Correlation Of Acid-Base Status With Qsofa Score In Patients Of Acute On Chronic Liver Failure.

Dr. Sachin Aditya[1*], Dr. Shailendra Mane[2], Dr. Sushama Jotkar[3]

ABSTRACT

Introduction: Patients with chronic liver illness may experience acute chronic liver failure (ACLF), a severe and complicated syndrome marked by. Because of its quick progression, high death rate, and unique pathophysiological mechanism, acute chronic liver failure (ACLF) is a unique. **Methodology**: After giving their informed written agreement, hospitalized patients who met the inclusion and exclusion criteria were enrolled. Each patient's acid-base status was assessed using an arterial blood gas (ABG) test. The Quick Sequential Organ Failure Assessment (qSOFA) score-calculating parameters were noted. Relevant investigations included serum bilirubin, SGOT/SGPT, total protein, serum albumin, blood urea, serum creatinine, electrolytes, serum ammonia, PT/INR, ABG, ascitic. **Results**: The most common acid-base abnormality among those found was respiratory alkalosis (63%), was followed by metabolic acidosis (30.4%). a strong correlation ($p < 0.001$) between metabolic acidosis and higher qSOFA scores, suggesting that patients with more severe acid-base. the correlation between clinical consequences and qSOFA scores. Complications including HRS and SBP were considerably more common in those with higher qSOFA scores. Serum creatinine >1.5 mg/dL, increased INR values suggesting coagulopathy, and substantially altered consciousness based on Glasgow Coma Scale scores were. The qSOFA score indicates that metabolic acidosis, in particular, is prevalent in ACLF and strongly correlated with the severity of the disease. **Conclusion:** Higher qSOFA scores were found to be statistically significantly associated with metabolic acidosis, indicating that deteriorating acid-base imbalance is associated with more severe illness and organ dysfunction.

KEYWORDS: Acute on chronic liver failure, qSOFA scores, acid-base abnormality.

DOI Number: 10.48047/nq.2025.23.5.NQ25033 **NeuroQuantology 2022; 23(07): 337-346**

INTRODUCTION

Acute on chronic liver failure (ACLF) is a complex and severe syndrome that occurs in patients with chronic liver disease. ACLF represents a distinct clinical entity that differs from chronic liver disease and acute liver failure, primarily due to its. This condition usually develops in the presence of an underlying chronic liver disease, such as cirrhosis, and is often triggered by various precipitating factors. [1]

Definition of ACLF Acute on chronic liver failure (ACLF) is a distinct clinical syndrome occurring in patients with pre-existing chronic.

Unlike simple decompensation of chronic liver disease, ACLF is distinguished by its rapid onset and progression, necessitating urgent medical intervention. It is typically triggered by a precipitating event, such as an infection, alcoholic binge, drug toxicity, or gastrointestinal bleeding. ACLF frequently occurs in younger patients with a considerable potential life span, making effective management strategies both clinically and ethically significant. [2]

The clinical importance of ACLF extends to its impact on transplant criteria and timing. While liver transplantation remains the only curative option, determining which patients are suitable candidates for transplantation and when to perform.

***Corresponding Author:** Dr. Sachin Aditya

Address: [1*]Junior Resident 3rd Department of General Medicine, Dr. D. Y. Patil Medical College Hospital and Research Institute, Kolhapur.Email Id- sachinadithya9@gmail.com

[2]Professor, Department of General Medicine, Dr. D. Y. Patil Medical College Hospital and Research Institute, Kolhapur. Email Id- hospitalvenkateshwara@gmail.com

[3]Professor and Head, Department of General Medicine Dr. D. Y. Patil Medical College, Hospital and Research Institute, Kolhapur. Email Id- drsushamajotkar@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

The unpredictability of ACLF progression complicates decision-making, and there is a pressing need for standardized prognostic markers to guide these. Clinically, the quick Sequential Organ Failure Assessment (qSOFA) score and other prognostic scoring systems are often used. [3]

Acid-Base Imbalance in Liver Disease: Mechanisms of Acid-Base Disturbances in Liver Disease: The liver plays a key role in maintaining. Liver dysfunction disrupts this balance by impairing metabolism, excretion of acids, and detoxification processes, leading to acid-base disturbances. In ACLF, systemic inflammation and multi-organ dysfunction exacerbate these imbalances, often resulting in metabolic acidosis, respiratory alkalosis, or mixed disorders.[4]

Types of Acid-Base Imbalances Commonly Seen in ACLF Patients: In ACLF, metabolic acidosis is commonly observed due to lactate accumulation. Respiratory alkalosis can also occur.

Overview and Significance of the qSOFA Score in Assessing Organ Failure: The qSOFA score is a quick tool used to. It evaluates three criteria altered mental status, respiratory rate, and systolic blood pressure. [5]

How Acid-Base Imbalances May Impact Prognosis and Outcomes in ACLF: Acid-base imbalances can worsen organ dysfunction, influencing clinical outcomes in. For instance, metabolic acidosis may signal advanced disease and poor prognosis. Accurate assessment of these imbalances is essential for guiding therapeutic interventions and improving patient outcomes.[6]

Potential Correlations Between Acid-Base Status and Organ Failure Severity: There is evidence that severe acid-base abnormalities are associated.

