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Comparison of Acute on Chronic Liver Failure Prognostic Scores after Plasma Exchange and standard Medical Therapy

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Abstract **Original Research Article**

Introduction: Acute and acute-on-chronic liver failure (ACLF) has a very high short-term mortality rate. Jaundice, hepatic encephalopathy, hepato-renal syndrome, hemodynamic instability, increased susceptibility to severe infections, and finally multi-organ failure may occur in the final stage of ACLF regardless of its underlying etiology. Biochemical parameters play a vital role in assessing the prognosis of the mortality rate of the disease. ***Aim of the study:*** This study aimed to compare acute on chronic liver failure prognostic scores in predicting short-term mortality rates after plasma exchange and standard medical therapy. ***Methods:*** This randomized control trial was conducted at the Department of Hepatology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from September 2020 to September 2021. All the patients admitted to the Department of Hepatology, BSMMU with ACLF were considered as the study population. A total of 28 patients (14 in each group of PLEX and SMT) were selected as study subjects by simple random sampling technique. All data were analyzed by SPSS version 21.0. Qualitative data were analyzed by Chi-square test and Quantitative data were analyzed by Student´s t-test. Comparison between the two groups in each follow-up was done by unpaired t-test. ***Result:*** The majority (57.1%) of patients survived in the PLEX group then 5(35.7%) in the SMT group. The difference was statistically not significant ($p>0.05$) between the two groups. Serum bilirubin, AST, ALT, MELD score, MELD-Na score, and AARC score were statistically significant ($p<0.05$) between the two groups. ***Conclusion:*** This study concludes that serum bilirubin, serum AST, serum ALT, MELD score, MELD-Na score, and AARC score are statistically significant in patients with ACLF. Serum bilirubin, serum AST, serum ALT, MELD score, MELD-Na score, and AARC score can act as predictors of short-term mortality rate in ACLF after plasma exchange and standard medical therapy.

Keywords: Plasma exchange, AARC score, Standard medical therapy**,** Liver failure.

INTRODUCTION

Acute and acute-on-chronic liver failure (ACLF) has a high short-term mortality rate. A wide variety of etiology can cause this. Jaundice, hepatic encephalopathy, hepato-renal syndrome, infections, and finally multi-organ failure may occur in the final stage of ACLF regardless of its underlying etiology. [1] Both hepatic and extra hepatic organ failure, caused by systemic inflammation is the main contributor to high mortality rate in ACLF (Moreau *et al.,* 2013). The presence of systemic inflammatory response syndrome (SIRS) predicts the development of ACLF in patients with alcoholic liver disease [2]. Before the onset of sepsis and development of extra-hepatic organ failure in a patient with ACLF, there is a brief period of about 1 week. It is known as the "Golden Window". Organ failure during this period is about to be prevented by different therapeutic interventions and provide a potential opportunity to reverse the insult-induced liver injury and potential multi-organ failure [3]. Available therapeutic options are limited. Present medical therapy includes management of the triggering events, support end organs, and prevention/treatment of complications, until the eventual recovery of liver function [4]. If medical treatment fails, Transplantation is the only option for eligible patients. The only definitive treatment for ACLF is Liver transplantation until now. However, the donor organs and expertise are limited, the cost is very high, and widespread availability is not ensured everywhere. These limit its usefulness in the management of patients with ACLF. Cellular devices

such as albumin dialysis and plasma exchange/infiltration are two major types of liver support systems. Molecular Adsorbent Recirculating System (MARS) and Prometheus devices are the two best-studied liver support devices. Albumin dialysis is the basic mechanism of these devices. Besides its oncotic properties, albumin has several functions. Removal of TNF-α, IL-6, IL-8, IL-γ, and IL-4, reduction of Nitric Oxide, and improvement of systemic and hepatic hemodynamics may be the principle of actions of these devices [4]. A widespread range of accumulated toxins in patients with liver failure can be eliminated by Plasma exchange (PLEX). It provides an environment favorable to liver renewal by facilitating recovery of failing liver. So, it can be effectively used as a therapy for relating the failing liver to liver transplant. PLEX can also potentiate the elimination of toxic metabolites and the poorly recognized mediators of multi-organ failure which can help to regain the function of existing healthy liver [5,6]. Diagnosis of ACLF is made based on APASL criteria; "Acute hepatic insult manifesting as Jaundice (serum bilirubin ≥5 mg/dl) and coagulopathy (INR ≥1.5) complicated within 4 weeks by ascites and/or encephalopathy in a patient with previously diagnosed or undiagnosed chronic liver disease" [7]. To establish this criteria patient's history, examination, and laboratory assessment are needed. Thus, biochemical parameters play a vital role in assessing the condition of the disease. This study aimed tocompare acute on chronic liver failure prognostic scores in predicting short-term mortality rates after plasma exchange and standard medical therapy.

