

## PREVALENCE AND MICROBIOLOGICAL PROFILE OF SPONTANEOUS BACTERIAL PERITONITIS IN PATIENTS OF CIRRHOSIS WITH ASCITES

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### Abstract

**Background:** To assess prevalence and microbiological profile of spontaneous bacterial peritonitis in patients of cirrhosis with ascites. **Materials and Methods:** 150 adult patients both male and female having cirrhosis with ascites admitted in Department of Medicine, Govt. Medical College and Rajindra Hospital Patiala were included. Prevalence and microbiological profile of spontaneous bacterial peritonitis in patients of cirrhosis with ascites was recorded. **Result:** Out of 150 cirrhotic patients with ascites, 24 reported spontaneous bacterial peritonitis (SBP) i.e. 16%. Out of 24 patients of SBP, 19 reported Culture Negative Neutrocytic Ascites (CNNA) while 5 reported Classical SBP. No case of Mono-microbial Non-neutrocytic Bacterascites (MNBA) was found. Out of 5 patients with classical SBP, E. coli was found in 60 percent of the patients, Klebsiella spp. in 20 percent and Streptococcus pyogenes was found in 20 percent of the patients. On comparison of important parameters between patients with SBP and Non SBP patients, Mean values of Serum Creatinine were significantly higher in patients with SBP. Serum Sodium, Ascitic Fluid Protein was significantly lower in patients with SBP. No statistically significant difference was found in mean value of platelet count between both groups. Also 100% of patients with SBP had Child Turcotte Pugh (CTP) score C while 80.9% of Non SBP patients had CTP score C and 19.1% of Non SBP patients had CTP score B. **Conclusion:** We found advanced cirrhosis, low Ascitic Fluid Protein, high Serum Creatinine and Hyponatremia significantly associated with SBP and thus, should be considered for primary prophylactic therapy for SBP.

## INTRODUCTION

Chronic liver diseases (CLD) cause significant morbidity and mortality worldwide. Multiple etiological factors lead to a similar clinico-pathological syndrome in CLDs, although the rates of progression and clinical course may be different.<sup>[1]</sup> Mortality data is most often used to assess the disease burden and there had been a 46% increase in CLD mortality in the world underscoring the emerging public health importance of CLD. Most of this increase in CLD mortality has been reported from the low and low-middle income countries (LMIC) of Asia and Africa.<sup>[2]</sup> It is intriguing to note that most countries in this region have very poor vital events reporting systems, indicating that the current data could underestimate the existing situation and complimentary approaches

are needed to assess the overall impact of CLDs on health systems.<sup>[3]</sup>

Ascites is a very common manifestation of decompensated cirrhosis and represents a pathologic accumulation of fluid within the peritoneal cavity.

The term “ascites” is derived from the Greek term “askos” in reference to its similar appearance to a winebag or sac.<sup>[4]</sup> This seems rather appropriate, both in description of presentation and as an allusion to a main cause of cirrhosis. The most common disease that causes patients to get ascites is cirrhosis, which accounts for approximately 80% of cases. Other causes of ascites include cancer, 10%; heart failure, 3%; tuberculosis, 2%; dialysis, 1%; pancreatic disease, 1%; and others, 2%.<sup>[5]</sup>

Gram-negative bacteria are the main causative agents of spontaneous bacterial peritonitis, with Escherichia coli and Klebsiella spp. being the most frequently isolated organisms. However, gram-positive bacteria including Streptococcus viridians,

*Staphylococcus aureus* and *Enterococcus* spp., can also be found.<sup>[6]</sup> The present study was conducted to assess the prevalence and microbiological profile of spontaneous bacterial peritonitis in patients of cirrhosis with ascites.