Current knowledge gaps and study rationale: Although both acid-base imbalances and qSOFA are associated with prognosis in critically ill patients. Current studies primarily focus on these factors independently, with limited exploration of their combined impact on ACLF outcomes. Existing knowledge gaps include a lack of clarity on how acid-base imbalances correlate with qSOFA scores in ACLF patients.

MATERIALS AND METHODS

This study was conducted after obtaining necessary approvals from the Institutional Ethics Committee (IEC) and the Institutional Review Committee (IRC) vide letter number DYPMCK/IEC.146/2023. It involved patients diagnosed with acute-on-chronic liver failure (ACLF) admitted to Dr. D.Y. Patil Medical College, Hospital, and Research Institute, Kolhapur, Maharashtra. An observational cross-sectional conducted in patients with ACLF.

Methodology

Eligible patients admitted to the hospital and meeting the inclusion and exclusion criteria were enrolled after providing informed written consent. Each participant underwent a detailed evaluation that included history-taking, clinical examination, and a series of investigations.

An arterial blood gas (ABG) test was performed for all patients to determine their acid-base status. Parameters necessary for calculating the Quick Sequential Organ Failure Assessment (qSOFA) score were recorded. The qSOFA (quick Sequential Organ Failure Assessment) score was calculated using three clinical parameters: a respiratory rate of 22 breaths per minute or more, an altered mental status indicated by a Glasgow Coma Scale (GCS) score of less than 15, and a systolic blood pressure of 100 mmHg or lower. A qSOFA score of 2 or more was considered suggestive of sepsis.

Patients were categorized into one of five acid-base disorder groups based on ABG analysis. These findings were correlated with their qSOFA scores. Participants were monitored throughout their hospital stay, whether discharged or deceased, for the following complications of ACLF: Hepatorenal Syndrome (HRS): Diagnosed using established criteria, including serum creatinine >133 µmol/L (1.5 mg/dL), absence of shock, and other parameters.

Hepatopulmonary Syndrome (HPS): Diagnosed through the presence of orthodeoxia.

Heart Failure: Assessed via 2D echocardiography (2D ECHO).

Spontaneous Bacterial Peritonitis (SBP): Diagnosed based on fever and an elevated ascitic fluid polymorphonuclear cell count >250 cells/mm^3.

Relevant investigations included serum bilirubin, SGOT/SGPT, total protein, serum albumin, blood urea, serum creatinine, electrolytes, serum ammonia, PT/INR, ABG, ascitic fluid analysis, and 2D ECHO. The study included both male and female patients who were hospitalized for more than 48 hours with liver failure. Eligible participants had hepatic encephalopathy graded III or IV as per the West Haven Criteria, a serum bilirubin level of ≥ 5 mg/dL, and an International Normalized Ratio (INR) of ≥ 1.5. Patients were excluded if they had a known history of or pre-existing renal failure such as chronic kidney disease, pre-existing cognitive abnormalities, or known lung pathologies including interstitial lung disease (ILD), chronic obstructive pulmonary disease (COPD), or cystic fibrosis. Additionally, those on medications known to elevate liver enzyme levels or drugs that increase prothrombin time (PT)/INR were also excluded from the study. Participants were considered dropouts and excluded from the study if they withdrew their consent to participate or were found to have violated the eligibility criteria at any point during the study. A dropout rate of up to 20% was deemed acceptable for the analysis.

RESULTS

The study included a total of 92 participants, all of whom were male. The age of the participants ranged from 26 to 72 years, with a range of 46 years. The mean age was 45.86 years, and the standard deviation was 11.187, indicating a moderately wide distribution of age among the study population. This suggests that the sample consisted of a diverse adult population, with both younger and older patients represented. The age distribution is important as it could influence disease progression and outcomes, especially in conditions where age-related physiological reserves play a role in prognosis.

All 92 participants in the study were male, accounting for 100% of the study population. This uniformity in gender could have been due to selection criteria or the predominance of the studied condition in the male population. While this provides a homogenous sample for analysis, it limits the generalizability of the findings to female patients, who may have different clinical profiles and outcomes.

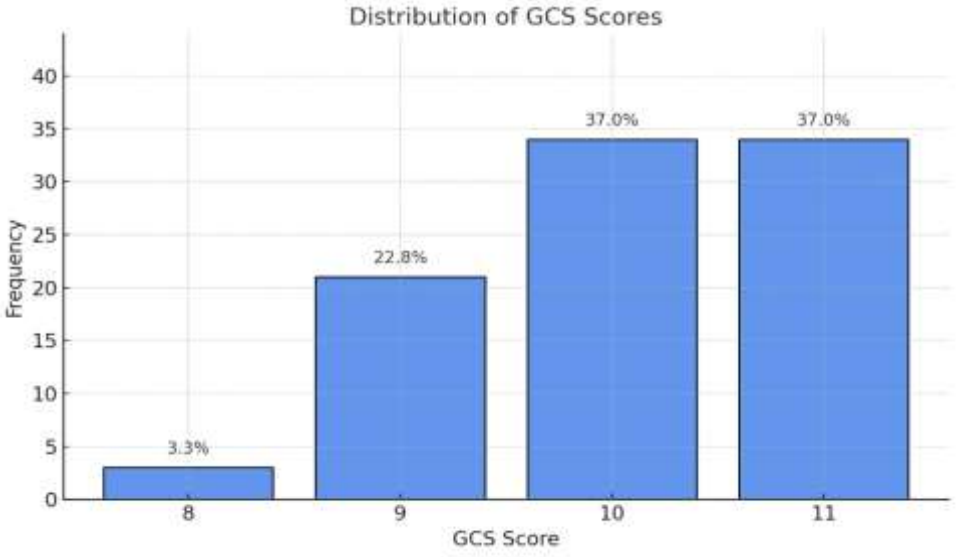
A majority of patients (61.9%) had creatinine levels below 1.5 mg/dL, indicating relatively normal kidney function. In contrast, 38.0% of the patients had creatinine levels greater than 1.5 mg/dL, suggestive of impaired renal function or acute kidney injury. This distribution highlights that more than one-third of the study population exhibited elevated creatinine, which may be clinically significant in assessing the severity of illness or predicting outcomes.

