Original Article

Indian Journal of Medical & Health Sciences
Volume 11 Number 2, July - December 2024
DOI: https://dx.doi.org/10.21088/ijmhs.2347.9981.11224.6

A Study of Clinical Parameters and Outcomes of Acute Kidney Injury Hepatorenal Syndrome in Patients with Cirrhosis of Liver and Ascites

Shashibhushan J.[1], Gownisha P.[2], Raghavendra F.N.[3], Mudegoudara Lingaraj[4]

How to cite this article:

Shashibhushan J., Gownisha P., *et al.,* A Study of Clinical Parameters and Outcomes of Acute Kidney Injury-Hepatorenal Syndrome in Patients with Cirrhosis of Liver and Ascites. Jr. Med. & Health Sci. 2024;11(2):97–106.

Abstract

Introduction: Liver cirrhosis can cause serious complications. One of the most common and serious complications which causes increased mortality is Hepatorenal syndrome. The clinical parameters and treatment modify the outcome of the disease.

Objectives: To assess the demographic and clinical parameters in patients with Cirrhosis and ascites with acute kidney injury hepatorenal syndrome and to assess the outcome and improvement in Acute kidney injury hepatorenal syndrome with conservative management.

Materials and Methods: This a cross-sectional, descriptive study was conducted at the Department of General Medicine and Gastroenterology, Ballari Medical College & Research Centre, Ballari, India, between July 2022 and December 2023 witha sample size of 100 cases. The study aimed to investigate the clinical parameters and outcomes of acute kidney injury, specifically hepatorenal syndrome, in patients with cirrhosis of the liver and ascites.

Results: Out of these 100 cases, majority were from 51-70 years age group (36%) with a mean 49.7 ± 19.2 years with Male predominance 85%. 88% of the cases had history of alcohol use. The most common presentations were Abdominal distension-56%, Reduced urine output-52%, Bilateral lower limb swelling-60%. USG abdomen revealed cirrhosis with ascites in 90% cases. Albumin infusion was given to majority 40% patients. Response to treatment showed improvement in 41% cases, stable in 30% and condition worsened in 29% cases. Death rate in the study was 46%. Long-term renal function outcome revealed improvement in 32% cases, stability in 35% and worsened condition in 33% cases. Serum creatinine >3 mg/dL with OR -1.97 (0.62-3.04) (p-0.0441), serum bilirubin >10 mg/dL with OR- 1.93 (0.69-3.41) and (p-0.0298), response to treatment (worsened) with OR as 3.61 (1.44-9.05) and (p-0.006) and Complications (present) with OR -3.12 (1.38-7.08) and p value of 0.006. 41.9% of the patients on Albumin infusion were improved as against 39% that were worsened ($p<0.05$).

Conclusion: This study demonstrates the most common presentations and clinical parameters seen in cirrhosis of liver with hepatorenal syndrome and a significant association between serum creatinine and bilirubin with worsened outcomes as prognostic indicators. The treatment outcomes show that there is significant improvement with Albumin infusion treated patients. These findings highlight the importance of comprehensive management of cirrhosis at the earlier stage and prevention of hepatorenal syndrome.

Keywords: Hepatorenal syndrome, Acute kidney injury, Cirrhosis of liver.

Author's Affiliation: [1]Professor & Unit Chief, [2]Postgraduate Final Year, [3]Professor, [4]Senior Specialist, Department of General Medicine, Ballari Medical College and Research Centre Ballari, Karnataka 583104, India.

.**Corresponding Author: Gownisha P.,** Postgraduate Final Year, General Medicine, Ballari Medical College and Research Centre Ballari, Karnataka 583104, India.

E-mail: gowniparam23@gmail.com

Received on: 26-09-2024 **Accepted on:** 29-10-2024

INTRODUCTION

Liver cirrhosis is a chronic, progressive illness that causes fibrous scar tissue to replace normal liver tissue, impairing liver function and causing a host of other problems.[1] Hepatorenal syndrome (HRS) is a manifestation of acute kidney damage (AKI), one of the most serious consequences of cirrhosis[2]. Renal failure with hepatorenal syndrome (HRS) is a potentially curable condition that primarily affects individuals with severe liver disease, especially those who have ascites and cirrhosis.[3] Since HRS development is linked to a poor prognosis and high death rates, early detection and effective therapy are essential for enhancing patient outcomes.[4]

A variety of inflammatory processes, hemodynamic alterations, and neurohumoral dysregulation are all part of the intricate pathophysiology of HRS.[5] Portal hypertension in cirrhosis patients causes splanchnic vasodilation, which triggers compensatory pathways such the sympathetic nervous system and the renin-angiotensin-aldosterone system (RAAS). [6] These compensatory mechanisms cause renal vasoconstriction and salt retention in an effort to maintain the effective arterial blood volume. But chronic stimulation of these mechanisms eventually results in renal hypoperfusion and the development of HRS as liver disease advances.[7]

Treating the underlying liver disease, maximizing hemodynamic parameters, and offering supportive care are the three main focuses of HRS management [8]. It has been demonstrated that vasoconstrictors, such as terlipressin or noradrenaline, when combined with albumin, enhance renal function and patient survival in Type 1 HRS patients. Since liver transplantation treats the underlying cause of HRS and has the potential to fully resolve renal dysfunction, it continues to be the gold standard for treating the condition.

