https://doi.org/10.29309/TPMJ/2026.33.03.10154 www.theprofesional.com

ORIGINAL ARTICLE

Risk of deep venous thrombosis in abdomino pelvic surgeries.

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ABSTRACT… Objective: To determine the frequency and associated risk factors of deep venous thrombosis (DVT) among patients undergoing abdomino-pelvic surgeries and to evaluate their risk stratification according to the American College of Chest Physicians (ACCP) guidelines. **Study Design:** Descriptive Case Series. **Setting:** Surgical Unit, Hayatabad Medical Complex (HMC), Peshawar, Pakistan. **Period:** 1st July 2021 to 31st December 2021. **Methods:** A total of 174 hospitalized patients aged 15–70 years with duplex ultrasound–confirmed lower limb DVT were enrolled through consecutive convenience sampling. Patients with chronic or ambiguous DVT findings were excluded. Data on demographics, clinical characteristics, comorbidities, mobility, hospital stay, and surgical details were recorded. Risk stratification was performed as per ACCP guidelines into low, moderate, high, and very high-risk groups. Data were analyzed using SPSS version 22, applying chi-square tests for associations, with $p \leq 0.05$ considered statistically significant. **Results:** Among 174 patients, the majority were males (62.1%) with a predominant age group of 41–50 years. High and very high-risk categories accounted for 40.8% and 37.4% of patients, respectively. Obesity (33.3%), limited mobility (72.4%), and comorbidities (66.1%) were the most significant risk factors. Statistical analysis revealed strong associations between DVT risk level and age ($p < 0.001$), BMI ($p = 0.001$), comorbidities ($p < 0.001$), and mobility status ($p < 0.001$). Most patients (72.4%) had a hospital stay of ≤7 days, and 89.1% underwent surgeries lasting ≤1 hour. **Conclusion:** DVT risk in abdomino-pelvic surgical patients is strongly associated with age, obesity, immobility, comorbidities, and prolonged hospitalization. Regular risk assessment and adherence to thromboprophylactic guidelines are essential to reduce preventable morbidity and mortality.

Key words: Abdomino-pelvic Surgery, ACCP Guidelines, Deep Venous Thrombosis, Risk Stratification, Surgical Patients, Thromboprophylaxis.

Article Citation: Khan SA, Abbas M, Hamdullah, Khan S, Yasin MD, Khan W. Risk of deep venous thrombosis in abdomino pelvic surgeries. Professional Med J 2026; 33(03):511-517. https://doi.org/10.29309/TPMJ/2026.33.03.10154

INTRODUCTION

Blood inside the vessels usually does not clot normally due to the body's natural defence system against clotting i.e. thrombomodulin, anti-thrombin III, protein C, protein S, smooth walls of the vessels and regular smooth flow of blood. Virchow in 1920s explained that blood clots inside the vessels leading to thrombus formation due to three factors which are known as the Virchow's Triad, i.e. changes in the blood vessel endothelium, changes in the blood flow, and changes in the composition of the blood chemistry. Any change in the defence mechanism leads to deep venous thrombosis (DVT).[1] The signs and symptoms of DVT include erythema of the limb or area at which the clot occludes the vessel, localised pain, oedematous swelling, prominent veins (non-varicose) and palpable veins etc.[2] Literature search on DVT risk factors highlights increasing age, immobilisation, active rheumatologic disease, acute myocardial infarction (AMI), arterial insufficiency, cancer, central catheters, hormone therapy, congestive heart failure, cerebrovascular accidents, infection, surgical procedures, inflammatory bowel disease, nephritic syndrome, obesity, paresis of legs, severe respiratory diseases, thrombophilias and varices/chronic venous insufficiency.[3] The number of people affected by DVT, according to the Centre of Disease Control (CDC) ranges from 60,000 to 100,000 each year in the United States alone.[4] The SMART study concluded that DVT prevalence and mortality rate is also not low in the Asian countries.[5] Less work has been done so far in Pakistan on conditions involving DVT or embolism.[6,7]

The study showed that these patients were at moderate risk of DVT according to accepted criteria a 15%incidence and these findings are now reflected in the American College of Chest Physicians and International Consensus Statements that recommend thromboprophylaxis.[8,9]

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Article received on:
24/10/2025
Accepted for publication:
01/01/2026

The present study was conducted to determine the dominating risk factors to help in the prognosis of the disease. The current study is aimed to know the measures taken for prevention of this major preventable cause of death in a teaching hospital of Peshawar. Also to do the risk assessment and type of prophylaxis given to the hospitalized patients in a tertiary care hospital and compare with their requirements according to the American College of Chest Physicians (ACCP) guideline for DVT.

