

A Study On Incidence And Clinical Profile Of Tuberculosis Peritonitis Among The Cirrhosis Of Liver With Ascities Patients

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Abstract: Tuberculosis is a disease caused by bacteria called mycobacterium tuberculosis. The bacteria usually attack the lungs, but they can also damage other parts of the body. Alcoholic liver disease is frequently linked to increased incidence of TBP particularly in the western countries. The mechanism behind the increased susceptibility of ALD patients to TBP remains unknown. The aim of the study is to study the prevalence and clinical profile of tuberculosis peritonitis among the Cirrhosis of liver patients. This prospective observational study was conducted for a period of 24 months i.e. from January 2016 to December 2017 at general medicine department in Rajiv Gandhi institute of medical sciences, kadapa. A total of 90 patients were included based on inclusion criteria. Abdominal pain was observed in 14 patients (82%), fever was observed in 12 patients (70.59%), in a total of 17 patients with TBP among cirrhotic ascites patients. Ascitic fluid total protein > 2.5 gm/dl is seen in almost 100% of patients with isolated TBP. Incidence of Tuberculosis among Cirrhotic ascites patients is more than compared to the general population and TBP among Cirrhotic ascites patients is more than compared to the general population.

Keywords: Tuberculosis, peritonitis, incidence, cirrhosis of liver, Ascites

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I. Introduction

Tuberculosis is a disease caused by bacteria called mycobacterium tuberculosis. The bacteria usually attack the lungs, but they can also damage other parts of the body^{1,2}. According to WHO, Tuberculosis is second only to HIV/AIDS as the greatest killer worldwide due to a single infectious agent^{3,4}. In 2011, 8.7 million people fell ill with TB and 1.4 million died from TB^{4,5}. At least one-third of the 34 million people living with HIV worldwide are infected with TB bacteria, although not yet ill with active TB. Tuberculosis is classified as pulmonary, extra pulmonary, or both. 80% of all the cases of TB were limited to the lungs, before the advent of HIV infection^{6,7}. However, up to two-thirds of HIV infected individuals with TB have Extra Pulmonary TB alone or both pulmonary and extra pulmonary TB^{8,9}. Among the extra pulmonary TB most commonly involved sites are the lymph nodes, pleura, genitourinary tract, bones and joints, meninges, peritoneum and pericardium. The first documented case of ancient 'tuberculous peritonitis' was described in humans in 1843^{10,11}. Alcoholic liver disease (ALD) is frequently linked to increased incidence of TBP particularly in the western countries¹².

Pathogenesis of TB peritonitis in cirrhosis:

The mechanism behind the increased susceptibility of ALD patients to TBP remains unknown. Unlike spontaneous bacterial peritonitis, factors such as impaired opsonization, complement deficiency, low immunoglobulin levels in the ascitic fluid and low serum albumin level do not appear to explain the onset of TBP, which is related to impaired cell-mediated immunity^{13,14}. Also, there is no evidence to suggest that the impaired humoral immunity of cirrhosis would play any role in the evolution of this opportunistic infection. Theoretically, the presence of stagnant ascitic fluid could potentially predispose to the onset of opportunistic infections, as might be the case with patients on CAPD¹⁵. Against that is the fact that cellular immunity is impaired in patients with uraemia and this would be a likely explanation for the increased susceptibility to TB¹⁶. Tuberculosis is more common in haemodialysis patients than in patients undergoing CAPD (28% vs. 4.8%),^{17,18,19} which further negates the hypothesis that the stagnant ascitic fluid is a significant risk factor of TBP. Malnutrition frequently develops in cirrhotic patients and is more prominent in patients of ALD due to a number of reasons. Previous studies have documented the poorer nutritional health of patients with ALD in comparison with non-alcoholics.²⁰ Additionally, these patients demonstrate cutaneous energy to a variety of

antigens, suggesting impaired T cell-dependent functions, and this immune defect is again more commonly seen in ALD compared with cirrhosis from other causes.²¹ Therefore, it is likely that an interaction between immunological dysfunction and malnutrition produces the higher prevalence of TBP in patients with cirrhosis²².

II. Aims Of The Study

- ✓ To study the prevalence of tuberculosis peritonitis among the Cirrhosis of liver patients.
- ✓ To describe, the clinical profile of the patients with tuberculous peritonitis among cirrhotic Ascites.

III. Materials and methods

This prospective observational study was conducted for a period of 24 months i.e. from January 2016 to December 2017 at general medicine department in Rajiv Gandhi institute of medical sciences, kadapa. A total of 90 patients were included based on inclusion criteria i.e. Patients with Cirrhotic ascites having clinical features suggestive of chronic liver disease. Age more than 18 years of both sexes are taken into the study with above features. Informed written consent is obtained from the patients, who are willing to participate in the study in the language known to them. All the investigations are done free of cost to the patients in the institution. The cost of the ADA test is met by the investigator. The patients who are not willing to give written consent are excluded from the study.

Method of ADA Estimation

The ADA assay was performed using the sensitive calorimetric method of Galanti and Guisti principle.

Kit: TULIP diagnostics – Micro press for the determination of ADA in Biological fluids.

Principle:

Adenosine deaminase catalyzes deamination of adenosine leading to formation of inosine and ammonia. Ammonia forms intensely blue indophenols with sodium hypochlorite and phenol in alkaline solution. Sodium nitro prusside is the catalyst. The ammonia concentration thus released, deamination by ADA is directly proportional to the examination of indophenols. The reaction catalyzes by ADA is stopped at the end of incubation period by addition of phenol nitroprusside. Specimen collection and storage: Ascetic fluids were centrifuged and analyzed immediately after collection or stored at 2- 8°C for 3 days.

Reagent:

Micro press ADA-MTB is a reagent for laboratory use, ADA- MTB comprises of

- a. ADA-MTB reagent (L1) – Buffer reagent , ready to use
- b. ADA-MTB reagent (L2) - Adenosine Reagent, ready to use
- c. ADA-MTB reagent (L3) - Phenol Reagent
- d. ADA-MTB reagent (L4) - Hypochlorite Reagent
- e. ADA-MTB reagent (L5) – ADA Standard, ready to use.

Reagent Preparation:

Reagents L1, L2 and standard are ready to use. Adenosine reagent may form crystals at 2 – 8 °C. Dissolve the same by gently warming (37 – 50°C) the reagent for some time before use. Both the Phenol reagent and hypochlorite reagent need to be diluted 1: 5 with distilled water before use. The working phenol reagent and working hypochlorite reagent are stable for at least 6 months when stored at 2 – 8°C in tightly closed bottles.

Test Procedure:

1. All reagents and samples are brought to room temperature before use.
2. The working phenol reagent and working hypochlorite reagent are prepared.
3. Spectrophotometer filter is set at 570 – 630 nm at 37 °C
4. Into four clean dry test tubes labeled blank (B), standard (S), sample blank (SB), and test (T), following are added using a pipette.

Additional sequence	B/ml	S/ml	SB/ml	T/ml
Buffer reagent	0.20	0.20	-	-
Adenosine reagent	-	-	0.20	0.02
Deionised water	0.02	-	-	-
Standard	-	0.02	-	-
Sample	-	-	-	0.02

5. Mixed well and incubated at 37 °C for exactly 60 minutes and then added the following:

	B	S	SB	T
Working phenol reagent	1.00	1.00	1.00	1.00
Working hypochlorite Sol.	1.00	1.00	1.00	1.00
Sample	-	-	0.02	-

6. Mixed well and incubated at 37 °C for 15 minutes at room temperature for 30 minutes.
7. Measured the absorbance of the blank (Abs.B), standard (Abs.S), sample blank (Abs.SB) and test (Abs.T) against distilled water.