Even with improvements in our knowledge of the pathophysiology and treatment of HRS, the illness still presents substantial difficulties in clinical settings. The high morbidity and mortality rates linked to HRS are a result of the disorder's variable clinical presentation, the existence of comorbidities, and the scarcity of available treatments. Thus, more research is desperately needed to find novel biomarkers for early detection, create more potent treatment plans, and enhance patient outcomes.

We want to evaluate the efficacy of existing management options, investigate potential predictors of patient outcomes, and discover factors that influence the onset and progression of HRS by studying a cohort of patients with these illnesses. The results of this investigation will augment the expanding corpus of information about HRS and could potentially guide forthcoming investigations and clinical judgments concerning the handling of this intricate and demanding ailment.

METHODOLOGY

The current cross sectional study was conducted on patients admitted in medical wards at Ballari Medical College & Research Centre, Ballari fulfilling the inclusion criteria, after obtaining approval and clearance from the institutional ethics committee. A total of 100 participants were selected after explaining the purpose of the study and procedure in detail and, after attaining their consent in written format for each patient. Demographic data, history, clinical examination and details of investigations were recorded in the study proforma. The history was collected by direct interview of the patient and patient relatives accompanying the patient

Relevant investigations were done to confirm diagnosis and detection of complications. The study was conducted for a total duration of 18 months. The collected Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data will be expressed in terms of proportions Quantitative data will be expressed in terms of Mean and Standard deviation Association between two qualitative variables will be seen by using Chi square/ Fischer's exact test Comparison of mean and SD within same groups will be done by using paired t test to assess whether the mean difference between groups is significant or not Descriptive statistics of each variable will be presented in terms of Mean, standard deviation, standard error of mean.A p value of <0.05 will be considered as statistically significant.

RESULTS

1. Out of these 100 cases, majority were from 51-70 years age group (36%) with a mean 49.7 ± 19.2 years with Male predominance 85%. (Table 1 and fig. 1,2)
2. 88% of the cases had history of alcohol use. (Table 2 and fig. 3)
3. The most common presentations were Abdominal distension-56%, Reduced urine output-52%, Bilateral lower limb swelling-60%. (Table 3 and Fig. 4)

Table 1: Demographic Characteristics of Study Population

Characteristics	Category	n (%)	Mean ± SD
Age (years)	18-30	15 (15%)	49.7 ± 19.2
	31-50	35 (35%)	
	51-70	36 (36%)	
	>70	14 (14%)	
Gender	Male	85 (85%)	–
	Female	15 (15%)	
BMI (kg/m^2)	<18.5	2 (2%)	29.2 ± 5.7
	18.5-24.9	24 (24%)	
	25.0-29.9	31 (31%)	
	≥30.0	43 (43%)	

