

# Prevalence of thrombosis in patients with chronic liver disease presenting to a tertiary care health facility of Sindh

Afsheen Ashfaq, Omer Sultan, Inam Khan, Abdul Rabb Bhutto, Seema Gul, Farheen Javed

Jinnah Postgraduate Medical Center, Karachi Pakistan

## ABSTRACT

**Objective:** To identify the prevalence of thrombosis in Chronic liver disease (CLD) patients visiting a tertiary care hospital in Sindh.

**Material and Methods:** The study was a prospective cross-sectional descriptive study done in the Department of Internal Medicine, Jinnah Postgraduate Medical Centre (JPMC), Karachi, within six months. Consecutive sampling was applied in the enrollment of 164 patients aged between 18 and 70 years old with CLD. Demographic data, comorbidities, and the duration of the disease was reported. Clinical assessment was done to determine thrombosis and was verified by Doppler ultrasound. The analysis of the data was done with SPSS version 24. Risk factors were evaluated with the help of logistic regression.

**Results:** The mean age of participants was 49.8 (12.6) years, and 102 (62.2%) patients were male. Hepatitis C infection was the most frequent etiology (92 [56.1%]), followed by hepatitis B infection (47 [28.7%]). Thrombosis was diagnosed in 18 (11.0%) patients, with deep vein thrombosis (DVT) being the predominant type (77.8%). Significant associations were observed with age >50 years ( $p=0.030$ ), diabetes mellitus ( $p=0.041$ ), and CLD duration >5 years ( $p=0.021$ ).

**Conclusion:** Thrombosis is a common issue in CLD patients, which should be subject to clinical attention. This high-risks group may have morbidity reduced by selective thromboprophylaxis.

**Keywords:** Cirrhosis, Chronic liver disease, Doppler ultrasound, Thrombosis, Venous thromboembolism.

This article can be cited as: Ashfaq A, Sultan O, Khan I, Bhutto AR, Gul S, Javed F. Prevalence of thrombosis in patients with chronic liver disease presenting to a tertiary care health facility of Sindh. Pak J Pathol. 2026; 37(3): 189-195. DOI: <https://doi.org/10.55629/pakipathol.v37i3.1040>

## INTRODUCTION

Chronic liver disease (CLD) is still a major health problem worldwide and a major cause of morbidity and mortality. Cirrhosis is the end stage of chronic liver damage and is defined as the presence of ongoing fibrosis, portal hypertension and various systemic complications. The European Association for the Study of the Liver (EASL) has recently given guidance that vascular complications should be monitored in patients with advanced and decompensated cirrhosis because hemostasis can be disturbed – leading to bleeding and thromboembolic events. It is well known that cirrhosis is a hypo coagulable condition, but recent studies indicate that patients with chronic liver disease have a rebalanced but unstable coagulation system, which could make them vulnerable to thrombotic events [1]. In patients with chronic liver disease, venous thromboembolism (VTE), including deep vein

thrombosis (DVT), pulmonary embolism (PE) and portal vein thrombosis (PVT), is an important vascular complication. The American College of Gastroenterology (ACG) Clinical Guideline points out that the hepatic and mesenteric circulation is a clinically important issue in that it may affect disease course and outcomes, particularly portal vein thrombosis [2]. New recommendations regarding vascular liver diseases also highlight the need to be aware of potential coagulation abnormalities in patients with liver disease and the importance of discriminating between a coagulopathy and thrombotic events [3-4].

DVT is becoming evident as a clinically significant complication of cirrhosis. It is linked to a reduction in portal blood flow, endothelial dysfunction, systemic inflammation and changes in procoagulant and anticoagulant factors. Recent recommendations emphasize the need for early diagnosis and adequate management of portal and systemic thrombosis in patients with CLD to minimize their complications [5-6].

