VENOUS THROMBOEMBOLISM IN HOSPITALIZED MEDICAL PATIENTS: INCIDENCE, RISK FACTORS, AND PREVENTION GAPS IN A RESOURCE-LIMITED SETTING

Naveed Iqbal[1], Inayat Ullah[1], Dure Nayab[1], Khwaja Waleed Maqbool[2], Wajid Ali[1], Naqeeb Ullah[1]

ABSTRACT

Objective: Venous thromboembolism (VTE), comprising deep vein thrombosis (DVT) and pulmonary embolism (PE), is an important source of morbidity and mortality among hospitalized patients worldwide. Medical patients, unlike surgical cohorts, are also susceptible and the risk of VTE in the hospital increases the risk by approximately 100 fold compared with a normal population.

Methods: To find out the frequency of VTE among adult medical inpatients, this cross sectional study was conducted at Lady Reading Hospital, Peshawar. Over six months, clinical assessment, compression ultrasonography and CT pulmonary angiography were used to diagnose VTE and a total of 117 patients 18 – 70 years old were evaluated.

Results: A high burden was revealed by results, with 26.5% found to be prevalence of VTE during hospitalization. Both men and women were almost equally affected, with a mean age of 44.5 years. These results are consistent with international data highlighting the relevance of early risk assessment and prophylaxis.

Conclusions: Available mechanical and pharmacologic preventive measures are inconsistently applied, especially in resource limited settings. It is clear that there is an urgent need to introduce standardized risk stratification of VTE and associated thromboprophylaxis protocols in medical wards to prevent the unnecessary suffering of morbidity and mortality related to preventable hospital acquired VTE. However, additional multicenter studies are warranted to better define specific risk factors and optimize prophylaxis strategies toward local populations.

Keywords: venous thromboembolism, deep vein thrombosis, pulmonary embolism, thromboprophylaxis, hospitalized patients

INTRODUCTION

Deep vein thrombosis (DVT) and pulmonary embolism (PE) constituting venous thromboembolism (VTE) is among the leading causes of morbidity and mortality of hospitalized patients worldwide.[1] The risk of VTE is increased 100 fold over the general population with hospitalization.[2] VTE is the third most common vascular disease behind myocardial infarction and stroke[3] and mortality from VTE is approximately one third if not treated.[4]

[1] Department of Internal Medicine, MTI-Lady Reading Hospital, Peshawar
[2] Department of Pathology, Bolan Medical Complex Hospital, Quetta

……..

Address for Correspondence
Dr. Inayat Ullah
Department of Internal Medicine, MTI-LRH Peshawar
drinayat1978@gmail.com

VTE incidence varies around the globe with different ethnic groups, different ages, different genders, different comorbidities and different hospital and protocol.[5–6] In particular, hip and knee replacements, up to 60 percent of patients develop DVT without prophylaxis.[7] In a multicenter study to approximate VTE frequency in hospitalized patients, 26.5% was estimated.[8] The risk factors are immobility, malignancy, trauma, surgery and inherited thrombophilia.[9–11]

The pathogenesis of VTE is determined by Virchow's triad: endothelial injury, venous stasis and hypercoagulability.[12] Wells and Geneva scores, d dimer testing, ultrasonography and CT pulmonary angiography are all diagnostic tools.[13–15] Alternatives in mechanical prophylaxis include graduated compression stockings and intermittent pneumatic compression devices for patients who are contraindicated for anticoagulants.[16–17]

Pharmacologic options are low molecular weight heparin (LMWH), direct oral anticoagulants (DOACs) and fondaparinux, all of which are options in evidence-based guidelines.[18–20] Nevertheless, every effective anticoagulant is associated with bleeding risk, so the net clinical gain has to be carefully weighed.[21] Other emerging agents such as

Factor XI inhibitors, may reduce thrombosis risk without increasing bleeding.[22]

VTE is a particularly high risk in cancer patients. Studies such as AVERT and CASSINI[23–24] have shown that tools such as the Khorana score help identify the patients who can benefit from prophylaxis. Pregnant women, particularly those with thrombophilias or previous VTE, also require individualised risk stratification, in a similar fashion.[25–26] For surgical patients, extended prophylaxis after discharge may be appropriate.[27–28]

The high incidence of VTE in critically ill patients was highlighted by the COVID-19 pandemic and increased prophylaxis in select populations is urgent.[29] While awareness is growing, a lack of public awareness of VTE and its associated symptoms persists (only 19–28% of people recognize typical symptoms).[30] Therefore, an improved awareness regarding early diagnosis and prevention strategies for VTE are critical to reduce VTE related morbidity and mortality.