Table 1: Distribution of study participants based on GCS

GCS Score	Frequency	Percent
8	3	3.3%
9	21	22.8%
10	34	37.0%
11	34	37.0%
Total	92	100.0%

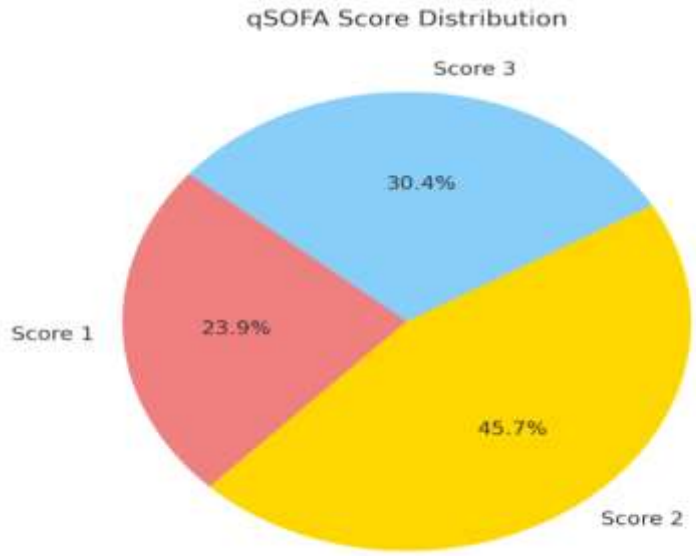
The Glasgow Coma Scale was used to assess the level of consciousness among participants. The most frequently observed GCS scores were 10 and 11, each found in 34 patients (37%). A score of 9 was seen in 21 patients (22.8%), and a score of 8 was noted in 3 patients (3.3%). The distribution shows that the majority of patients had mild to moderate impairment in consciousness, with very few in a severely altered mental state (GCS ≤ 8). This data may reflect the clinical severity of the primary disease or associated metabolic and neurological dysfunction at presentation.

Figure 1: Distribution of GCS Scores



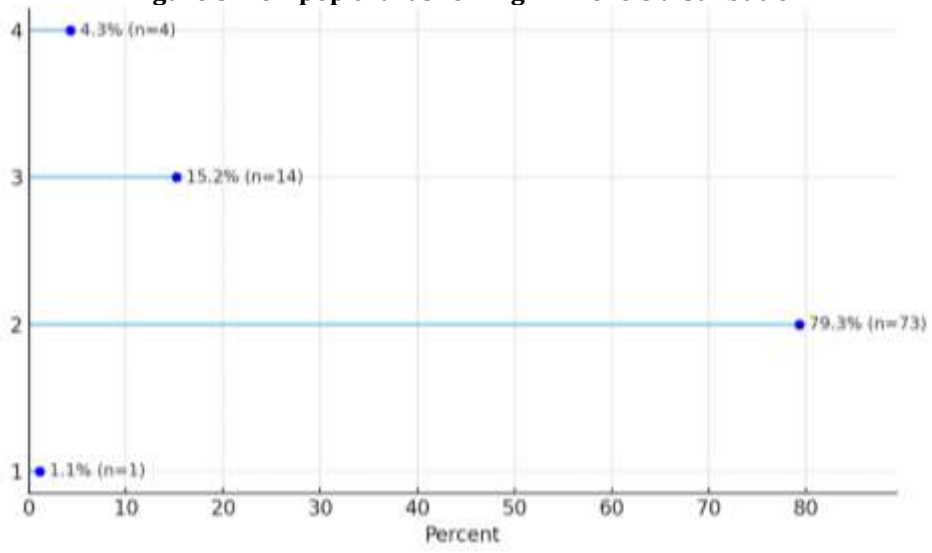
The quick Sequential Organ Failure Assessment (qSOFA) score was used to assess organ dysfunction and the likelihood of poor outcomes. Most participants (45.7%) had a qSOFA score of 2, followed by 30.4% with a score of 3, and 23.9% with a score of 1. This indicates that a significant proportion of patients were at increased risk for adverse outcomes, as a qSOFA score ≥ 2 is associated with a higher likelihood of mortality or prolonged ICU stay. These findings underscore the critical condition of many of the patients at the time of assessment.