Calculation:

$$\text{Total ADA activity in U/L} = \frac{\text{Abs.T} - \text{Abs. SB}}{\text{Abs. S} - \text{Abs. B}} \times 50$$

Linearity:

The procedure is linear upto 150 U/L, if value exceeds this limit, dilute the sample with de ionized water and repeat the assay. Calculate the value using appropriate dilution factor.

IV. Results

Distribution of patients based on age:

A total of 90 patients were constituted the present study, among which majority patients were in the age group of 45± 10 years (77%). Ranging from 32 to 68 years, with a mean age of 47.8 ±7.70 years.

Table: 1. Age distribution of the patients

Age in years	No. of patients	Percentage
30 – 40	17	18.9
41 – 50	41	45.6
51 – 60	28	31.1
>60	4	4.4
Total	90	100

Mean age = 47.8 ±7.70 years, Standard Error: 0.816

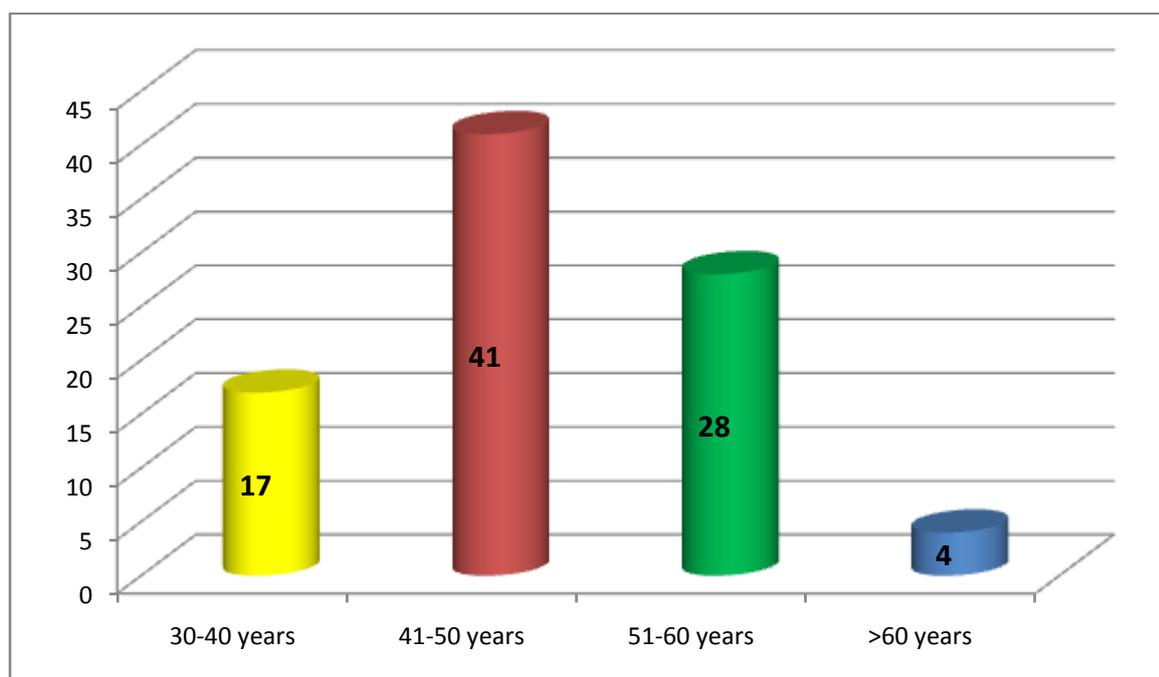


Figure: 1. showing distribution of patients based on age

Distribution of patients based on gender:

Among the study group 73 were males and 17 were females, with a Male to Female ratio of 5:1

Table: 2. gender distribution of the patients

Sex	No. of patients	Percentage
Males	73	81.1
Females	17	18.9
Total	90	100

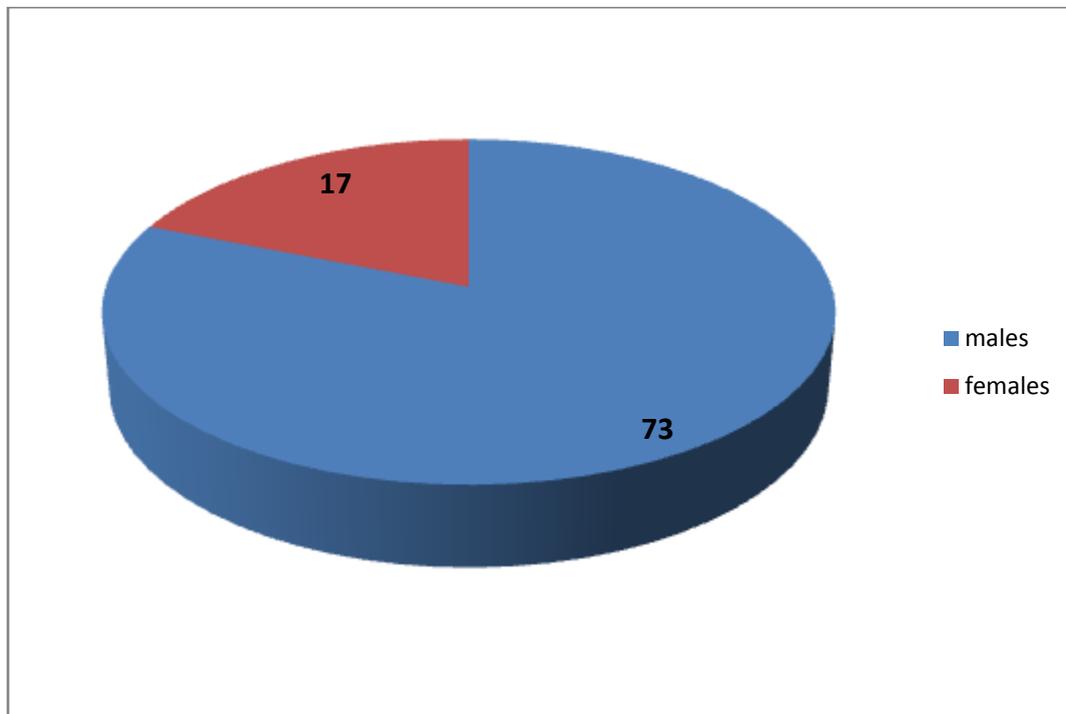


Figure: 2.Showing patient distribution based on gender

Distribution of patients based on incidence of TB peritonitis:

Among the study group i.e., a total of 90 subjects, 17 (18.9%) were found to be positive for Tuberculosis peritonitis.