Thrombosis in CLD is multifactorial and can be attributed to several patient and disease related factors. [7]. Potential risk factors for thrombosis include advanced age, long duration of liver disease, metabolic disorders (diabetes mellitus) and severity

Correspondence: Dr. Afsheen Ashfaq, Postgraduate Trainee, Jinnah Postgraduate Medical Center, Karachi Pakistan

Email: [drafshleen75@gmail.com](mailto:drafshleen75@gmail.com)

Receiving Date: 18 Aug 2026

Revision Date: 01 Sep 2026

Acceptance Date: 08 Sep 2026



Copyright © 2026. Afsheen Ashfaq, et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License, which permits unrestricted use, distribution & reproduction in any medium provided that original work is cited properly.

of cirrhosis. [8-9]. Recent epidemiologic studies have shown that cirrhosis patients do not have an inhibitory effect on venous thromboembolism and can have clinically important thrombotic events that should be carefully evaluated and managed [10].

Thrombotic complications in chronic liver disease have been increasingly recognized; however, the evidence is largely from Western populations with limited data from south Asian countries including Pakistan. The factors that affect the frequency and predictors of thrombosis may vary depending on the disease, healthcare resources, diagnostic strategies, and patient characteristics. Hence, the objective of this study was to find the prevalence of thrombosis in patients with chronic liver disease at a tertiary care health centre of Sindh and to assess the risk factors of thrombosis in these patients. The results of this study will lead to better identification of high-risk patients and could help in early clinical evaluation of thrombotic complications in chronic liver disease.

## MATERIAL AND METHODS

The research design is a prospective descriptive cross-sectional study that was carried out at the Department of Internal Medicine, Ward I, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from 1<sup>st</sup> January, 2025 to 30<sup>th</sup> June 2025. The Institutional Review Board and Ethics Review Committee of JPMC (ERC No. F.2-81/2025-GENL/469/JPMC dated 8<sup>th</sup> October 2025) gave the ethical approval. This research was according to the Declaration of Helsinki. All participants gave informed consent in written, and data was kept confidential by means of coded data and reporting in the form of aggregates.

Patients with a chronic liver disease (CLD) of at least three months duration were eligible to be considered as adults (18 to 70 years old). The diagnosis of CLD was made through clinical examination and ultrasonography. The patients who had previous history of venous thrombosis were not included. Other exclusion criteria were active malignancy, major abdominal or pelvic surgery in the last four weeks, paralysis or inability to move around a long leg cast, and recent pregnancy or being the postpartum period (less than 12 weeks).

The required sample of 164 participants was determined by WHO sample size calculator with the assumption of a prevalence of venous thrombosis of 4%, an absolute precision of 3%, and a 95% confidence level from an existing literature [16]. The sampling was done using non-probability consecutive sampling.

A structured proforma was used to gather demographic data, the length of CLD, hepatitis B and C, and comorbidity such as diabetes mellitus and hypertension. Immobility, obesity, smoking and active infection are examples of variables that were not systematically captured and were viewed as potential residual confounders.

Clinical examination of lower limbs was done to all participants. The clinical forecast of suspicion of deep vein thrombosis was severe calf pain, limb swelling, tenderness, erythema, or local warmth; formal clinical prediction score was not used. Patients who were clinically suspicious were treated as Doppler ultrasonography of lower limb veins was done by a trained sonographer with GE Healthcare system (USA). Thrombosis was established as a non-existence of the venous flow on Doppler imaging.

Data was analyzed with the help of Statistical Package for Social Sciences (SPSS) 24 version. For continuous variables like age and duration of chronic liver disease (CLD), distribution was assessed and presented as mean  $\pm$  standard deviation (SD) or median with interquartile range (IQR) as appropriate. Categorical variables (such as gender, hepatitis B virus (HBV) infection, hepatitis C virus (HCV) infection, diabetes mellitus, hypertension, and presence of thrombosis) were expressed as numbers and percentages.

The Chi-square test was used to compare between patients with and without thrombosis for categorical variables: age group ( $>50$  years), male gender, diabetes mellitus, hypertension, and CLD duration ( $>5$  years). Fisher's exact test was used in cases where cell counts were inadequate. Comparisons of continuous variables were made using independent sample t test or Mann-Whitney U test based on data distribution. The binary logistic regression analysis was used to find factors associated to thrombosis. Univariate logistic regression p-values of  $<0.25$  were used to include variables in the multivariate logistic regression model. The results were presented as odds ratios (ORs) and 95% confidence intervals (CIs). The analysis was considered statistically significant when p was less than 0.05.

