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A Study of Spontaneous Bacterial Peritonitis in Cirrhosis of Liver with Ascites with Special Reference to Serial Ascitic Fluid Cell Count as Prognostic Marker

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Abstract:
Aim: *To study clinical features and prognostic significance of various clinical, biochemical parameters and serial ascitic fluid cell count in SBP..*
Study design: *Prospective, observational, single centre, non-blind (open label).*
Place and duration of study: *General Medicine Department, Maharaja's Institute of Medical Sciences, Nellimarla, Vizianagaram, Vizianagaram Dist, India from October 2014 to September 2016.*
Methodology: *50 patients admitted to MIMS General Hospital, Nellimarla, diagnosed as cirrhosis of liver with SBP were studied. SBP was diagnosed based on ascetic fluid cell PMN count of > 250. Serial ascitic fluid cell count was done at 0 hour, 24 hours, 48 hours, and at 5 days. The results were compared between the survivors and non-survivors and subjected to appropriate statistical analysis..*
Results: *Male:Female ratio in SBP patients was 2:1. Mean age at the time of diagnosis was 53.68 +/- 9.06 years (37 – 75 years). Common clinical features were - jaundice(64 %), fever(56 %), abdomen pain(56 %), altered sensorium(40%), haemetemesis or malena (36 %) and oliguria(32 %), icterus (84 %), asterixis (48 %), hypotension (24 %), abdominal tenderness (68%).Ascitic fluid culture did not show any growth in 48 % of cases while 24 % showed E. Coli, 20 % showed klebsiella, and 4 % each of proteus and staphylococcus aureus. Outcome was grave with 44 % mortality.*
Conclusion: : *TLC above 11,000/mm3, total bilirubin above > 5mg/dl and sr. creatinine > 1.5 were associated with increased mortality. An ascetic fluid PMN count of > 600 at time of diagnosis, > 700 at 24 hours and > 450 at 48hours was associated with poor prognosis. A progressive fall in serial ascitic fluid cell PMN count was associated with good prognosis.*
Key Words: *SBP and serial ascitic fluid cell count*.

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I. Introduction

Cirrhosis of liver is the common hepatic disorder seen in day to day clinical practice. The mortality in cirrhosis patients mainly because of the complications like hepatic encephalopathy and spontaneous bacterial peritonitis. One of the factors which are responsible for subsequent deterioration in the condition of cirrhosis patient is appearance of spontaneous bacterial peritonitis (SBP). Spontaneous bacterial peritonitis is most common life-threatening, infectious complication in patients with ascites characterized by abrupt onset of fever, chills, abdominal pain with rebound tenderness over abdomen, absent bowel sounds and leucocytosis. Paracentesis reveals cloudy ascitic fluid with many WBCs predominantly, polymorphonuclear cells (PMN). SBP is defined as the infection of previously sterile ascitic fluid without an apparent intra-abdominal source of

infection. A single organism usually, enteric group is cultured from the ascitic fluid in majority of cases[1] . The same organism is often recovered from blood culture. Most of the patients die, due to infection per se, others of its complications and some from other hazards of cirrhosis such as bleeding varices or the hepatorenal syndrome. Spontaneous bacterial peritonitis which first appeared to be a disorder of alcoholic cirrhosis, has also been reported in post-necrotic cirrhosis[2], chronic active hepatitis[3], Nephrotic syndrome[4], Cardiac cirrhosis[5] , malignant ascites and primary biliary cirrhosis[6] . The full blown syndrome may not be present and any one or all of its components may be missing. It may present as fever of unknown origin or as hypothermia. Sometimes it emerges as encephalopathy of uncertain cause. So unexplained fever, hypothermia, hypotension, encephalopathy, abdominal pain or simply unexplained clinical deterioration should be considered as the indications for diagnostic paracentesis in cirrhotics for the diagnosis of SBP[7-12]. SBP is caused by enteric group of organisms by about 75% and the remainder by nonenteric including anaerobes. SBP being the problem in cirrhosis with ascites, all cirrhotics should be screened for SBP with at least ascitic fluid PMN cell count and culture of ascitic fluid. These patients are treated with antibiotics aggressively as they have poor prognosis and high mortality if not treated early. High degree of suspicion, routine diagnostic paracentesis, standardization of diagnostic criteria of ascitic fluid infection and use of non-nephrotoxic antibiotics is essential for early diagnosis and management. Early diagnosed and treated SBP episodes resolved satisfactorily and improved short-term prognosis. The long-term prognosis continues to be extremely poor. On the basis of these considerations, considerable efforts have been made in recent years to develop an alternative test for prediction of prognosis in patients with SBP. This represents an interesting and promising area of investigation, which could determine the further optimization of SBP management and further improvement in its prognosis. Ideally such a test should be performed at the bedside at the time of paracentesis and should have a high sensitivity and a low false-positive rate.

But studies evaluating the utility of ascitic fluid cell count in diagnosing SBP are few. Therefore, there is a need for more studies to validate the same. Hence, this study is being done to evaluate whether ascitic fluid PMN cell count can serve as useful prognostic markers for SBP. The study done to evaluate the importance of serial ascitic fluid PMN cell count showed that the serial ascitic fluid cell count can be used to monitor the treatment and in determining the duration of antimicrobial therapy in SBP[13,14].

II. Aims And Objectives

1. To study clinical features, pathogenic organisms, clinical course and outcome of spontaneous bacterial peritonitis.
2. To study the prognostic factors in spontaneous bacterial peritonitis.
3. The role of serial ascitic fluid polymorphonuclear cell count in predicting prognosis in patients of cirrhosis with ascites with spontaneous bacterial peritonitis.

III. Materials And Methods

Total of 50 patients of age group >20 years, diagnosed as SBP were studied thoroughly with regards to both history and clinical examination, under a special proforma. All patients who were confirmed of hepatic cirrhosis by ultra sound were screened for SBP were selected who were admitted in to ICU and Medical wards, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram from October 2014 to September 2016.

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3.1Inclusion criteria

- age group >20 years, diagnosed as SBP were studied thoroughly with regards to both history and clinical examination.

3.2 Exclusion criteria

- Cardiac cirrhosis
- Infiltrative liver disorders
- Chronic kidney disease
- Bleeding diathesis
- Biliary cirrhosis
- Malignant ascites
- Tuberculous bacterial peritonitis
- Meigs syndrome
- Secondary bacterial peritonitis
- Nephrotic syndrome

Ascitic fluid for analysis was aspirated as soon as the patients were admitted, before giving any antibiotics and before subjecting the patients for invasive procedures like liver biopsy, endoscopy or therapeutic aspiration. All patients underwent paracentesis within 24 hours of admission. About 40 ml of ascitic fluid was tapped in each patient with aseptic precautions. Blood contaminated or bloody ascitic fluids were discarded from the study.