OBJECTIVE

General Objective

- To compare acute on chronic liver failure prognostic scores in predicting short-term mortality rate after plasma exchange and standard medical therapy.

Specific Objectives

- To observe the sociodemographic status of the respondents.
- To know the association between baseline parameters.
- To analyze the biochemical variables.

METHODS

This randomized control trial was carried out at the Department of Hepatology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from September 2020 to September 2021. All the patients admitted to the Department of Hepatology, BSMMU with ACLF were considered as the study population. A total of 28 patients (14 in each group of PLEX and SMT) were selected as study subjects by simple random sampling technique as per inclusion and exclusion criteria.

Inclusion Criteria

- Adult patients.
- Patients diagnosed to have ACLF (APASL criteria) irrespective of etiology.
- Patients who were willing to give consent.

Exclusion Criteria

- Patients with hepatocellular carcinoma or any other malignancy.
- Patients with sepsis (patients were included after sepsis was controlled).
- Pregnant patients.
- Patients with severe cardio or pulmonary disease.
- Patients who did not give consent to participate in the study.

The patients who gave informed written consent were provisionally included in the study and randomization was done by using the website Randomization.com (http://www.randomization.com). The enrolled patients were randomized into 2 groups. In one group patients received plasma exchange and standard medical therapy and another group received standard medical therapy only. Data were collected using a preformed data collection sheet (questionnaire). Baseline information was collected from the patient after exploration of different complaints. All information regarding clinical features and investigations was recorded in a data collection sheet. All necessary investigations were done. Data analysis was done by SPSS (version 21.0; IBM Corp). Analysis of qualitative data was done by Chi-square test and quantitative data by Student´s t-test. Comparison between the two groups was completed by unpaired t-test. Pvalueless than 0.05 was considered as statistically significant finding. Ethical clearance was taken from the ethical review committee of BSMMU.

RESULTS

Table 1: Association between demographic variables between two groups (N=28)

Variables	PLEX Group (n=14)		SMT Group (n=14)		P value
	n	%	n	%	
Age (in years)					
<50	10	71.4	8	57.1	[a]0.483[ns]
≥50	4	28.6	6	42.9	
Mean ± SD	41.7±12.2		44.6±9.2		
Range (min-max)	23-65		26-55		
Sex					
Male	13	92.9	12	85.7	[b]0.541[ns]
Female	1	7.1	2	14.3	
Educational Qualification					
Illiterate	3	21.4	5	35.7	[b]0.112[ns]
Primary	7	50.0	2	14.3	
SSC	0	0.0	4	28.6	
HSC	1	7.1	1	7.1	
Bachelor and above	3	21.4	2	14.3	
Occupational status					
Housewife	1	7.1	2	14.3	[b]0.441[ns]
Service	4	28.6	2	14.3	
Farmer	3	21.4	4	28.6	
Businessman	6	42.9	4	28.6	
Other	0	0.0	2	14.3	
Monthly Income (BDT)					
≤5000	1	7.1	2	14.3	[b]0.838[ns]
5001-10000	3	21.4	3	21.4	
10001-20000	4	28.6	5	35.7	
>20000	6	42.9	4	28.6	

ns= not significant, [a]p value reached from the unpaired t-test, [b]p value reached from chi-square test

Almost two-thirds of 10 (71.4%) patients aged<50 years in the PLEX group and 8 (57.1%) were in the SMT group. The majority of patients were male in both groups, 13 (92.9%) were in the PLEX group and 12 (85.7%) were in the standard medical therapy (SMT) group. Half (50.0%) of patients were primarily passed in the PLEX group and 2 (14.3%) in the standard medical therapy group. The majority of 6 (42.9%) patients were businessmen in the PLEX group and 4 (28.6%) in the standard medical therapy group. The difference was statistically not significant (p>0.05) between the two groups. [Table 1]