## MATERIALS AND METHODS

The study design was an observational cross-sectional study and was done in a period of 2 years. In the present study, 150 adult patients both male and female having cirrhosis with ascites admitted in Department of Medicine, Govt. Medical College and Rajindra Hospital Patiala were included. The patients were explained in their vernacular language about the procedures to be adopted in the study and their informed consent was taken. The study was approved by Local Ethics Committee, Govt. Medical College and Rajindra Hospital Patiala. The diagnosis of cirrhosis was based on clinical, laboratory and imaging findings.

Following set of patients were included such as age group > 18 years, both sexes, diagnosed cases of cirrhosis with ascites and ascitic fluid protein  $\leq$  2.5 gm/dl (SAAG > 1.1). Following set of patients were excluded from the study such as patients with age < 18 years, ascites due to renal, cardiac, tubercular and malignant pathology, pregnancy, HIV infected patients, undergone abdominal surgery within 3 months of study entry, history of abdominal paracentesis within past 1 week, patients with secondary peritonitis and patients already on antibiotics.

Information such as sex, age, etiology of cirrhosis, severity of disease (on the basis of CTP score), presence or absence of Jaundice, Abdominal distension, Encephalopathy, Fever, Abdominal pain, Melena, Hematemesis and Oliguria. The Child-Turcotte-Pugh (CTP) score was determined to assess the severity of disease on the basis of the presence of Ascites, Hepatic Encephalopathy, levels of Total Serum Bilirubin and Serum Albumin and INR was collected. CTP Score is obtained by adding the score for each parameter. CTP Class A, 5-6 Points; Class B, 7-9 Points; Class C, 10-15 points. Parameters such as Serum Creatinine, Prothrombin Time by International Normalized Ratio, Platelet count, Serum bilirubin, Serum albumin, Ascitic Fluid Total Protein and Albumin, Ascitic Fluid TLC count and PMN cell count, Ascitic Fluid culture was recorded. Ten ml of ascitic fluid was sent for biochemical and cytology examination. Ascitic fluid was inoculated into blood culture bottles for culture and sensitivity. In biochemical analysis, ascitic fluid glucose, total protein and albumin were done. Cytology was done for total and differential count. SAAG was calculated. Depending on the cell count and culture of ascitic fluid, SBP was classified into its variants, classical spontaneous bacterial peritonitis, culture Negative Neutrocytic Ascites (CNNA), Mono-microbial Non-neutrocytic

Bacterascites (MNBA). Values were considered to be statistically significant if p-Value < 0.05. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0.

## RESULTS

In this study 74.67 percent of the patients belonged to the age group of 51 to 69 years while 16 percent belonged to the age group of 20 to 50 years. Mean age of the patients was 59.5 years [Table 1].

Etiology was alcohol in 55.3 percent of the patients while it was hepatitis C virus in 27.3 percent of the patients and Hepatitis B in 1.3 percent of the patients. In 14.67 percent of the patients, etiology was both alcohol and hepatitis C. In the remaining 1.3 percent of the patients, cirrhosis was due to other causes like Autoimmune, cryptogenic, NASH etc [Table 2].

Jaundice was the most common presentation found in 90.67 percent of the patients while abdominal distension was seen in 89.33 percent of the patients. Oliguria and hematemesis were seen in 69.33 percent and 16 percent of the patients respectively. Melena was seen in 62.67 percent of the patients while abdominal pain, encephalopathy and fever were seen in 18.67 percent, 21.33 and 21.33 percent of the patients respectively [Table 3].

According to Child-Turcotte-Pugh score, 84 percent of the patients were of Class C while 16 percent of the patients were of Class B [Table 4].

Mean Total Serum Bilirubin concentration in present study was 5.57 mg/dl, Mean Total Serum Protein concentration was 4.63 g/dl, mean Serum Albumin was 3.04 g/dl, and mean INR was 2.2. Mean Serum Creatinine value and mean BUN value were found to be 1.65 mg/dL and 53.79 mg/dL respectively. The mean value of fibroscan was 26.12 KPa [Table 5].