1. 10ml of ascitic fluid was immediately inoculated into blood culture bottles at the bedside for proper transport to microbiological laboratory.
2. 10ml of ascitic fluid was sent to the laboratory in sterile test tubes for conventional culture.
3. 20ml of ascitic fluid was sent for biochemical and cytological examination.

Ascitic fluid of all patients was analyzed for the type of cells and cell count. Ascitic fluid was cultured to know the presence of pathogenic organisms. Due to lack of facilities, culture for anaerobes, fungi and viruses in the ascitic fluid could not be done in the present study. Patients were studied in detail in relation to clinical presentation, laboratory investigations, response to treatment, prognosis and outcome during the hospitalization. Special importance was given to serial ascitic fluid cell count and its relation to prognosis.
Patients diagnosed of SBP were treated with I.V cefotaxime 2 grams 8 hourly.

3.3 Methodology of SBP Diagnose :

SBP diagnosed by following criteria

- An ascitic fluid PMN cell count greater than 250 cells/ mm3

  Or
- An ascitic fluid cell count greater than 500 cells/ mm3
- With >50% PMN cells.

  and
- An absence of a primary source of infection.

3.4 Investigations used:

Routine tests	Optional tests	Specific tests
WBC count & differential count	Total protein	Tuberculosis smear and
Serum albumin	Glucose	Culture
Cultures in blood-culture bottles	LDH	Cytology
SAAG	Gram staining	Triglyceride
	Amylase	Bilirubin

3.5 Calculations

Statistical Methods:

95% confidence Interval has been used to find the significance of study characteristics. ANNOVA test (multiple independent variables) has been used to find the significance of study parameters between Survived and Death taking P value of < 0.05 as significant. Receiving Operating Characteristics tool has been used to find the diagnostic performance of study parameters.

IV. Observation And Results

Total 50 patients of age group >20 years, diagnosed as SBP were studied thoroughly with regards to both history and clinical examination.

Table 1 Age Distribution of Patients

Age in years	Number	%
31-40	4	8.0
41-50	16	32.0
51-60	22	44.0
61-70	4	8.0
>70	4	8.0
Total	50	100.0
Mean±SD	53.68±9.06	

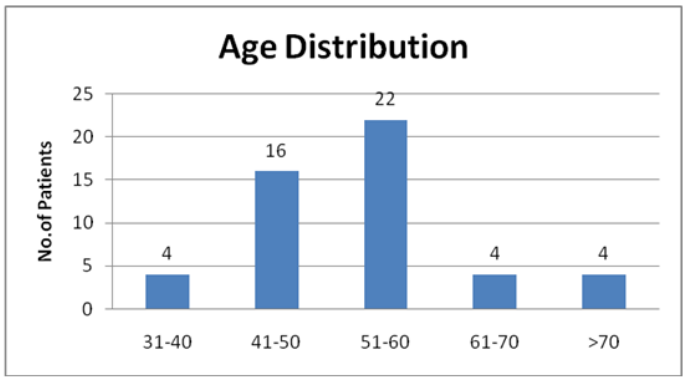


Table 2: Sex Distribution

Sex	**Number**	**%**
Male	**36**	**72.0**
Female	**14**	**28.0**
Total	**50**	**100.0**

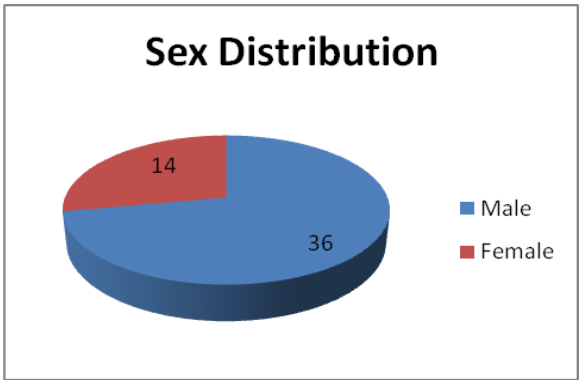


Table 3: Etiology of Cirrhosis

Etiology	Number	Percentage
Alcoholic	37	74
HBsAg	8	16
Others	5	10

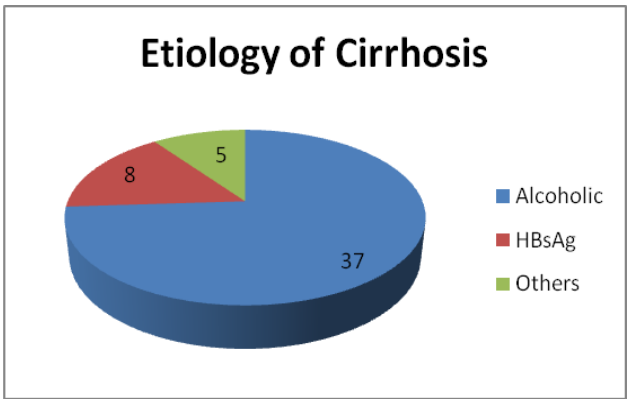


Table 4 Symptoms Distribution of Patients

Symptoms	Number	%	95%CI
Abdomen distension	50	100	100.00-100.0
Jaundice	32	64	49.19-77.08
Abdomen pain	28	56	41.25-70.01
Fever	28	56	41.25-70.01
Haemetemesis, Malena	18	36	22.92-50.81
Altered Sensorium	20	40	26.40-54.82
Oliguria	16	32	19.52-46.70

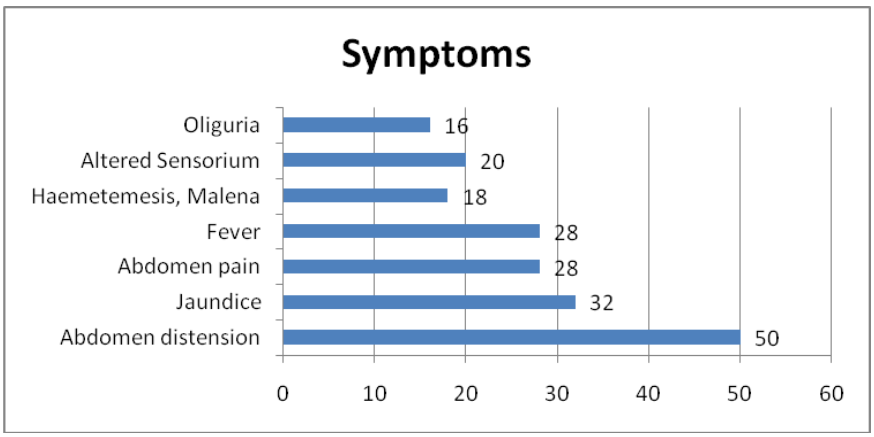


Table -5: Signs Distribution of Patients

Signs	Number	%
Fever	28	56
Icterus	42	84
Ascites	50	100
Abdominal tenderness	34	68
Petechiae, purpura, ecchymosis	16	32
Asterixis	24	48
Hypotension	12	24
Hepatomegaly	2	4
Splenomegaly	10	20