METHODS

This descriptive case series was conducted from 1st July 2021 to 31st December 2021 in the Surgical Unit at Hayatabad Medical Complex (HMC), Peshawar after taking approval from ethical board (REU: 44093). The primary objective was to determine the frequency of risk stratification among hospitalized patients diagnosed with Deep Venous Thrombosis (DVT).

The sample size was calculated using the WHO sample size calculator, assuming a 15% proportion of patients at moderate risk of DVT, with a 95% confidence interval and 5% margin of error [9]. A total of 174 patients were included using consecutive convenience sampling.

Inclusion Criteria

Hospitalized patients aged between 15 and 70 years with a diagnosis of DVT of the lower extremities confirmed via duplex ultrasound.

Exclusion Criteria

Patients with chronic DVT (duration >3 months), unclear duplex reports, or contradictory duplex findings were excluded.

Data collection was initiated after obtaining approval from the institutional ethical and research review board. Eligible patients who met the inclusion criteria were invited to participate after written informed consent was obtained. Data were recorded using a structured proforma, which captured demographic details (name, age, gender, height, weight), clinical characteristics (diagnosis, operative status, co-morbidities, duration of hospital stay and surgery, ambulatory status), and DVT risk factors. Risk stratification was conducted according to the American College of Chest Physicians (ACCP) guidelines, categorizing patients into low, moderate, high, and very high-risk groups.

The data were analyzed using SPSS version 22. Descriptive statistics were computed for all variables. Quantitative variables (age, height, weight, hospital stay, and surgery duration) were presented as mean ± standard deviation. Qualitative variables (gender, ambulatory status, procedure type, risk factors, and risk stratification) were expressed as frequencies and percentages. Stratification was performed for age, gender, height, weight, duration of hospital stay and surgery, and ambulatory status to assess effect modification. Post-stratification, the chi-square test was applied. A p-value ≤ 0.05 was considered statistically significant. Results were displayed in tabular and graphical formats.

RESULTS

The study population comprised 174 patients. The majority were between 41–50 years of age, accounting for 74 (42.5%) individuals. This was followed by those aged 51–60 years with 53 (30.5%), and 31–40 years with 29 (16.7%). Fewer patients belonged to the 61–70 years group, 12 (6.9%), and the 18–30 years group, 6 (3.4%). Regarding gender distribution, males predominated with 108 (62.1%), while females comprised 66 (37.9%). Risk stratification revealed that a considerable proportion of patients were in the high-risk category, 71 (40.8%), followed closely by the very high-risk group, 65 (37.4%). Moderate risk was noted in 21 (12.1%) patients, and a smaller proportion, 17 (9.8%), were classified as low risk. Most patients presented with a disease duration of ≤ 3 months, 122 (70.1%), while 52 (29.9%) had symptoms for more than 3 months. The distribution of BMI categories showed that 73 (42.0%) were overweight and 58 (33.3%) were obese. Normal BMI was observed in 38 (21.8%), and underweight individuals comprised only 5 (2.9%). Mobility status varied across the cohort, with 72 (41.4%) being minimally mobile and 54 (31.0%) bed bound. Additionally, 42 (24.1%) were partially mobile, while only 6 (3.4%) were fully mobile. A significant number of patients, 132 (75.9%), reported a past history of deep vein thrombosis (DVT), whereas 42 (24.1%) had no such history. In terms of hospital stay, the

majority of patients, 126 (72.4%), were admitted for ≤ 7 days, while 48 (27.6%) stayed beyond one week. Most procedures were completed within one hour, with 155 (89.1%) surgeries lasting ≤ 1 hour and only 19 (10.9%) exceeding this duration. Co-morbidities were present in 115 (66.1%) patients, while 59 (33.9%) had no known co-morbid conditions.