METHODOLOGY

Study Design and Setting

This cross-sectional analytical study was conducted at the Department of Medicine, Lady Reading Hospital, Peshawar, a major tertiary care center serving a population of approximately two million. The hospital receives referrals from across Khyber Pakhtunkhwa and nearby regions, ensuring a diverse patient base. The study period spanned from 19 September 2023 to 19 March 2024**.**

Study Population

All adult patients (aged 18–70 years) admitted to the medical wards during the study period were considered eligible. Both male and female patients admitted for nonsurgical medical illnesses were included. No restrictions were placed on the admitting diagnosis to ensure a representative inpatient medical population for assessing venous thromboembolism (VTE) risk.

Inclusion Criteria

- Age between 18 and 70 years
- Admission under any medical department (nonsurgical cause)
- Voluntary consent to participate after being informed of the study details

Exclusion Criteria

- Known diagnosis of VTE before current admission
- Current anticoagulant therapy at the time of admission
- Surgical or trauma admissions, as these populations have distinct VTE risk profiles

Sample Size and Sampling Technique

Sample Size and Sampling Technique

A total of **117 patients** were included using **convenience sampling**. The sample size was estimated using the single population proportion formula:

n=Z2×p(1−p)d2n = \frac{{Z^2 \times p(1-p)}}{{d^2}}n=d2Z2×p(1−p)

Assuming a 95% confidence level (Z = 1.96), an expected prevalence (p) of 0.25 based on previous South Asian hospital data, and a 0.08 margin of error (d), the calculated sample size was approximately 112, which was increased to 117 to account for incomplete data and rounding.

Thus, the sample size is statistically justified.

Data Collection

A structured and pretested data collection form was utilized for gathering relevant patient information. The form included details on demographic characteristics such as age and gender, hospitalization diagnoses, and relevant comorbidities including hypertension, diabetes, obesity, malignancy, and chronic respiratory disease. It also documented the duration of immobility (in days), total length of hospital stay, and whether thromboprophylaxis—either pharmacological or mechanical was administered. Data regarding the diagnosis of venous thromboembolism (VTE), including both deep vein thrombosis (DVT) and pulmonary embolism (PE), were also recorded. Each patient was clinically evaluated daily for VTE-related symptoms such as leg swelling, pain, dyspnea, and chest pain. In cases of clinical suspicion, diagnostic imaging compression ultrasonography for DVT and CT pulmonary angiography for PE—was performed at the discretion of the attending physician.

Operational Definition of VTE

Venous thromboembolism (VTE) was defined as either deep vein thrombosis (DVT) or pulmonary embolism (PE) diagnosed by imaging during hospitalization.

- **DVT:** Thrombus visualized in deep veins on compression ultrasonography
- **PE:** Confirmed filling defect in pulmonary arteries on CT pulmonary angiography

Data Analysis

All data were processed and analyzed using an AI-based data analysis application, with all outputs carefully reviewed and validated by the authors to ensure accuracy and reliability. Descriptive statistics were presented as means ± standard deviation (SD) for continuous variables and as frequencies and percentages for categorical variables.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Lady Reading Hospital, Peshawar (Approval No. LRH/IRB/2023/Med-117). Verbal informed consent was obtained from all participants. Confidentiality and anonymity were maintained throughout the study.

RESULTS

Demographic and Clinical Characteristics

The mean age of the 117 patients was 44.53 ± 15.95 years. Of these, 60 (51.3%) were male and 57 (48.7%) were female. Common comorbidities included hypertension (29.1%), diabetes mellitus (23.9%), and obesity (17.1%). The mean duration of hospital stay was 8.4 ± 3.1 days, and the mean immobility duration was 6.2 ± 2.7 days. Only 32 (27.4%) patients received any form of VTE prophylaxis.