Table: 3. Incidence of TB peritonitis

TB peritonitis	No. of patients	Percentage
Positive	17	18.9
Negative	73	81.1
Total	90	100

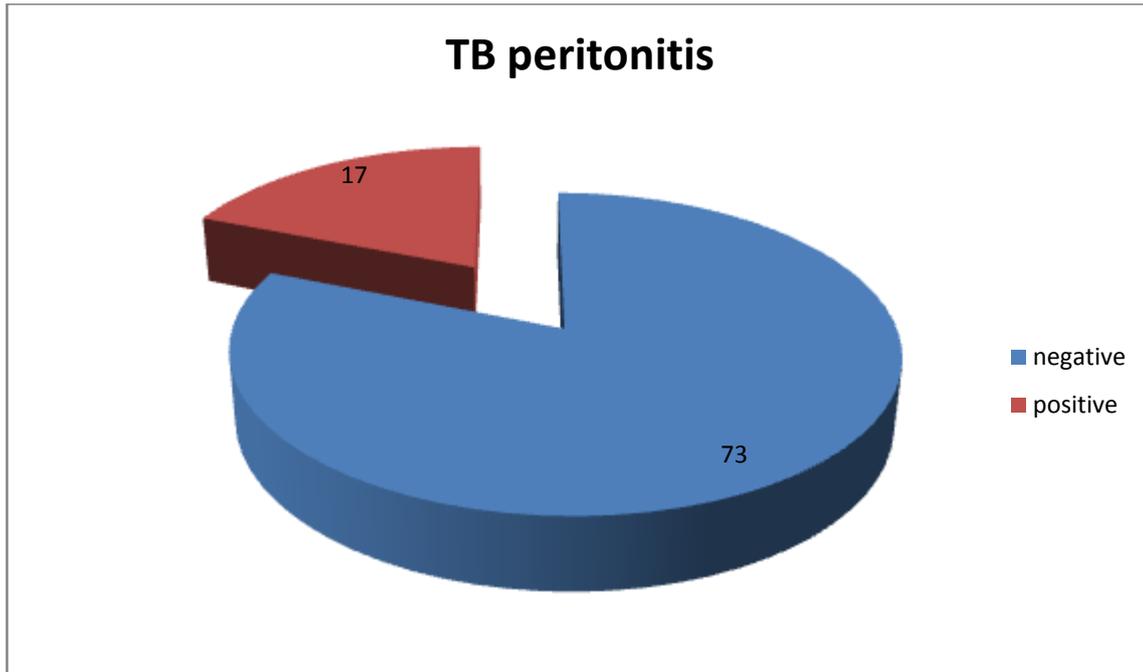


Figure: 3. showing patient distribution based on incidence of T.B peritonitis

1. Incidence of TBP versus Age distribution:

Among the TBP positive patients, most common age group was 41-50 years.

Table: 4. Incidence of TBP versus Age distribution

Age Distribution	Tuberculous positive peritonitis	Tuberculous negative peritonitis	Total
30-40 years	5 (29.4)	12 (61.6)	17
41-50 years	8 (19.5)	33(81.5)	41
51-60 years	4 (14.2)	24 (85.8)	28
Total	17	69	86

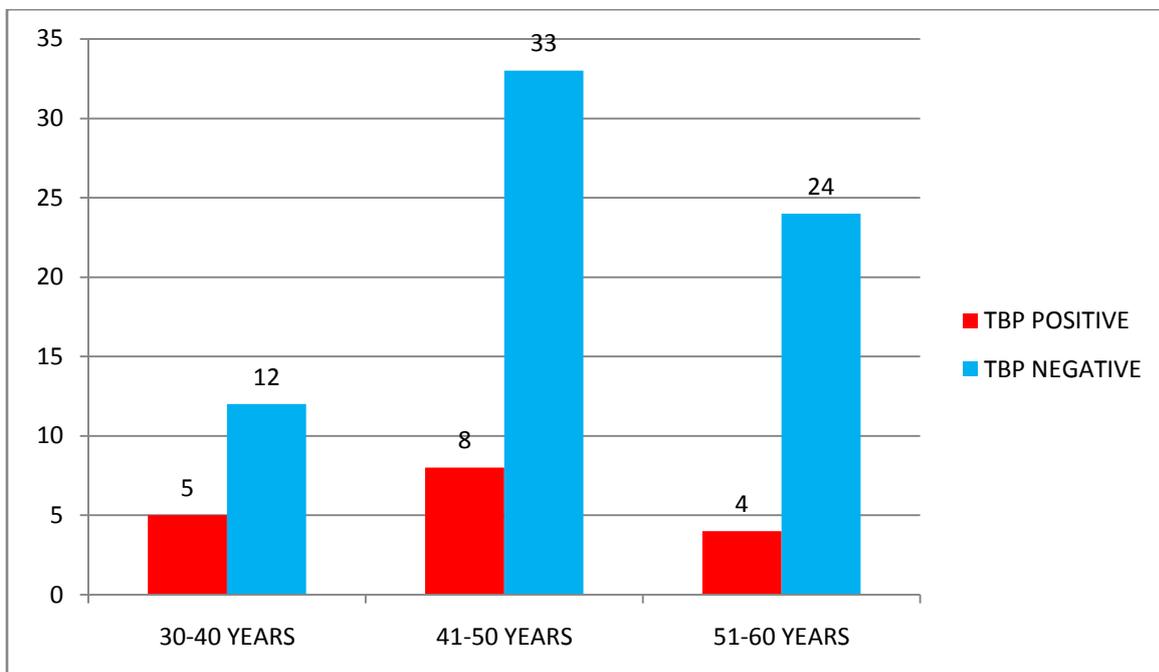


Figure: 4. showing Incidence of TBP versus Age distribution

Incidence of Tuberculosis peritonitis versus Age and gender distribution:

Among male patients most common age group was 41-50 years and among female patients no particular pattern was observed.

Table: 5. Incidence of Tuberculous peritonitis versus Age and gender distribution

Age Distribution	Tuberculous positive Male peritonitis	Tuberculous positive Female peritonitis	Total
30-40 years	4 (80)	1 (20)	5
41-50 years	7(87.5)	1(12.5)	8
51-60 years	3 (75)	1 (25)	4
Total	14(82.35)	3(17.65)	17

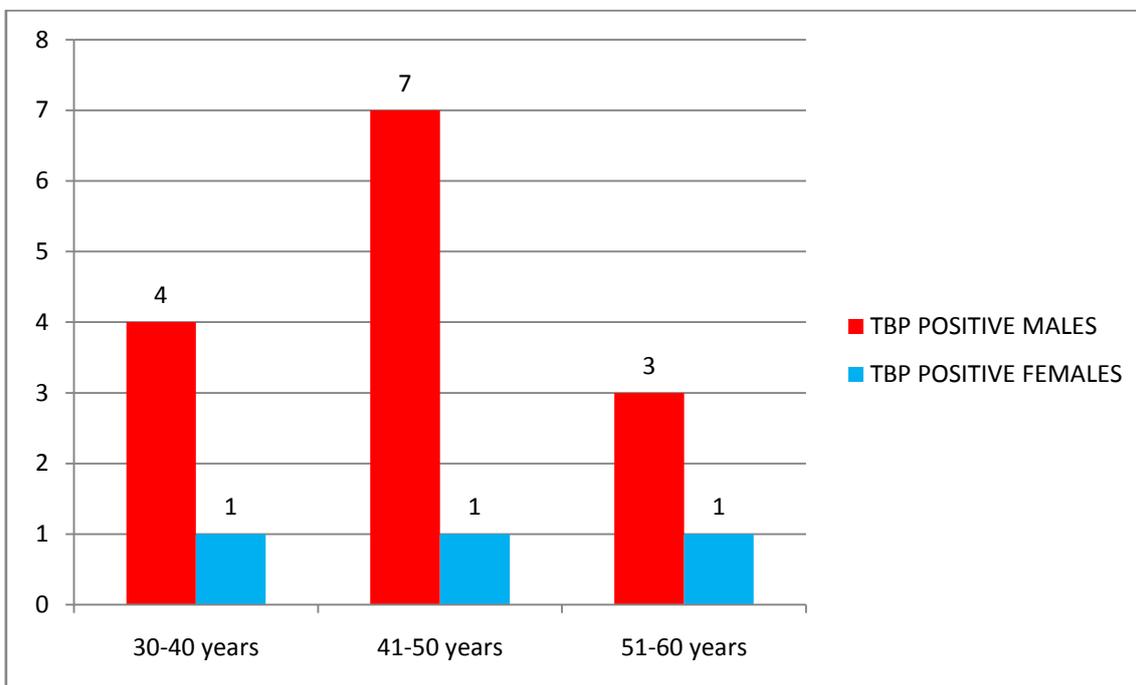


Figure: 5. Analysis of TBP positive

Co- infection in cirrhosis of liver patients:

Among the co-infections, HIV was associated with TBP in 1 patient, Hepatitis B was associated with TBP in 2 patients.