Out of 150 cirrhotic patients with ascites, 24 reported SBP i.e. 16% [Table 6].

Out of 24 patients of SBP, 19 reported CNNA while 5 reported Classical SBP. No case of Mono-microbial Non-neutrocytic Bacterascites (MNBA) was found [Table 7].

Out of 5 patients with classical SBP, *E. coli* was found in 60 percent of the patients, *Klebsiella* spp. in 20 percent and *Streptococcus pyogenes* was found in 20 percent of the patients [Table 8].

On comparison of important parameters between patients with SBP and Non SBP patients, Mean values of Serum Creatinine were significantly higher in patients with SBP. Serum Sodium, Ascitic Fluid Protein was significantly lower in patients with SBP. No statistically significant difference was found in mean value of platelet count between both groups [Table 9]. Also 100% of patients with SBP had CTP score C while 80.9% of Non SBP patients had CTP score C and 19.1% of Non SBP patients had CTP score B.

**Table 1: Age-wise distribution**

Age group (years)	Number of patients	Percentage
20 to 50	24	16
51 to 69	112	74.67
≥70	14	9.33
Total	150	100
Mean	59.5	

**Table 2: Etiology of Cirrhosis**

Etiology of liver cirrhosis	Number of patients	Percentage
Hepatitis C virus	41	27.3
Alcohol	83	55.3
Alcohol + Hepatitis C	22	14.67
Hepatitis B virus	2	1.3
Others (Aut. Autoimmune, Cryptogenic, NASH)	2	1.3
Total	150	100

**Table 3: Clinical profile**

Clinical profile	Number	Percentage
Fever	32	21.33
Abdominal pain	28	18.67
Abdominal distension	134	89.33
Melena	94	62.67
Jaundice	136	90.67
Oliguria	104	69.33
Hematemesis	24	16
Encephalopathy	32	21.33

**Table 4: Child-Turcotte-Pugh (CTP) score**

Child-Turcotte-Pugh (CTP)	Number	Percentage
Class A	0	0
Class B	24	16
Class C	126	84
Total	150	100

**Table 5: Assessment of parameters**

Parameters	Variables	Mean	SD
Liver parameters	Total Serum Bilirubin (mg/dl)	5.57	1.8
	Total Serum Protein (g/dl)	4.63	0.37
	Serum Albumin (g/dl)	3.04	0.45
	INR	2.2	0.29
Renal profile	Serum creatinine (mg/dL)	1.65	0.66
	BUN (mg/dL)	53.79	14.29
Fibroscan (LSM) (kPa)		26.12	10.15

**Table 6: Prevalence of SBP**

<b>Total Patients</b>	<b>150</b>
Patients with SBP	24
SBP Prevalence	16 %

**Table 7: Variants of SBP**

VARIANT	Number of patients	Percentage
Classical SBP Ascitic Fluid TLC: > 500/mm <sup>3</sup> Ascitic Fluid Neutrophils: > 250/mm <sup>3</sup> Ascitic Fluid Culture: Positive	5	20.83
Culture Negative Neutrocytic Ascites (CNNA) Ascitic fluid TLC: > 500/mm <sup>3</sup> Ascitic Fluid Neutrophils: > 250/mm <sup>3</sup> Ascitic Fluid Culture: Negative	19	79.16
Total	24	100

**Table 8: Culture of Ascitic fluid**

Bacteriology	Number of patients	Percentage
Klebsiella spp.	1	20
E. coli	3	60
Streptococcus pyogenes	1	20
Total	5	100

**Table 9: Correlation of SBP with various Lab Parameters**

Variable	With SBP(n=24)		Without SBP(n=126)		p-Value
	Mean	SD	Mean	SD	
Ascitic Fluid Protein(g/dl)	1.0	0.15	2.24	0.17	<0.0001
Serum Creatinine (mg/dl)	3.06	0.29	1.39	0.23	<0.0001
Serum Sodium (mEq/L)	119.75	2.49	132.79	2.63	<0.0001
Platelet Countx104/mm <sup>3</sup>	8.8x104	1.8x104	9.4x104	1.9x104	0.155

