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Original Article

Clinical characteristics & outcome of upper body deep vein thrombosis in critically ill patients

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***Background & objectives*: The incidence, risk factors and outcomes of upper body deep vein thrombosis (DVT) is less well studied in critically ill patients. This study aimed to estimate the incidence and identify the risk factors for the development of upper body-DVT. Secondary objectives included evaluating the anatomical sites of DVT, the impact of thromboprophylaxis, and short-term outcomes.**

***Methods*: In this prospective observational cohort study, patients admitted to the intensive care unit (ICU) between December 2021 and December 2022 were screened for DVT using duplex ultrasonography at 48 h, 7, 14, 21, and 28 days after admission.**

***Results*: Among 241 participants, 39 (16.2%) developed upper body DVT and 8 (3.3%) had lower limb DVT. The internal jugular vein was the most frequent site of DVT. Multivariable analysis identified platelet transfusion [Odds ratio (OR)=19.4; 95% Confidence interval (CI): 4.4-86.1], platelet count (OR=1.007; 95% CI: 1.002-1.011), duration of central venous catheter use (OR= 1.2; 95% CI: 1.1-1.3), and number of dialysis sessions (OR= 1.15; 95% CI: 1.01-1.3) as independent risk factors for upper body DVT. Participants with upper body DVT had significantly longer ICU stay (41 *vs.* 8 days) and duration of mechanical ventilation (33 *vs.* 5 days). However, ICU mortality was similar in those with or without DVT (48.7% *vs.* 44.3%).**

***Interpretation & conclusions*: Upper body DVT occurred more frequently than lower limb DVT, with internal jugular vein being the most common site. Platelet transfusion, higher platelet counts, prolonged catheter use, and increased dialysis sessions were associated with increased risk of upper body DVT. Upper body DVT was also linked to prolonged ICU stay and increased ventilation days but not increased mortality.**

Key words Anticoagulation - catheter associated thrombosis - duplex ultrasonography - intensive care unit - upper body deep vein thrombosis

Deep vein thrombosis (DVT) is a common issue in critically ill patients due to multiple causes[1]. DVT, if left untreated, can lead to pulmonary embolism. Guidelines for venous thromboembolism in intensive care units (ICU) recommend daily anticoagulation prophylaxis administration to prevent the development

of DVT[2]. In critically ill patients, DVT is commonly reported in the lower limb, with an incidence that has been variably reported between 5-28 per cent[3-5]. Lower extremity DVT is predominantly attributed to immobility and stasis. However, due to the presence of central venous catheters along with the infusion of high osmolarity medications and the presence of an arterial cannula, DVT can occur in the upper extremity also. DVT, which occurs in the brachial, axillary, subclavian or internal jugular veins, constitutes the upper body DVT.

The incidence of upper body DVT in ICU patients is reported to be from 2 to 17 per cent[6,7]. Upper body DVT can cause pulmonary embolism (11-26%)[8], superior vena cava syndrome (21-23%) and post-thrombotic syndrome (27-50%)[9]. The clinical outcomes of upper body DVT are not well understood in critically ill patients. The currently available studies on the outcome of upper body DVT are from non-critically ill patients with peripherally inserted central catheters (PICC). In addition, the Asian population have been found to have a lower risk of DVT in comparison to the Western population due to various genetic factors[10,11].

We designed this study to document the incidence of upper body DVT over the study period of 28 days and to elucidate the risk factors predisposing to its development during the ICU stay. Secondary objectives included evaluating the anatomical locations of DVT, development of DVT in relations to prophylactic anticoagulant use in ICU, and consequences and short-term outcomes of DVT during treatment in patients admitted to ICU.

Materials & Methods

This prospective observational study was undertaken by the department of Critical Care Medicine, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow, Uttar Pradesh, India, after obtaining the ethical approval from the Institute's Ethics Committee, with a waiver of informed consent granted due to its anonymous nature.

Study design and settings: This was a single-centre cohort study conducted from December 2021 to December 2022. The study was carried out in the 20-bed mixed medical ICU within the department of Critical Care Medicine, SGPGIMS, Lucknow, Uttar Pradesh, India, which is a 1200-bed tertiary care institute located in northern India.

Study participants: The study included all consecutive adult individuals of age ≥18 yr who were expected to stay in the ICU for more than three calendar days. Patients with DVT at ICU admission, and those in whom we were unable to perform an ultrasound examination secondary to the poor sonographic window, pregnant patients and patients who had opted for palliative care were excluded.