Table: 6. Co- infection in cirrhosis of liver patients

Co- infection	TB peritonitis positive (%)	TB peritonitis negative (%)	Total
HIV	1 (50.0)	1(50.0)	2
Hepatitis B	2 (16.7)	10 (83.3)	12
Hepatitis C	0 (0.0)	5 (100.0)	5

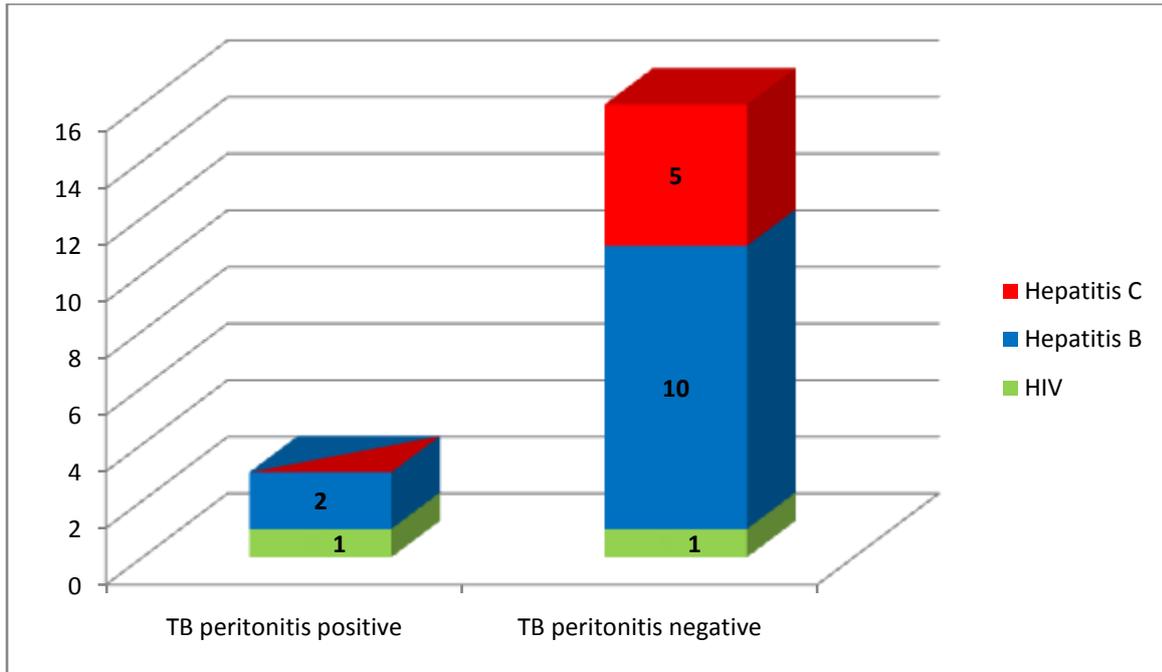


Figure: 6. Showing Patients With Co infections

TBP positive patients SAAG values:

Among TBP positive patients SAAG <1.1 was observed in 16(94.1%) compared to SAAG >1.1 in 1 (5.9 %) patients with a sensitivity of 94.12%, and a specificity of 100% and a PPV of 100% and NPV of 98.65%

Table: 7. SAAG values

Diagnosis	SAAG <1.1 (%)	SAAG >1.1 (%)	Total
TB peritonitis positive	16 (94.1)	1 (5.9)	17
TB peritonitis negative	9 (12.3)	64 (87.7)	73
Total	25	65	90

Fishers exact test: P value – <0.0001(Significant)

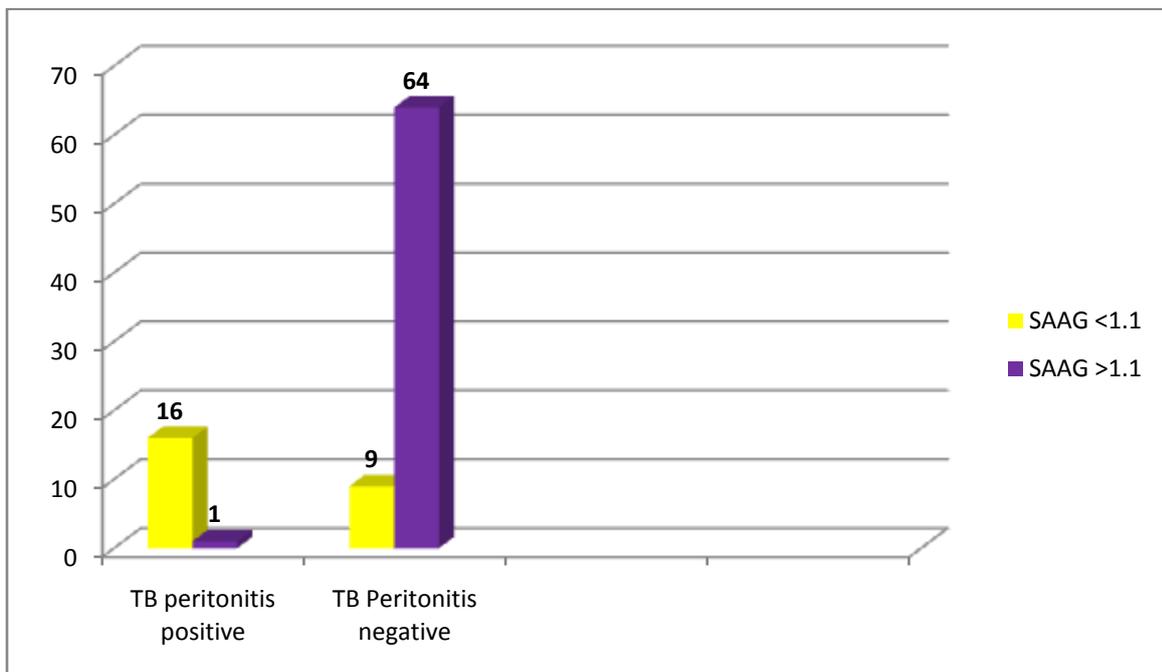


FIGURE: 7. Showing TBP positive patients with SAAG

ESR values:

Analysis of ESR values show that as the ESR values increase the TBP rate of positivity also increases. ESR>50 mm/hr is observed with a sensitivity of 70.59% and a specificity of 97.26%, and a PPV of 85.71% and NPV of 93.42%.