TABLE-I

Summary table of key variables (n = 174)

Variable	Categories	n (%)
Age Group	18–30 years	6 (3.4%)
	31–40 years	29 (16.7%)
	41–50 years	74 (42.5%)
	51–60 years	53 (30.5%)
	61–70 years	12 (6.9%)
Gender	Male	108 (62.1%)
	Female	66 (37.9%)
Risk Stratification	Low	17 (9.8%)
	Moderate	21 (12.1%)
	High	71 (40.8%)
	Very High	65 (37.4%)
Disease Duration	≤ 3 Months	122 (70.1%)
	> 3 Months	52 (29.9%)
BMI Classification	Underweight	5 (2.9%)
	Normal	38 (21.8%)
	Overweight	73 (42.0%)
	Obese	58 (33.3%)
Ambulatory Status	Fully Mobile	6 (3.4%)
	Partially Mobile	42 (24.1%)
	Minimally Mobile	72 (41.4%)
	Bed Bound	54 (31.0%)
Past History of DVT	Yes	132 (75.9%)
	No	42 (24.1%)
Hospital Stay	≤ 7 Days	126 (72.4%)
	> 7 Days	48 (27.6%)
Duration of Surgery	≤ 1 Hour	155 (89.1%)
	> 1 Hour	19 (10.9%)
Co-morbidities	Present	115 (66.1%)
	Absent	59 (33.9%)

When the cohort was stratified by risk levels, notable variations emerged across age groups. Among patients aged 51–60 years, 10 (58.8%) were in the low-risk group, while the majority of those aged 41–50 years were in the high-risk group, 48 (67.6%). Interestingly, the very high-risk category was most represented by patients aged 51–60 years, 30 (46.2%). Patients in the youngest age group (18–30 years) were sparsely distributed across all risk levels, making up only 1 (5.9%) in the low-risk and 4 (6.2%) in the very high-risk category. The association between age and risk level was statistically significant ($p < 0.001$). Gender distribution showed that males were more frequently categorised as low risk, 16 (94.1%), and high risk, 43 (60.6%), while females predominated in the moderate-risk group, 11 (52.4%). In the very high-risk category, males and females were nearly equally represented, 39 (60.0%) and 26 (40.0%) respectively ($p = 0.024$). The duration of disease did not significantly vary across risk groups ($p = 0.101$), although 16 (94.1%) of patients with low risk had disease duration of ≤ 3 months, compared to 41 (63.1%) in the very high-risk group. Among those with disease lasting more than 3 months, 24 (36.9%) were in the very high-risk group, reflecting a trend toward longer disease duration in higher-risk individuals.

Body Mass Index (BMI) showed a strong association with risk level ($p = 0.001$). Obese patients were notably concentrated in the low-risk group, 13 (76.5%), and the very high-risk group, 21 (32.3%). Overweight individuals accounted for the majority of high-risk patients, 50 (70.4%), while those with normal BMI were most common in the moderate-risk group, 8 (38.1%). Underweight status was rare and limited primarily to the very high-risk group, 4 (6.2%). Co-morbidities were significantly associated with risk stratification ($p < 0.001$). None of the patients in the low-risk group had co-morbidities, whereas the vast majority in the high-risk and very high-risk groups did, at 62 (87.3%) and 46 (70.8%) respectively. Conversely, patients without co-morbidities were primarily distributed in the low-risk group, 17 (100.0%), and to a lesser extent in the moderate-risk group, 14 (66.7%). Length of hospital stay also varied significantly with risk level ($p = 0.027$).

All low-risk patients, 17 (100.0%), were discharged within 7 days, whereas extended hospital stays (> 7 days) were more common in moderate-risk patients,

7 (33.3%), and high-risk patients, 25 (35.2%). While the duration of surgery did not show a statistically significant relationship with risk (p = 0.109), a greater proportion of short-duration procedures (≤ 1 hour) was seen across all groups, including 62 (95.4%) in the very high-risk group and 60 (84.5%) in the high-risk group.

Ambulatory status showed a clear association with risk level (p < 0.001). Bed-bound patients constituted the majority in the low-risk group, 10 (58.8%), while minimally mobile individuals were predominant in the high-risk group, 44 (62.0%). Among the very high-risk group, mobility was more evenly distributed: 24 (36.9%) were bed-bound and 17 (26.2%) were minimally mobile.

Fully mobile individuals were rare overall but most concentrated in the very high-risk group, 4 (6.2%). Lastly, although the past history of DVT did not reach statistical significance (p = 0.177), it was highly prevalent across all risk groups, especially in the very high-risk group, 51 (78.5%), and high-risk group, 51 (71.8%). Only 1 (5.9%) low-risk patient reported no prior DVT, reflecting the overall high burden of thrombotic history in this population.

