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Original Article

Frequency of Deep Vein Thrombosis in Patients Admitted to General Medical Unit in a Tertiary Care Hospital

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ABSTRACT

Background: Deep vein thrombosis is a major cause of preventable morbidity and mortality among hospitalized patients because of its close relationship with venous thromboembolism and pulmonary embolism. Medical inpatients represent an important at-risk population, yet locally generated data from tertiary care settings remain limited. Objective: To determine the frequency of deep vein thrombosis in patients admitted to the general medical unit of a tertiary care hospital and to examine its distribution across selected demographic and clinical risk factors. Methods: This cross-sectional study was conducted at Pak-Emirates Military Hospital, Rawalpindi, from October 2023 to March 2024. A total of 205 adult patients admitted to the general medical ward were enrolled through non-probability consecutive sampling. Baseline demographics, smoking history, body mass index, comorbidities, and duration of admission were recorded. Patients were assessed daily for suspected deep vein thrombosis, screened clinically using the Wells score, and confirmed by Doppler ultrasonography where indicated. Data were analyzed using SPSS version 20. Results: The mean age was 50.38 ± 7.63 years, and 60.49% of participants were male. Deep vein thrombosis was diagnosed in 12 patients, yielding a frequency of 5.85%. Higher proportions were observed among patients aged ≤50 years (9.28%, p=0.048), smokers (16.28%, p=0.001), and those with chronic liver disease (14.81%, p=0.033). Gender, diabetes, chronic renal failure, and hypertension were not significantly associated. Conclusion: Deep vein thrombosis constituted a meaningful in-hospital burden among general medical patients. Structured risk assessment and strengthened thromboprophylaxis practices may help reduce preventable thromboembolic complications in tertiary care medical wards. Keywords: Deep vein thrombosis, venous thromboembolism, hospitalization, medical ward, thromboprophylaxis.

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INTRODUCTION

Deep vein thrombosis is a major vascular disorder characterized by thrombus formation within the deep venous system, most commonly in the lower limbs, and remains a clinically important cause of preventable morbidity and mortality in hospitalized patients because of its close association with pulmonary embolism and other complications of venous thromboembolism (1,2). The pathophysiology of deep vein thrombosis is multifactorial and involves a complex interaction between endothelial dysfunction, venous stasis, activation of platelets and leukocytes, and dysregulation of coagulation pathways, ultimately promoting thrombus initiation and propagation (3,4). Although these mechanisms are increasingly understood, the clinical burden of thrombosis continues to be substantial, particularly among patients exposed to immobilization, acute medical illness, systemic inflammation, and prolonged hospitalization (5).

A wide range of acquired and inherited risk factors has been associated with deep vein thrombosis, including advanced age, obesity, smoking, diabetes mellitus, hypertension, malignancy, dehydration, thrombophilia, infection, pregnancy, and reduced mobility due to severe illness or hospital admission itself (6,7). Hospitalized medical patients represent a particularly vulnerable group because acute illness often coexists with immobility, metabolic derangement, and multiple comorbid conditions that can synergistically increase thrombotic risk. Previous literature has reported variable frequencies of deep

vein thrombosis and venous thromboembolism among admitted patients, with estimates differing according to study setting, patient population, prophylaxis practices, and diagnostic protocols (8,9). This variability indicates that the burden of disease cannot be assumed to be uniform across institutions and must be evaluated within local clinical contexts.

This issue is especially relevant in low- and middle-income settings, where thromboprophylaxis may not be consistently implemented as part of routine inpatient care and where disease surveillance is often less systematic. In such environments, the true burden of deep vein thrombosis in general medical wards may remain underrecognized despite the potentially fatal consequences of delayed diagnosis or inadequate prevention. While international studies have documented notable inpatient thrombotic risk, locally generated evidence from general medical units in Pakistan remains limited, particularly for non-surgical hospitalized adults managed in routine tertiary-care practice. This represents an important knowledge gap because institution-specific data are necessary to guide risk recognition, optimize preventive strategies, and support the integration of thromboprophylaxis into standard inpatient management pathways (8,10).