## RESULTS

A total of 164 patients with chronic liver disease (CLD) were enrolled in the study. Table-I shows the demographic and clinical profile of the patients with chronic liver disease (CLD) at the baseline. The mean age of the study population was 49.8 (12.6) years, which mainly consisted of middle-aged people. The majority of patients studied were male (102,

62.2%). The average duration of chronic liver disease was 6.2 (3.4) years, indicating a long course of disease in the patients enrolled. Concerning the etiology of CLD, HCV was the most prevalent with 92 (56.1%) patients followed by HBV with 47 (28.7%). Fourteen patients (8.5%) had non-alcoholic fatty liver disease (NAFLD) and 11 patients (6.7%) had other causes of chronic liver disease. In this study population, the most common underlying cause of CLD was viral hepatitis (HCV and HBV).

Table-II shows the relationship between demographic and clinical features and thrombosis development in the patients with chronic liver disease. A significantly higher frequency thrombosis was observed in patients >50 years of age, with 12 (66.7%) patients with thrombosis and 54 (37.0%) without thrombosis ( $p=0.030$ ). Females were not significantly associated with thrombosis as 11 (61.1%) cases and 91 (62.3%) cases were males and females respectively ( $p=0.910$ ). Significant association was observed between diabetes mellitus and thrombosis; 8 (44.4%) patients with thrombosis and 29 (19.9%) patients without thrombosis had diabetes mellitus ( $p=0.041$ ). Thrombosis was more common among the patients with hypertension (7 [38.9%]) than patients without thrombosis (40 [27.4%]); although this was not statistically significant ( $p=0.310$ ). There was significantly more thrombosis in patients with chronic liver disease duration >5 years with 13 (72.2%) patients with thrombosis and 56 (38.4%) patients with no thrombosis ( $p=0.021$ ). Overall, age > 50 years, diabetes mellitus and duration of chronic liver disease

were significantly associated with thrombosis while gender and hypertension were not. The p-values in Table-II (association of risk factors with thrombosis) were calculated using Chi-square/Fisher's exact test as appropriate.

The univariate logistic regression of factors associated with thrombosis among patients with chronic liver disease is shown in Table-III. The older age group (>50 years) was significantly associated with thrombosis (OR=3.42, 95% CI: 1.24–9.42,  $p=0.018$ ) compared with younger age group ( $\leq 50$  years). Diabetes mellitus was also significantly associated with thrombosis, as diabetic patients had 3.22 times higher odds of thrombosis compared with non-diabetic patients (OR=3.22, 95% CI: 1.16–8.92,  $p=0.025$ ). Likewise, patients with chronic liver diseases for >5 years had the highest probability of thrombosis with OR of 4.18 (95% CI: 1.46–11.97,  $p=0.007$ ). However, male gender was not significantly associated to thrombosis (OR=0.95, 95% CI: 0.36–2.53,  $p=0.910$ ). There were also no statistically significant differences between the presence of hypertension and thrombosis (OR=1.69, 95% CI: 0.63–4.54,  $p=0.298$ ). Univariate logistic regression revealed that age >50 years, diabetes mellitus, and CLD duration >5 years were significant predictors for thrombosis, while gender and hypertension did not significantly predict for thrombosis. Table-III (univariate logistic regression analysis) were obtained from Wald test in logistic regression models.

**Table-I: Baseline characteristics of study population (n=164).**

| Variable                           | Result      |
|------------------------------------|-------------|
| Age (years), Mean (SD)             | 49.8 (12.6) |
| Male gender, n (%)                 | 102 (62.2%) |
| Duration of CLD (years), Mean (SD) | 6.2 (3.4)   |
| HCV infection, n (%)               | 92 (56.1%)  |
| HBV infection, n (%)               | 47 (28.7%)  |
| NAFLD, n (%)                       | 14 (8.5%)   |
| Other causes, n (%)                | 11 (6.7%)   |