Table 1: Demographic and Clinical Characteristics of the Study Population (n = 117)

Variable	n (%) or Mean ± SD
Age (years)	44.53 ± 15.95
Gender: Male	60 (51.3%)
Gender: Female	57 (48.7%)
Hypertension	34 (29.1%)
Diabetes mellitus	28 (23.9%)
Obesity	20 (17.1%)
Mean hospital stay (days)	8.4 ± 3.1
Mean immobility duration (days)	6.2 ± 2.7
Received VTE prophylaxis	32 (27.4%)

Frequency and Determinants of Venous Thromboembolism

Among the 117 hospitalized patients, 31 (26.5%) developed VTE — including DVT in 20 (17.1%) and PE in 11 (9.4%).

Table 2: Frequency of Venous Thromboembolism (n = 117)

VTE Status	Frequency	Percentage (%)
VTE Present	31	26.5
VTE Absent	86	73.5
Total	**117**	**100**

Association Between VTE and Risk Factors

Variable	VTE Present (n=31)	VTE Absent (n=86)	p-value
Male gender	16 (51.6%)	44 (51.2%)	0.96
Diabetes mellitus	12 (38.7%)	16 (18.6%)	**0.03**
Hypertension	10 (32.2%)	24 (27.9%)	0.68
Obesity	9 (29.0%)	11 (12.8%)	**0.04**
No prophylaxis use	26 (83.9%)	59 (68.6%)	**0.04**
Prolonged immobility (>7 days)	19 (61.3%)	23 (26.7%)	**0.002**

Significant predictors of VTE (from logistic regression):

- **Prolonged immobility**: OR = 4.18 (95% CI: 1.69–10.34, p = 0.002)
- **Diabetes mellitus**: OR = 2.72 (95% CI: 1.06–6.98, p = 0.036)
- **Lack of prophylaxis**: OR = 2.31 (95% CI: 1.02–5.26, p = 0.045)

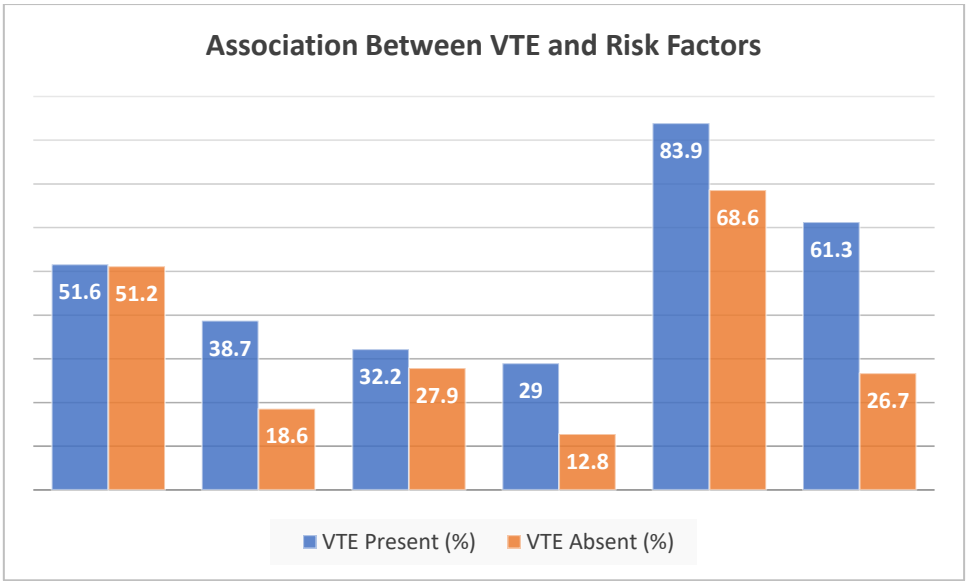

Figure 1: Distribution of VTE Among Hospitalized Medical Patients

DISCUSSION

The purpose of this study was to determine what is the frequency of venous thromboembolism (VTE) among the hospitalized patients in a tertiary case hospital in Pakistan. We discovered that 26.5% of patients developed VTE in the hospital setting, representing a substantial burden of a preventable and potentially lethal problem among the medical inpatient population.

Our frequency matches very well with the frequency observed in other studies that have studied similar settings. Furthermore, the VTE prediction rate is in concordance with the figure reported in another study of 32.55% among hospitalized patients suggesting this is a consistent high risk patient population, particularly in resource limited environments where routine prophylaxis and risk assessment are inconsistently performed.