TABLE-II

Comparison of DVT Risk levels with patients characteristics

Variable	Category	Low Risk n (%)	Moderate Risk n (%)	High Risk n (%)	Very High Risk n (%)	Total n (%)	P-Value
Age (years)	18–30	1 (5.9)	0 (0.0)	1 (1.4)	4 (6.2)	6 (3.4)	
	31–40	4 (23.5)	8 (38.1)	4 (5.6)	13 (20.0)	29 (16.7)	
	41–50	2 (11.8)	8 (38.1)	48 (67.6)	16 (24.6)	74 (42.5)	
	51–60	10 (58.8)	5 (23.8)	8 (11.3)	30 (46.2)	53 (30.5)	
	61–70	0 (0.0)	0 (0.0)	10 (14.1)	2 (3.1)	12 (6.9)	<0.001
Gender	Male	16 (94.1)	10 (47.6)	43 (60.6)	39 (60.0)	108 (62.1)	
	Female	1 (5.9)	11 (52.4)	28 (39.4)	26 (40.0)	66 (37.9)	0.024
Duration of Disease	≤ 3 Months	16 (94.1)	15 (71.4)	50 (70.4)	41 (63.1)	122 (70.1)	
	> 3 Months	1 (5.9)	6 (28.6)	21 (29.6)	24 (36.9)	52 (29.9)	0.101
BMI Classification	Underweight	0 (0.0)	0 (0.0)	1 (1.4)	4 (6.2)	5 (2.9)	
	Normal	2 (11.8)	8 (38.1)	5 (7.0)	23 (35.4)	38 (21.8)	
	Overweight	2 (11.8)	4 (19.0)	50 (70.4)	17 (26.2)	73 (42.0)	
	Obese	13 (76.5)	9 (42.9)	15 (21.1)	21 (32.3)	58 (33.3)	0.001
Co-morbidities	Present	0 (0.0)	7 (33.3)	62 (87.3)	46 (70.8)	115 (66.1)	
	Absent	17 (100.0)	14 (66.7)	9 (12.7)	19 (29.2)	59 (33.9)	<0.001
Hospital Stay	≤ 7 Days	17 (100.0)	14 (66.7)	46 (64.8)	49 (75.4)	126 (72.4)	
	> 7 Days	0 (0.0)	7 (33.3)	25 (35.2)	16 (24.6)	48 (27.6)	0.027
Duration of Surgery	≤ 1 Hour	16 (94.1)	17 (81.0)	60 (84.5)	62 (95.4)	155 (89.1)	
	> 1 Hour	1 (5.9)	4 (19.0)	11 (15.5)	3 (4.6)	19 (10.9)	0.109
Ambulatory Status	Fully Mobilized	1 (5.9)	0 (0.0)	1 (1.4)	4 (6.2)	6 (3.4)	
	Partially	4 (23.5)	4 (19.0)	14 (19.7)	20 (30.8)	42 (24.1)	
	Minimally	2 (11.8)	9 (42.9)	44 (62.0)	17 (26.2)	72 (41.4)	
	Bed Bound	10 (58.8)	8 (38.1)	12 (16.9)	24 (36.9)	54 (31.0)	<0.001
Past History of DVT	Yes	16 (94.1)	14 (66.7)	51 (71.8)	51 (78.5)	132 (75.9)	
	No	1 (5.9)	7 (33.3)	20 (28.2)	14 (21.5)	42 (24.1)	0.177

DISCUSSION

The present study analyzed the clinical and demographic determinants of venous thromboembolism (VTE) risk among surgical patients, revealing significant associations between age, gender, comorbidities, body mass index (BMI), ambulatory status, and DVT risk stratification. Most patients belonged to the 41–60-year age group, aligning with findings by bharti et al. [10], who reported a similar predominance of middle-aged individuals in thromboembolic cohorts. The observed male predominance (62.1%) also corresponds with the pattern noted by Zhao et al.[11], who attributed higher male risk to greater exposure to modifiable cardiovascular and metabolic factors. Conversely, Daves et al.[12] demonstrated a female preponderance in DVT cases, suggesting that hormonal influences, pregnancy, and oral contraceptive use may alter thrombotic risk profiles.