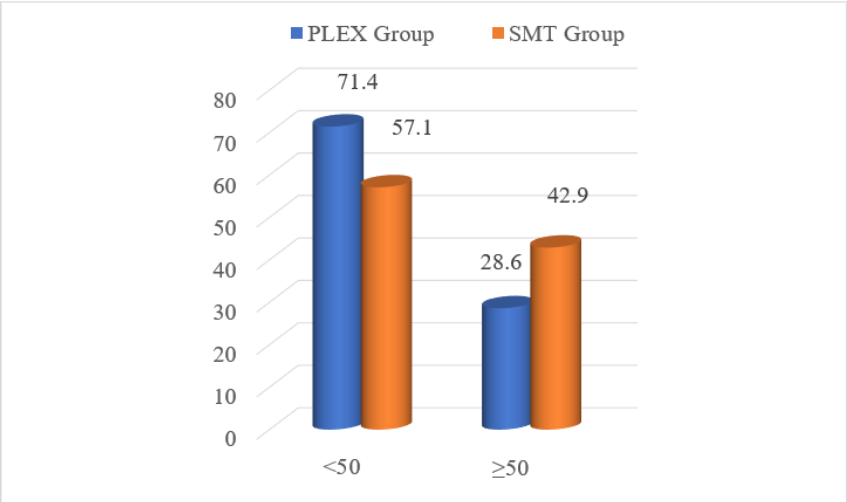

Figure 1: The bar diagram shows the age distribution of the study patients

Table 2: Association between baseline parameters between two groups (N=28)

Parameters	PLEX Group (n=14)		SMT Group (n=14)		P value
	n	%	n	%	
Ascites	14	100.0	14	100.0	-
Jaundice	14	100.0	14	100.0	-
Anaemia	11	78.6	13	92.9	0.248^{ns}
Presence of stigmata of CLD	9	64.3	11	78.6	0.234^{ns}
Spleen palpable	8	57.1	5	35.7	0.160^{ns}
Presence of testicular atrophy	8	57.1	11	78.6	0.158^{ns}
Liver palpable	3	21.4	2	14.3	0.337^{ns}
Altered level of consciousness	3	21.4	5	42.9	0.420^{ns}
AARC ACLF grade					
Grade I	2	14.3	2	14.3	0.998^{ns}
Grade II	9	64.3	9	64.3	
Grade III	3	21.4	3	21.4	

All the patients in both groups had Ascites and Jaundice. In the PLEX Group, 11(78.6%) patients and 13 (92.9%) in the SMT group were anemic. Stigmata of CLD were present in 9(64.3%) patients and 11(78.65%) in the PLEX Group and SMT Group respectively. Only 3(21.4%) in the PLEX Group and 5 (42.9%) in the SMT group had altered levels of consciousness. [Table 2]

Table 3: Association between biochemical parameters in different follow-ups among two groups (N=28)

Investigations	PLEX Group	SMT Group	P value
	Mean ± SD	Mean ± SD	
S Bilirubin (mg/dl)			
Baseline (n=14/14)	23.6±11.2	18.3±9.1	0.181^{ns}
At 1st follow-up (At 7 day) (n=14/12)	13.1±6.7	19.9±8.3	0.032^{s}
At 2nd follow-up (At 30 day) (n=11/7)	9.1±4.6	15.8±6.3	0.026^{s}
At 3rd follow-up (At 90 day) (n=8/5)	2.5±1.2	3.5±1.8	0.298^{ns}
ALT (U/L)			
Baseline (n=14/14)	314.1±505.7	260.6±208.3	0.717^{ns}
At 1st follow-up (At 7 day) (n=14/12)	115.1±48.5	151.3±32.5	0.039^{s}
At 2nd follow-up (At 30 day) (n=11/7)	102.5±32.4	138.4±38.3	0.048^{s}
At 3rd follow-up (At 90 day) (n=8/5)	64.8±47.3	89.8±31.6	0.273^{ns}
AST (U/L)			
Baseline (n=14/14)	349.4±508.1	259.9±255.5	0.561^{ns}
At 1st follow-up (At 7 day) (n=14/12)	152.3±90.4	141.8±88.6	0.768^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	110.4±90.3	104.5±49.5	0.876^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	121.8±90.2	78.2±48.9	0.346^{ns}
Prothrombin Time (Sec)			
Baseline (n=14/14)	28.2±9.0	27.9±9.6	0.932^{ns}
At 1st follow-up (At 7 day) (n=14/12)	21.3±5.1	22.5±6.7	0.609^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	18.9±4.8	20.2±4.7	0.580^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	17.8±3.4	15.6±3.2	0.270^{ns}
INR			
Baseline (n=14/14)	2.3±0.7	2.4±1.0	0.761^{ns}
At 1st follow-up (At 7 day) (n=14/12)	1.7±0.4	1.9±0.6	0.321^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	1.6±0.4	1.7±0.5	0.644^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	1.5±0.3	1.2±0.4	0.149^{ns}
S. Creatinine (mg/dl)			
Baseline (n=14/14)	1.3±0.8	1.5±1.9	0.719^{ns}
At 1st follow-up (At 7 day) (n=14/12)	1.1±0.4	0.9±0.6	0.323^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	1.1±0.3	0.8±0.2	0.033^{s}
At 3rd follow-up (At 90 day) (n=8/5)	1.2±0.3	0.8±0.2	0.023^{s}
S. Albumin (gm/l)			
Baseline (n=14/14)	2.5±0.5	2.2±0.6	0.162^{ns}
At 1st follow-up (At 7 day) (n=14/12)	2.9±0.6	2.6±0.4	0.150^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	2.7±0.6	2.5±0.5	0.474^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	2.8±0.7	2.4±0.6	0.314^{ns}