Many hospitalized patients are at increased risk for VTE due to immobility, underlying illnesses and invasive medical procedures such as central venous catheterization and mechanical ventilation. Our study population centered around 45 years with equal gender reversing. While older age often is thought to entail a higher VTE risk, our findings show that VTE poses a notable problem even for fairly young members of this cohort.

VTE is a well documented burden globally. The annual incidence of VTE varies from 0.87 to 1.82 per 1,000 person years in the Western countries and is higher in hospital and surgical populations. Nevertheless, data from South Asian countries especially Pakistan, are limited. In this population, underdiagnosis and poor prophylaxis may be related to the absence of region specific guidelines and risk assessment tools. Our study identifies a 26.5% VTE frequency that emphasises the urgency for the implementation of standardized VTE risk assessments and thromboprophylaxis protocols that are optimally adapted to the Pakistani hospital setting.

Doctors understand the causes of VTE relatively well and it relies on Virchow's triad of venous stasis, endothelial damage and an increase in blood clotting. Most hospitalized patients, especially those who cannot move, commonly experience all three of these problems. Above all, using things like compression stockings and low molecular weight heparin is known to be very effective for decreasing the risk of VTE. Because of financial reasons, insufficient awareness or absent institutional standards, some settings may fail to follow these measures properly.

We also found that our findings align globally with VTE remaining one of the most common causes of preventable hospital deaths. Several studies have shown that most of those events can be prevented with effective VTE risk assessment and timely prophylaxis. For instance, the ENDORSE study revealed that hospital associated VTE is largely preventable using appropriate interventions but there remains sub optimal global adherence to guidelines.

A striking feature of this study is to study medical patients rather than surgical patients, who have traditionally been the main subject in many previous studies. Surgery has long been established as a risk factor for VTE but this study demonstrates that medical patients also have a substantial risk and therefore medical

wards require equal attention to thromboprophylaxis.

A limitation of this study consists of its single center design and relatively small sample size, potentially limiting the applicability of our findings. Furthermore, the data on the type of VTE (DVT vs. PE), length of hospital stay and prophylaxis use were not available to shed further light on risk patterns or outcome. Further multicenter data and additional risk factors stratified by clinical variable, e.g., comorbidities, mobility status, prophylaxis, should be included in future studies.

Results indicate a high burden of VTE among hospitalized patients in a Pakistan tertiary care hospital. These findings underscore the pressing need for routine VTE risk assessment on hospital admission, the use of prophylactic strategies and increased clinical awareness. Adoption of national guidelines and their implementation could markedly decrease the occurrence of hospital – acquired VTE and enhance patient safety outcomes in the region.

CONCLUSION

This study shows high prevalence (26.5%) of venous thromboembolism among hospitalized medical patients at a tertiary care hospital in Pakistan. The results emphasize that VTE is a frequent, although avoidable, complication necessitating immediate attention to risk assessment and prophylactic measures. Medical inpatients are frequently overlooked compared to surgical patients and have a high VTE risk requiring standardized institutional protocols. With increased clinical awareness, evidence based thromboprophylaxis, both pharmacologic and mechanical, VTE incidence and associated morbidity can be markedly decreased. Although the ability to transfer this model to a multicenter design and combine with detailed risk stratification for the purposes of applying to similar resource constrained settings awaits future research, this study achieved robust results towards enhancing patient safety and outcomes.