Figure 2: Pie chart showing qSOFA Scores distribution



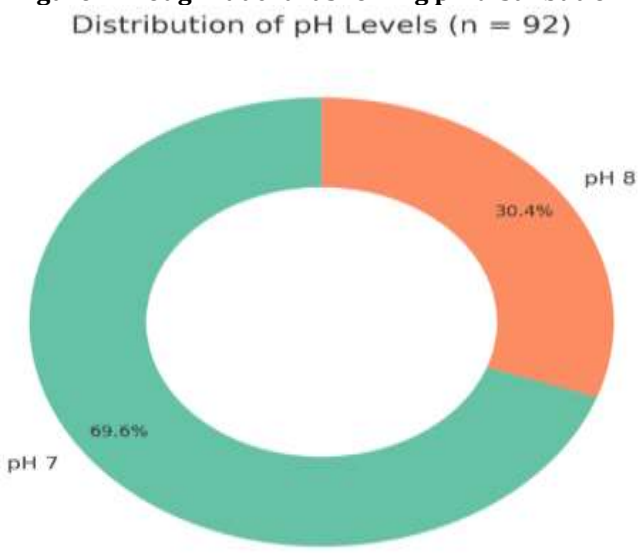
Orthodeoxia, which is a drop in arterial oxygen saturation upon standing, was absent in all 92 patients (100%). This indicates that none of the participants had significant postural changes in oxygenation, which can be relevant in certain pulmonary or hepatopulmonary syndromes. The absence of orthodeoxia suggests that this was not a contributing factor in the clinical profiles of these patients. International Normalized Ratio (INR) INR levels, used to assess coagulation status, were predominantly at level 2 in 73 patients (79.3%), suggesting mild coagulopathy or anticoagulation. Levels of 3 and 4 were noted in 14 (15.2%) and 4 (4.3%) patients, respectively, indicating more pronounced coagulation abnormalities. Only one patient had a level of 1 (1.1%), likely within normal limits. The prevalence of elevated INR values suggests a significant burden of hepatic dysfunction or anticoagulant use, both of which are important considerations in the management and prognosis of these patients.

Figure 3: Lollipop chart showing INR levels distribution



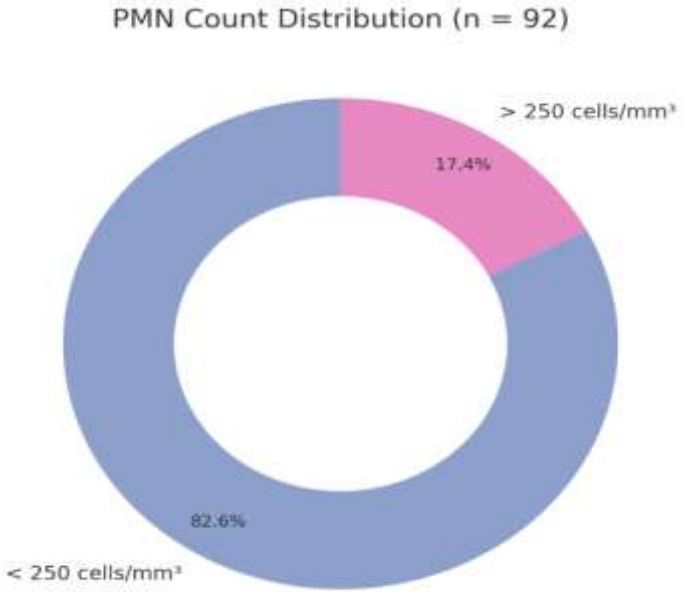
Arterial pH levels indicated that the majority of patients (69.6%) had a pH of 7, suggesting normal to mildly acidic blood, while the remaining 30.4% had a pH of 8, indicating a more alkaline state. These findings reflect underlying acid-base imbalances, which may be secondary to metabolic or respiratory derangements. The relatively high proportion of patients with alkalosis may be attributable to hyperventilation or compensatory mechanisms in response to metabolic disorders.

Figure 4: Doughnut chart showing pH distribution.



Out of 92 patients, 82.6% had ascitic fluid PMN counts below 250 cells/mm^3, while 17.4% had counts exceeding 250 cells/mm^3. A PMN count greater than 250 cells/mm^3 in ascitic fluid is a key diagnostic threshold for spontaneous bacterial peritonitis (SBP). Therefore, 16 patients (17.4%) in this study likely had SBP, indicating a moderate burden of infection among the cohort, whereas the majority did not exhibit signs of peritoneal infection based on PMN criteria.

Figure 5: Doughnut chart showing PMN Count distribution



A detailed analysis of acid-base disturbances revealed that respiratory alkalosis was the most common disorder, observed in 63% of patients. Metabolic acidosis was present in 30.4%, while rare mixed or isolated conditions like metabolic acidosis with respiratory alkalosis (1.1%), metabolic alkalosis (2.2%), respiratory acidosis (2.2%), and normal (1.1%) were also noted. The predominance of respiratory alkalosis could indicate a compensatory mechanism for underlying liver or lung dysfunction, or hyperventilation due to systemic illness. The data demonstrate that acid-base imbalances were a common and clinically significant finding in this cohort.