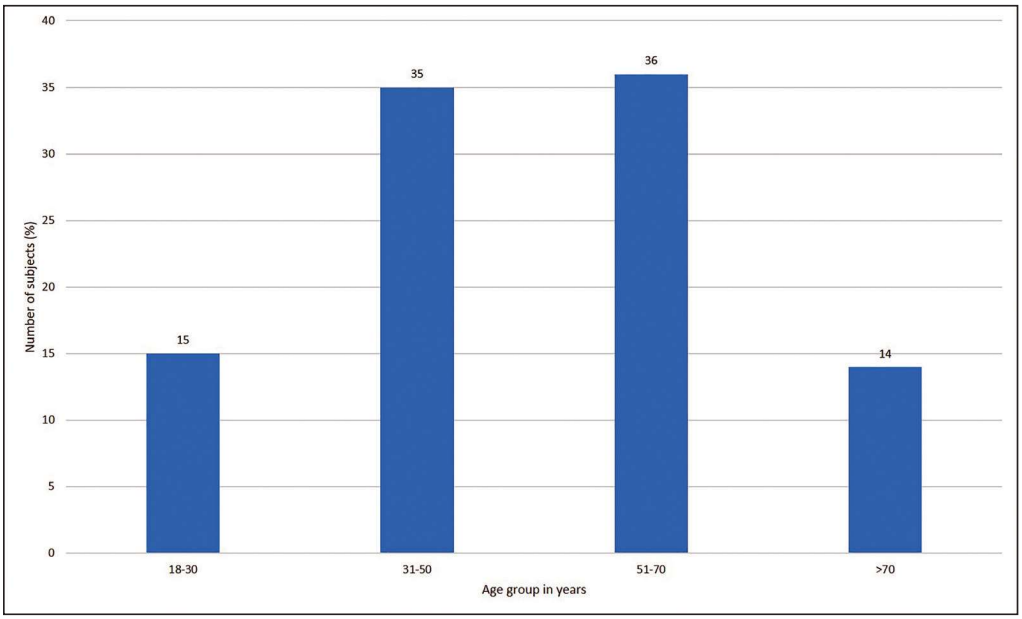

Fig. 1: Bar diagram showing Age wise distribution

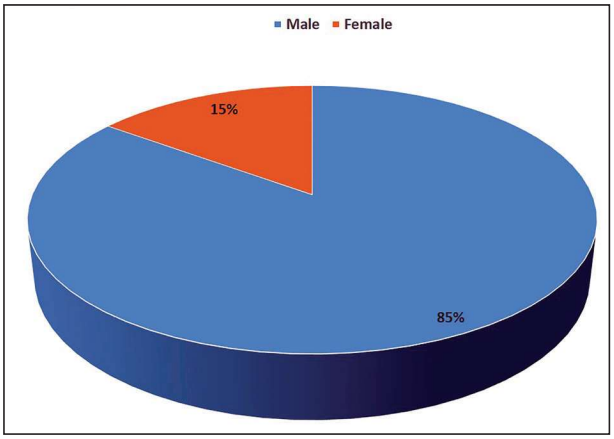

Fig. 2: Bar diagram showing Gender wise distribution

Table 2: Clinical History and Comorbidities

Characteristic	Category	n (%)
Duration of liver disease (years)	<5	21 (21%)
	5 to 10	38 (38%)
	>10	41 (41%)
History of alcohol use	Yes	88 (88%)
	No	12 (12%)
History of hepatitis infection	Yes	16 (16%)
	No	84 (84%)
Type of hepatitis (if Yes)	Hepatitis B	9(56.2%)
	Hepatitis C	7(43.7%)
History of other comorbidities	Diabetes	**21 (21%)**
	Hypertension	20 (20%)
	IHD	15 (15%)
	COPD/ASTHMA	16(16%)
	None	28 (28%)

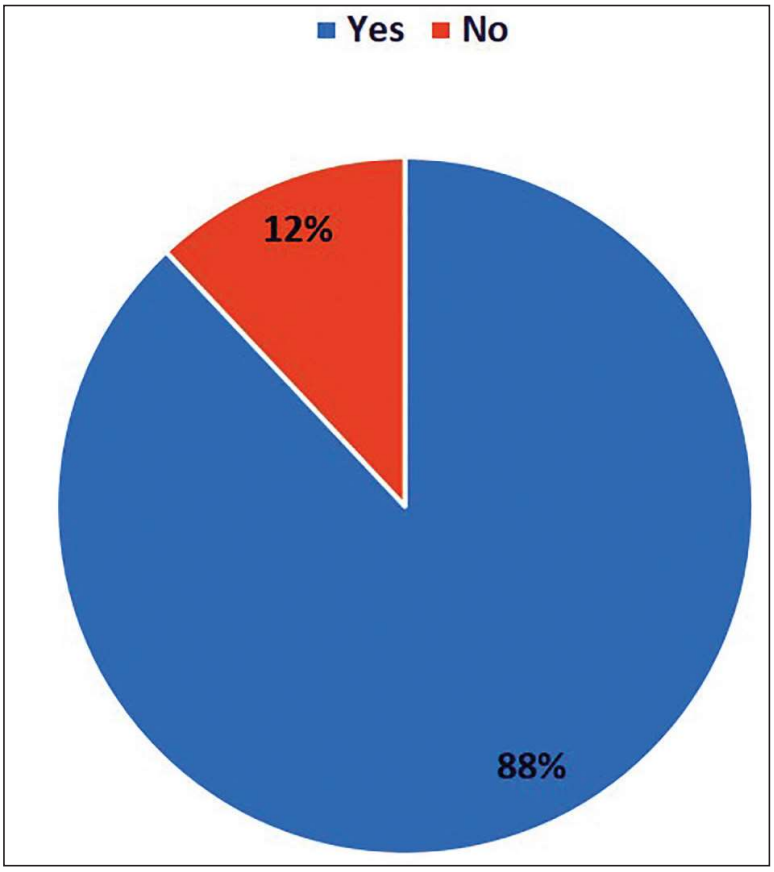

Fig. 3: Bar diagram showing Alcohol addiction

Table 3: Symptoms at Presentation

Symptom	n (%)
Abdominal distension	56 (56%)
Reduced urine output	52 (52%)
Bilateral lower limb swelling	60 (60%)
Hematemesis	44 (44%)
Melena	58 (58%)
Altered sensorium	39 (39%)
Yellowish discoloration of eyes /urine	25(25%)