The present study was therefore designed to determine the frequency of deep vein thrombosis among patients admitted to the general medical unit of a tertiary care hospital and to examine its distribution across demographic and clinical risk factors. It was hypothesized that deep vein thrombosis would occur in a measurable proportion of hospitalized medical patients and would be more frequent among patients with established thrombotic risk characteristics such as smoking, obesity, and medical comorbidities.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Pak-Emirates Military Hospital, Rawalpindi, over a six-month period from October 2023 to March 2024 after approval from the institutional ethical committee. The study was designed to determine the in-hospital frequency of deep vein thrombosis among patients admitted to the general medical ward and to assess its distribution according to selected demographic and clinical characteristics. A cross-sectional design was considered appropriate because the principal objective was to estimate the burden of a defined clinical outcome within a specified hospitalized population during the study period rather than to establish long-term incidence or causal pathways.

The sample size was calculated using the WHO sample size calculator for a single population proportion with specified absolute precision, based on an anticipated frequency of deep vein thrombosis in hospitalized patients of 15.8%, a 95% confidence level, and an absolute precision of 5%, yielding a required sample of 205 participants. Patients were enrolled through non-probability consecutive sampling from among those admitted to the general medical ward during the study period. Consecutive recruitment was used to reduce arbitrary selection and to enhance feasibility in a busy inpatient setting while maintaining a uniform eligibility framework across all admissions.

Eligible participants included adult patients aged 18 years or older of either gender who were admitted to the general medical ward. Patients with a prior history of venous thromboembolism, those already receiving anticoagulant or antiplatelet therapy, patients with known valvular heart disease, and those with a history of atrial fibrillation were excluded to avoid confounding by pre-existing thromboembolic disease, competing embolic mechanisms, or ongoing pharmacologic thromboprophylaxis. Written informed consent was obtained from all participants before inclusion.

At enrollment, baseline demographic and clinical information was recorded on a structured data collection form. Variables included age, gender, body mass index, smoking history, duration of hospital admission, and comorbid conditions including diabetes mellitus, chronic renal failure, chronic liver disease, and hypertension. Age was recorded in completed years and later categorized for stratified analysis as 50 years or younger and older than 50 years. Body mass index was calculated in kilograms per square meter and categorized as below 30 kg/m² or 30 kg/m² and above. Smoking status was classified

dichotomously as present or absent on the basis of documented history. Duration of hospitalization was recorded in days from admission until discharge or completion of in-hospital follow-up for the purpose of the study. The primary outcome variable was the occurrence of a new episode of deep vein thrombosis during the hospital stay.

Participants were assessed daily during ward rounds for clinical features suggestive of deep vein thrombosis, particularly new-onset swelling of an arm or leg. When such findings were identified, the Wells score for deep vein thrombosis was applied as an initial clinical risk stratification tool, consistent with established diagnostic practice for identifying patients with a high pretest probability of disease (11,12). A Wells score of 2 or greater was considered indicative of sufficient clinical suspicion to warrant diagnostic imaging. In these cases, a consultant radiologist was contacted to perform bedside Doppler ultrasonography of the symptomatic limb for confirmation of deep vein thrombosis. Compression Doppler ultrasonography was selected as the confirmatory modality because of its recognized diagnostic utility and high accuracy in evaluating suspected limb thrombosis (13,14). Only radiologically confirmed cases were classified as having deep vein thrombosis. Following confirmation, patients were started on anticoagulation therapy according to renal status under the supervision of a consultant physician experienced in the management of thromboembolic disease.

Several steps were taken to improve methodological consistency and reduce bias. Uniform eligibility criteria were applied to all participants throughout the study period, and all patients underwent routine daily clinical assessment to minimize differential case detection. The same clinical threshold for further evaluation, based on new limb swelling and Wells score assessment, was used across participants. Confirmation of suspected cases by consultant-performed Doppler ultrasonography reduced the risk of outcome misclassification. Exclusion of patients with previous venous thromboembolism and those already on antithrombotic medication was intended to reduce confounding and ensure that the observed events represented newly identified in-hospital episodes. Stratified analysis by age, gender, body mass index, smoking, and comorbid conditions was planned to explore the distribution of the outcome across relevant clinical subgroups.