Table: 8. ESR values

ESR values (in mm/ 1 st hour)	TB peritonitis positive (%)	TB peritonitis negative (%)	Total
< 20	0 (0.0)	35 (100.0)	35
20 – 40	1 (3.2)	30 (96.8)	31
41 – 60	10 (55.6)	8 (44.4)	18
>60	6 (100.0)	0 (0.0)	6
Total	17	73	90

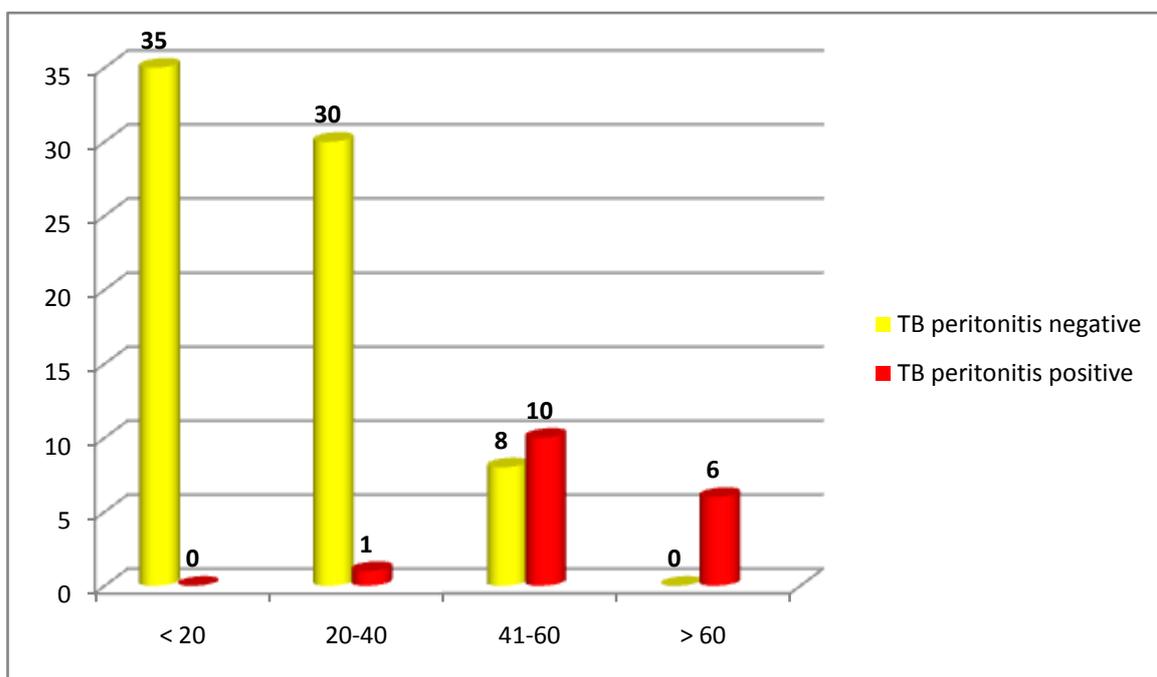


Figure: 8. Showing analysis of ESR values

X-ray findings:

Among the patients with X-Ray findings suggestive of Pulmonary TB i.e., 9 patients 8 (88.8%) were positive for tuberculous peritonitis, with a sensitivity of 47.06%, and a specificity of 98.63% and a PPV of 88.89% and NPV of 88.89%.

Table: 9. X-ray findings

Diagnosis	TBP	Total
X- RAY S/O PTB	8 (88.8)	9
NORMAL X- RAY	9(11.1)	81

Fishers exact test: P value <0.0001 (significant)

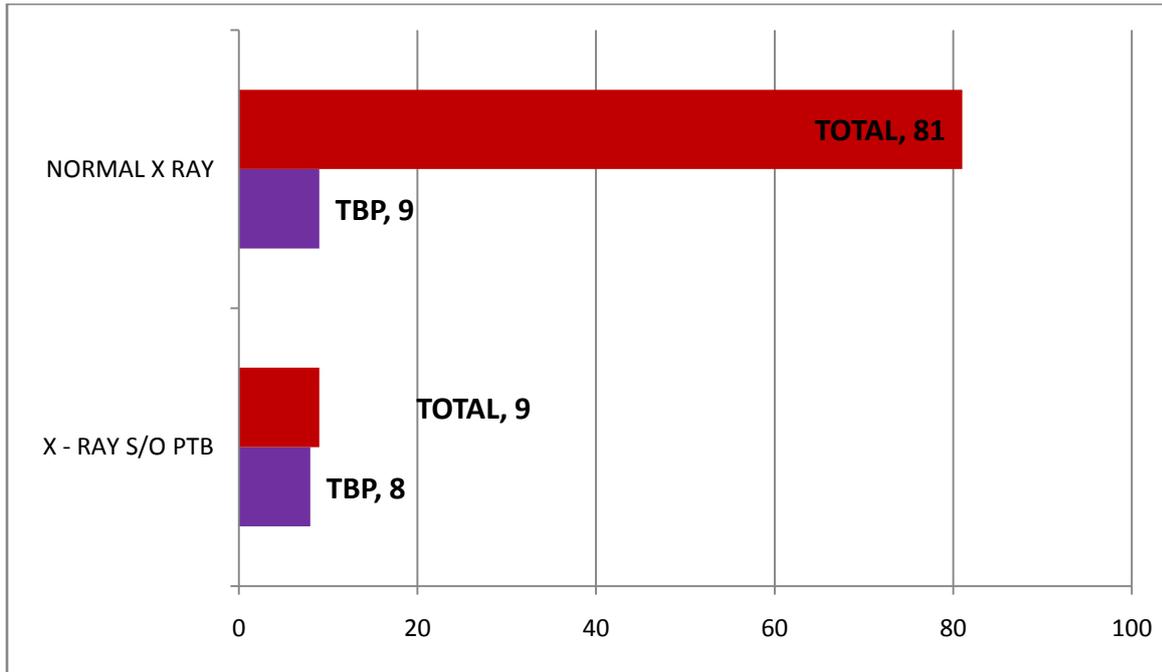


Figure: 9. Showing the patients with X-Ray findings

MODE OF PRESENTATION OF TBP CASES:

Among clinical profile, abdominal pain followed by fever were most commonly associated with TBP.

Table: 10. Mode of presentation of TBP cases

MODE OF PRESENTATION	NO. OF CASES	POSITIVE FOR TBP	PERCENTAGE%
FEVER	21	12	70.59
ABDOMINAL TENDERNESS	15	8	47.06
JAUNDICE	52	10	58.82
ABDOMINAL PAIN	16	14	82.35

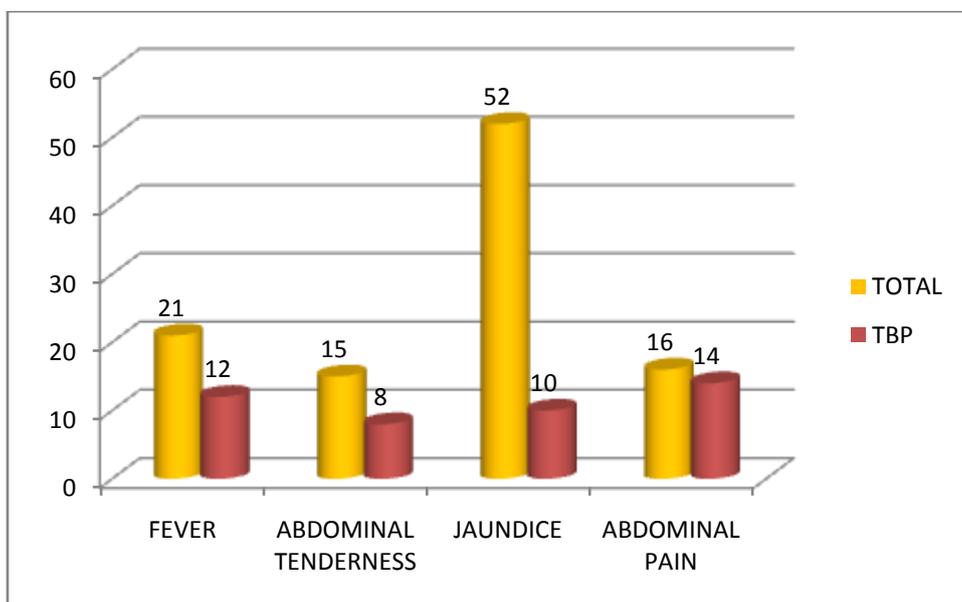


Figure: 10. Showing TBP with others

Ascitic Fluid Protein-Albumin

Among all the patients TBP was 100% positive in the group which has ascitic fluid albumin more than 2.5 gm/dl , and about 44% positive in the group having ascitic fluid albumin between 1.5- 2.5 gm/dl, sensitivity of 29.41% and specificity of 100% , with a PPV of 100. % and NPV of 88.88%.