Pharmacological thromboprophylaxis was given to all study participants, with the choice individualized by the treating team considering the patient's underlying pathology and bleeding risk. Mechanical thromboprophylaxis, delivered *via* knee-length, multi-chamber intermittent pneumatic compression cuffs, was utilized when clinically indicated. Vascular access was obtained and maintained in accordance with intravascular devices infection prevention practice guidelines[12]. CVC were inserted under aseptic precautions by trained intensivists under ultrasound guidance.

Upon admission to the ICU, all patients underwent screening for deep vein thrombosis (DVT) in both upper and lower limbs using duplex ultrasound, within the first 48 h. Patients with pre-existing thrombus were excluded. All the included study participants were subsequently screened weekly. Screening was repeated if there were any clinical features suggestive of DVT, like unilateral limb swelling. If a thrombus was identified, it was subsequently informed to the treating team and further DVT management was at their discretion. Computed tomography pulmonary angiography (CTPA) was done in cases when PE was clinically suspected.

Definitions of DVT and screening protocol: Lower extremity DVT was defined as ultrasonography-confirmed thrombosis occurring anywhere from the common femoral vein to the popliteal vein trifurcation. Upper body DVT was defined as ultrasonography-confirmed thrombosis involving any of the following: radial, ulnar, brachial, axillary, subclavian or internal jugular veins. Pulmonary embolism was confirmed if an intraluminal filling defect was identified on CTPA.

DVT screening was done by a single ICU physician with one year of experience in critical care. He was trained by a senior radiologist. He performed 20 DVT screening under the supervision of a trained radiologist. Only after achieving satisfactory performance in these assessments was the physician allowed to perform independent scans for the study. The ultrasound

examination was done by a commercially available ultrasound machine (SonoSite Edge II ultrasound machine) using a linear probe with a frequency of 6-13 Hz. Veins of the upper limb, lower limb and neck were screened for the presence of DVT. The duplex ultrasound included compression and colour Doppler examination of a particular vein for the diagnosis of DVT. A vein was considered thrombosed if any of the following was noted - a non-compressible vein, presence of a thrombus of variable echogenicity, or an absence of colour flow in the thrombus or a variable echogenic structure that was outlined by colour.

The study participants were followed up until ICU discharge or death whichever was earlier for the development of DVT. All participants with DVT were followed up weekly till discharge or death regarding the outcome of the DVT.

Screening for Upper body DVT: Screening of the upper limb for DVT was done according to the methods described by Chin *et al*[13]. For the upper body DVT screening, we sonographically assessed the internal jugular, brachiocephalic, subclavian, axillary, brachial, and basilic veins. The study participants were made supine with arms abducted and slightly externally rotated. Transverse imaging was used for the radial, ulnar, and brachial veins. The axillary, subclavian, and internal jugular veins were scanned both transversally and longitudinally. Direct compression was performed in the transverse plane, particularly for the jugular vein, to prevent transducer slippage. When overlying bones obstructed direct compression (*e.g*., subclavian vein), colour doppler imaging was utilized.

Starting at the mid-medial upper arm, the transducer was placed transversely to identify the brachial artery and its paired brachial veins. These were then traced proximally to the axillary vein, deep to the pectoralis minor. The probe was then angled cephalad and moved medially beneath the clavicle to visualize the subclavian vein, which lies superficial and inferior to the subclavian artery. After examining the upper limb veins, the ipsilateral jugular vein was assessed with the patient's head rotated slightly away from the examination side.

Screening for Lower extremity DVT: Lower limb ultrasound was performed as described by Kory *et al*[14]. Study participants were positioned supine with legs abducted and slightly externally rotated. The examination began with compression of the common femoral vein at three sites: the groin crease, the sapheno-femoral junction, and the confluence of the femoral and deep femoral veins. Compression of the femoral vein then continued distally at 2 cm intervals, extending from just below the common femoral vein down to the popliteal vein and its confluence with the calf veins.

Data collection: The following data were collected at admission: Age, sex, sequential organ failure assessment score (SOFA), acute physiology and chronic health evaluation (APACHE II), body mass index (BMI), primary organ involvement, and comorbidities.