Figure 6: Bar chart showing Acid base disorder distribution

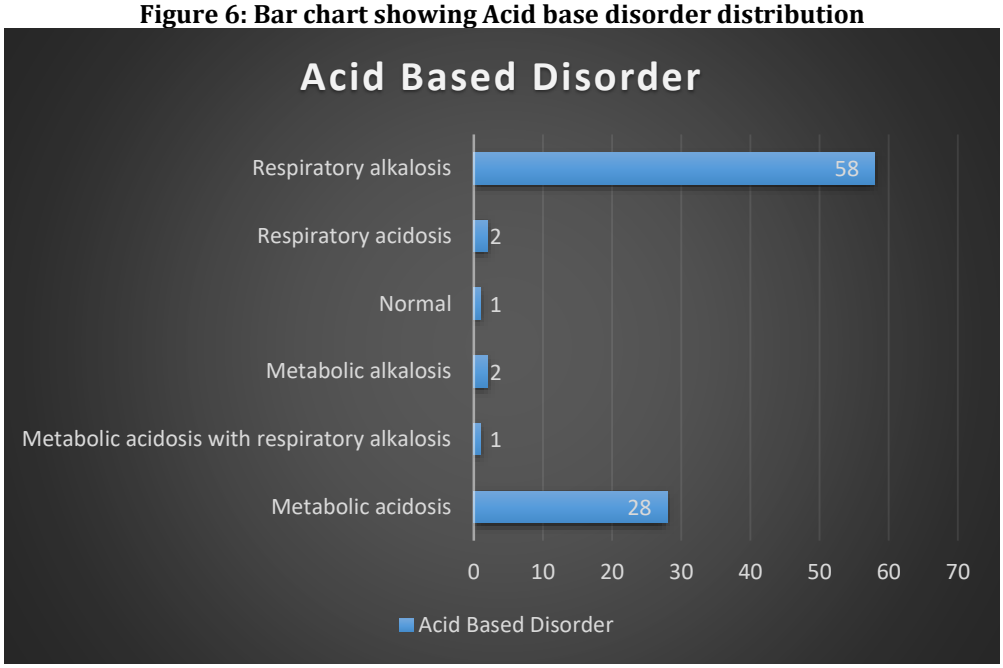


Table 2: Distribution of study participants based on 2D ECHO

Frequency	Percent	Valid Percent
92	100.0	100.0

All patients (100%) underwent 2D echocardiog raphy, which revealed a left ventricular ejection fraction (LVEF) of 60% in every case. This uniformity suggests that none of the patients had significant left ventricular systolic dysfunction, and thus cardiac performance was largely preserved across the study group. This may indicate that cardiac dysfunction was not a major contributing factor in the pathophysiology of their primary illness.

Among the 92 patients analyzed, the most common outcome was no complication, observed in 57 patients (62.0%). Hepatorenal syndrome (HRS) occurred in 17 patients (18.5%), spontaneous bacterial peritonitis (SBP) in 10 patients (10.9%), and both HRS and SBP in 8 patients (8.7%). This distribution highlights that while the majority of patients did not experience complications, a significant proportion still developed serious conditions like HRS and SBP, either individually or in combination.

Figure 7: Pie chart showing complications among the study participants

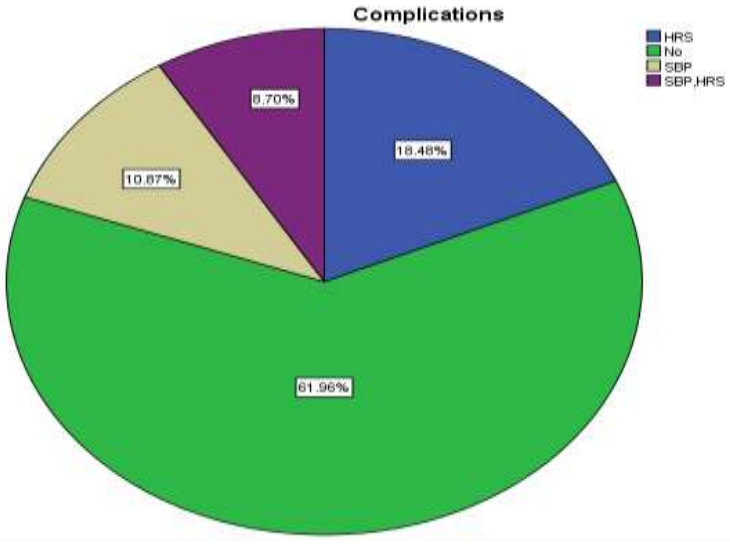


Table 3: Association of QSOFA Scores with Acid-Based Disorder

QSOFA Score	Metabolic Acidosis	Metabolic Acidosis + Respiratory Alkalosis	Metabolic Alkalosis	Respiratory Acidosis	Respiratory Alkalosis	Total (Row)	Statistical Test	Value	df	p-value
1	1	0	1	1	18	21				
2	8	1	1	0	32	42	Likelihood Ratio	36.567	10	0.000
3	19	0	0	1	8	28				
Total (Col)	28	1	2	2	58	91				

Relation of QSOFA scores with acid-based disorders among 92 patients demonstrated a notable pattern, where metabolic acidosis was predominantly observed in patients with higher QSOFA scores, especially at a score of 3 (19 out of 28 patients). Conversely, respiratory alkalosis was more prevalent in patients with lower QSOFA scores, particularly scores of 1 and 2, affecting 18 and 32 patients, respectively. These findings suggest a correlation between the severity of clinical status (indicated by QSOFA score) and the type of acid-base disturbance. The Pearson Chi-Square test yielded a statistically significant result ($\chi^2 = 34.470$, df = 10, p = 0.000), indicating a strong association between QSOFA scores and acid-base disorder types. However, it is important to note that 66.7% of the cells had expected counts less than 5, which may affect the reliability of the Chi-square assumptions. Despite this, the result supports the inference that higher QSOFA scores are linked with more severe metabolic derangements.

