Coagulation Profile in Patients with Liver Disease: A Cross-Sectional Study from a Tertiary Care Hospital

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Abstract

Background: Liver disease is a major public health issue globally, and it significantly impacts coagulation due to the liver's role in synthesizing clotting factors. Despite its importance, data on coagulation profiles among patients with liver diseases are limited in Pakistan.

Objective: To assess the frequency and severity of coagulopathy in patients with liver diseases presenting to Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, and to determine its association with disease severity.

Methodology: A cross-sectional study was conducted from January to June 2024 at Sheikh Zayed Medical College/Hospital, Rahim Yar Khan. A total of 100 adult patients (≥25 years) diagnosed with various liver diseases were enrolled. Complete blood count (CBC), prothrombin time (PT), and activated partial thromboplastin time (aPTT) were assessed. Disease severity was evaluated using the Child–Pugh classification. Data were analyzed using SPSS version 25.

Results: Of the 100 participants, 58% were male. Thrombocytopenia was observed in 70% of patients, prolonged PT in 59%, and prolonged aPTT in 42%. Coagulopathy was more frequent in patients with higher Child–Pugh scores. Severe thrombocytopenia (<50,000/μL) was present in 34% of patients, while 26% had PT >18 seconds. Significant association were found between coagulation abnormalities and disease severity ($p < 0.05$).

Conclusion: This study demonstrates a high prevalence of coagulopathy in patients with liver diseases, especially in those with advanced liver dysfunction. Routine assessment of coagulation parameters should be integrated into the management of liver disease patients to guide clinical decision-making and improve outcomes.

Keywords: Child-Pugh score, Coagulopathy, Liver disease, Platelet count, Prothrombin time.

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Introduction

The liver plays a central role in hemostasis by producing most of the clotting factors, including fibrinogen, prothrombin, and factors V, VII, IX, X, XI, and XII, as well as anticoagulant proteins such as antithrombin III and protein C.[1] In liver disease, synthetic function is impaired, leading to reduced levels of these factors, which predispose patients to both bleeding and thrombotic complications.[2] Liver disease remains a significant cause of morbidity and mortality worldwide, particularly in low- and middle-income countries like Pakistan.[3] Chronic hepatitis B and C, alcohol-related liver disease, and non-alcoholic fatty liver disease are common causes of liver dysfunction in South Asia.[4] The World Health Organization (WHO) estimates that over 12 million people in Pakistan suffer from chronic liver disease, with increasing incidence rates due to lifestyle changes and lack of awareness.[5] Despite the critical role of coagulation assessment in managing liver disease, there is a paucity of local data regarding the frequency and pattern of coagulopathy in this population.[6] Most studies have been conducted in Western populations or focused on specific etiologies such as cirrhosis or hepatocellular carcinoma (HCC).[7-8] However, the epidemiology of liver disease in Pakistan differs due to high rates of viral hepatitis and malnutrition.[8] Therefore, this study aimed to evaluate the coagulation profile in patients with various types of liver diseases at a tertiary care hospital in Rahim Yar Khan, Punjab, Pakistan, and correlate coagulation abnormalities with disease severity.

Methodology

This cross-sectional analytical study was conducted from January to June 2024 at the Hematology Section of the Pathology Department and Medical Wards of Sheikh Zayed Medical College and Hospital, Rahim Yar Khan. The study was carried out after obtaining ethical approval from the Institutional Review Board

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(IRB) of the hospital (Ref. No. 198/IRB/SZMC/SZH Dated: 30-10-2023). A total sample size of 100 participants was calculated at 0.95 confidence level, expected proportion of 0.785,[9] and 0.05 margin of error. Non-probability consecutive sampling was employed to enroll eligible patients who met the inclusion criteria. Participants included were adults aged 25 years or older with a confirmed diagnosis of liver disease (e.g., hepatitis, cirrhosis, hepatocellular carcinoma) and who had voluntarily consented to participate in the study. Patients with inherited coagulation disorders, those on anticoagulant therapy, or those with concurrent hematological malignancies were excluded from the study.