The risk factors for the development of DVT included general risk factors like age, obesity, pregnancy, cancer, stroke, spinal cord injury, recent history of surgery and ICU acquired factors like mechanical ventilation, presence of central venous catheter and acute renal failure. Data regarding these factors were noted. In addition, other factors which may contribute to the development of DVT like the dialysis catheter and arterial lines, prophylactic measures like sequential compression devices, and use of prophylactic anticoagulants were also noted. Though arterial lines have not been described associated with the development of DVT, we postulated that its presence may hamper the mobility that might contribute to the development of DVT. After a diagnosis of DVT is made, the treating team was informed regarding the diagnosis, and further management was left to their decision. The study participants was followed up till ICU discharge or death.

Primary and secondary outcomes: The primary outcome measure was to elucidate the incidence and risk factors of upper body DVT developed during ICU course. Secondary outcomes were to find anatomical locations of DVT, development of DVT in relations to prophylactic anticoagulant use in ICU, consequences and short-term outcomes of DVT during treatment in patients admitted to ICU.

Statistical analysis: Continuous variables were presented as median with interquartile range (IQR) whereas categorical variables as numbers and percentages. Kruskal-Wallis H test was used to compare the continuous variables whereas the Chi-Square test/ Fisher exact test was used to compare the proportion between the lower extremity DVT and upper body DVT participants. Study participants were classified into upper body DVT, lower extremity DVT, and no DVT groups based on duplex ultrasound findings.

Table I. Demographic variables in study population including critically ill patients with and without deep vein thrombosis (DVT)

Variable	Total (n=241)	Upper body DVT (n=39)	Lower extremity DVT (n=8)	No DVT (n=194)	*P* value
Age (yr), median (IQR)	45 (30-60)	45 (29-61)	48 (39.5-56.5)	45 (29-60)	0.799
Male, n (%)	133	21 (53.8)	3 (37.5)	109 (56.2)	0.602
APACHE 2 score, median (IQR)	17 (10-23)	19 (13-23)	22 (11.5-24.5)	16 (10-23)	0.278
SOFA score, median (IQR)	8 (4-11)	8 (6-12)	10 (6.5-11)	7 (4-11)	0.088
Charlson comorbidity index, median (IQR)	1 (0-4)	1 (0-4)	1.5(0-4)	1 (0-4)	0.973
BMI, median (IQR), kg/m^2	22.6 (21-24.7)	21.6 (19.8-24.1)	24.3 (23.4-27.45)	22.65 (21.3-24.6)	0.016
COVID infection <3 months, n (%)	14 (5.6)	1 (2.6)	1 (12.5)	12 (6.2)	0.374
Hypertension, n (%)	65 (27)	12 (30.8)	2 (25)	51 (26.3)	0.861
Diabetes, n (%)	66 (27.4)	10 (25.6)	4 (50)	52 (26.8)	0.367
Chronic kidney disease, n (%)	19 (7.9%)	7 (17.9)	2 (50)	10 (5.2)	0.005
History of stroke, n (%)	5 (2.1)	1 (2.6)	0 (0)	4 (2.1)	0.999
Atrial fibrillation, n (%)	7 (2.9)	0 (0)	0 (0)	7 (3.6)	0.689
Obstructive sleep apnea, n (%)	19 (7.9)	2 (5.1)	1 (12.5)	16 (8.3)	0.564
Cancer, n (%)	8 (3.3)	3 (7.7)	0 (0)	5 (2.6)	0.256
Mechanical thromboprophylaxis, n (%)	159 (66)	32 (82.1)	4 (50)	123 (63.4)	0.05
Pharmacological thromboprophylaxis	139 (57.7)	34 (87.2)	5 (62.5)	100 (41.49)	0.001

Data are expressed as number (n) percentage (%), median and IQR. BMI, body mass index; APACHE II, acute physiology and chronic health evaluation II; SOFA, sequential organ failure assessment; IQR, inter quartile range

To estimate the proportion of upper body DVT among participants with DVT admitted to the ICU, we assumed its incidence to be 75 per cent among all DVT. This was based on an internal unpublished pilot data, as there were no Indian studies available on the incidence of upper body DVT in ICU. With a 15 per cent margin of error and a two-sided 95 per cent confidence interval, the required sample size of DVT patients was calculated to be 39. Additionally, to estimate the overall incidence of DVT among critically ill ICU patients, we assumed a prevalence of 20 per cent. With a 7.5 per cent margin of error and a 95 per cent confidence level, the estimated required sample size was 123. Sample size calculations were performed using the power analysis and sample size software. Accordingly, we planned to enrol a minimum of 123 critically ill patients admitted to the ICU, which is expected to include at least 39 individuals with DVT.