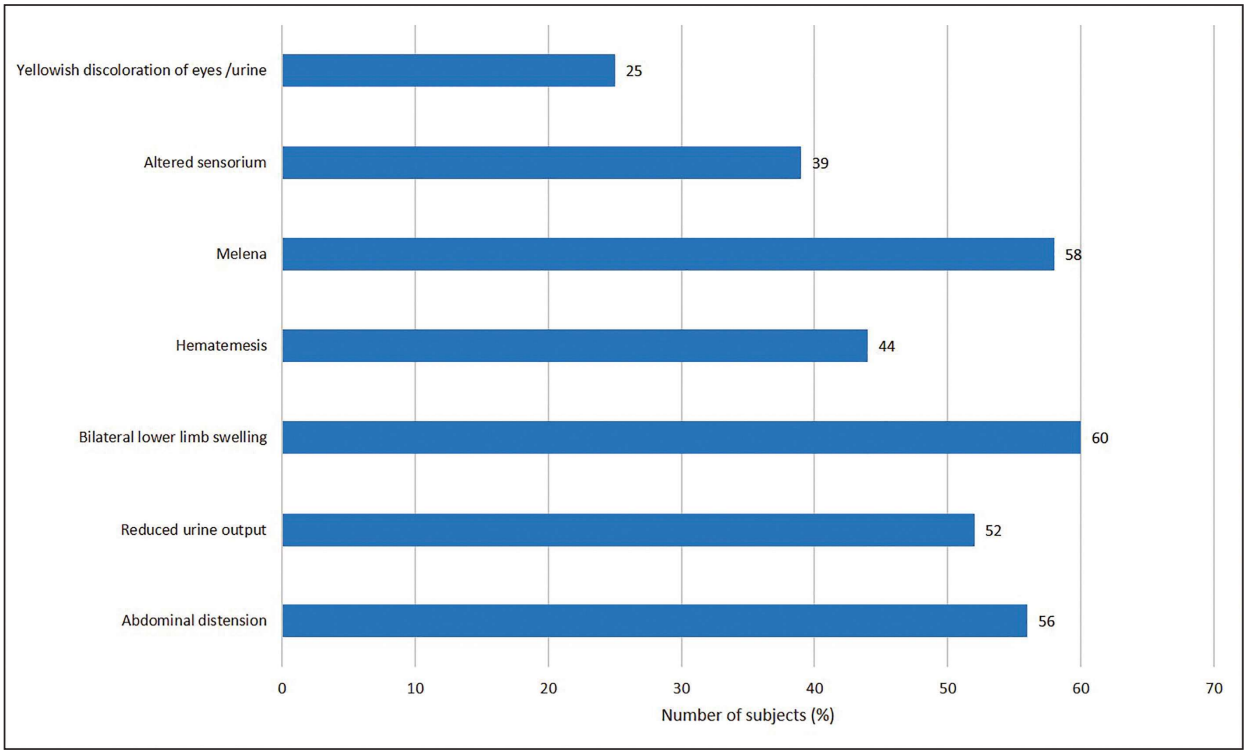

Fig. 4: Bar diagram showing Symptoms at Presentation

4. USG abdomen revealed cirrhosis with ascites in 90% cases. (*Table 4 and Fig. 5*)

Table 4: Imaging and Endoscopic Findings

Finding	Category	n (%)
Ultrasound abdomen	Cirrhosis	10 (10%)
	Cirrhosis with ascites	90 (90%)
UGI endoscopy	Varices	41 (41%)
	Gastropathy	38 (38%)
	Normal	21 (21%)