Data were entered and analyzed using Statistical Package for the Social Sciences version 20. Quantitative variables were summarized as mean and standard deviation, whereas categorical variables were reported as frequencies and percentages. The frequency of deep vein thrombosis was calculated as the proportion of enrolled patients who developed radiologically confirmed disease during admission. Post-stratification comparisons were performed using the chi-square test to assess associations between deep vein thrombosis and categorical explanatory variables. A p-value of 0.05 or less was considered statistically significant. Data forms were reviewed for completeness before entry to maintain data integrity, and analysis was performed on complete recorded observations available during the admission period. Ethical conduct was maintained throughout the study by ensuring voluntary participation, informed consent, confidentiality of patient information, and use of study data solely for research purposes (15,16).

RESULTS

A total of 205 patients admitted to the general medical ward were included in the analysis. The mean age of the cohort was 50.38 ± 7.63 years, and 108 patients (52.68%) were older than 50 years, whereas 97 (47.32%) were aged 50 years or younger. Males constituted 124 patients (60.49%) and females 81 (39.51%). The mean body mass index was 32.62 ± 6.73 kg/m², with 116 patients (56.58%) having a body mass index of at least 30 kg/m². The mean duration of hospitalization was 13.22 ± 5.31 days. Smoking history was present in 43 patients (20.98%), diabetes in 105 (51.22%), chronic renal failure in 28 (13.66%), chronic liver disease in 27 (13.17%), and hypertension in 111 (54.15%) (Table 1).

During hospitalization, 12 of 205 patients developed radiologically confirmed deep vein thrombosis, corresponding to an overall frequency of 5.85%. This proportion corresponds to an approximate 95%

confidence interval of 2.64% to 9.07%, indicating that while the absolute burden was modest, the event was not rare within the admitted medical population.

When stratified by age, deep vein thrombosis occurred in 9 of 97 patients aged 50 years or younger (9.28%) compared with 3 of 108 patients older than 50 years (2.78%), yielding a statistically significant association (p = 0.048) and an odds ratio of 3.55 (95% CI: 0.93–13.59). By gender, the proportion was higher in females than males, with events in 7 of 81 women (8.64%) and 5 of 124 men (4.03%), although this difference did not reach statistical significance (p = 0.169; OR 2.25, 95% CI: 0.69–7.37). A notable gradient was also observed across body mass index categories, where deep vein thrombosis was detected in 10 of 89 patients with body mass index below 30 kg/m² (11.24%) and in 2 of 116 patients with body mass index of at least 30 kg/m² (1.72%), corresponding to a borderline association (p = 0.054; OR 7.21, 95% CI: 1.54–33.78).

Table 1. Baseline Characteristics of Study Participants (n = 205)

Characteristic	Value
Mean age, years	50.38 ± 7.63
Age ≤50 years	97 (47.32%)
Age >50 years	108 (52.68%)
Male	124 (60.49%)
Female	81 (39.51%)
Mean body mass index, kg/m²	32.62 ± 6.73
Body mass index <30 kg/m²	89 (43.42%)
Body mass index ≥30 kg/m²	116 (56.58%)
Mean duration of hospitalization, days	13.22 ± 5.31
Smoking history present	43 (20.98%)
Smoking history absent	162 (79.02%)
Diabetes present	105 (51.22%)
Diabetes absent	100 (48.78%)
Chronic renal failure present	28 (13.66%)
Chronic renal failure absent	177 (86.34%)
Chronic liver disease present	27 (13.17%)
Chronic liver disease absent	178 (86.83%)
Hypertension present	111 (54.15%)
Hypertension absent	94 (45.85%)

Smoking history showed one of the strongest associations with deep vein thrombosis. Among smokers, 7 of 43 patients (16.28%) developed deep vein thrombosis compared with 5 of 162 non-smokers (3.09%), representing a statistically significant difference (p = 0.001) and an odds ratio of 6.11 (95% CI: 1.80–20.74). Similarly, chronic liver disease was associated with a significantly higher proportion of events, with deep vein thrombosis observed in 4 of 27 affected patients (14.81%) versus 8 of 178 patients without chronic liver disease (4.49%) (p = 0.033; OR 3.70, 95% CI: 1.01–13.55). Although diabetes and hypertension were associated with numerically higher event proportions, these relationships were not statistically significant. Deep vein thrombosis occurred in 8 of 105 diabetic patients (7.62%) versus 4 of 100 non-diabetic patients (4.00%) (p = 0.270; OR 1.98, 95% CI: 0.57–6.92), and in 9 of 111 hypertensive patients (8.11%) versus 3 of 94 normotensive patients (3.19%) (p = 0.135; OR 2.68, 95% CI: 0.71–10.17). Chronic renal failure showed little separation between groups, with deep vein thrombosis in 2 of 28 patients with renal failure (7.14%) and 10 of 177 patients without renal failure (5.65%) (p = 0.754; OR 1.28, 95% CI: 0.26–6.18) (Table 2).