Table: 11. Ascitic fluid protein-albumin

ASCITIC FLUID ALBUMIN	NO.OF CASES	POSITIVE FOR TBP	PERCENTAGE %
LESS THAN 1.5 gm/dl	60	1	1.66%
1.5-2.5gm/dl	25	11	44%
MORE THAN 2.5 gm/dl	5	5	100%

Fishers exact test: P value<0.0001 (significant)

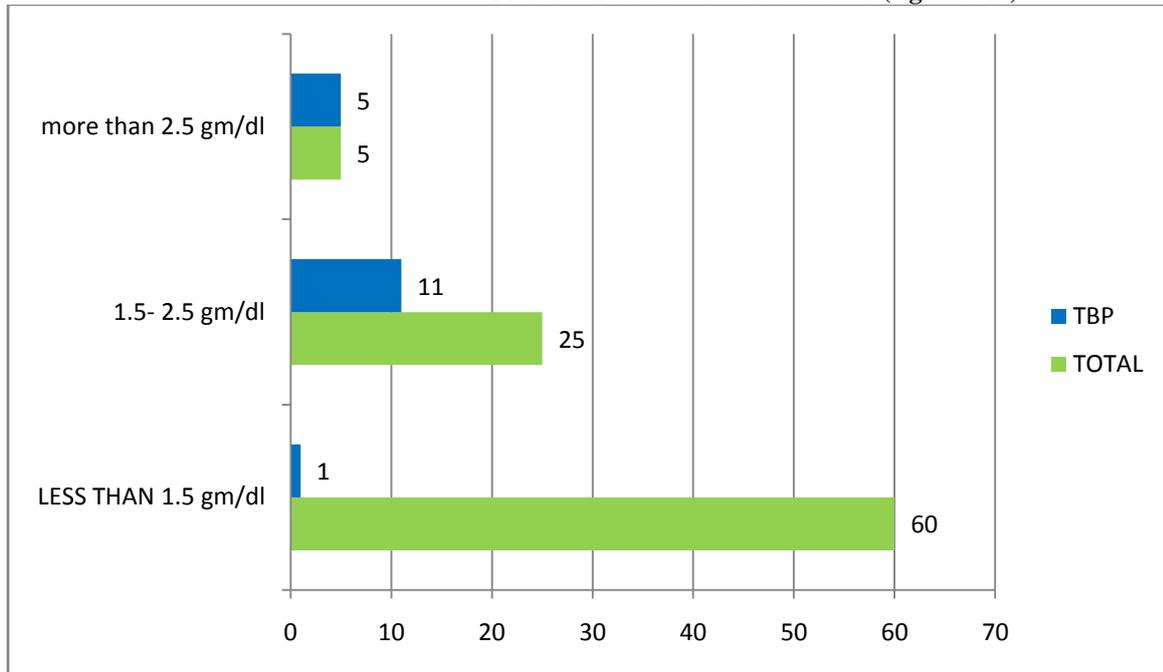


Figure: 11. Showing ascetic fluid with albumin details

Correlation Of Serum Bilirubin With Tbp:

Analysis of TBP positive patients by value of serum bilirubin does not reveal a particular pattern.

Table: 12. correlation of serum bilirubin with TBP

TOTAL BILIRUBIN	NO. OF CASES	POSITIVE FOR TBP
0-1	11	2 (18%)
1.1 – 3	52	12(23%)
3.1 - 5	26	3(11.53%)

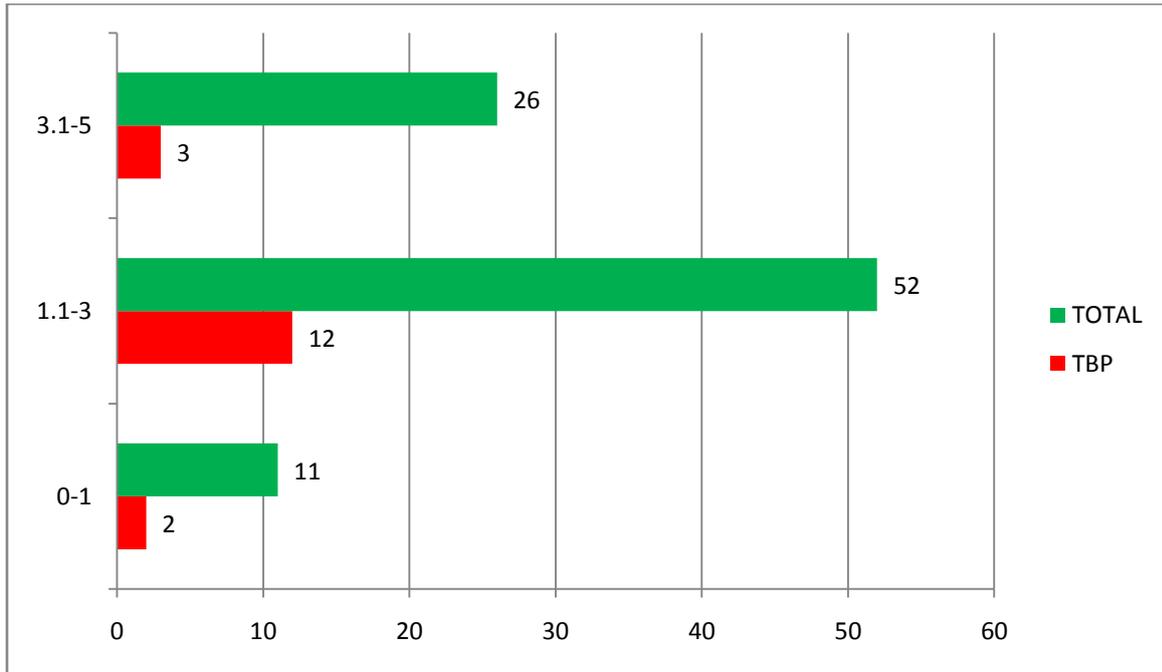


Figure: 12. Showing TBP positive patients by value of serum bilirubin

Correlation Of Renal Function Tests With Tbp:

Among the patients with raised renal function tests i.e., 9, tuberculous peritonitis positive was observed in (44.4%).