## DISCUSSION

Cirrhosis is a leading cause of mortality and it is associated with significant reduction in health related quality of life. Spontaneous Bacterial Peritonitis is the most frequent and potentially lethal bacterial infection in patients with cirrhosis, associated with 30 days mortality rate of 31.5%. Any cirrhotic patient with ascites can develop SBP. The present study was undertaken for determining the prevalence of SBP in patients of liver cirrhosis with ascites and for assessing the microbiological profile of SBP. A total of 150 patients were enrolled in our study.

In our study, 74.67 percent of the patients belonged to the age group of 51 to 69 years while 16 percent belonged to the age group of 20 to 50 years. In our study, 73.33 percent of the patients were males while the remaining 26.67 percent were females. This high male to female ratio was due to the fact that most of the men had cirrhosis due to alcohol intake and none of the 40 females who participated in this study had history of alcohol consumption. In a study conducted by Hafez MZE et al 63 percent of the patients were males while the remaining were females.<sup>[7]</sup>

We found that Alcohol was the leading causes of cirrhosis in males followed by HCV. In females, HCV was the only cause of cirrhosis. Harchand P et al<sup>8</sup> found 54.9 percent of the patients had alcohol as an etiologic factor respectively.<sup>[8]</sup> In our study, Jaundice was the most common presentation found in 90.67 percent of the patients while abdominal distension was seen in 89.33 percent of the patients. Oliguria and hematemesis were seen in 69.33 percent and 16 percent of the patients respectively. In a study conducted by Paul K et al,<sup>[9]</sup> the presenting complaints of cases were abdominal distention in 109 (89%) followed by jaundice in 47 (39%), fever in 38 (31%), altered sensorium in 25 (20.5%), oedema feet in 23 (18.9%), pain abdomen in 20 (16.4%) and UGI bleed in 17 (13.9%) cases.

According to Child-Turcotte-Pugh score, 84 percent of the patients were of Class C while 24 percent of the patients were of Class B in our study. In another study conducted by Oladimeji AA et al,<sup>[10]</sup> Majority (80%) of the patients were in Child's grade C, while the remaining 20% were in Child's grade B. In present study, Mean Serum creatinine was 1.65 mg/dl. Similarly, in study conducted by Harchand P et al mean serum creatinine was 1.75mg/dl.

We found that 24 patients out of 150 had SBP which showed a prevalence of 16 percent. In studies conducted by Paul K et al,<sup>[9]</sup> SBP prevalence was

20.4 percent. In the present study, patients with SBP had significantly lower mean ascitic fluid protein concentration i.e.1.0 g/dl as compared to patients without SBP, which has been an established risk factor for development of initial episode of SBP.<sup>[10]</sup> In a study conducted by Nadagouda SB et al,<sup>[11]</sup> mean ascitic fluid protein concentration was 0.93 gm/dl.

In present study, mean Serum Sodium of SBP patients was 119.75 mEq/L while Mean Serum Sodium of Non SBP patients was 132.79 mEq/L. Kwon JH et al,<sup>[12]</sup> through a study found that hyponatremia was an independent risk factor for SBP. Probably hyponatremia indicates advanced liver cirrhosis.

The limitation of the study was that Analysis of 150 hospitalised cirrhotic patients may not reflect pattern of disease in the community and requires a larger population study.