Table 2. Distribution of Deep Vein Thrombosis Across Demographic and Clinical Variables (n = 205)

Variable	Category	DVT, n/N (%)	No DVT, n/N (%)	p-value	Odds Ratio	95% CI
Age	≤50 years	9/97 (9.28%)	88/97 (90.72%)	0.048	3.55	0.93–13.59
	>50 years	3/108 (2.78%)	105/108 (97.22%)		Reference	
Gender	Female	7/81 (8.64%)	74/81 (91.36%)	0.169	2.25	0.69–7.37
	Male	5/124 (4.03%)	119/124 (95.97%)		Reference	
Body mass index	<30 kg/m²	10/89 (11.24%)	79/89 (88.76%)	0.054	7.21	1.54–33.78
	≥30 kg/m²	2/116 (1.72%)	114/116 (98.28%)		Reference	

Variable	Category	DVT, n/N (%)	No DVT, n/N (%)	p-value	Odds Ratio	95% CI
Smoking history	Yes	7/43 (16.28%)	36/43 (83.72%)	0.001	6.11	1.80–20.74
	No	5/162 (3.09%)	157/162 (96.91%)		Reference	
Diabetes	Yes	8/105 (7.62%)	97/105 (92.38%)	0.270	1.98	0.57–6.92
	No	4/100 (4.00%)	96/100 (96.00%)		Reference	
Chronic renal failure	Yes	2/28 (7.14%)	26/28 (92.86%)	0.754	1.28	0.26–6.18
	No	10/177 (5.65%)	167/177 (94.35%)		Reference	
Chronic liver disease	Yes	4/27 (14.81%)	23/27 (85.19%)	0.033	3.70	1.01–13.55
	No	8/178 (4.49%)	170/178 (95.51%)		Reference	
Hypertension	Yes	9/111 (8.11%)	102/111 (91.89%)	0.135	2.68	0.71–10.17
	No	3/94 (3.19%)	91/94 (96.81%)		Reference	

To improve clinical readability, the subgroup comparisons may also be viewed from the perspective of event concentration. Of the 12 total deep vein thrombosis events, 7 cases occurred in smokers, meaning smokers accounted for 58.33% of all observed thrombotic events despite representing only 20.98% of the full cohort. Likewise, patients with chronic liver disease contributed 4 of 12 events (33.33%) while constituting only 13.17% of admissions, and patients aged 50 years or younger accounted for 9 of 12 events (75.00%) despite comprising less than half of the sample. In contrast, patients with body mass index ≥30 kg/m² represented 56.58% of the cohort but contributed only 2 of 12 events (16.67%), underscoring the unexpected inverse pattern seen in the present data. These gradients suggest that the observed thrombotic burden clustered disproportionately within selected subgroups rather than being evenly distributed across all admitted patients.

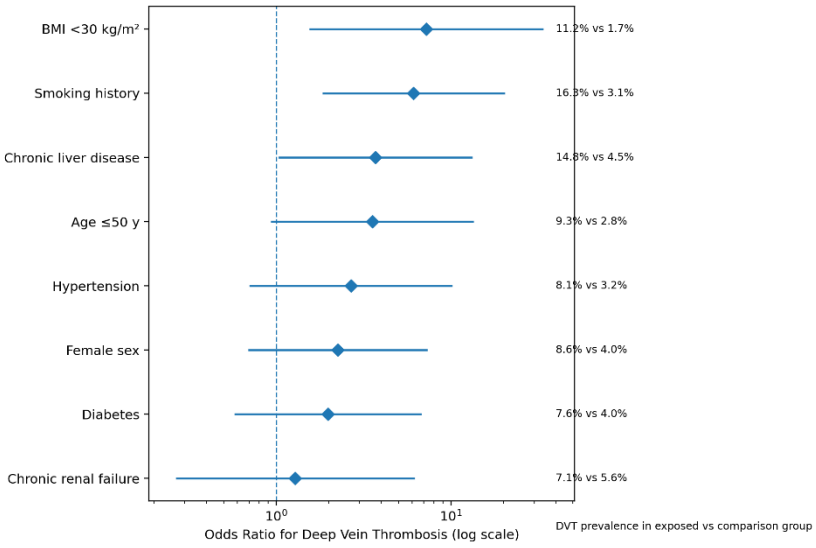

Figure 1 Smoking history demonstrated the strongest observed association with deep vein thrombosis