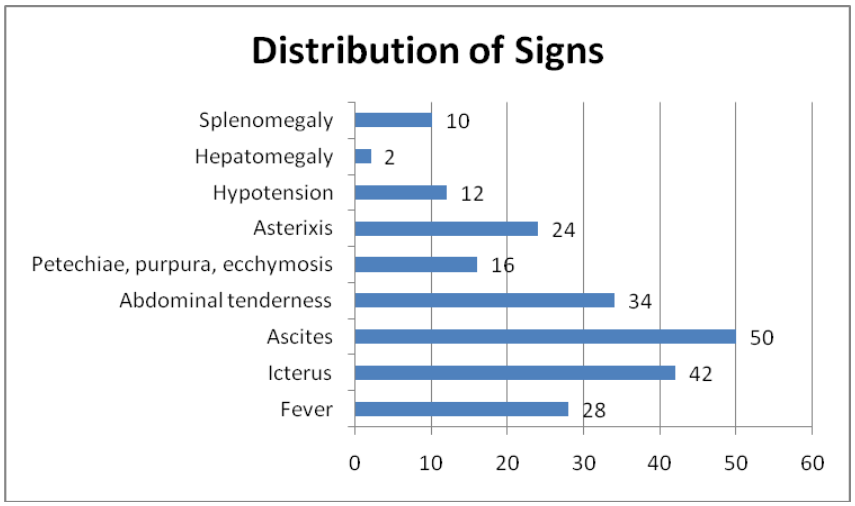


Table 6: Outcome SBP Patients

Outcome	Number	%	95%CI
Survived	28	56	41.25-70.01
Died	22	44	29.99-58.75

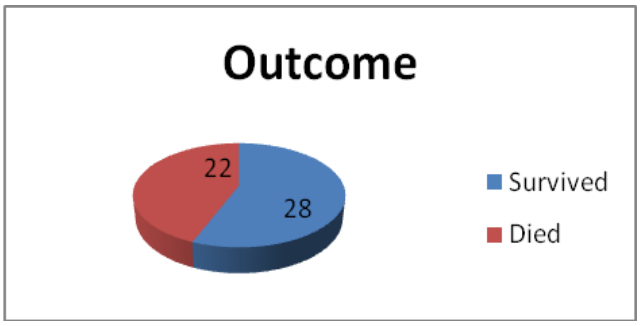


Table -7: Comparison of Investigations between the Patients of SBP- Died and Survived

Investigations	Outcome				P value
	Survived		Died		
	Mean	SD	Mean	SD	
Total count	8889.62	4496.50	10181.81	6671.59	0.41805
Total Bilirubin	4.91	2.55	6.62	3.35	0.04575
SGOT	109.71	44.71	125.00	46.98	0.83584
SGPT	66.07	34.86	94.18	25.23	0.83180
Sr.Albumin	2.24	0.34	2.08	0.21	0.46930
Sr.Creatinine	1.55	0.99	2.75	2.22	0.01423
AF Protein	1.02	0.20	0.96	0.39	0.50979

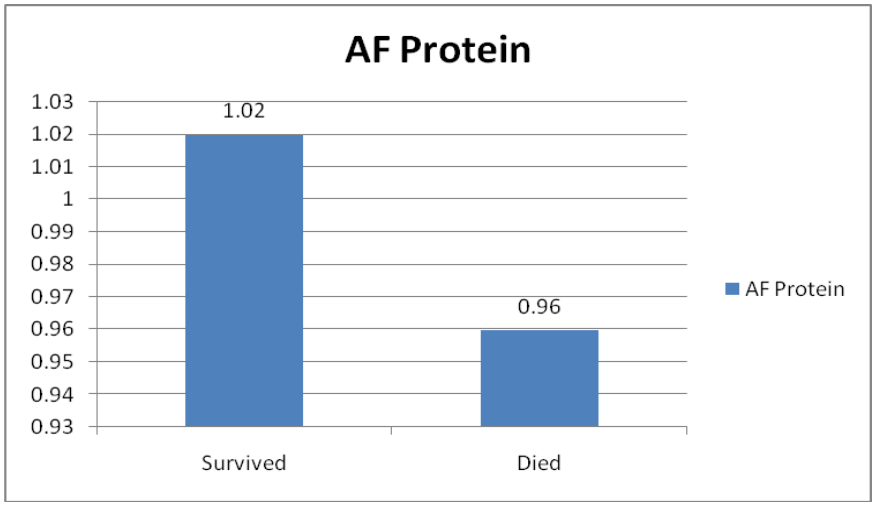


Table-8: Comparison of AF Cells Between the Patients Who Died and Survived

Investigations	Outcome				P value
	Survived		Died		
	Mean	SD	Mean	SD	
AF Cells(PMNs) 0 hours	567.85	295.40	990.90	816.15	0.01421
AF Cells(PMNs) 24 hrs	510.70	139.01	961.16	639.37	0.00017
AF Cells(PMNs) 48 hrs	262.85	127.27	631.81	367.92	0.00001
AF Cells(PMNs) 5 days	107.85	79.92	250.00	57.73	0.00187