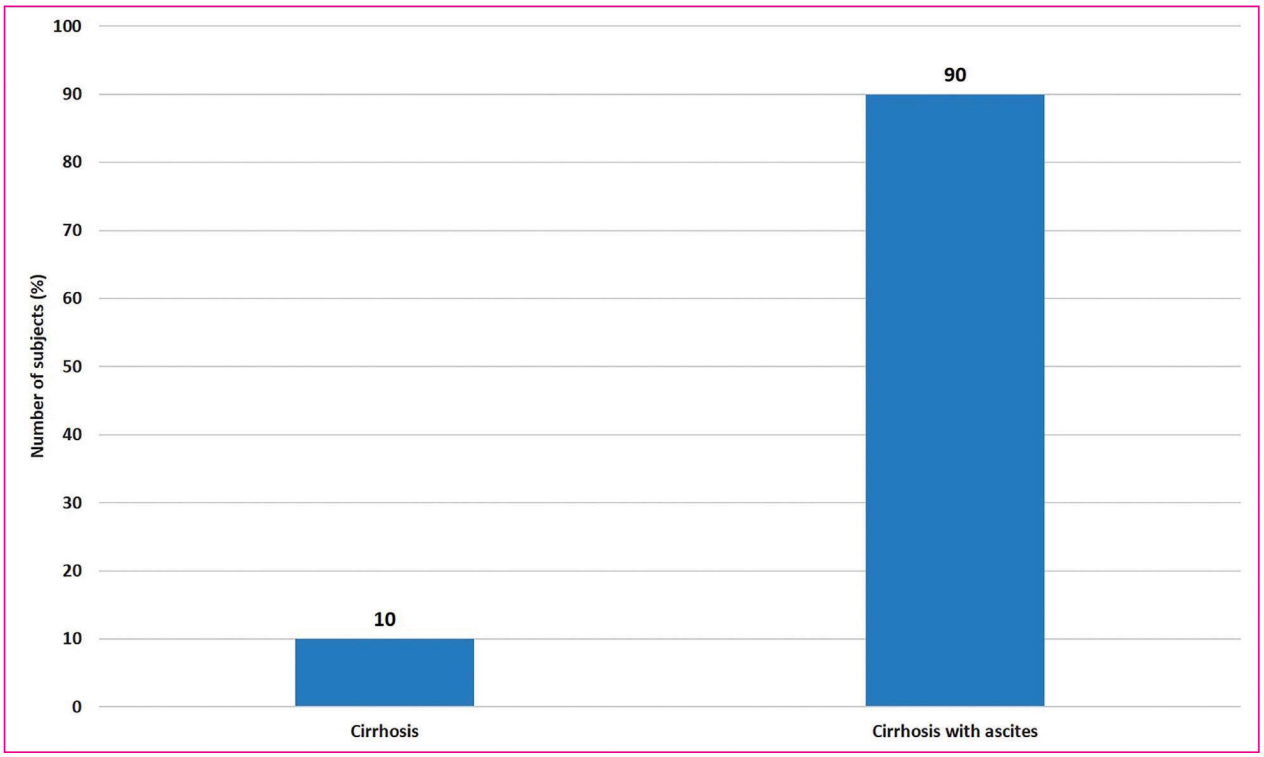

Fig. 5: Bar diagram showing Ultrasound abdomen

Table 5: Laboratory Investigations

Investigation	Mean ± SD
Haemoglobin (g/dL)	10.9 ± 2.5
WBC count (cells/mm^3)	7853 ± 2447
Platelet count (cells/mm^3)	258722 ± 108851
Serum creatinine (mg/dL)	3.1 ± 0.9
Blood urea nitrogen (mg/dL)	58.6 ± 18.9
Serum sodium (mmol/L)	134.6 ± 5.1
Serum potassium (mmol/L)	4.2 ± 0.7
Serum bilirubin (total) (mg/dL)	10.2 ± 5.6
AST (U/L)	227 ± 100
ALT (U/L)	224 ± 105
ALP (U/L)	179 ± 77
Serum albumin (g/dL)	2.9 ± 0.6
Prothrombin time (sec)	16.0 ± 2.1
INR	1.7 ± 0.4

5. Albumin infusion was given to majority 40% patients. (*Table 6 and Fig. 6*)
6. Response to treatment showed improvement in 41% cases, stable in 30% and condition worsened in 29% cases. Death rate in the study was 46%. (*Table 8 and Fig. 7*)
7. Long-term renal function outcome revealed improvement in 32% cases, stability in 35% and worsened condition in 33% cases.

Table 6: Type and Duration of Conservative Management

Type of Management	n (%)
Diuretics Withdrawal	23 (23%)
Albumin infusion	40 (40%)
Antibiotics	10 (10%)
Terlipressin	10 (10%)
Terlipressin and Albumin	14(14%)
Dialysis	3(3%)