Among the examined subgroup contrasts, smoking history demonstrated the strongest observed association with deep vein thrombosis, with an odds ratio of 6.11 and a prevalence gradient of 16.3% versus 3.1% in non-smokers. Body mass index below 30 kg/m² also showed a pronounced association, with an odds ratio of 7.21 and event proportions of 11.2% versus 1.7% in those with body mass index ≥30 kg/m², although this estimate was imprecise because of the small number of events. Chronic liver disease was associated with a 3.70-fold higher odds of thrombosis, with event rates of 14.8% versus 4.5%, while age ≤50 years showed a 3.55-fold higher odds with corresponding rates of 9.3% versus 2.8%. Female sex, diabetes, chronic renal failure, and hypertension showed smaller or statistically less stable associations, with confidence intervals crossing unity. Collectively, the pattern indicates that the thrombotic burden in this cohort was concentrated most heavily in smokers, patients with chronic liver disease, and younger admitted adults, whereas several conventional comorbidities showed weaker separation in this dataset.

DISCUSSION

Deep vein thrombosis remains a clinically significant complication among hospitalized patients because even a modest in-hospital event burden may translate into substantial preventable morbidity, prolonged

hospitalization, increased treatment cost, and risk of pulmonary embolism. In the present study, radiologically confirmed deep vein thrombosis was identified in 5.85% of patients admitted to the general medical ward, indicating that approximately 1 in every 17 hospitalized medical patients in this cohort developed this complication during admission. This finding supports the view that venous thromboembolic risk is not confined to surgical or critically ill populations and that general medical inpatients also constitute a meaningful high-risk group requiring careful surveillance and preventive planning. The observed frequency is consistent with the report by Mugeni et al., who documented a prevalence of 5.5% among hospitalized medical and obstetric patients, suggesting that the burden identified in the present setting is plausible and clinically relevant rather than incidental (17). At the same time, the frequency observed here was lower than the rates reported by Zhang et al. and Permpikul et al., who found markedly higher proportions in hospitalized and critical care populations, a difference that may reflect variability in patient acuity, thromboprophylaxis practices, diagnostic thresholds, mobility limitations, and underlying disease severity across institutions and study populations (18,19).

An important strength of the present findings is that the diagnosis of deep vein thrombosis was not based solely on clinical suspicion but was confirmed by Doppler ultrasonography following clinical screening with the Wells score, thereby improving diagnostic specificity. Nevertheless, the pattern of subgroup distribution warrants careful interpretation. One of the most unexpected observations was the significantly higher frequency of deep vein thrombosis among patients aged 50 years or younger. Specifically, 9.28% of patients in the younger age group developed deep vein thrombosis compared with 2.78% among those older than 50 years. This contrasts with the conventional epidemiological expectation that venous thromboembolic risk generally increases with advancing age. Although prior studies have often demonstrated either a positive association with older age or no statistically meaningful age effect, the current pattern suggests that age alone may not have been the dominant determinant of thrombosis in this admitted medical cohort (20). It is possible that younger patients in this sample were hospitalized with more acute immobilizing conditions, pro-inflammatory states, or unmeasured thrombotic predispositions that outweighed chronological age as a risk determinant. Another possible explanation is the influence of the relatively small number of outcome events, which may have amplified subgroup fluctuations. Accordingly, this age-related finding should be interpreted cautiously and verified in larger prospective samples before drawing broad clinical conclusions.

Smoking emerged as one of the most clinically convincing correlates in the present study. Deep vein thrombosis occurred in 16.28% of smokers compared with only 3.09% of non-smokers, with smoking accounting for more than half of all thrombotic events despite representing only about one-fifth of the study population. This marked difference aligns with current evidence indicating that smoking contributes to venous thromboembolism through endothelial injury, inflammatory activation, altered platelet function, and a procoagulant milieu (21). From a clinical standpoint, this finding is particularly relevant because smoking history is easy to identify at admission and may help refine bedside risk recognition in resource-limited wards where formal thrombosis risk scoring is not routinely embedded into admission workflows.