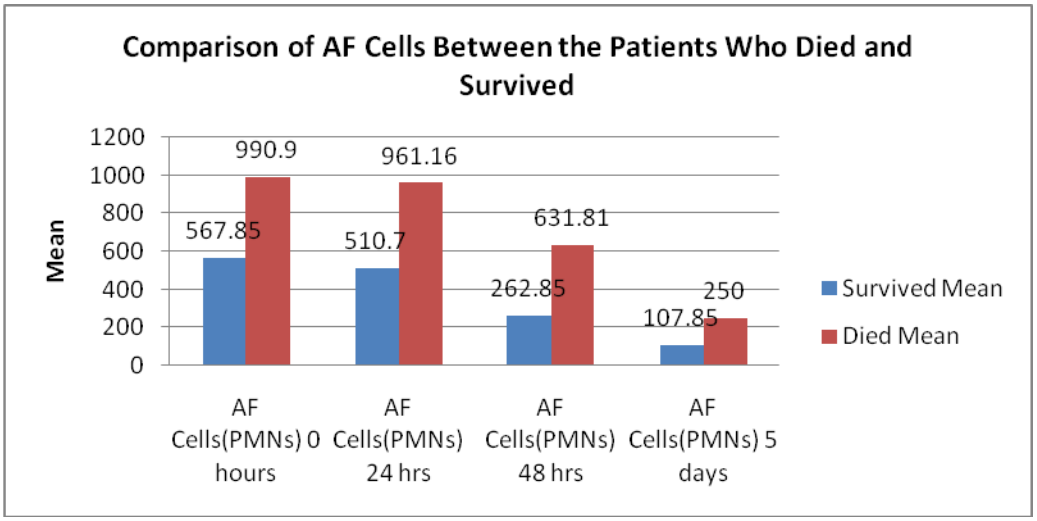


Table – 9 Comparison of AF Cells Between the Patients Who Died and Survived

Investigations	Survived	Died
	% Change	% Change
AF Cells(PMNs) 0 hours	_	_
AF Cells(PMNs) 24 hrs	0.10%	0.30%
AF Cells(PMNs) 48 hrs	53.4%	35.9%
AF Cells(PMNs) 5 days	81.7%	74.1%

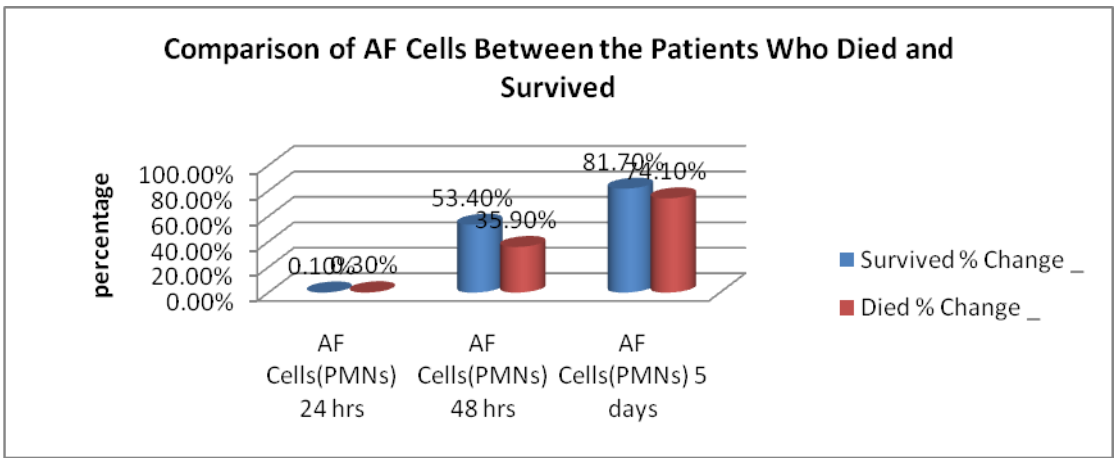


Table 10: Prediction of death Based on AF Cells (PMNs) at 0 Hour

AF cells at 0 hour s Cut-off	Sensitivity	95% CI	Specificity	95% CI	+LR	-LR
>250	0.00	0.0 - 12.3	100.00	84.6 - 100.0	0 .00	1.00
>250	7.14	0.9 - 23.5	100.00	84.6 - 100.0	0.00	0.93
>300	7.14	0.9 - 23.5	90.91	70.8 - 98.9	0.79	1.02
>400	42.86	24.5 - 62.8	90.91	70.8 - 98.9	4.71	0.63
>450	50.00	30.6 - 69.4	81.82	59.7 - 94.8	2.75	0.61
>500	57.14	37.2 - 75.5	81.82	59.7 - 94.8	3.14	0.52
>550	71.43	51.3 - 86.8	72.73	49.8 - 89.3	2.62	0.39
>600	71.43	51.3 - 86.8	63.64	40.7 - 82.8	1.96	0.45
>650	78.57	59.0 - 91.7	54.55	32.2 - 75.6	1.73	0.39
>700	78.57	59.0 - 91.7	45.45	24.4 - 67.8	1.44	0.47
>750	85.71	67.3 - 96.0	45.45	24.4 - 67.8	1.57	0.31
>950	85.71	67.3 - 96.0	18.18	5.2 - 40.3	1.05	0.79
>1300	100.00	87.7 - 100.0	18.18	5.2 - 40.3	1.22	0.00
>3200	100.00	87.7 - 100.0	0.00	0.0 - 15.4	1.00	0.00

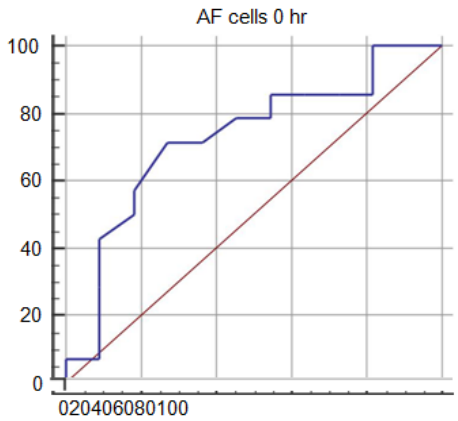


Table-11: Prediction of Death Based on AF Cells (PMNs) at 24 Hours

AF Cells at 24 hour cut-off	Sensitivity	95% CI	Specificity	95%CI	+LR	-LR
>300	0.00	0.0-12.3	100.00	84.6-100.0	0.00	1.00
>500	57.14	37.2-757	100.00	84.6-100.0	0.00	0.43
>550	67.29	44.1-81.4	90.91	70.8*98.9	7.07	0.39
>600	64.29	44.1-81.4	63.64	40.7-82.8	1.77	0.56
>700	100.00	87.7-100.0	63.64	40.7-82.8	2.75	0.00
>2800	100.00	87.7-100.0	0.00	0.0-15.4	1.00	0.00

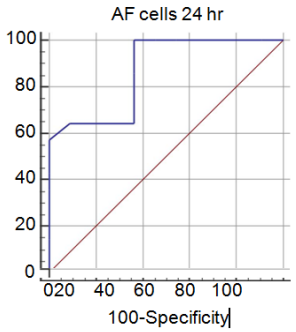


Table-12: Prediction of Death Based on AF Cells (PMNs) at 48 Hours

AF Cells at 48 hour cut-off	Sensitivity	95% CI	Specificity	95%CI	+LR	-LR
<100	0.00	0.0-12.3	100.00	84.6-100.0	0.00	1.00
>100	21.43	8.3-41.0	90.91	70.8-98.9	2.36	0.86
>200	42.86	24.5-62.8	90.91	70.8-98.9	4.71	0.63
>250	42.86	24.5-62.8	81.82	59.7-94.8	2.36	0.70
>270	50.00	30.6-69.4	81.82	59.7-94.8	2.75	0.61
>300	64.29	44.1-81.4	72.73	49.8-89.3	2.36	0.49
>350	78.57	59.0-91.7	72.73	49.8-89.3	2.88	0.29
>400	92.86	76.5-99.1	63.64	40.7-82.8	2.55	0.11
>450	92.86	76.5-99.1	54.55	32.2-75.6	2.04	0.13
>500	100.00	87.7-100	54.55	32.2-75.6	2.20	0.00
>1400	100.00	87.7-100	0.00	0.0-15.4	1.00	0.00