**Table-II: Association of risk factors with thrombosis among CLD patients (n=164).**

| Variable              | Thrombosis Present n (%) (n=18) | Thrombosis Absent n (%) (n=146) | Total n (%) | p-value |
|-----------------------|---------------------------------|---------------------------------|-------------|---------|
| Age >50 years         | 12 (66.7%)                      | 54 (37.0%)                      | 66 (40.2%)  | 0.030*  |
| Male gender           | 11 (61.1%)                      | 91 (62.3%)                      | 102 (62.2%) | 0.910   |
| Diabetes mellitus     | 8 (44.4%)                       | 29 (19.9%)                      | 37 (22.6%)  | 0.041*  |
| Hypertension          | 7 (38.9%)                       | 40 (27.4%)                      | 47 (28.7%)  | 0.310   |
| CLD duration >5 years | 13 (72.2%)                      | 56 (38.4%)                      | 69 (42.1%)  | 0.021*  |

Statistically significant at  $p \leq 0.05$

**Table-III: Logistic regression analysis of factors associated with thrombosis in CLD patients (n=164).**

| Variable              | Odds Ratio (OR) | 95% Confidence Interval | p-value |
|-----------------------|-----------------|-------------------------|---------|
| Age >50 years         | 3.42            | 1.24–9.42               | 0.018*  |
| Male gender           | 0.95            | 0.36–2.53               | 0.910   |
| Diabetes mellitus     | 3.22            | 1.16–8.92               | 0.025*  |
| Hypertension          | 1.69            | 0.63–4.54               | 0.298   |
| CLD duration >5 years | 4.18            | 1.46–11.97              | 0.007*  |

Statistically significant at  $p \leq 0.05$

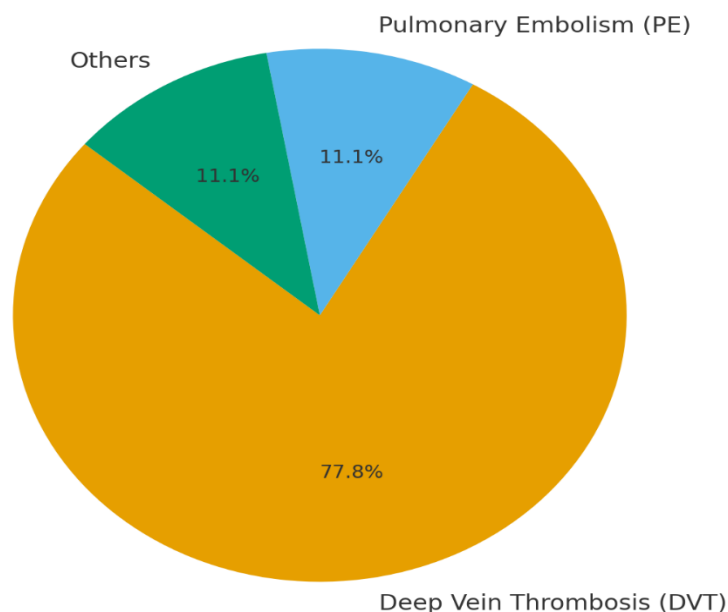


**Figure-I: Distribution of thrombosis types in CLD patients.**

## DISCUSSION

Out of 164 patients with chronic liver disease (CLD), thrombosis was found in 18 patients or 11.0% of patients, most of whom developed deep vein thrombosis (DVT). This discovery is consistent with the knowledge that CLD is not a thrombosis-protective protein. As per International Society on Thrombosis and Haemostasis the haemostatic state in liver disease is rebalanced, with procoagulant and anticoagulant mechanisms being simultaneously affected. This balance is fragile and may shift towards bleeding or thrombosis according to the clinical circumstances [11].

Thrombosis was also significantly associated with diabetes mellitus in our study (unadjusted OR 3.22). This finding is in general agreement with the systematic review and meta-analysis by Li *et al.*, that showed association of diabetes mellitus and portal vein thrombosis in cirrhosis patients. Their results, however, were portal vein thrombosis, and in our population, DVT prevailed. The results thus suggest that the metabolic comorbidities are relevant, but are not necessarily directly comparable estimates of risk. Several haemostatic abnormalities interact to give rise to the biological basis of thrombotic susceptibility in cirrhosis. Changes in procoagulant factors and increased von Willebrand factor are accompanied by reduced concentrations of natural anticoagulants such as protein C, protein S and antithrombin. Lisman *et al.* stressed that these changes make the interpretation of traditional coagulation tests more difficult. Thus, abnormalities in coagulation should not

be assumed to be a sign of protection against thrombotic events [13].