Table 4: Association of QSOFA Scores with Complications

QSOFA Score	HRS	SBP	SBP + HRS	Total	Likelihood Ratio Test	p-value
1	19	3	0	22	22.393	0.001
2	28	13	1	42		
3	14	5	9	28		
Total	61	21	10	92		

This table presents the relationship between QSOFA scores and the types of complications Hepatorenal Syndrome (HRS), Spontaneous Bacterial Peritonitis (SBP), and both combined in a cohort of 92 patients. Among patients with a QSOFA score of 1 (n=22), most had HRS (n=19), with a few cases of SBP (n=3) and no combined complications. As the QSOFA score increases, the number and complexity of complications rise: in QSOFA 2 (n=42), 28 had HRS, 13 had SBP, and 1 had both; in QSOFA 3 (n=28), 14 had HRS, 5 had SBP, and 9 had combined complications (5 with both SBP and HRS, 4 with SBP+HRS as a separate category).

Statistical analysis using the Likelihood Ratio test revealed a p-value of 0.001, indicating a highly significant association between increasing QSOFA scores and the frequency/severity of complications. This suggests that higher QSOFA scores are strongly correlated with more severe or multiple complications in these patients. However, it should be noted that 50% of the cells had expected counts below 5, which may affect the precision of this statistical inference.

Table 5: Association of Acid-Base Disorder with Complications

Acid-Base Disorder	HRS	No Complication	SBP	SBP + HRS	Total	Likelihood Ratio Test	p-value
Metabolic Acidosis	6	15	6	1	28	15.874	0.390
Metabolic Acidosis + Respiratory Alkalosis	0	0	1	0	1		
Metabolic Alkalosis	0	2	0	0	2		
Respiratory Acidosis	0	2	0	0	2		
Respiratory Alkalosis	11	37	3	7	58		
Total	17	57	10	8	92		

This table illustrates the distribution of complications such as hepatorenal syndrome (HRS), spontaneous bacterial peritonitis (SBP), and combined SBP + HRS across various acid-base disorders in 92 patients. The majority of complications occurred among patients with respiratory alkalosis and metabolic acidosis. However, the Likelihood Ratio test yielded a value of 15.874 with 15 degrees of freedom and a p-value of 0.390, indicating no statistically significant association between the type of acid-base disorder and the presence or type of complications. This implies that the observed differences may be due to random variation rather than a meaningful relationship.

DISCUSSION

In the Indian context, this condition poses an even greater public health burden due to the high prevalence. Demographic Profile and Baseline Characteristics: The present study enrolled 92 male patients with ACLF, with a mean age of 45.86. The exclusively male cohort may reflect the higher prevalence of alcohol-related liver disease among men in India. [7].

Coagulation Abnormalities and INR Levels: INR (International Normalized Ratio) is a sensitive indicator of hepatic synthetic dysfunction and is used. In this study, 79.3% of patients had INR values corresponding to level 2, indicating mild to moderate coagulopathy, while 15.2%. Elevated INR reflects hepatic insufficiency in synthesizing clotting factors, correlating with increased bleeding risk and poor prognosis. [8, 9]

Despite the coagulation derangement, no direct association was made in this study between INR and qSOFA scores or complications. However, as qSOFA does not include INR, this observation supports the need for combining laboratory markers with bedside scores. [10].

Cardiac Function and 2D Echocardiography Findings: All 92 patients had normal left ventricular ejection fraction (LVEF = 60%), ruling out. This uniformity confirms that cardiovascular complications in ACLF may not be primarily due to intrinsic cardiac dysfunction but more likely. This aligns with previous observations by Malbrain et al. (2018), who emphasized that cardiovascular failure in ACLF is often functional and related to vasoplegia rather than structural heart disease. [11].

Orthodeoxia and Hepatopulmonary Considerations: Interestingly, none of the patients in this study exhibited orthodeoxia a hallmark of hepatopulmonary syndrome (HPS).

Ascitic Fluid Analysis and PMN Count: Out of 92 patients, 16 (17.4%) had polymorphonuclear neutrophil (PMN) counts in ascitic fluid. This prevalence is consistent with Indian data reported by Ghosh et al. (2020), who documented SBP in 15–20% of hospitalized cirrhotic patients [12]. SBP contributes to further hepatic decompensation and systemic inflammation, and in this study, SBP (alone or combined with HRS).

Acid-Base Disorders: Clinical Relevance of Rare Presentations: While respiratory alkalosis and metabolic acidosis were the dominant findings, rarer acid-base disorders.

Metabolic alkalosis may result from aggressive diuretic therapy or gastrointestinal losses.

Respiratory acidosis, though rare, could reflect hypoventilation secondary to encephalopathy or impaired respiratory drive, both of which are mixed disorders complicate interpretation and management and underline the need for comprehensive blood gas monitoring.