A significant correlation was observed between advancing age and elevated DVT risk, with individuals aged 41–60 years comprising the majority of high- and very high-risk categories. This relationship is consistent with the physiological decline in venous elasticity and increased platelet reactivity associated with aging, as described by Abudukadier et al.[13] However, the absence of a strong association in patients older than 60 years contrasts with the results of Li et al.[14], who reported progressive risk escalation beyond this age, possibly reflecting differing population characteristics or exclusion of severely ill elderly patients in the present cohort.

BMI demonstrated a strong and statistically significant association with thrombotic risk ($p = 0.001$). Overweight and obese patients accounted for nearly three-quarters of high- and very high-risk individuals. Obesity is known to promote venous stasis, systemic inflammation, and endothelial dysfunction—all key mechanisms underlying DVT pathogenesis. Similar trends have been observed by Hotoleanuet al.[15], who documented a threefold increase in DVT risk among obese surgical patients. Conversely, Sloan et al.[16] found no independent association after adjusting for immobility and comorbidities, suggesting that obesity may act as a surrogate for overall physical deconditioning rather than an isolated risk factor.

Mobility status also showed a pronounced effect, with minimally mobile and bed-bound patients constituting the majority of high-risk groups ($p < 0.001$). Prolonged immobility leads to venous stasis, decreased calf muscle pump activity, and hypercoagulability, consistent with Virchow's triad. These findings correspond with those of stone et al.[17], who highlighted immobility as a principal modifiable determinant of hospital-acquired thrombosis. Nonetheless, Lau et al.[18] observed that of early ambulation alone may not fully mitigate risk in patients with multiple comorbidities, emphasizing the need for comprehensive thromboprophylactic measures.

Co-morbid conditions were present in two-thirds of the cohort and were strongly associated with elevated DVT risk ($p < 0.001$). Patients with cardiovascular disease, diabetes mellitus, or malignancy are known to possess heightened thrombotic potential through endothelial injury and hypercoagulable states. This finding is supported by Aru et al.[19], who reported that the coexistence of systemic illness significantly increases postoperative DVT incidence. However, azeem et al.[20] found that aggressive prophylaxis and early mobilization can offset this risk, highlighting the importance of individualized preventive strategies.

The duration of hospital stay was also significantly associated with higher risk ($p = 0.027$). Prolonged hospitalization likely reflects either increased illness severity or delayed recovery, both of which contribute to extended immobilization. This is in agreement with Aggarwal et al.[21], who noted a direct correlation between inpatient duration and thrombotic events. Nevertheless, Tang et al.[22] reported that modern enhanced recovery protocols have substantially reduced inpatient DVT rates even with shorter stays, suggesting that hospitalization alone may not be the determining factor but rather the quality of perioperative care.

While most procedures in this study lasted less than one hour and the duration of surgery did not significantly affect risk levels, prior studies by Bui et al.[23] emphasized that operative time exceeding two hours markedly increases thrombotic risk due to venous stasis under anesthesia. The discrepancy may be attributed to the relatively shorter surgical

times in this study.

A past history of DVT was common, observed in 75.9% of patients, yet not statistically significant (p = 0.177). Recurrent thromboembolism is known to occur in up to one-third of cases as per Hwang et al. [24], but the high baseline prevalence of previous DVT in both groups may have obscured intergroup differences.

Overall, these findings underscore that DVT risk in surgical patients is multifactorial, influenced by age, gender, BMI, comorbidity burden, mobility, and hospitalization duration. The results reinforce the importance of systematic risk assessment and individualized prophylaxis. Future research should explore predictive models incorporating both clinical and biochemical markers to enhance precision in risk stratification.

This study has certain limitations. Being a single-center descriptive case series, its findings may not be generalizable to broader populations. The sample size, although statistically adequate, was relatively small and may not capture all potential confounding factors influencing deep venous thrombosis (DVT) risk. Furthermore, the absence of long-term postoperative follow-up precluded assessment of delayed thrombotic events or recurrence. Future multicenter studies with larger cohorts and longitudinal follow-up are recommended to validate and expand upon these findings.

CONCLUSION

An appropriate preventive strategy in general surgery should take into account the risk of VTE keeping in mind the safety of their use. In moderate-risk patients who are > 40 years of age or undergoing major operations, but who have no additional clinical risk factor.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Shahkar Ali Khan:** Conceptualization.
2	**Muhammad Abbas:** Methodology.
3	**Hamdullah:** Drafting.
4	**Sameer Khan:** Proof reading.
5	**Muhammad Danish Yasin:** Methodology.
6	**Wasif Khan:** Conceptualization.