The risk for thrombosis is also influenced by the haemodynamic alterations of liver disease. Turon *et al.* in a prospective study pointed to portal hypertension and decreased portal blood flow as key factors to consider when predicting PVD. Their results were not in favour of haemostatic abnormalities, inflammatory markers being reliable predictors of this outcome. While portal vein thrombosis is different from systemic DVT, this evidence shows the need for an understanding of the mechanisms and predictors of the various thrombotic complications. [14]

Our observed prevalence is to be taken in this context. Cirrhosis is a coagulopathy that is often misunderstood, and bleeding and thrombotic events can occur simultaneously," Roberts said. Variations in severity of disease, patient characteristics, methods of diagnosis and clinical setting may be sources of differences between studies. The prevalence in our population was therefore 11.0 % and is unique to the patients recruited to the study and the procedures used for the assessment of prevalence and should not be inferred as a universal estimate of prevalence in all patients with CLD [15].

In our study, patients with CLD who had a CLD duration > 5 years had higher unadjusted odds of thrombosis. But the length of the disease does not necessarily reflect the severity of the hepatic dysfunction. According to EASL guidelines on non-invasive assessment, it is important to assess the severity of liver disease and prognosis through

appropriate assessment methods. Our findings cannot determine whether or not the duration of disease was independent of the severity of liver disease and associated with thrombosis, since severity measurements were not made in a systematic manner.

The current guidance also allows for a personalised evaluation of vascular complications. No case-based recommendations were given for the treatment of PHT, except for the consideration of the extent, chronicity and clinical consequences of portal vein thrombosis when choosing treatment. These suggestions may help with careful assessment of possible thrombosis, but should not be routinely used for anticoagulation of all CLD patients [17].

In the Baveno VII consensus, the focus is also on the broader management of portal hypertension and cirrhosis, where thrombotic complications will also be taken into consideration. Our results confirm the importance of evaluating the thrombotic risk in the context of the liver disease status. However, the cross-sectional study design and lack of severity measurements preclude inferences about the association between progressive liver disease and thrombosis [18].

For systemic DVT, there are some evidences that can be compared with our results. Abou Yassine *et al.* found the prevalence of DVT in hospitalized cirrhotic patients to be 3.29% and diabetes mellitus to be one of the factors. The lower prevalence than our own could be due to differences in recruitment, population characteristics and ascertainment of outcomes. This association with diabetes offers contextual support for our finding, even though our univariate analysis does not independently show this relationship [19].

A high proportion (1.5%) of venous thromboembolism was reported within 6 months of hospitalization in patients with cirrhosis. This incidence estimate can not simply be compared with our cross-sectional prevalence. They also could not show a significant decrease in venous thromboembolism with pharmacological prophylaxis. We therefore advocate clinical vigilance and individual risk assessment and larger prospective studies before conclusions in relation to preventive treatment are drawn [20].

There are a number of strengths to this study. Firstly, it supplies local data on thrombosis in patients having chronic liver disease obtained from tertiary care healthcare centre in Sindh, Pakistan where evidence is still limited. Secondly, the diagnosis of thrombosis was verified by Doppler ultrasonography, and not just on clinical suspicion. Thirdly, systematic assessment

of demographic and clinical risk factors was possible as there was no selection bias because patients were enrolled sequentially.