Univariate analysis using binary logistic regression was performed to identify variables associated with both upper/lower limb DVT. Variables with a *P* value < 0.20 in univariate analysis were included in the multivariable logistic regression model to identify independent risk factors for both lower/upper limb. Since the multivariable logistic regression model was constructed to identify predictors of upper body DVT, only variables associated with upper body DVT in univariate analysis were considered for inclusion. A two-sided *P* value < 0.05 was considered statistically significant in the multivariable model. All statistical analyses were conducted using statistical package for social sciences, version-20 (SPSS Inc., Chicago, Il, USA).

Results

Cohort characteristics: During the study period, 343 consecutive patients were screened, and 241 participants were enrolled in the study. There were 39 cases of upper body DVT and eight cases of lower extremity DVT and their incidence respective were 16.2 per cent and 3.3 per cent. The baseline demographic and clinical characteristics of the patients in the cohort are presented in table I. The commonest cause for admission included acute pancreatitis (19.9%), tropical infections (17%), acute respiratory failure (15.8%) and acute on chronic liver failure (10.4%). The flowchart of DVT incidence is shown in figure 1.

Participants were evaluated in three cohort groups (lower extremity DVT, upper body DVT, no DVT). Among the premorbid risk factors, chronic kidney disease was associated with a higher incidence of upper body DVT. Other non-ICU risk factors like the presence of cancer, obstructive sleep apnoea, and atrial

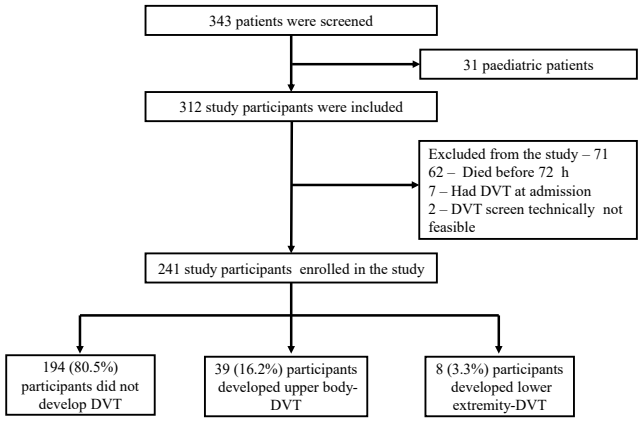

Fig. 1. Flowchart of the ultrasound assessment of deep vein thrombosis in ICU.

fibrillation were not associated with a higher risk of upper body DVT in our study cohort.

Primary outcome:

ICU factors associated with the development of DVT: Table II shows that there were significant differences between the three groups of study participants with respect to ICU-acquired factors. The upper body DVT group had a significantly higher proportion of study participants with a platelet count of > 200,000/μL and study participants who received platelet transfusion and fresh frozen plasma (FFP) transfusion than the lower extremity DVT and no DVT groups. The upper body DVT group had a significantly higher proportion of study participants who needed vasopressor and mechanical ventilation support and a central line catheter in place for >14 days than the other groups. A longer length of pre-ICU hospital stay, a higher platelet count, a higher number of dialysis sessions, platelet and FFP transfusion, the use of vasopressor, a longer duration of mechanical ventilation and higher central venous catheter days were all associated with a higher risk of developing upper body DVT based on univariate analysis. A higher disseminated intravascular coagulation (DIC) score was associated with a higher risk of lower extremity DVT. The interruption of anticoagulation, which is expressed as a percentage of the total number of days in which anticoagulation was withheld, was not associated with the development of DVT in our study cohort. Results of multivariate analysis are shown in table III.

Secondary outcomes:

Anatomical locations of DVT: Analysis of the anatomical distribution of DVT revealed that the right internal jugular vein was the most frequently affected site, observed in 22 study participants. The left internal jugular vein was the second most common site, accounting for 12 study participants. Femoral vein involvement was less frequent, with DVT noted in the right femoral vein in five study participants and the left femoral vein in three study participants. Additionally, bilateral internal jugular vein DVT was identified in five study participants. There were no cases of subclavian thrombosis noted in our cohort. Six cases of superficial vein thrombosis were also noted.

Occurrence of DVT in relation to thromboprophylaxis: Thromboprophylaxis use in our cohort is described in table IV. Nearly 58 per cent of study participants received pharmacological thromboprophylaxis and low molecular weight heparin (LWMH) was the commonest choice. Mechanical thromboprophylaxis in the form of sequential compression device was used in 65 per cent of them. Patients with no DVT group had a significantly higher proportion of patients who received no anticoagulant drugs than the lower extremity-DVT and no DVT groups. Around 75 per cent of the overall cohort had an interruption of anticoagulation during any time in their ICU stay.