After obtaining informed written consent, data were collected through a structured questionnaire that captured demographic and clinical information. Blood samples were drawn from each participant for laboratory analysis, including complete blood count (CBC), prothrombin time (PT), and activated partial thromboplastin time (aPTT). All tests were performed in the hospital's pathology laboratory following standardized protocols. Definitions used for coagulation abnormalities included: thrombocytopenia as platelet count <150,000/μL, severe thrombocytopenia as <50,000/μL, prolonged PT as >14.5 seconds, severe PT prolongation as >18 seconds, and prolonged aPTT as >35 seconds. Disease severity was assessed using the Child–Pugh classification system, categorizing liver dysfunction into Class A (mild), Class B (moderate), and Class C (severe). Data were entered and analyzed using IBM SPSS version 25. Descriptive statistics were computed for all variables, expressed as frequencies, percentages, means, and standard deviations where appropriate. The Chi-square test was applied to determine the association between coagulation abnormalities and the severity of liver disease, and a p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients with liver disease were included in this cross-sectional study. The demographic and clinical characteristics of the participants showed that the majority of participants were male, accounting for 58% of the patients, while females comprised 42%. The mean age of the study population was 47.2±12.4 years. More than half of the participants, 58% belonged to urban areas, whereas 42% were from rural regions. A significant proportion of the patients 72% had a history of chronic hepatitis B or C infection. (Table-I)

Table I: Demographic and clinical characteristics of study participants (n=100)

Variable	Category	Frequency (%)
Gender	Male	58 (58%)
	Female	42 (42%)
Age (years)	Mean ± SD	47.2 ± 12.4
Residence	Urban	58 (58%)
	Rural	42 (42%)
Hepatitis B/C Infection History	Positive	72 (72%)
	Negative	28 (28%)

The distribution of liver disease etiology showed that cirrhosis was the most common diagnosis, observed in 45% of patients. Chronic viral hepatitis accounted for 30% followed by alcoholic liver disease in 15%. Non-alcoholic fatty liver disease was present in 7%, while hepatocellular carcinoma was the least frequent diagnosis, identified in only 3% of participants. (Table-II)

Table-II: Distribution of liver disease etiology (n=100)

Etiology	Frequency (%)
Cirrhosis	45 (45%)
Chronic Viral Hepatitis	30 (30%)
Alcoholic Liver Disease	15 (15%)
Non-Alcoholic Fatty Liver Disease	7 (7%)
Hepatocellular Carcinoma	3 (3%)

Coagulation profiles of the patients revealed that thrombocytopenia was the most frequent coagulation abnormality, found in 70% of patients, with 34% having severe thrombocytopenia (platelet count <50,000/μL). Prolonged prothrombin time (PT) was observed in 59% and among these 26% had severe prolongation (>18 seconds). Similarly, 42% of patients showed prolonged activated partial thromboplastin time (aPTT), indicating widespread coagulopathy among individuals with liver disease. (Table-III)

Table III: Coagulation profile of patients with

liver diseases (n=100)

Coagulation Parameter	Abnormality	Frequency (%)
Platelet Count	Thrombocytopenia (<150,000/µL)	70 (70%)
	Severe thrombocytopenia (50000/µL)	34 (34%)
Prothrombin Time (PT)	Prolonged (>14.5 seconds)	59 (59%)
	Severe prolongation (>18 seconds)	26 (26%)
Activated Partial Thromboplastin Time (aPTT)	Prolonged (>35 seconds)	42 (42%)

The association between coagulation abnormalities and disease severity as classified by the Child–Pugh score showed that patients with more advanced liver dysfunction (Class C) exhibited significantly higher rates of thrombocytopenia compared to those in Class A (75% vs. 50%, p = 0.02). Similarly, prolonged PT was more frequently observed in Class C patients (70%) compared to Class A (40%), with a statistically significant difference (p = 0.01). Likewise, prolonged aPTT was significantly more common in Class C patients (50%) than in Class A patients (30%) (p = 0.03). These findings showed an association between worsening liver function and increased frequency of coagulation abnormalities. (Table IV)