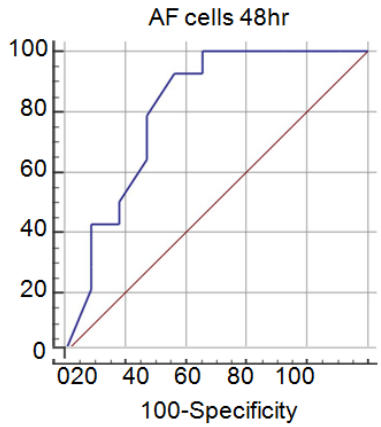


Table-13: Prediction of Death Based on AF Cells (PMNS)

AF Cells	Cutoff	Sensitivity	Specificity	+LR	-LR	AUROC
AF cells (PMN) 0 hrs	>600	71.43	63.64	1.96	0.45	0.727
AF cells (PMN) 24 hrs	>700	100.00	63.64	2.75	0.00	0.867
AF cells (PMN) 48 hrs	>450	92.86	54.55	2.04	0.13	0.808
AF Cells (PMN) 5 days	>200	85.71	68.18	2.69	0.21	0.927

Table-14: Ascitic Fluid Culture

AF Culture	Number	%
No Growth	24	48%
EC	12	24%
KP	10	20%

Proteus	2	4%
SA	2	4%
Total	50	100

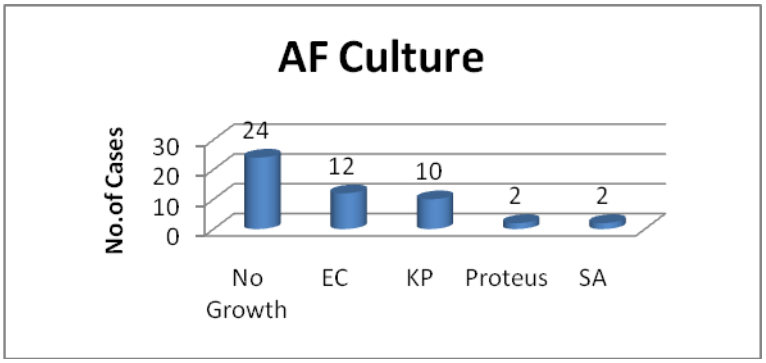
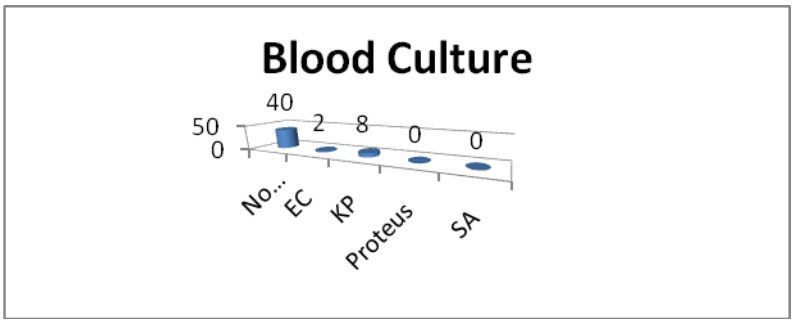