Investigations	PLEX Group	SMT Group	P value
	Mean ± SD	Mean ± SD	
S. Lactate(mmol/L)			
Baseline (n=14/14)	2.9±2.2	2.0±1.0	0.175^{ns}
At 1st follow-up (At 7 day) (n=14/12)	2.7±1.8	1.9±0.8	0.168^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	2.1±1.7	1.7±0.3	0.550^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	2.3±1.7	1.4±0.3	0.273^{ns}

I this series, serum bilirubin and serum ALT were statistically significant ($p<0.05$) between at 1st follow-up (at 7 day) and 2nd follow-up (At 30 day) among the two groups. Serum creatinine reduced significantly in the SMT group compared to the PLEX group in the 2nd and 3rd visit. [Table 3].

Table 4: Outcome of the patients at 90 days after treatment between the two groups (N=28)

Parameter	PLEX Group (n=14)		SMT Group (n=14)		P value
	n	%	n	%	
Alive	8	57.1	5	35.7	0.255^{ns}
Dead	6	42.9	9	64.3	

S= significant, p-value reached from chi-square test

The majority (57.1%) of patients survived in the PLEX group and 5(35.7%) in the SMT group. The difference was statistically not significant ($p>0.05$) between the two groups. [Table 4]

Table 5: Distribution of the study patients by MELD score in follow-up visits (N=28)

MELD score	PLEX Group	SMT Group	P value
	Mean ± SD	Mean ± SD	
Baseline (n=14/14)	28.6±4.8	28.0±5.3	0.756^{ns}
At 1st follow-up (At 7 day) (n=14/12)	22.4±4.2	23.7±7.3	0.567^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	19.9±5.8	21.7±3.4	0.470^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	15.6±4.6	14.2±2.9	0.558^{ns}

ns= not significant, p-value reached from unpaired t-test

Mean MELD score was found 28.6±4.8 in the PLEX group and 28.0±5.3 in the standard medical therapy group at baseline. At 1st follow-up (At 7day) mean was found 22.4±4.2 in the PLEX group and 23.7±7.3 in the standard medical therapy group. At 2nd follow-up (At 30 day) mean was found 19.9±5.8 in the PLEX group and 21.7±3.4 in the standard medical therapy group. At 3rd follow-up (At 90 day) mean was found 15.6±4.6 in the PLEX group and 14.2±2.9 in the standard medical therapy group. The difference was statistically not significant ($p>0.05$) between the two groups. [Table 5]

Table 6: Distribution of the study patients by MELD Na score in follow-up visits (N=28)