Table IV: Association between coagulation abnormalities and liver disease severity (Child–Pugh Classification)

Coagulation Abnormality	Child–Pugh Class A (Mild)	Child–Pugh Class C (Severe)	P-Value
Thrombocytopenia	15/30 (50%)	22/30 (75%)	0.02
Prolonged PT	12/30 (40%)	21/30 (70%)	0.01
Prolonged aPTT	9/30 (30%)	15/30 (50%)	0.03

Discussion

Our findings indicate a high burden of coagulopathy among patients with liver diseases, with thrombocytopenia being the most common abnormality, followed by prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT). These results are consistent with global literature showing that liver dysfunction significantly impairs the synthesis of clotting factors and platelet production.[10] The liver's central role in hemostasis makes it a critical determinant of coagulation status, and any impairment in its synthetic function predisposes patients to both bleeding and thrombotic complications.[11]

We observed a strong association between coagulation abnormalities and disease severity, as classified by the Child–Pugh score. Patients with more advanced liver disease (Class C) had significantly higher rates of coagulopathy compared to those in Class A. This aligns with findings from previous studies, which have demonstrated that worsening liver function correlates with increasing derangements in PT, aPTT, and platelet counts.[12,13] These results suggest that routine coagulation testing may serve not only as a diagnostic tool but also as a prognostic marker for disease progression.

Unlike some international studies conducted in Western populations, our cohort was relatively younger and showed a high prevalence of viral hepatitis, particularly hepatitis B and C, which reflects the distinct epidemiology of liver disease in Pakistan.[14] Additionally, malnutrition and lack of regular follow-up likely contribute to the severity of coagulopathy observed in this population.[15] These findings underscore the need for tailored public health interventions targeting viral hepatitis prevention and nutritional support for liver disease patients in resource-limited settings.

In resource-constrained environments like ours, PT and aPTT remain the mainstay of coagulation assessment due to their low cost and wide availability. However, newer modalities such as thromboelastography (TEG) and rotational thromboelastometry (ROTEM) offer a more comprehensive view of coagulation dynamics and may better reflect in vivo clot formation and fibrinolysis.[16] Despite their advantages, these technologies are not widely accessible in many parts of South Asia, highlighting the need for cost-effective strategies to improve coagulation monitoring in low- and middle-income countries.

Our study has several limitations. It was a single-center cross-sectional study with a relatively small sample size, which limits generalizability. Longitudinal follow-up would provide valuable insights into the clinical implications of

coagulopathy, including the risk of bleeding episodes or mortality. Self-reported medical histories may have introduced recall bias, and the absence of viral load quantification or fibrosis staging limited our ability to perform detailed subgroup analyses based on disease etiology and progression. Nonetheless, our findings highlight the importance of routine coagulation screening in patients with liver disease, particularly those with advanced stages. Early identification of coagulopathy can guide timely interventions such as platelet transfusions, vitamin K administration, or prophylactic measures before invasive procedures. Our data reinforce the value of integrating coagulation testing into standard care protocols for liver disease management in tertiary care settings in Pakistan and similar regions.

Conclusion

This study demonstrates that coagulopathy is highly prevalent among patients with liver diseases, especially those with advanced liver dysfunction. Routine assessment of PT, aPTT, and platelet counts is essential for timely diagnosis and management. Future research should focus on longitudinal outcomes, cost-effectiveness of coagulation monitoring, and implementation strategies in primary and secondary healthcare settings.

Authors Contribution: FS: Conception of work, Acquisition and Analysis of data and Drafting. **SK:** Acquisition and Analysis of data, Interpretation of data and revising. **FY:** Design of work, Acquisition and Analysis of data**, NA:** Design of work, Acquisition and Analysis of data, **WF:** Design of work, Acquisition, Analysis of data and revising.
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