Table-15: Blood Culture

Blood Culture	Number	%
No Growth	40	80.0
EC	2	4.0
KP	8	16.0
Proteus	_	_
SA	_	_



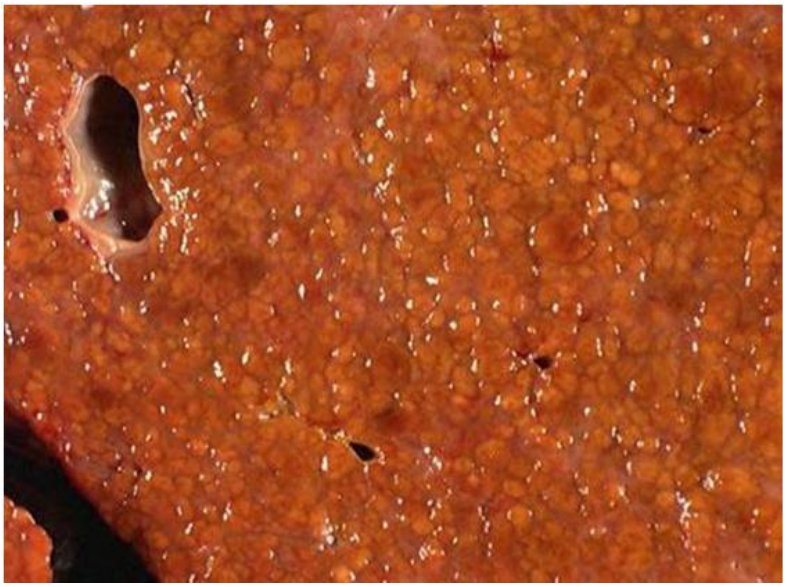


Fig-1: gross appearance

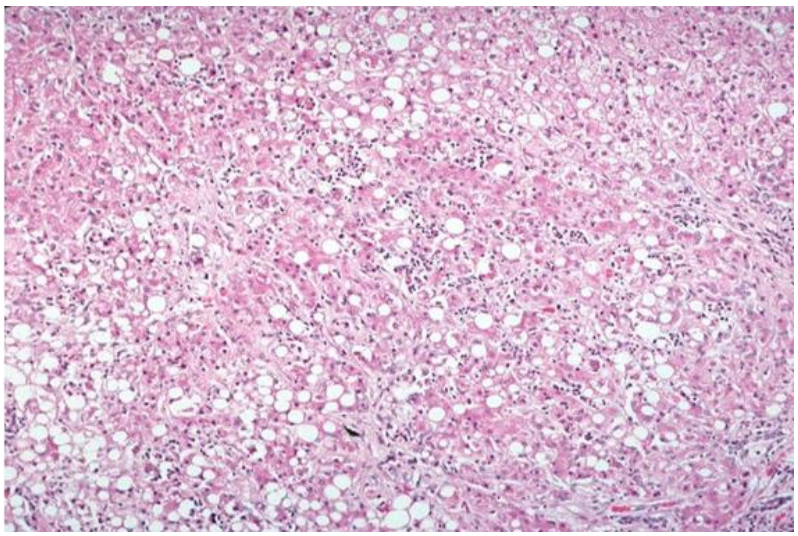


Fig-2: Microscopic features

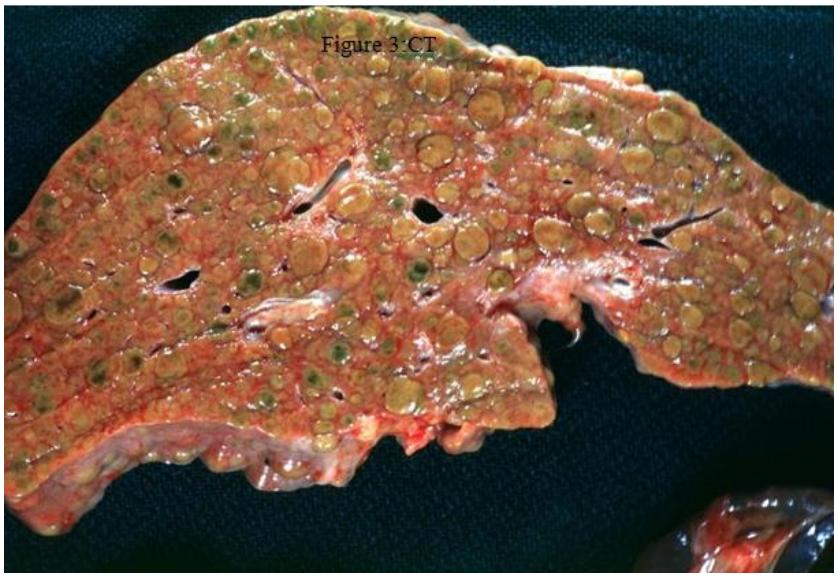


Figure 3: gross appearance

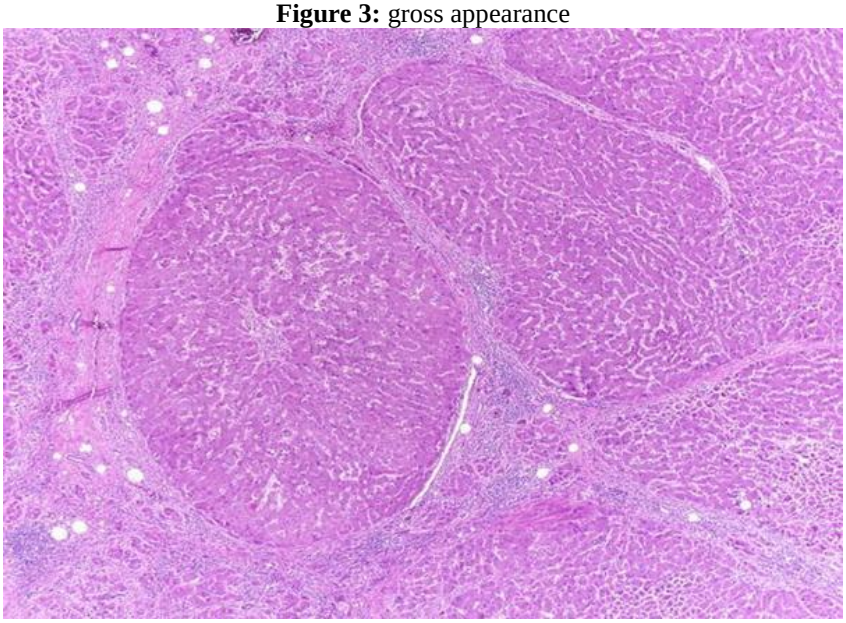


Figure 4: microscopic features.