Consequences of UB-DVT: 50 per cent of lower extremity DVT developed within the first week, whereas nearly 40 per cent of upper body DVT was noted during the fourth week of the ICU stay (Fig. 2).

During the serial ultrasonographic assessment of upper body DVT, 59 per cent of the DVT had a complete recanalization of the vein once the catheter was removed and anticoagulation prophylaxis was initiated. During the follow-up period, none of the study participants developed clinically significant pulmonary embolism.

UB-DVT and participants outcomes: Outcome of study participants developing DVT during ICU stay is shown in table V.

Discussion

In our mixed ICU cohort, the incidence of upper body DVT was 16.2 per cent, considerably higher than lower extremity-DVT at 3.3 per cent. Internal jugular vein was the most frequently involved site, reflecting its frequent use for CVC insertion. Nearly 40 per cent of upper body DVTs occurred during the fourth week of ICU stay, while half of lower extremity DVTs

Table II. ICU risk factors for the development of upper body deep vein thrombosis (DVT)

Parameters	Total (n=241)	UB- DVT (n=39)	LE-DVT (n=8)	No DVT (n=194)	*P* value
Length of pre-ICU hospital stay, days, median (IQR)	7 (4-12)	12 (7-20)	9 (7-12)	6 (3-10)	<0.001
Per cent of days with anticoagulation interruption during ICU stay, median (IQR)	62.5 (0-100)	50 (26.2-67)	45.4 (15-100)	74.3 (0-100)	0.429
Platelet count highest (mm^3), median (IQR)	215 (130-370)	373 (190-518)	233 (197-297)	202 (120-335)	0.001
Number of sessions of dialysis, median (IQR)	0 (0-2)	2 (0-12)	3 (1-3)	0 (0-1)	<0.001
DIC score, median (IQR)	3 (2-5)	5 (3-6)	6 (4-6)	3 (2-5)	0.018
Platelet transfusion, n (%)	36 (14.9)	19 (48.7)	2 (25)	15 (7.7)	<0.001
FFP transfusion, n (%)	105 (43.6)	29 (74.4)	4 (50)	72 (37.1)	<0.001
Central venous catheter days, median (IQR)	9 (6-18)	20 (14-28)	13 (8.5-27)	7.5 (5-12)	<0.001
Cannula size -12.5 Fr, n (%)	103	20 (19.4)	7 (6.8)	76 (73.8)	0.03
Vasopressor use, n (%)	195 (80.91)	38 (97.44)	8 (100)	149 (76.8)	0.002
Platelet count (mm^3), median (IQR)	150 (75-270)	267 (104-380)	135 (105-174.5)	140 (70-240)	0.004
Duration of mechanical ventilation (days), median (IQR)	7 (3-16)	20 (12-28)	14 (6-26)	5 (2-10)	<0.001

Data are expressed as number (n) percentage (%), median and IQR. DVT, deep vein thrombosis; UB-DVT, upper body deep vein thrombosis; LE-DVT, lower extremity deep vein thrombosis; ICU, intensive care unit; DIC, disseminated intravascular coagulation; FFP, fresh frozen plasma

Table III. Multivariate logistic regression analysis of independent risk factors for upper body deep vein thrombosis

Parameter	Odd ratio	95% CI	*P* value
Platelet transfusion	19.39	(4.37-86.1)	<0.001
Platelet count	1.01	(1.0-1.01)	0.002
Central venous catheter duration	1.19	(1.11-1.28)	<0.001
Dialysis sessions	1.15	(1.01-1.30)	0.029
Blood stream infection	2.76	(0.98-7.77)	0.054

CI, confidence interval

occurred within the first week. Factors significantly associated with upper body DVT included platelet transfusions, higher platelet count, prolonged central venous cannulation (CVC) days, and increased dialysis sessions. In contrast, lower extremity DVT was associated with obesity, prolonged mechanical ventilation, high DIC scores, and absence of mechanical thromboprophylaxis. Nearly 60 per cent of upper body DVT is completely recanalized after the removal of CVC and prophylactic anticoagulation therapy. There were no cases of clinically significant pulmonary embolism in patients with upper body DVT. Patients who had upper body DVT had a longer ICU and hospital stay and had a longer duration of mechanical ventilation. However, there was no association between upper body DVT and mortality.