MELD Na score	PLEX Group	SMT Group	P value
	Mean ± SD	Mean ± SD	
Baseline (n=14/14)	30.7±3.7	30.1±5.3	0.731^{ns}
At 1st follow-up (At 7 day) (n=14/12)	23.6±4.8	25.9±6.7	0.319^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	23.1±5.3	24.9±4.3	0.462^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	19.3±6.9	18.2±3.1	0.746^{ns}

ns= not significant, p-value reached from unpaired t-test

At baseline mean MELD Na score was found 30.7±3.7 in the PLEX group and 30.1±5.3 in the standard medical therapy group. At 1st follow-up (At 7day) mean was found 23.6±4.8 in the PLEX group and 25.9±6.7 in the standard medical therapy group. At 2nd follow-up (At 30 day) mean was found 23.1±5.3 in the PLEX group and 24.9±4.3 in the standard medical therapy group. At 3rd follow-up (At 90 day) mean was found 19.3±6.9 in the PLEX group and 18.2±3.1 in the standard medical therapy group. [Table 6]

Table 7: Distribution of the study patients by AARC score in follow-up visits (N=28)

AARC score	PLEX Group	SMT Group	P value
	Mean ± SD	Mean ± SD	
Baseline (n=14/14)	9.5±1.6	9.2±1.8	0.645^{ns}
At 1st follow-up (At 7 day) (n=14/12)	8.1±1.2	8.4±2.5	0.693^{ns}
At 2nd follow-up (At 30 day) (n=11/7)	7.5±2.1	7.1±0.7	0.636^{ns}
At 3rd follow-up (At 90 day) (n=8/5)	6.9±1.1	6.2±0.4	0.204^{ns}

ns= not significant, p-value reached from unpaired t-test

At baseline mean AARC score was found 9.5±1.6 in the PLEX group and 9.2±1.8 in the standard medical therapy group. At 1st follow-up (At 7day) mean was found 8.1±1.2 in the PLEX group and 8.4±2.5 in the standard medical therapy group. At 2nd follow-up (At 30 day) mean was found 7.5±2.1 in the PLEX group and 7.1±0.7 in the standard medical therapy group. At 3rd follow-up (At 90 day) mean was found 6.9±1.1 in the PLEX group and 6.2±0.4 in the standard medical therapy group. The difference between the two groups did not appear to become statistically significant (p>0.05). [Table 7].

Table 8: Univariate analysis for comparison of variables at baseline for predicting mortality (N=28)

Parameter	Survival Group (n=13)	Dead Group (n=15)	P value
	Mean ± SD	Mean ± SD	
Age (in years)	41.1±12.1	44.6±11.2	0.434^{ns}
Sex (M/F)	11/2	14/1	0.455^{ns}
PLEX/ SMT	8/5	6/9	0.255^{ns}
Prothrombin Time (Sec)	27.9±8.6	26.3±9.8	0.652^{ns}
INR	2.3±0.7	2.2±1.0	0.765^{ns}
Serum Albumin	2.5±0.5	2.2±0.7	0.209^{ns}
Serum Creatinine	1.1±0.3	1.6±0.9	0.067^{ns}
Serum Ferritin (ng/ml)	1560.2±873.4	1040.9±648.2	0.083^{ns}
Serum Lactate (mmol/L)	2.7±0.9	2.1±0.7	0.058^{ns}
Serum Bilirubin (mg/dl)	8.7±3.2	19.2±9.2	0.001^{s}
ALT (U/L)	130.1±45.7	98.8±32.6	0.044^{s}
AST (U/L)	122.8±62.4	182.4±67.1	0.022^{s}
MELD score	17.8±4.8	25.6±6.2	0.001^{s}
MELD-Na score	20.4±5.7	29.9±4.0	0.001^{s}
AARC score	6.5±0.7	9.4±1.7	0.001^{s}

In this study, serum bilirubin, serum AST, serum ALT, MELD score, MELD-Na score, and AARC score were statistically significant (p<0.05) [Table 8]