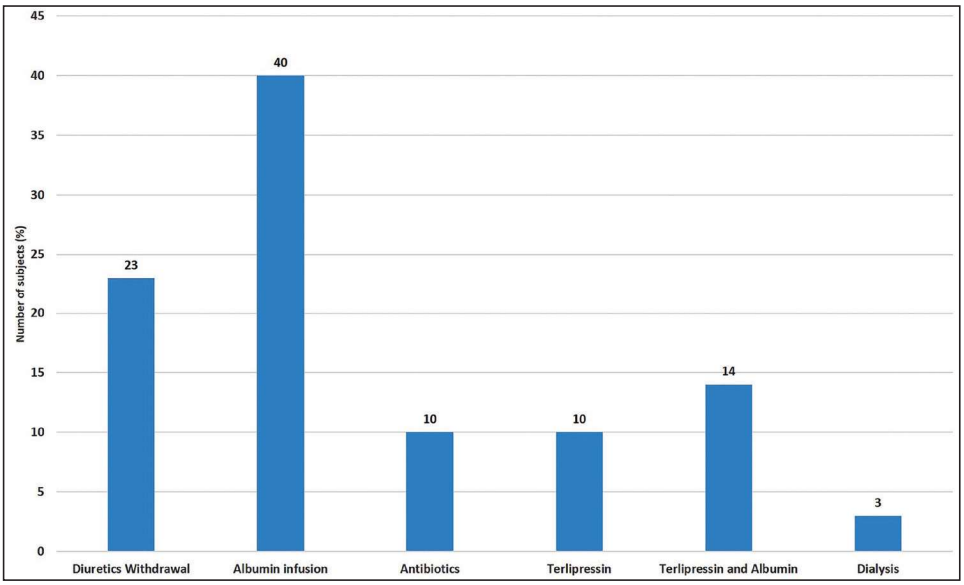

Fig. 6: Bar diagram showing Type and Duration of Conservative Management

Table 7: Prognostic Factors for Survival (Odds Ratios)

Parameter	Odds Ratio (95% CI)	p-value
Age >50 years	1.37 (0.62-3.04)	0.44
Male gender	0.82 (0.43-1.06)	0.55
BMI ≥30 kg/m^2	0.81 (0.36-1.81)	0.605
Duration of liver disease >10 years	1.40 (0.63-3.12)	0.412
History of alcohol use	1.07 (0.58-1.97)	0.82
History of hepatitis infection	1.08 (0.98-1.59)	0.77
History of other comorbidities	1.09 (0.39-3.08)	0.83
Serum creatinine >3 mg/dL	1.97 (0.62-3.04)	0.0441
Serum bilirubin >10 mg/dL	1.93 (0.69-3.41)	0.0298
Serum albumin <3 g/dL	1.40 (0.63-3.12)	0.412
INR >1.5	1.29 (0.58-2.86)	0.53
SAAG <1.1 g/dL	1.31 (0.59-2.93)	0.509
Response to treatment (worsened)	3.61 (1.44-9.05)	0.006*
Complications (present)	3.12 (1.38-7.08)	0.006*
Readmission within 30 days	1.87 (0.84-4.15)	0.124

8. Serum creatinine >3 mg/dL with OR -1.97 (0.62-3.04) (p-0.0441), serum bilirubin >10 mg/dL with OR- 1.93 (0.69-3.41) and (p-0.0298), response to treatment (worsened) with OR as 3.61 (1.44-9.05) and (p-0.006) and Complications (present) with OR -3.12 (1.38-7.08) and p value of 0.006. (*Table 7*)
9. 41.9% of the patients on Albumin infusion were improved as against 39% that were worsened (p<0.05). (*Table 8 and Fig. 7*)

Table 8: Treatment and its response outcome

Type of Conservative Management	Improved		Stable		Worsened		Total	P
	No	%	No	%	No	%		
Albumin and Terlipressin	1	3.2	8	28.6	7	17.1	16	0.58
Albumin Infusion	13	41.9	9	32.1	16	39.0	38	0.042
Antibiotics	2	6.5	5	17.9	3	7.3	10	0.68
Dialysis	1	3.2	1	3.6	1	2.4	3	1
Diuretics Withdrawal	12	38.7	2	7.1	9	22.0	23	0.88
Terlipressin	2	6.5	3	10.7	5	12.2	10	0.98
Total	31	100.0	28	100.0	41	100.0	100	