Table: 13. Correlation of renal function tests with TBP

RFT RAISED	POSITIVE FOR TBP	PERCENTAGE %
9	4	44.4%

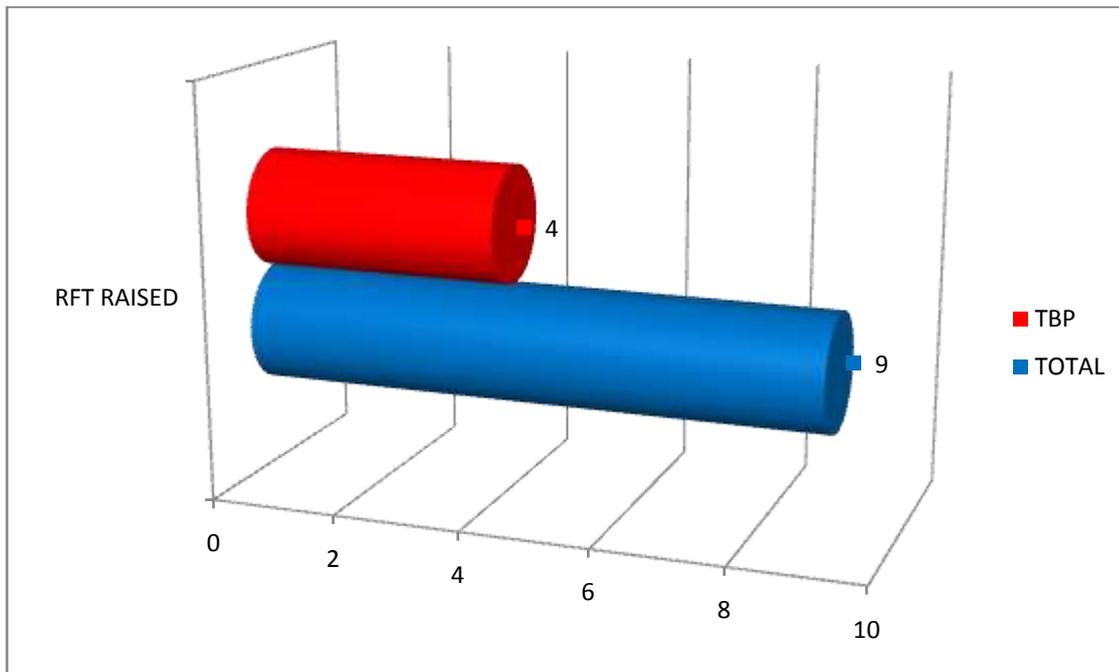


Figure: 13. Showing the patients with raised renal function tests

Correlation Of Ascitic Fluid Ada With Tbp:

Among all the TBP positive patients ADA was found to be greater than 40 IU/L i.e., 100% sensitivity and all the patients who have ADA greater than 40 IU/L were found to be TBP positive i.e., 100% specific in our study.

Table: 14. Correlation of ascitic fluid ADA with TBP

ADA> 40	TBP POSITIVE	PERCENTAGE
17	17	100

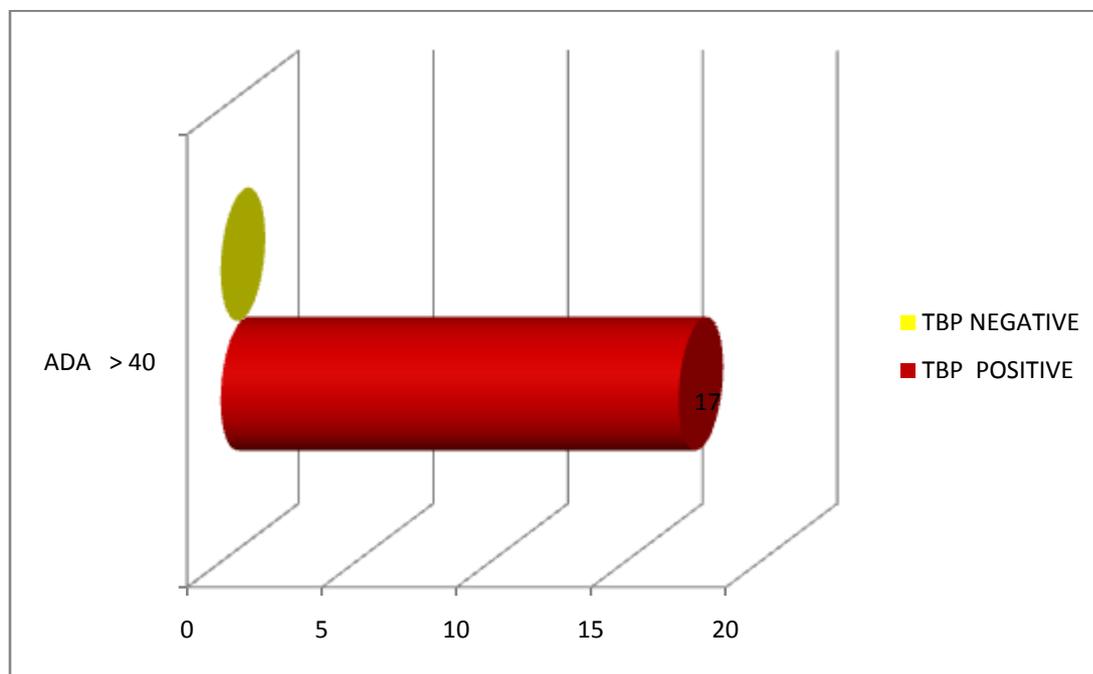


Figure: 14. Correlation of ascitic fluid ADA with TBP

Correlation Of Ratio Of Ascitic Fluid Total Protein To Serum Proteins With Tbp:

The ratio of ascitic fluid total protein to serum total protein >0.5 is present in 16 out of 17 TBP positive cases with a sensitivity of 94.12%, specificity of 53.42%, a PPV of 32.00% and a NPV of 97.50%

Table: 15. Correlation of ratio of ascitic fluid total protein to serum proteins with TBP

RATIO	TOTAL CASES	TBP POSITIVE	TBP NEGATIVE
>0.5	50	16	34
< 0.5	40	1	39

Chi square =12.62: P=0.0004(Significant)

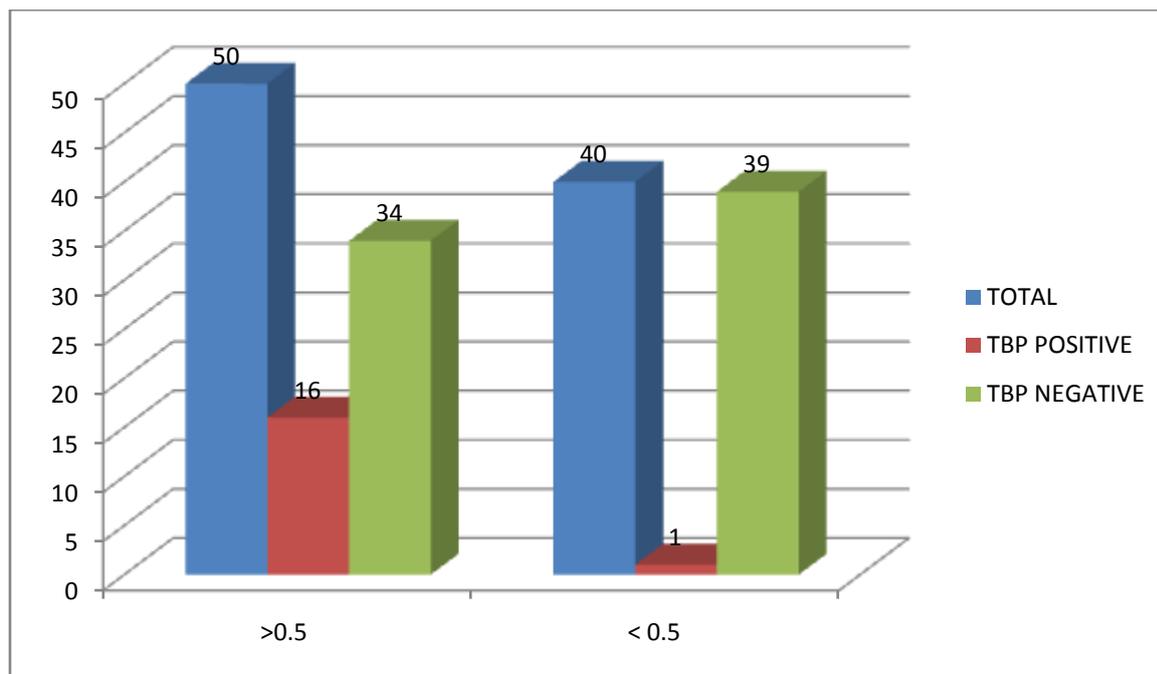


Figure: 15. Showing Correlation Of Ratio Of Ascitic Fluid Total Protein To Serum Proteins With TBP