Chronic liver disease was another variable that showed a significant association with deep vein thrombosis in this cohort. Patients with chronic liver disease had an event frequency of 14.81% compared with 4.49% in those without liver disease. While liver disease has historically been misperceived as a purely hemorrhagic condition because of abnormalities in conventional coagulation parameters, contemporary understanding recognizes that these patients may also exist in a fragile rebalanced hemostatic state with susceptibility to thrombosis under specific clinical conditions. The present findings reinforce the need to avoid assuming that chronic liver disease protects against thrombotic events and instead support individualized risk assessment among hospitalized medical patients with hepatic dysfunction.

The relationship between body mass index and deep vein thrombosis in this study also deserves nuanced interpretation. Contrary to the common expectation that obesity would increase thrombotic risk, patients with body mass index below 30 kg/m² had a higher event frequency than those with body mass index of at least 30 kg/m². This inverse pattern diverges from prior literature demonstrating a positive association between obesity and venous thromboembolism (22). Several explanations are possible. First, body mass index in this dataset may not have captured relevant aspects of thrombotic vulnerability such as immobility, body composition, inflammatory burden, or acute disease severity. Second, the number of outcome events was small, making subgroup percentages sensitive to even a few cases. Third, the observed pattern may reflect residual confounding by factors not measured in the study, including reason for admission, level of mobility, severity of infection, hydration status, or exposure to prophylactic measures. For these reasons, the body mass index finding should not be interpreted as evidence against obesity as a thrombotic risk factor, but rather as a dataset-specific observation requiring validation.

Although diabetes mellitus and hypertension were associated with numerically higher frequencies of deep vein thrombosis, these associations did not reach statistical significance. This may indicate either a genuinely weak relationship within this cohort or, more likely, limited statistical power due to the small number of thrombotic events. Both diabetes and hypertension are biologically plausible contributors to endothelial dysfunction and vascular risk, and the direction of the current findings remains consistent with broader literature even in the absence of formal significance. Similarly, chronic renal failure showed only a slight difference between groups, which may again be related to limited sample size or heterogeneity in renal disease severity.

From a practical standpoint, the present study carries important implications for inpatient care in tertiary medical wards. Even though the overall frequency was lower than that reported in some intensive care settings, the burden remains clinically meaningful because deep vein thrombosis is potentially preventable. The data support the routine incorporation of thrombosis risk recognition into ward practice, especially for patients with smoking history, chronic liver disease, and other clinically relevant comorbid profiles. More systematic use of thromboprophylaxis protocols, mobility assessment, and early diagnostic escalation in symptomatic patients may help reduce avoidable thromboembolic complications. In institutions where thromboprophylaxis is inconsistently applied, locally generated evidence such as this can serve as an important catalyst for policy refinement and clinical audit.

The study should also be interpreted in light of its limitations. The cross-sectional design precludes temporal inference beyond the hospitalization period and does not allow evaluation of post-discharge thrombotic events. The use of non-probability consecutive sampling may have introduced selection bias, and the relatively small number of deep vein thrombosis events limited the precision of subgroup estimates. Diagnostic imaging was performed in clinically suspected cases rather than universally across all admissions, which means asymptomatic events may have been missed and the true frequency may have been underestimated. In addition, no multivariable modeling was performed, so residual confounding cannot be excluded. Despite these limitations, the study contributes useful hospital-based data from a setting where local evidence remains limited and underscores the continuing need for vigilance toward venous thromboembolism in general medical inpatients.

CONCLUSION

In conclusion, deep vein thrombosis occurred in 5.85% of patients admitted to the general medical unit of this tertiary care hospital, demonstrating that venous thrombotic events represent a meaningful clinical burden even outside surgical and critical care settings. The event frequency was particularly elevated among smokers, patients with chronic liver disease, and, unexpectedly, younger admitted adults, while diabetes and hypertension showed numerically higher but statistically non-significant frequencies. These findings support the need for structured inpatient risk assessment, timely diagnostic

evaluation of suspected cases, and stronger integration of thromboprophylaxis into routine medical ward practice to reduce preventable thromboembolic complications.

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