## LIMITATIONS

There are certain drawbacks to this study. The first is that the cross-sectional design does not allow to determine temporal relationships between the risk factors and the occurrence of thrombosis. Second, this study was performed in one tertiary care center and may not be applicable to other healthcare environments. Third, Doppler ultrasonography was primarily used for diagnosis, so that pulmonary embolism or thrombosis elsewhere in the vascular system could not have been detected, especially if it was asymptomatic. Fourth, some of the possible confounding factors, such as obesity, smoking status, immobility, inflammatory markers, use of anticoagulants, and severity scores of cirrhosis were not examined systematically. Lastly, the number of thrombosis cases was small, which may have reduced the statistical power of regression analysis. Larger multicenter prospective studies are suggested to better define the incidence and predictors of thrombosis associated with CLD. Regular evaluation of thrombotic risk factors, such as liver disease severity, diabetes mellitus, disease duration, and age, may be a useful strategy to identify patients that are at higher risk and should be monitored more closely. Better imaging techniques and universal screening for thrombosis may help detect clinically silent thrombosis.

## CONCLUSION

In this study, thrombosis was observed in 11.0% of the patients with chronic liver disease and the most prevalent thrombotic event was Deep Vein Thrombosis. Thrombosis was significantly associated with older age, diabetes mellitus and chronic liver disease of longer duration. These data reinforce the fact that patients with CLD are not immune to complications of thrombosis and hence should undergo proper risk assessment, especially those who have a longer disease duration or metabolic comorbidities.

## ACKNOWLEDGEMENT

The authors would like to acknowledge the medical and nursing staff of the Department of Internal Medicine, Jinnah Postgraduate Medical Center, Karachi Pakistan, for their cooperation in patient recruitment and data collection.

**CONFLICT OF INTEREST**

None

**GRANT SUPPORT & FINANCIAL DISCLOSURE**

Declared none

**Disclosure**

None

**AUTHORS CONTRIBUTION**

**Afsheen Ashfaq:** Study design, acquisition of data, manuscript drafting, final approval, responsible for every aspect of the research

**Omer Sultan:** Dermatological assessment and interpretation of cutaneous findings, critical review for important intellectual content, final approval, responsible for every aspect of the research

**Inam Khan:** Analysis and interpretation of data, critical review for important intellectual content, final approval, responsible for every aspect of the research

**Abdul Rabb Bhutto:** Acquisition of data, manuscript drafting or review for important intellectual content, final approval, responsible for every aspect of the research

**Seema Gul and Farheen Javed:** Acquisition of data, manuscript drafting or review for important intellectual content, final approval, responsible for every aspect of the research.

**REFERENCES**

1. European Association for the Study of the Liver. EASL clinical practice guidelines on the management of decompensated cirrhosis. *J Hepatol.* 2022; 77(3): 807-24. DOI: <https://doi.org/10.1016/j.jhep.2022.06.002>
2. Simonetto DA, Singal AK, Garcia-Tsao G, Caldwell SH, Ahn J, Kamath PS. ACG Clinical Guideline: Disorders of the hepatic and mesenteric circulation. *Am J Gastroenterol.* 2022; 115(1): 18-40. DOI: <https://doi.org/10.14309/ajg.00000000000000486>
3. Northup PG, Garcia-Pagán JC, Garcia-Tsao G, Intagliata NM, Superina RA, Roberts LN, *et al.* Vascular liver disorders, portal vein thrombosis, and procedural bleeding in patients with liver disease: Updated guidance. *Hepatology.* 2021; 73(1): 366-413. DOI: <https://doi.org/10.1002/hep.31646>
4. Lim JK. Diagnosis and management of portal vein thrombosis in patients with cirrhosis. *Gastroenterol Hepatol (NY).* 2025; 21(11): 711-4. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC12853760/pdf/GH-21-11-711.pdf>
5. Qi X, Han G, Fan D. Management of portal vein thrombosis in cirrhosis. *Nat Rev Gastroenterol Hepatol.* 2014; 11: 434-46. DOI: <https://doi.org/10.1038/nrgastro.2014.36>