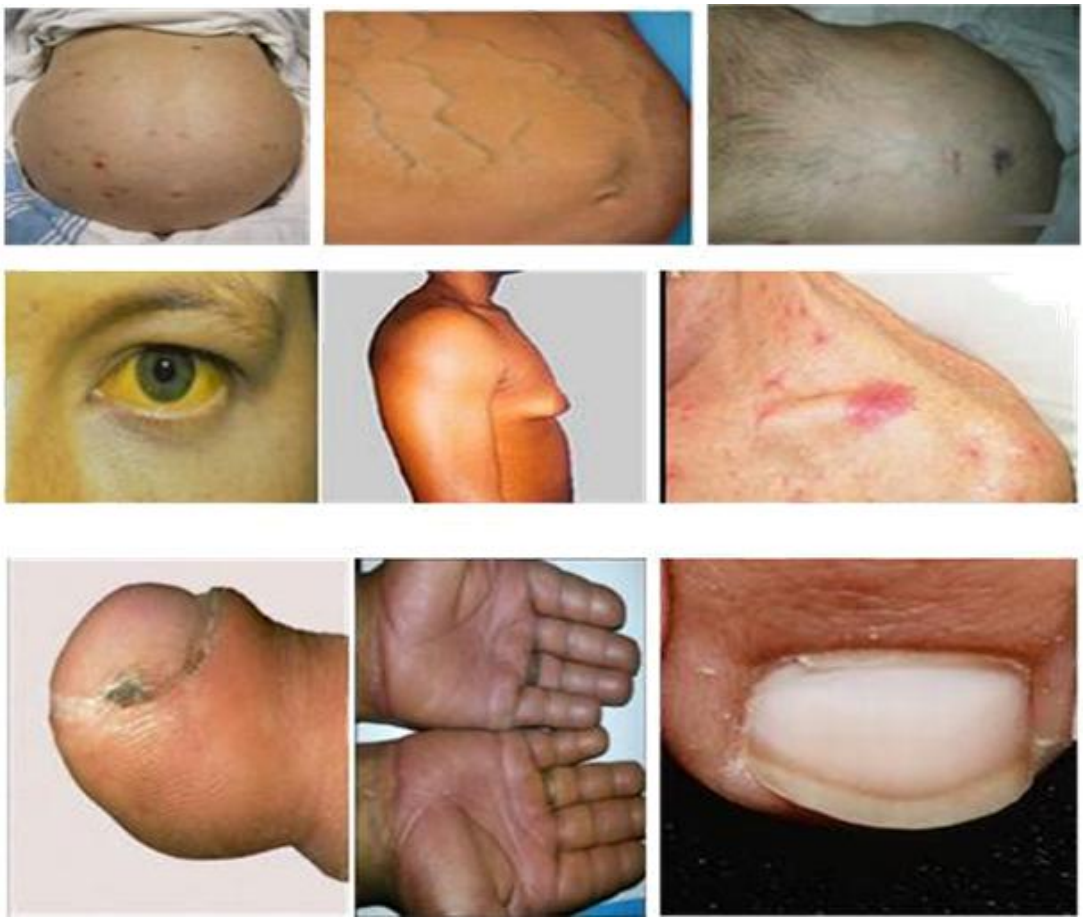


Figure 5: Clinical Features of Cirrhosis of Liver Patients

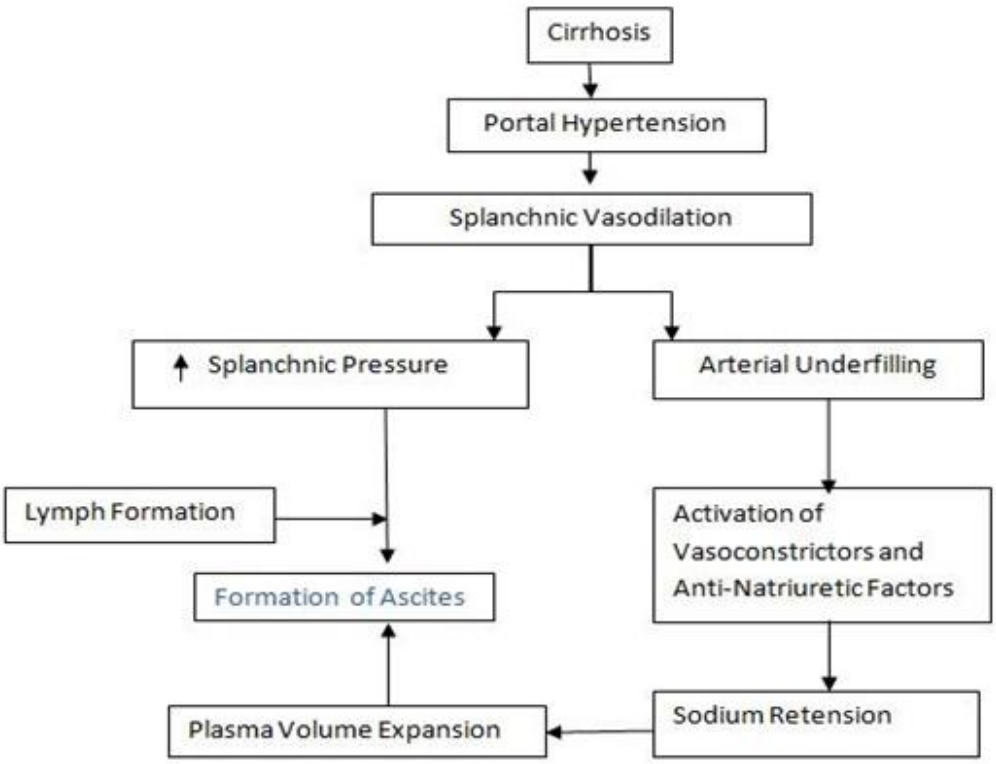


Figure -6: Development of Ascites in Cirrhosis

V. Discussion

This study was carried out on patients admitted to MIMS General Hospital, Nellimarla, Vizianagaram. Patients admitted for liver disorder and/ or its complications of hepatic cirrhosis were studied during the period from October 2014 to September 2016. USG machine was used to diagnose cirrhosis of liver and ascites giving special reference to caudate lobe, portal vein, and spleen. All patients who were confirmed of hepatic cirrhosis by ultra sound were screened for SBP.

Ascitic fluid for analysis was aspirated as soon as the patients were admitted, before giving any antibiotics and before subjecting the patients for invasive procedures like liver biopsy, endoscopy or therapeutic aspiration.

5.1 Age & Sex Distribution:

SBP was seen predominantly in male population i.e. 36 cases (72 %) and only 14 (28%) females. SBP was seen in predominantly older age group, with most patients in 6th decade. Mean age at the time of diagnosis was 54 years.

Mean age at the time of diagnosis in **Filik L, Unal S**[59] was 49.9 while 39 in **N Rawat, MK Bhatnagar**[13,67] series and 44 in **Mihas AA**[10] study. The mean is 54.1 years[10] ranging from 28 to 74 years old and males are being 62% in **Rahul Pathak et al**[70] 2015 study. The mean age in our series of cases was slightly higher than in other studies. While distribution of males and females was almost similar in all the studies.

5.2 clinical features of SBP

The common mode of presentation of SBP in our series was jaundice associated with fever, abdominal pain and abdominal tenderness.

In present series 64 % of cases had jaundice at presentation while it was 81% in **Jose Pinto Correira**[6] series and 54.5% in **Filik L, Unal S**[59] series indicating decompensated cirrhosis. Jaundice was the commonest presenting complaint in all the series of patients including our patients.

In **S Bankar, A De, S Baveja et al**[71] 2014 study, jaundice (82.76%) is the commonest presentation followed by abdominal pain (82.56%) and fever (68.97%).

In **AK Bhardwaj et al**[72] 2015 study, abdominal distention (100%) is the commonest presentation followed by abdominal pain (58%) and fever (62%).

Except for the **DN Amarapurkar**[31] study (28%) the incidence of hepatic encephalopathy was very high ranging from 46 % in **Mihas AA**[10] study, 48 % in present study, 50.7 % in **Filik L, Unal S**[59] and as high as 71 % in **Jose Pinto Correira, Conn HO**[6] study indicating that patients were in advanced stage of cirrhosis.

The incidence of hepatic encephalopathy was very high in **Jose Pinto Correira, Conn HO**[6] study, probably due to unavailability of effective drugs. One of the reasons could also be unawareness of the complications like SBP at that time (1975), and lack of regular screening for SBP in all patients of ascites. Only 56 % of cases had fever and 56 % had abdominal pain at the time of presentation indicating that many patients of SBP may not have fever or abdominal pain and can just present with hepatic encephalopathy. So all patients presenting with encephalopathy without an obvious precipitating factor must be screened for SBP.

The incidence of abdominal pain and abdominal tenderness in our study was comparable to other studies

5.3 Mortality:

In **Jose P**[6] (1975) series the mortality was 96 % while in **Hoefs JC**[18] (1984) the mortality was 78 %. Both these study had high mortality due to non availability of higher antibiotics during that period. Now with advent of higher antibiotics like cephalosporins and quinolones the mortality has decreased. Also mortality may have been decreased due to increased awareness of SBP and more aggressive treatment.