DISCUSSION

The majority of 10(71.4%) patients belonged to the age group of <50 years in the PLEX group and 8(57.1%) in the standard medical therapy group. The mean age was found 41.7±12.2 years in the PLEX group and 44.6±9.2 years in the standard medical therapy group. The minimum age was 23 years and the maximum 65 years. In a study, the mean age was observed 52 years in the PLEX group and 53 years in the standard medical therapy group conducted by Stahl *et al.*, [8]. Baseline mean serum bilirubin was found 23.6±11.2 in the PLEX group and 18.3±9.1 in the standard medical therapy group. However, bilirubin decreased gradually in each subsequent follow-up in both groups though the differences were statistically significant (p<0.05) between the two groups in the first two follow-ups but not in the third follow-up. At 1st follow-up (At 7days) mean was found 13.1±6.7 in the PLEX group and 19.9±8.3 in the standard medical therapy group. At 2nd follow-up (At 30days) mean was found 9.1±4.6 in the PLEX group and 15.8±6.3 in the standard medical therapy group. In these two visits, serum bilirubin was statistically significant (p<0.05). At 3rd follow-up (At 90 days) mean was found 2.5±1.2 in the PLEX group and 3.5±1.8 in the standard medical therapy group. Significant reductions in bilirubin levels in the first two follow-ups were consistent with a study conducted with PLEX vs standard medical therapy in ACLF by Larsen *et al.*, [6] and Hung *et al.*, [9]. At baseline, the ALT level was much higher in the PLEX group (314.1±505.7) than in the standard medical therapy group (260.6±208.3). However, SGPT also decreased gradually in each subsequent follow-up in both groups, and like bilirubin, the difference was statistically significant (p<0.05) between the two groups in the first two follow-ups but not in the third follow-up. At 1st follow-up (At 7days) mean was found 115.1±48.5 in the PLEX group and 151.3±32.5 in the standard medical therapy group. At 2nd follow-up (At 30days) mean was found 102.5±32.4 in the PLEX group and 138.4±38.3 in the standard medical therapy group. In these two visits, ALT was statistically

significant ($p<0.05$). At 3rd follow-up (At 90 days) mean was found 64.8±47.3 in the PLEX group and 89.8±31.6 in the standard medical therapy group. Significant reductions of ALT levels in the first two follow were consistent with a study conducted with PLEX vs standard medical therapy in ACLF by Larsen *et al.,* [6]. Regarding serum creatinine level, a recent study observed different findings compared with Larsen *et al.,* [6]. In their study, despite similar creatinine at enrolment creatinine level was unchanged from day 0 to day 7 in the HVP group but increased from 226 ± 181 to 286 ± 230 micromol/L in the SMT Group ($p <0.0001$). However, this study observed more reduction of creatinine levels in the SMT group, and when it was compared with the PLEX group in the 2nd and 3rd follow-up, it was statistically significant ($p<0.05$). Maheshwari *et al.,* [10] also observed no significant development of serum creatinine in the Pre and Post PLEX group. However, Cheng *et al.,* [11] also observed an increase in serum creatinine levels after PLEX therapy in ACLF patients. Serum Lactate level was slightly higher at baseline in the PLEX Group (2.9±2.2) than the standard medical therapy Group (2.0±1.0). And lactate level remained high in each follow-up and there was no statistical significance between the two groups, which was consistent with the observation of Larsen *et al.,* [6] and Stahl *et al.,* [8]. Though these studies observed significant differences in the reduction of INR between two groups but current study was not consistent with those observations.15 patients expired in this series. Out of them, 6 patients were in the PLEX group. On the other hand, 9 patients were in the standard medical therapy group. The majority of the causes of death were variceal hemorrhage in this study which findings were not similar in another study conducted with PLEX vs control in ACLF by Yue-Meng *et al.,* [12], where the most common cause of death was hepatic encephalopathy. In the present study, 8 out of 14 patients (57.1%) endured at the end of 90 days of follow-up in the PLEX group. Whereas, 5 out of 14 patients (35.7%) survived in the standard medical therapy group. To observe the possible predictors of mortality various baseline clinical & laboratory variables were analyzed. On univariate analysis serum bilirubin, AST, ALT, MELD score, MELD-Na score, and AARC score were found to be significantly different in the two groups. Serum bilirubin and MELD scores were also found significant as a predictor of mortality in studies conducted with PLEX vs control in ACLF by Yue-Meng *et al.,* [12], Xie *et al.,* [13] Yu, JW *et al.,* [14], and Sreeram VV *et al.,* [15].

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community. Moreover, the lack of ICU support during the COVID-19 pandemic may also have increased the mortality rate in patients with ACLF.

CONCLUSION

This study concludes that serum bilirubin, serum AST, serum ALT, MELD score, MELD-Na score, and AARC score can act as predictors of short-term mortality rate in ACLF after plasma exchange and standard medical therapy.

RECOMMENDATION

This study recommends utilizing serum bilirubin, AST, ALT, MELD score, MELD-Na score, and AARC score to predict short-term mortality in ACLF patients. Further studies should be conducted involving a large sample size, multiple centers, and for a longer duration in this context to get robust data.

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Conflict of Interest: None declared.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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