## CONCLUSION

Spontaneous Bacterial Peritonitis is a potentially serious complication of cirrhosis and all admitted patients should be screened for it, as early diagnosis and management will help to reduce mortality in these patients. SBP should be ruled out in all patients with ascites. A high index of suspicion must be kept in patients of ascites, who present with acute clinical deterioration. Any patient with cirrhosis and ascites, who presents with pain abdomen, fever, jaundice, UGI bleed or hepatic encephalopathy, should undergo diagnostic paracentesis before starting antibiotics. Bedside inoculation of culture bottle would yield better results. CNNA is the most common variant of SBP. Gram negative bacteria is the main causative agent of Spontaneous Bacterial Peritonitis, with E. coli and Klebsiella being the most frequently isolated organisms and should be the target of antibiotic therapy in this region. In our study we found advanced cirrhosis, low Ascitic Fluid Protein, high Serum Creatinine and Hyponatremia significantly associated with SBP and thus, should be considered for primary prophylactic therapy for SBP.

## REFERENCES

1. Ripoll C, Groszmann R, Garcia-Tsao G, Grace N, Burroughs A, Planas R, et al. Hepatic venous pressure gradient predicts clinical decompensation in patients with compensated cirrhosis. *Gastroenterology*. 2007;133(2):481-8. doi: 10.1053/j.gastro.2007.05.024.

2. Senousy BE, Draganov PV. Evaluation and management of patients with refractory ascites. *World J Gastroenterol.* 2009;15(1):67-80. doi: 10.3748/wjg.15.67.
3. Tam AC, Lapworth R. Biochemical analysis of ascitic (peritoneal) fluid: what should we measure? *Ann Clin Biochem.* 2010;47(Pt 5):397-407. doi: 10.1258/acb.2010.010048.
4. Reynolds TB. Ascites. *Clin Liver Dis.* 2000;4(1):151-68, vii. doi: 10.1016/s1089-3261(05)70101-x.
5. Conangla-Planes M, Serres X, Persiva O, Augustín S. Imaging diagnosis of portal hypertension. *Radiologia (Engl Ed).* 2018;60(4):290-300. English, Spanish. doi: 10.1016/j.rx.2017.12.010.
6. Kibrit J, Khan R, Jung BH, Koppe S. Clinical Assessment and Management of Portal Hypertension. *Semin Intervent Radiol.* 2018;35(3):153-159. doi: 10.1055/s-0038-1660793.
7. Kasztelan-Szczerbinska B, Słomka M, Celinski K, Serwacki M, Szczerbinski M, Cichoż-Lach H. Prevalence of spontaneous bacterial peritonitis in asymptomatic inpatients with decompensated liver cirrhosis - a pilot study. *Adv Med Sci.* 2011;56(1):13-7. doi: 10.2478/v10039-011-0010-6.
8. Harchand P, Gupta V, Ahluwalia G, Chhina RS. Clinical and Bacteriological Profile of Spontaneous Bacterial Peritonitis in Cirrhotic Patients. *J Gastrointest Infect.* 2017;7(1):15-20.
9. Paul K, Kaur J, Kazal HL. To Study the Incidence, Predictive Factors and Clinical Outcome of Spontaneous Bacterial Peritonitis in Patients of Cirrhosis with Ascites. *J Clin Diagn Res.* 2015;9(7):OC09-12. doi: 10.7860/JCDR/2015/14855.6191.
10. Oladimeji AA, Temi AP, Adekunle AE, Taiwo RH, Ayokunle DS. Prevalence of spontaneous bacterial peritonitis in liver cirrhosis with ascites. *Pan Afr Med J.* 2013;15:128. doi: 10.11604/pamj.2013.15.128.2702.
11. Jain AP, Chandra LS, Gupta S, Gupta OP, Jajoo UN, Kalantri SP. Spontaneous bacterial peritonitis in liver cirrhosis with ascites. *J Assoc Physicians India.* 1999;47(6):619-21.
12. Kwon JH, Koh SJ, Kim W, Jung YJ, Kim JW, Kim BG, et al. Mortality associated with proton pump inhibitors in cirrhotic patients with spontaneous bacterial peritonitis. *J Gastroenterol Hepatol.* 2014;29(4):775-81. doi: 10.1111/jgh.12426.