V. Discussion

The present study demonstrates the incidence of tuberculous peritonitis among cirrhotic ascites. There are many studies in which the clinical features, laboratory diagnosis and treatment options for tuberculous peritonitis have been described, but there are few case studies in which tuberculous peritonitis among cirrhosis of liver patients. There exists a large difference in the incidence of TBP among Cirrhotic ascites in literature, taking into account its concomitant risk factors with rates ranging from a low of 13% to a high of 44% Baijal *et al.*²³ concluded in their study that incidence of TBP was 13% in a total of 770 patients. Shakil *et al.*²⁴ concluded that in their study the incidence of TBP was 44% in a total of 47 patients. In the present study the incidence of TBP was 18.9% (17) in a total of 90 patients. In the present study clinical features suggestive of tuberculous peritonitis in cirrhosis of liver patients has been described. Kai Ming Chow *et al.*²⁵ found in their study that abdominal pain was observed in 44 patients (73%) among TBP in cirrhotic ascites patients. Vyranathan *et al.*²⁶ concluded that abdominal pain was found in 65.7% of patients in their study among TBP in cirrhotic ascites patients. Sotoudehmanesh *et al.*²⁷ concluded that abdominal pain was found in 84% of patients in their study. In the present study abdominal pain was observed in 14 patients (82%), in a total of 17 patients with TBP among cirrhotic ascites patients. Kai Ming Chow *et al.*²⁸ found in their study that fever was observed in 35 patients (58%) among TBP in cirrhotic ascites patients. Vyranathan *et al.*²⁹ concluded that fever was found in 68.5% of patients in their study among TBP in cirrhotic ascites patients. Sotoudehmanesh *et al.*³⁰ concluded that fever was found in 50% of patients in their study. In the present study fever was observed in 12 patients (70.59%), in a total of 17 patients with TBP among cirrhotic ascites patients. Ascitic fluid total protein > 2.5 gm/dl is seen in almost 100% of patients with isolated TBP. However the sensitivity is reduced in Cirrhosis of liver patients. Shakil *et al.*³¹ observed in their study that Ascitic fluid total protein > 2.5 gm/dl in 70% i.e., 14 out of 20 patients. Aguado *et al.*³¹ observed in their study that Ascitic fluid total protein > 2.5 gm/dl in 42% of patients. In the present study, it is observed that Ascitic fluid total protein > 2.5 gm/dl in 30% i.e., 5 out of 17 patients. Ascitic fluid total protein > 2.5 gm/dl in 30% i.e., 5 out of 17 patients, with TBP among cirrhotic ascites patients with a sensitivity of 29.41% and specificity of 100%, with a PPV of 100% and NPV of 88.88%. The ratio of ascitic fluid total protein to serum total protein >0.5 is present in 16 out of 17 TBP positive cases with a sensitivity of 94.12%, specificity of 53.42%, a PPV of 32.00% and a NPV of 97.50%. A low SAAG value < 1.1 is seen in 100% of patients with TBP, where as in cirrhotic patients it is reduced. Shakil *et al.*³² observed in their study that SAAG value <1.1 was present in 10 out of 20 patients i.e., 50%. In the present study it was observed that SAAG value <1.1 is seen 16 (94.1%) compared to SAAG >1.1 (%) in 1 (5.9%) patients with a sensitivity of 94.12%, and a specificity of 100% and a PPV of 100% and NPV of 98.65%. KM Chow *et al.*³³ found that in their study predominant lymphocytes were observed in 18 out of 40 patients i.e., 45%. In the present study lymphocytic predominance was observed in 15 out of 17 patients, i.e., sensitivity of 88.24%, and a specificity of 100% and a PPV of 100% and NPV of 97.33%. Abnormal Chest X-ray findings suggestive of PTB were observed in present study in 8 out of 17 patients, with a sensitivity of 47.06%, and a specificity of

98.63% and a PPV of 88.89% and NPV of 88.89%. KM Chow *et al.*³⁴ in their study observed that abnormal X-ray findings are present in 21 out of 59 patients i.e., 35.5%. Positive PPD test was found in 11 out of 17 patients in present study, with a sensitivity of 64.71%, and a specificity of 98.63% and a PPV of 91.67% and a NPV of 92.31%. Sotoudehmanesh *et al.*³⁵ concluded that positive PPD was found in 50% of patients in their study. In the present study analysis of ESR values show that as the ESR values increase the TBP rate of positivity also increase. ESR > 50 mm/hr is observed with a sensitivity of 70.59% and a specificity of 97.26%, and a PPV of 85.71% and NPV of 93.42%. Sotoudehmanesh *et al.*³⁶ concluded that ESR > 50 mm/hr was observed in 60% of patients in their study. In earlier studies CT-abdomen was found to be of limited value in assessing the TBP, but in recent studies it is found out to be of good value. Varaderi *et al.*³⁷ group of study concluded on their study that 95% of their patients with TBP had abnormal CT findings suggestive of TBP. In the present study it has been observed that, 11 out of 17 patients of TBP had features suggestive of TBP in CT abdomen, with a sensitivity of 64.71%, and a specificity of 100%, a PPV of 100% and a NPV of 92.41%. Shakil *et al.*³⁸ in their study concluded that Ascitic fluid AFB staining was negative in all the cases i.e., 100% Varaderali *et al.*³⁹ in their study also concluded the same as AFB staining was negative in all the 19 patients positive with TBP. In the present study also all the TBP suspected cases showed negative for staining with AFB in Ascitic fluid. Aguado *et al.*⁴⁰ concluded in their study that ADA was elevated in all the cases with TBP among cirrhotic ascites patients. In the present study also ADA was elevated in all the 17 cases i.e., 100 % sensitivity. In a systematic review study done by Sanai *et al.*, it was concluded that ADA was elevated in 94 % of patients. K M Chow *et al.*⁴¹ in their study of title "Tuberculous peritonitis-associated mortality is high among patients waiting for the results of mycobacterial culture of ascitic fluid samples", concluded that 11 (23) patients of positive culture was diagnosed after the death of the patients. In a systematic review study done by Sanai *et al.*⁴² it was concluded that culture for ascitic fluid for MTB was successful in 34 % of patients. In the present study, ascitic fluid culture was negative in all cases.

VI. Conclusion

1. Incidence of Tuberculosis among Cirrhotic ascites patients is more than compared to the general population.
2. Incidence of TBP among Cirrhotic ascites patients is more than compared to the general population.
3. Incidence of TBP among Cirrhotic ascites patients is 18.8% in the present study.
4. Abdominal pain, tenderness and fever in Cirrhotic ascites are common clinical manifestations in TBP.
5. In resource poor settings, where facilities of Laparoscopy are not available or patient condition is not favouring the invasive procedures or patient is not willing for invasive procedure, TBP should be diagnosed with ascitic fluid analysis showing lymphocyte predominance, ascitic fluid total protein more than 2.5 gm/dl, ratio of ascitic fluid total protein to serum total protein >0.5, SAAG less than 1.1, ADA more than 40 IU/L, CT abdomen showing matting of the loops, omental masses, nodular peritoneum, mesenteric thickening and lymphnodes.
6. Serum Bilirubin is not reliable indicator in diagnosing TBP.
7. Abnormal Chest X-ray i.e., suggestive of PTB has more specificity (98.63%) than sensitivity (47.06%) in diagnosing TBP.
8. Early treatment can be initiated without waiting for the reports of ascitic fluid for AFB staining and culture.

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