6. Tapper EB, Parikh ND. Diagnosis and management of cirrhosis and its complications: current evidence and future directions. *JAMA.* 2024; 329(18): 1589-1602. DOI: <https://doi.org/10.1001/jama.2023.5997>
7. Ginès P, Krag A, Abrales JG, Solà E, Fabrellas N, Kamath PS. Liver cirrhosis. *Lancet.* 2023; 401(10383): 1577-90. DOI: [https://doi.org/10.1016/s0140-6736\(22\)02459-x](https://doi.org/10.1016/s0140-6736(22)02459-x)
8. Moon AM, Singal AG, Tapper EB. Contemporary epidemiology of chronic liver disease and cirrhosis. *Clin Gastroenterol Hepatol.* 2020; 18(12): 2650-66. DOI: <https://doi.org/10.1016/j.cgh.2022.03.044>
9. Faccia M, Santopaolo F, Gasbarrini A, Pompili M, Zocco MA, Ponziani FR. Risk factors for portal vein thrombosis or venous thromboembolism in a large cohort of hospitalized cirrhotic patients. *Intern Emerg Med.* 2022; 17(5): 1327-34. DOI: <https://doi.org/10.1007/s11739-022-02928-8>
10. da Cruz Renó L, Tustumi F, Waisberg DR, Rocha-Santos V, Pinheiro RS, Macedo RA, *et al.* Venous thromboembolism in in-hospital cirrhotic patients: A systematic review. *Front Med (Lausanne).* 2022; 9: 1027882. DOI: <https://doi.org/10.3389/fmed.2022.1027882>
11. Lisman T, Hernandez-Gea V, Magnusson M, Roberts L, Stanworth S, Thachil J, *et al.* The concept of rebalanced hemostasis in patients with liver disease: communication from the ISTH SSC working group on hemostatic management of patients with liver disease. *J Thromb Haemost.* 2021; 19(4): 1116-22. DOI: <https://doi.org/10.1111/jth.15239>
12. Li J, Wang Q, Yang M, Sun X. Metabolic disorders and risk of portal vein thrombosis in liver cirrhosis: a systematic review and meta-analysis. *Turk J Gastroenterol.* 2022; 33(7): 541-53. DOI: <https://doi.org/10.5152/tjg.2022.211022>
13. Lisman T, Caldwell SH, Intagliata NM. Haemostatic alterations and management of haemostasis in patients with cirrhosis. *J Hepatol.* 2022; 76(6): 1291-305. DOI: <https://doi.org/10.1016/j.jhep.2021.11.004>
14. Turon F, Driever EG, Baiges A, Cerdà E, García-Criado Á, Gilabert R, *et al.* Predicting portal thrombosis in cirrhosis: A prospective study of clinical, ultrasonographic and hemostatic factors. *J Hepatol.* 2021; 75(6): 1367-76. DOI: <https://doi.org/10.1016/j.jhep.2021.07.020>
15. Roberts LN. Rebalanced hemostasis in liver disease: A misunderstood coagulopathy. *Hematology Am Soc Hematol Educ Program.* 2021; 2021(1): 485-91. DOI: <https://doi.org/10.1182/hematology.2021000283>
16. European Association for the Study of the Liver. EASL Clinical Practice Guidelines on non-invasive tests for evaluation of liver disease severity and prognosis - 2021 update. *J Hepatol.* 2021; 75(3): 659-89. DOI: <https://doi.org/10.1016/j.jhep.2021.05.025>
17. Davis JPE, Lim JK, Francis FF, Ahn J. AGA clinical practice update on management of portal vein thrombosis in patients with cirrhosis: Expert review. *Gastroenterology.* 2025; 168(2): 396-404.e1.

- DOI: <https://doi.org/10.1053/j.gastro.2024.10.038>
18. de Franchis R, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C. Baveno VII Faculty. Baveno VII—Renewing consensus in portal hypertension. *J Hepatol.* 2022; 76(4): 959-974.  
DOI: <https://doi.org/10.1016/j.jhep.2021.12.022>
19. Abou Yassine A, Abureesh M, Hamadi R, Dahabra L, Alshami M, Liliane D. Predictors of deep venous thrombosis in hospitalized patients with liver cirrhosis in the US. *Cureus.* 2022; 14(3): e23450.  
DOI: <https://doi.org/10.7759/cureus.23450> .
20. Alsheikh M, Kamar K, Kreidieh M, Sasso R, Madala S, Sharma R, *et al.* The incidence of venous thromboembolism and practice of deep venous thrombosis prophylaxis among hospitalized cirrhotic patients. *Gastroenterol Res.* 2022; 15(2): 67-74.  
DOI: <https://doi.org/10.14740/gr1493>