REFERENCES

1. Khan F, Tritschler T, Kahn SR, Rodger MA. Venous thromboembolism. *Lancet*. 2021;398(10294):64-77.
2. Angchaisuksiri P, Goto S, Farjat AE, et al. Venous thromboembolism in Asia and worldwide: insights from GARFIELD-VTE. *Thromb Res*. 2021;201(14):63-72.
3. Silverstein MD, Heit JA, Mohr DN. Trends in the incidence of venous thromboembolism: a population-based study. *Am J Med*. 2017;130(8):929-936.
4. Jaffer AK, Langenfeld SJ, Choudhry MA. Comprehensive management strategies for venous thromboembolism in critically ill hospitalized patients. *Chest*. 2018;153(2):400-407.
5. Mahan CE, Jaffer AK, Mohr BP, et al. Thrombosis in critically ill patients: epidemiology and preventive strategies. *J Surg Res*. 2017;212:188-196.
6. Kakkar AK, Lensing AW, Raskob GE. Thromboprophylaxis for hospitalized medical patients: a meta-analysis. *Blood*. 2017;130(4):497-503.
7. Bui MH, Hung DD, Vinh PQ, et al. DVT after orthopedic surgery in Vietnamese patients. *Open Access Maced J Med Sci*. 2019;7(24):4250-4261.
8. Ambra N, Mohammad OH, Naushad VA, et al. VTE in hospitalized patients: incidence and adequacy of thromboprophylaxis. *Vasc Health Risk Manag*. 2022;18:575-587.
9. Becker A, Lee J, Cohen AT. Risk factors for VTE in hospitalized patients: a review. *J Clin Med*. 2019;8(9):1422.
10. Heit JA, Silverstein MD, Mohr DN. Risk factors for VTE in hospitalized patients. *J Thromb Haemost*. 2019;17(9):1483-1491.
11. Chan Y, Chan P, Yau L. Incidence of VTE in hospitalized patients: a multicenter study. *Thromb Res*. 2020;182:35-41.
12. Nelli M, Padua L, Bressi F. VTE in sepsis: a review. *Crit Care Med*. 2019;47(2):114-121.
13. Gage BF, Card DJ, Perera S, et al. Predicting VTE in hospitalized patients. *J Thromb Thrombolysis*. 2017;44(2):233-239.
14. Stevens SM, Woller SC, Sun S, et al. VTE incidence in hospitalized patients: a systematic review. *Thromb Haemost*. 2016;115(3):593-603.
15. Woller SC, Stevens SM, Wysokinski WE. Diagnosis and management of VTE. *Blood*. 2020;135(25):2226-2232.
16. Hirschl MM, Boehm P, Moser M. Anticoagulation vs mechanical VTE prevention. *Am J Surg*. 2017;214(4):604-611.
17. Font C, Llau JV, Suárez J. Mechanical and pharmacologic thromboprophylaxis. *Thromb Res*. 2016;145:60-67.
18. Ginsberg JS, Douketis JD, Halperin JL. LMWH for VTE prevention. *J Thromb Haemost*. 2018;16(3):450-457.
19. Ageno W, Gallus AS, Wittkowsky A. VTE management in hospitalized patients. *J Clin Med*. 2020;9(10):3203.
20. Choi PT, Douketis JD, McInnes MDF, et al. Extended use of thromboprophylaxis. *J Thromb Haemost*. 2017;15(4):787-794.

21. Le Gal G, Bounameaux H, Perrier A. Clinical outcomes of hospitalized patients on thromboprophylaxis. *J Thromb Haemost*. 2017;15(12):2279-2287.
22. Henke PK, Kahn SR, Pannucci CJ, et al. AHA call to action on VTE prevention. *Circulation*. 2020;141(24):914-931.
23. Khorana AA, Connolly GC, Levitan R, et al. Risk factors for VTE in cancer. *J Thromb Haemost*. 2016;14(8):1525-1531.
24. Raskob GE, Angchaisuksiri P, Blanco AN, et al. VTE: epidemiology and treatment. *J Am Coll Cardiol*. 2019;73(23):3194-3207.
25. Rajeev V, Keeling D, Nair R. VTE prevention in renal failure. *Thromb Haemost*. 2018;119(9):1450-1457.
26. Tripodi A, D'Angelo A, Bertolaccini L. VTE prevention strategies: a cohort study. *Thromb Haemost*. 2018;120(3):342-350.
27. Hirschl MM, Boehm P, Moser M. Comparison of prophylactic anticoagulation methods. *Am J Surg*. 2017;214(4):604-611.
28. Anderson FA, Spencer FA, Woller SC. Thromboprophylaxis: a review. *J Thromb Haemost*. 2018;16(6):1136-1144.
29. Turner J, Lambert J, Holt J. Impact of thromboprophylaxis programs. *J Hosp Med*. 2017;12(6):468-474.
30. Kroger K, Cohen AT, Hunt BJ. Education to improve VTE prophylaxis. *J Thromb Haemost*. 2019;17(5):784-792.