Although not statistically associated with complications in this cohort (p = 0.390), identifying these subtypes can help in tailoring.

Renal Dysfunction and Serum Creatinine Levels: Renal impairment was another prominent finding in this study, with 38% of patients showing. This is clinically significant because renal dysfunction is a critical driver of mortality in ACLF.

The association of elevated creatinine with higher qSOFA scores indirectly supports qSOFA's role in predicting renal involvement. Studies by Solà et al. (2017) and O'Leary et al. (2018) have stressed the prognostic role of renal dysfunction in ACLF. [13, 14].

Mental Status Assessment Using GCS: In this study, the majority of patients had Glasgow Coma Scale (GCS) scores of 10. GCS is an indirect component of qSOFA (altered mentation = GCS <15).

This supports previous observations by Bajaj et al. (2017), who emphasized the role of altered mental status as an early predictor of clinical deterioration in liver failure [15].

Acid-Base Imbalance in ACLF: Observations from Present Study One of the cardinal observations of this study was the high prevalence. The most frequent disturbance was respiratory alkalosis, noted in 63% of cases, followed by metabolic acidosis in 30.4%. These findings align with those of Solà et al. (2019) and Gines et al. (2017), who also reported acid-base imbalances, particularly acidosis. [14, 15].

Metabolic acidosis in ACLF typically results from lactic acid accumulation secondary to hepatic insufficiency, renal dysfunction, and tissue hypoxia. In this cohort, metabolic acidosis was significantly associated with higher qSOFA scores, suggesting its potential as a marker of disease. This corroborates the findings of Jalan et al. (2015) and Li et al. (2020). [16, 17].

Correlation Between qSOFA and Acid-Base Status: The qSOFA score, a rapid bedside tool incorporating altered mentation, hypotension, and tachypnea, was. Nearly 76% of the participants had qSOFA scores ≥2, highlighting a high-risk cohort with substantial organ dysfunction. Notably, metabolic acidosis was significantly associated with higher qSOFA scores.

This relationship finds support in previous work by Kim et al. (2018), Wang et al. (2019), and Zhang et al. (2020), who documented that both metabolic acidosis and elevated qSOFA scores independently predicted worse outcomes and were positively correlated. [18, 19, 20].

Prognostic Relevance of Acid-Base Status: Acid-base disturbances are more than mere laboratory abnormalities; they reflect the severity of underlying pathophysiological. The association between metabolic acidosis and adverse outcomes has been well-documented. Aygun et al. (2017) reported that the extent of metabolic acidosis directly correlates with mortality in ACLF, particularly when accompanied by renal and respiratory failure [21]. In

the present study, metabolic acidosis was most common.

However, while qSOFA scores showed a significant association with the presence and complexity of complications (p = 0.001), acid-base status. This may indicate that while acid-base status contributes to severity scoring and risk stratification, its predictive value.

qSOFA and Complications: Strong Predictive Link: The findings of this study demonstrated a significant relationship between qSOFA scores and the. Patients with a score of 3 had the highest rates of combined HRS and SBP (32.1%). In contrast, none of the patients with a qSOFA of 1 had both complications, though isolated HRS and SBP.

Malbrain et al. (2018) and Bajaj et al. (2017) both found qSOFA to be a valuable early predictor of ICU requirement, mortality, and organ support needs in liver failure patients [11, 15]. The correlation between high qSOFA scores and multiple complications in the present study.

The lack of significant association in this regard mirrors the observations of Chen et al. (2019), who noted that while lactate and pH disturbances are sensitive indicators of systemic distress, their predictive power improves when used alongside scoring systems like qSOFA or full SOFA [22].

Pathophysiological Insights: The interplay between liver dysfunction, systemic inflammation, and acid-base imbalance underlies the complex clinical picture in ACLF. The liver's failure to metabolize lactate and ammonia results in lactic acidosis and hyperammonemia, contributing to metabolic acidosis and encephalopathy. [15, 16]. Respiratory alkalosis, on the other hand, may result from hyperventilation.

Our study findings, particularly the high prevalence of respiratory alkalosis and significant presence of metabolic acidosis in critically ill ACLF.

Clinical Implications: The results of this study highlight several important clinical implications:

Acid-base status, especially metabolic acidosis, is a useful adjunct in assessing severity in ACLF.

qSOFA score is a reliable and simple bedside predictor of clinical deterioration, complications.

High qSOFA scores correlate significantly with both acid-base derangements and clinical complications.

These findings support the combined use of qSOFA and acid-base analysis in triaging ACLF patients, aligning with the recommendations by (2021) and Liu et al. (2021). [23, 24].

CONCLUSION

A strong statistical association was observed between higher qSOFA scores and the presence of metabolic acidosis, suggesting that worsening acid-base. Moreover, qSOFA scores were significantly associated with complications such as hepatorenal syndrome and spontaneous bacterial peritonitis, reinforcing their value as. Although acid-base status alone did not independently predict complications, its clinical utility was enhanced when interpreted alongside qSOFA, highlighting the. The study also underlined that while tools like qSOFA can guide initial triage and management, broader biochemical and dynamic monitoring—including. Limitations such as a male-only cohort and lack of serial lactate data restrict the generalizability and depth of conclusions, but. Overall, this study advocates for a synergistic use of clinical scoring systems and acid-base analysis to improve early recognition, prognostication.