The mortality in **DN Amrapurkar**[31], **AK Bhardwaj et al**[72] and **Filik L, Unal S**[59] series was 43%, 32% and 37.4% which is similar to the mortality in present series (44%). Still the mortality of 44 % seen in our study is very high, as these patients present in advanced stage of cirrhosis.

5.4 Factors Predicting Mortality In SBP

Increased total leucocyte count, bilirubin above 5 mg/ dl and creatinine >1.5 mg / dl was significantly associated with increased mortality in our study.

Even studies by **Filik L, Unal S**[59] and **N Rawat, MK Bhatnagar**[67] showed association of increased total count, increased bilirubin levels and high creatinine levels with mortality.

In **Sort et al**[78] and **Kamani et al**[74] study, high creatinine and low serum albumin are associated with high mortality while in **AK Bhardwaj et al**[72] study, increased total leucocyte count, high serum Bilirubin and creatinine, low serum albumin and low ascitic fluid albumin are associated with poor prognosis.

According to study by **Filik L, Unal S**[59] decreased serum albumin and ascitic fluid protein was related to mortality while the present study and study by **MK Bhatnagar, N Rawat**[13] fails to find any such correlation. This could be because of the less number of patients studied.

In present study the serum albumin and ascitic fluid protein did not reach significance level though it showed a decreasing trend with increasing mortality.

5.5 Ascitic Fluid Analysis

Ascitic fluid protein plays an important role in developing SBP in these patients. Patients with ascitic fluid protein < 1 gm / dl are frequently predisposed to SBP. In **Runyon BA**[22] series the patients with ascitic fluid protein < 1 gm/dl were more predisposed to development of SBP. In the series of **DN Amarapurkar**[31] the mean ascitic fluid protein was 0.78 +/-0.24 gm/dl in patients of SBP. In **AK Bhardwaj et al**[72] study, the mean ascitic fluid protein was 1.086+/-0.3 gm/dl indicating the role of low AF protein in developing SBP.

In the present series the mean ascitic fluid protein was 1.02 gm/dl indicating the role of low ascitic fluid in developing SBP. However the ascitic fluid protein was not significantly related to mortality.

5.6 Ascitic Fluid Cell Count

In the present series the ascitic fluid cell count at the time of diagnosis as well as that done at 48 hours was significantly related to outcome. A very high cell count at the time of diagnosis was associated with increased mortality. The ascitic fluid cell count done at 48 hours was also related significantly to outcome. The % fall in ascitic fluid cell count from 0 hours to 48 hours was also related significantly to mortality. Attainment of ascitic fluid cell count of <200 /dl after starting treatment, was associated with better outcome.

Thus a fall in ascitic fluid cell count from 0 hours to 48 hours after starting treatment indicates that a patient is responding to treatment and can be used as a guide to monitor treatment. A fall of ascitic fluid cell count < 200 can be used as a guide for duration of antibiotic therapy in treatment of SBP.

According to **AK Bhardwaj et al**[72] study, the AF cell count at the time of diagnosis (>600 PMN cells) as well as that done at 48 hours (>450 PMN cells) was significantly related to outcome. The % fall in AF cell count from 0 hour to 48 hour was also related to mortality(28%). In **Krishnamurthy et al**[73] study also similar results were obtained.

According to study by **N Rawat, MK Bhatnagar**[13] the ascitic fluid cell count at the time of diagnosis was not significantly related to mortality. This may have been due to less number of patients studied .While the ascitic fluid count done at 48 hours was significantly related to outcome. The attainment of ascitic fluid cell count of < 250 during the course of treatment was also associated with better outcome, which was consistent with the results of present study. ASCITIC FLUID CULTURE

In **Filik L, Unal S**[59] study the ascitic fluid culture positivity was 25.4 % with gram negative organisms being most frequently isolated organism (76.2 %).

In **DN Amarapurkar**[31] series 47 patients showed ascitic fluid culture positive with 75 % showing growth of E. Coli and 1 (25%) patient showing growth of acenetobacter. In **Syed VA, Ansari JA et al**[75] study, culture positivity is 35% of patients showing E.coli 42.8% and K.pneumoniae 14.28% among culture positive cases.

According to Franca et al76 culture positivity is 47% while in Runyon BA et al 22 study, it was 60% and in David D et al study it was 63% positive for streptococci.

In another study by **A P Jain**[68] 88.8 % patients isolated organism with 44.44% growing coagulase positive stayphalococci aureus. Rest grown Escherichia Coli, Pseudomonas and Klebsiella. In present series 48 % didn't show any growth, 24 % showed E.Coli and 20% showed growth of Klebsiella and 4 patient each, showing growth of proteus and staphylococcus aureus. In above patients blood culture was positive in 20 % of cases which was consistent with the results of other studies.

5.7 Limitations of the present study :

There are certain limitations to this study. This is a hospital based study, so the data may not represent the general population. A hospital population was examined and referrals were admitted selectively for severity of the symptoms and requiring immediate nursing and hospital care.

- Unintensional confounding may have potentially been introduced by the observational design of this study.
- The findings of this study potentially represent the unique microbiological ecology of our hospital and patient population
- Self prescribing is a common practice in Andhra Pradesh, so over the counter use of antibiotics, may not have been adequately addressed in this study
- Survival was confined to observation made while patients were admitted to hospital and was not assessed longitudinally for the outcome
- This study relied on patient for the symptoms and nursing staff, physicians for the documentation of signs

- Furthermore, statistical analysis and results are limited by the small study population
- This is a prevalence study so the cause effect relationship couldn't be obtained
- No controls were included in this study

5.8 Recommendations For Further Work:

Additional prospective studies with larger sample sizes are needed to radiate this study findings using ascitic fluid PMN cell count as prognostic indicator and in ascertaining appropriate diagnostic thresholds.

Strong efforts should focus on effective prophylactic measures with low or zero risk for the development of bacterial resistance.

The longterm follow up of the survived population would ensure the frequency of the recurrent cases of spontaneous bacterial peritonitis which will help in actual quantification of the problem and in formulating appropriate prevention measures.

VI. Conclusion

All patients of cirrhosis of liver with ascites should be screened for spontaneous bacterial peritonitis (SBP) as it presents with minimum signs and symptoms. A diagnostic paracentesis should always be performed routinely within 24 hours of admission and thereafter due to high prevalence of spontaneous bacterial peritonitis (SBP) in cirrhotic patients. Increased total count, elevated levels of bilirubin and elevated creatinine levels are associated with poor prognosis. Once spontaneous bacterial peritonitis (SBP) is diagnosed, serial ascitic fluid PMN cell count is helpful in predicting prognosis and should be used as tool for monitoring the treatment. Spontaneous bacterial peritonitis (SBP) carries a very high mortality and should be dealt with aggressively.

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