascitic protein was 1 mg/dl on average. It was discovered that these values were statistically significant. The mean blood albumin level was 2.41 ± 0.39 gm/dl and the mean serum bilirubin level was 6.48 ± 4.2 mg/dl in a study by Nadagouda SB et al. The study found that the ascitic fluid had the highest protein concentration (1.9 gm/dl) and the lowest protein concentration (0.40 gm/dl). The protein concentration in ascitic fluid was 0.93 ± 0.44 gm/dl on average. Research has verified that the most accurate indicator for the initial episode of SBP is the concentration of ascitic fluid protein.

Low ascitic fluid protein levels (<1 mg/dl) and high serum bilirubin levels (>2.5 mg/dl) are thought to be powerful predictors of the development of SBP in both first and recurring episodes.

The mean serum creatinine level in the current investigation was 1.7 mg/dl. The mean blood creatinine level of the individuals who passed away was 2.2 mg/dl. At $p = 0.023$, this

difference was statistically significant. The mean blood creatinine value among those who survived the study by Musskopf MI et al. was 1.2 ± 0.3 mg/dl, while the value among those who died was 1.8 ± 0.8 mg/dl ($p = 0.009$). Therefore, compared to individuals who lived, hospitalized patients had far greater creatinine levels.

In the current study, 3 patients (4%) were in Child Pugh class A, 18 patients (22%) in class B, and 61 patients (74%) in class C. Eight (88.89%) of the nine patients in a research by Nadagouda SB et al. with SBP and its variations were in Child Pugh's Class C, whereas just one (11.11%) example was in Class B. Eighty-five percent ($n = 17$) of the cases in a study by Syed VA et al. were in Child's class C, and three percent ($n = 3$) were in Child's class B. But in our analysis, there was no relationship between Child Pugh grading and mortality.

In 38 cases (46%), the ascitic fluid culture was positive; in 43 cases (54%), CNNA was seen. The most frequent organism detected in ascitic fluid was E coli (26%), which was followed by Streptococcus pneumoniae (7.3%), Klebsiella (10%), and anaerobes in 2 cases. 23 ascitic fluid samples from 51 cases of spontaneous bacterial peritonitis in a research by Mane et al. had positive culture results. Thirteen cases (13%) had E. coli isolated; six cases (6%) had Klebsiella spp. isolated; two cases (2%) had acinetobacter isolated; one case (1%) had Pseudomonas aeruginosa isolated; and one case (1%) had proteus identified. Out of nine cases of SBP (Spontaneous Bacterial Peritonitis) in a research by Nadagouda SB et al., seven (77.78%) had CNNA (Culture-Negative Neutrocytic Ascites), and one (11.11%) had MNBA (Mono-Microbial Non-Neutrocytic Bacterial Ascites). The kind of organism cultivated in culture had no bearing on survival in our investigation.

CONCLUSION

The majority of the patients were males. The majority of the cases were in the age group of 30-50 years. 90% of the patients survived, while 10% expired. The most common etiology for cirrhosis amongst the study population was alcoholic cirrhosis, followed by Budd Chiarry syndrome. The most common clinical presentation was abdominal distension, followed by hepatic encephalopathy, abdominal pain, fever and GI bleeding. The recurrence of SBP was significantly associated with survival outcomes. 38 patients in the study showed positive cultures, of which E. coli was the most commonly cultured followed by Klebsiella and Streptococcus. Higher serum bilirubin and low ascitic protein levels were found to have a statistically significant association with survival outcomes. Higher serum creatinine levels and Child Pugh classes were significantly associated with outcomes.

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