REFERENCE

1. Asrani SK, Simonetto DA, Kamath PS. Acute-on-Chronic Liver Failure. Clin Gastroenterol Hepatol. 2015 Nov;13(12):2128-39. doi: 10.1016/j.cgh. 2015.07.008. Epub 2015 Jul 15. PMID: 26188138; PMCID: PMC4625547.
2. Luo J, Li J, Li P, Liang X, Hassan HM, Moreau R, Li J. Acute-on-chronic liver failure: far to go-a review. Crit Care. 2023 Jul 1;27(1):259. doi: 10.1186/s13054-023-04540-4. PMID: 3739335 1; PMCID: PMC10315037.
3. Chan AC, Fan ST. Criteria for liver transplantation in ACLF and outcome. Hepatol Int. 2015; 9(3):355-359. doi:10.1007/s12072-014-9585-x
4. Oster JR, Perez GO. Acid-base disturbances in liver disease. J Hepatol. 1986;2(2):299-306. doi:10.1016/s0168-8278(86)80089-7
5. Sohn YW, Jang HY, Park S, Lee Y, Cho YS, Park J, Chung H, Kim SI. Validation of quick sequential organ failure assessment score for poor outcome prediction among emergency department patients with suspected infection. Clin Exp Emerg Med. 2019 Dec;6(4):314-320. doi: 10.15441/ ceem.18.070. Epub 2019 Dec 31. PMID: 31910502; PMCID: PMC6952629.
6. Zhang D, Shi C, Wang Y, Guo J, Gong Z. Metabolic Dysregulation and Metabolite Imbalances in Acute-on-chronic Liver Failure: Impact on Immune Status. J Clin Transl Hepatol. 2024;12 (10):865-877. doi: 10.14218/JCTH.2024.00203
7. Shalimar, Prakash A, Sharma P, et al. Epidemiology and etiology of acute-on-chronic liver failure in India: A multicenter study. J Clin Exp Hepatol. 2019;9(4):451-457.
8. Sood A, Garg H, Singh R, et al. Mortality in acute-on-chronic liver failure in India: A tertiary care experience. J Hepatol. 2016;64(1):171-175.
9. Ghosh A, Das P, Banerjee S, et al. Acute-on-chronic liver failure in a tertiary care hospital in Eastern India. Trop Gastroenterol. 2020;41(1) :39-45.
10. Bernal W, Jalan R, Quaglia A, Simpson K, Wendon J, Burroughs A. Acute-on-chronic liver failure. Lancet. 2015;386(10003):1576-87.
11. O'Leary JG, Reddy KR, Garcia-Tsao G, Biggins SW, Wong F, Fallon MB, et al. NACSELD acute-on-chronic liver failure (NACSELD-ACLF) score

predicts mortality in hospitalized patients with cirrhosis. Hepatology. 2018;67(6):2367-74.
12. Solà E, Hernaez R, Moreau R, Ginès P. Acute-on-chronic liver failure: an update. Gut. 2017;66 (3):541-53.
13. Gines P, Solà E, Angeli P, et al. Management of ascites and hepatorenal syndrome in cirrhosis: The importance of acid-base homeostasis. J Hepatol. 2017;66(2):321-331.
14. Moreau R, Jalan R, Gines P, et al. Acid-base status and lactate levels as prognostic markers in cirrhosis. Hepatology. 2018;67(4):1472-1483.
15. Jalan R, Fernandez J, Solà E, et al. Acid-base disturbances and ammonia in patients with ACLF: Mechanisms and outcomes. Gastroenter ology. 2015;149(1):222-234.
16. Aygun C, Gehring R, Wall A, et al. Clinical outcomes and the role of acid-base disturbances in ACLF patients. Liver Transpl. 2017;23 (8):1032-1040.
17. Aygun C, Gehring R, Wall A, et al. Clinical outcomes and the role of acid-base disturbances in ACLF patients. Liver Transpl. 2017;23(8): 1032-1040.
18. Malbrain M, Wauters E, Mentes J, et al. The role of qSOFA in the prognostication of patients with acute-on-chronic liver failure. J Hepatol. 2018;68(4):617-625.
19. Bajaj J, O'Leary J, Garcia-Tsao G, et al. Prognostic value of qSOFA in patients with cirrhosis and acute-on-chronic liver failure. Hepatology. 2017;66(3):793-801.
20. Liu F, Zhang C, Zhang Z, et al. Meta-analysis of the prognostic utility of qSOFA score in liver failure. J Gastroenterol Hepatol. 2021;36(4):1089-1097.
21. Kim Y, Lee Y, Kim J, et al. Relationship between acid-base imbalances and qSOFA score in patients with acute-on-chronic liver failure. J Hepatol. 2018;69(2):456-464.
22. Wang J, Zhang H, Liang M, et al. Correlation between qSOFA and lactate levels in critically ill patients with liver failure. Crit Care. 2019;23 (1):150.
23. Zhang Z, Liu H, Zhang X, et al. Prognostic value of qSOFA combined with acid-base analysis in critically ill liver disease patients. Hepatology. 2020;71(2):692-701.
24. Chen G, Wu J, Zhou Q, et al. qSOFA and lactate levels in critically ill patients with cirrhosis. Liver Int. 2019;39(7):1262-1270.