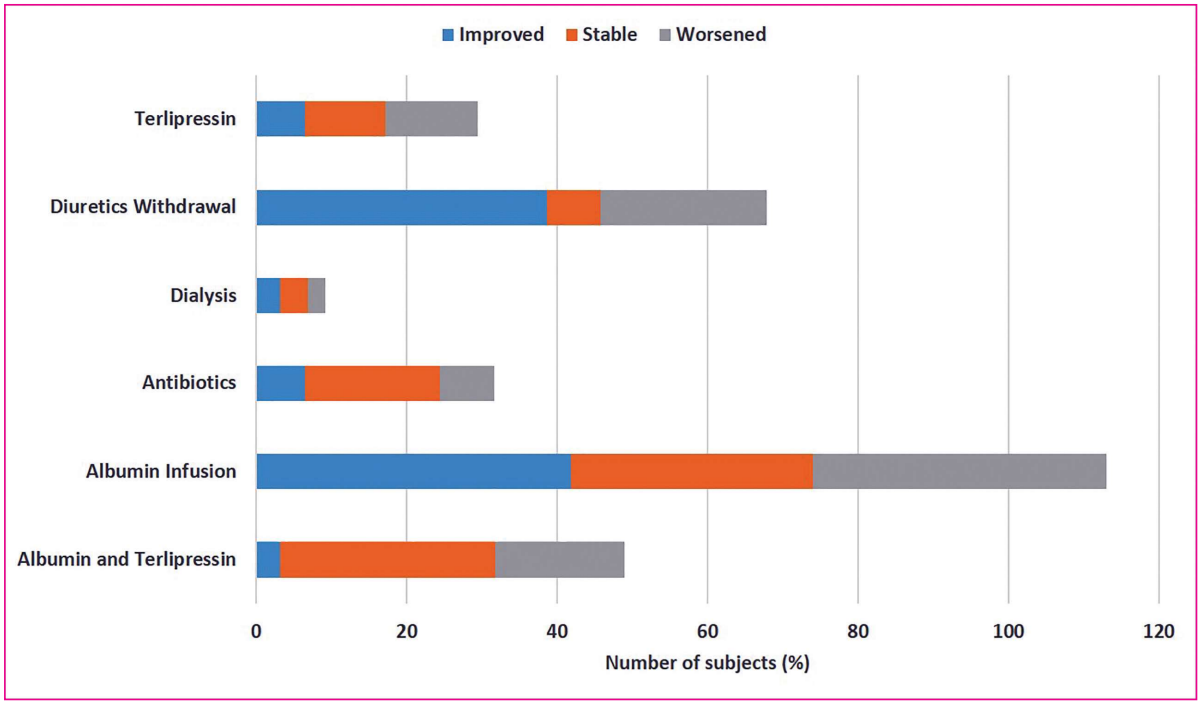

Fig. 7: Bar diagram showing Treatment and its response outcome

DISCUSSION

Out of these 100 cases, majority were from 51-70 years age group i.e. 36% followed by 35% from 31-50 years, 15% from 18-30 years and 14% from above 70 years age group. Mean age of the study population was 49.7 ± 19.2 years. 85% were males and 15% were females.

Tsien CD *et al*[9] in their study enrolled 90 patients. There were 64 men and 26 women, with a mean age of 55.860.8 years. During a mean follow-up period of 14.0561.07 months, there were 82 episodes of AKI in 49 patients, yielding a mean 1.67 episodes of AKI per patient (range one to four episodes).

Comorbid condition in our study revealed the prevalence of diabetes as 21%, hypertension as 20%, IHD 15%, COPD as 16%.

Allegretti AS *et al*[10] in their study reported that the most common etiologies of cirrhosis were alcoholic (30%), multifactorial (27%), and hepatitis C (20%). Eleven participants (9%) had stage I AKI, 23 participants (19%) had stage II AKI, and 86 participants (72%) had stage III AKI.

Distribution according to symptoms at the time of presentation revealed as follows: Abdominal distension-56%, Reduced urine output-52%, Bilateral lower limb swelling-60%, Hematemesis-44%, Melena-58%, Altered sensorium-39% and yellowish discoloration of eyes /urine-25%.

Distribution according to signs at the time of presentation revealed presence of ascites in 52%, pedal edema in 51% and icterus in 55%.

Kumar U *et al*[11] in their study reported that ascites was present in 94% of the cases, jaundice in 70%, decreased urine output in 27%, upper GI bleeding in 22%, hepatic encephalopathy in 21% and pain in abdomen in 17% cases.

Laboratory Investigations in our study revealed following findings: Mean Haemoglobin (g/dL) was 10.9 ± 2.5, Mean WBC count (cells/mm^3) was 7853 ± 2447, Mean Platelet count (cells/mm^3) was 258722 ± 108851, Mean Serum creatinine (mg/dL) was -3.1 ± 0.9, Mean Blood urea nitrogen (mg/dL) was 58.6 ± 18.9, Mean Serum sodium (mmol/L) was 134.6± 5.1, Mean Serum potassium (mmol/L) was 4.2 ± 0.7, Mean Serum bilirubin (total) (mg/dL)-10.2 ± 5.6, Mean AST (U/L) was 227 ± 100, Mean ALT (U/L) was 224 ± 105, Mean ALP (U/L) was 179 ± 77, Mean Serum albumin (g/dL) was 2.9 ± 0.6, Mean Prothrombin time (sec) was 16.0 ± 2.1 and Mean INR was 1.7 ± 0.4.

Diuretics Withdrawal was done in 23% cases, albumin infusion started in 40%, antibiotics in 10%, Terlipressin started in 10%, Terlipressin and Albumin started in 14%, and dialysis in 3% cases. Response to treatment showed improvement in 41% cases, stable in 30% and condition worsened in 29% cases.

Allegretti AS *et al*[10] in their study reported that Ninety-four participants (78%) received nephrology consultation. Thirty-eight participants (32%) required renal replacement therapy. Twenty-one participants (18%) went on to receive liver transplantation. Forty-nine participants (41%) received vasopressors while being hospitalized in the intensive care unit. Thirty-one participants with HRS (89%) were treated with midodrine and octreotide.

Prognostic Factors for Survival in our study were Serum creatinine >3 mg/dL with OR -1.97 (0.62-3.04) (p-0.0441), serum bilirubin >10 mg/dL with OR- 1.93 (0.69-3.41) and (p-0.0298), response to treatment (worsened) with OR as 3.61 (1.44-9.05) and (p-0.006) and Complications (present) with OR- 3.12 (1.38-7.08) and p value of 0.006.

3.2% of the patients on Albumin and Terlipressin were improved as against 17.1% that were worsened (p>0.05). 41.9% of the patients on Albumin infusion were improved as against 39% that were worsened (p<0.05). 6.5% of the patients on antibiotics were improved as against 7.3% that were worsened (p>0.05). 3.2% of the patients on dialysis were improved as against 2.4% that were worsened (p>0.05). 3.2% of the patients on Albumin and Terlipressin were improved as against 17.1% that were worsened (p>0.05). 6.5% of the patients on Terlipressin were improved as against 12.2% that were worsened (p>0.05).

CONCLUSION

1. Commonly affected age group in our study was 51-70 years age i.e. 36% followed by 35% from 31-50 years with male preponderance of 85%.
2. Commonly observed symptom in our study were abdominal distension-56%, Reduced urine output-52%, Bilateral lower limb swelling-60% and Melena-58%.
3. Commonly observed presentation in our study were presence of ascites in 52%, pedal edema in 51% and icterus in 55%.
4. USG abdomen revealed that presence of only cirrhosis in 10% cases and cirrhosis with ascites in 90% cases. UGI endoscopy revealed that presence of varices in 41%, gastropathy in 38% and normal findings in 21% cases.
5. Death rate in our study was 46%.
6. Distribution of the cases as per the prevalence complications was-infection-23%, encephalopathy-16% and bleeding in 14%.
7. Prognostic Factors for Survival in our study were Serum creatinine >3 mg/dL with OR -1.97 (0.62-3.04) (p-0.0441), serum bilirubin >10 mg/dL with OR- 1.93 (0.69-3.41) and (p-0.0298), response to treatment (worsened) with OR as 3.61 (1.44-9.05) and (p-0.006) and Complications (present) with OR- 3.12 (1.38-7.08) and p value of 0.006.
8. 41.9% of the patients on Albumin infusion were improved as against 39% that were worsened (p<0.05).

REFERENCES

1. Tsochatzis E.A., Bosch J., Burroughs A.K. Liver cirrhosis. Lancet. 2014; 383(9930):1749-1761.
2. Angeli P., Garcia-Tssao G., Nadim M.K., Parikh CR. News in pathophysiology, definition and classification of hepatorenal syndrome: A step beyond the International Club of Ascites (ICA) consensus document. J. Hepatol. 2019; 71(4):811-822.
3. Ginès P., Solà E., Angeli P., Wong F., Nadim M.K., Kamath P.S. Hepatorenal syndrome. Nat Rev Dis Primers. 2018; 4(1):23.
4. European Association for the Study of the Liver. EASL Clinical Practice Guidelines for the management of patients with decompensated cirrhosis. J Hepatol. 2018; 69(2):406-460.
5. Arroyo V., Ginès P., Gerbes A.L., *et al*. Definition and diagnostic criteria of refractory ascites and hepatorenal syndrome in cirrhosis. International Ascites Club. Hepatology. 1996; 23(1):164-176.
6. Bernardi M., Moreau R., Angeli P., Schnabl B., Arroyo V. Mechanisms of decompensation and organ failure in cirrhosis: From peripheral arterial vasodilation to systemic inflammation hypothesis. J. Hepatol. 2015;63(5):1272-1284.
7. Ruiz-del-Arbol L., Monescillo A., Arocena C, *et al*. Circulatory function and hepatorenal syndrome in cirrhosis. Hepatology. 2005; 42(2):439-447.
8. Runyon B.A.; AASLD Practice Guidelines Committee. Management of adult patients with ascites due to cirrhosis: an update. Hepatology. 2009; 49(6):2087-2107.
9. Tsien C., Rabie R., & Wong F. (2012). Acute kidney injury in decompensated cirrhosis. Gut, 62, 131-137.
10. Allegretti A., Ortiz G., Wenger J., Deferio J.J., Wibecan J., Kalim S., Chung R, Karumanchi S, & Thadhani R. (2015). Prognosis of Acute Kidney Injury and Hepatorenal Syndrome in Patients with Cirrhosis: A Prospective Cohort Study. International Journal of Nephrology.
11. Kumar U., Kumar R., Jha S., Jha A., Dayal V., & Kumar A. (2020). Short-term mortality in patients with cirrhosis of the liver and acute kidney injury: A prospective observational study. Indian Journal of Gastroenterology, 39, 457-464