Previous studies report a wide variation in UB-DVT incidence ranging from 2.2 to 16.9 per cent[6,7]. Trauma ICU studies report a upper body DVT

Table IV. Development of deep vein thrombosis (DVT) in relation to thromboprophylaxis use during ICU stay

Parameter	Total (n=241)	UB- DVT (n=39)	LE-DVT (n=8)	No DVT (n=194)	*P* value
Anticoagulant drug					
No anticoagulant, n (%)	102 (42.3)	5 (12.8)	3 (37.5)	94 (48.4)	0.001
Enoxaparin, n (%)	46 (19.1)	9 (23.1)	1 (12.5)	36 (18.6)	
Dalteparin, n (%)	88 (36.5)	24 (61.5)	3 (37.5)	61 (31.4)	
Heparin, n (%)	5 (2.1)	1 (2.6)	1 (12.5)	3 (1.5)	
Interruption of anticoagulant, n (%)	182 (75.5)	36 (92.3)	6 (37.5)	140 (72.2)	0.016
Antiplatelet drug use, n (%)	15 (6.2)	2 (5.1)	0 (0)	13 (6.7)	0.999
Mechanical thromboprophylaxis, n (%)	159 (66)	32 (82)	4 (50)	123 (63.4)	0.05
Arm restraints use, n (%)	97 (40.2)	21 (53.8)	4 (50)	72 (37.1)	0.128

Data are expressed as number (n) percentage (%), median and IQR

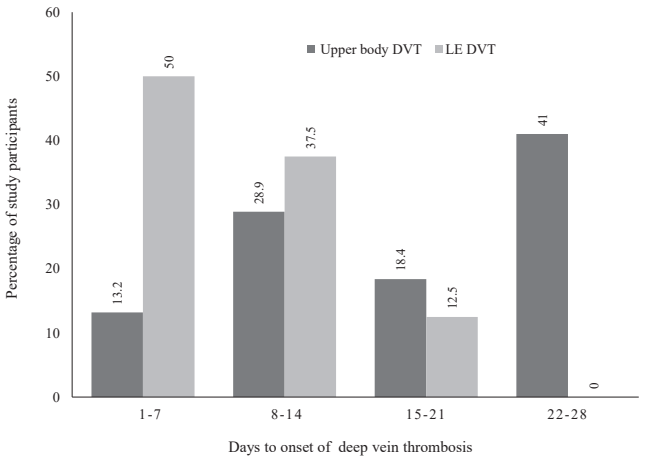

Fig. 2. Days to onset of deep vein thrombosis since ICU admission.

incidence of around 15 per cent, with catheter-related events forming a majority[15]. These align with our findings, where all patients with DVT had a CVC. The relatively low incidence of lower extremity DVT in our cohort may reflect the Southeast Asian population's lower genetic predisposition to thrombosis, notably the absence of factor V Leiden and prothrombin G20210A mutations[10,11].

The IJV was the most frequently involved site, consistent with findings by Endo *et al*[16] and Karabay *et al*[17] who also reported frequent involvement of the subclavian and axillary veins. The absence of subclavian thrombosis in our cohort reflects the local preference for IJV cannulation and limitations in ultrasound imaging due to overlying bone.

Of the established risk factors for DVT-only obesity (higher BMI) was significantly associated with lower limb DVT in our study. Obesity promotes thrombosis through a procoagulant state and may lead to suboptimal anticoagulant dosing[18]. None of these risk factors correlated with upper body DVT, highlighting the difference in pathophysiology. While lower extremity DVT typically results from venous stasis, upper body DVT often arises from endothelial injury related to CVC placement. Fewer patients in the No-DVT group received pharmacological prophylaxis. This may be due to a shorter ICU stay or early discharge, where thromboprophylaxis was either deemed unnecessary or deferred.

The median time to upper body-DVT diagnosis in our cohort was after the first ICU week, later than Wu *et al*[7] who reported a median of four days. The delayed presentation may reflect low prophylaxis use (8%) and the practice of using heparin flushes in CVC transducers. Thrombus resolution was observed in 59 per cent after catheter removal and anticoagulation, like their study[7]. The American College of Chest Physicians recommends catheter removal only if it is no longer necessary or dysfunctional, with overlapping therapeutic anticoagulation before removal, though this approach is not well validated[19]. Twelve patients underwent CTPA due to suspected pulmonary embolism (PE), but no cases of clinically significant PE were identified. This aligns with the low PE incidence (1-2%) in other ICU studies[20].

Duration of CVC has consistently been a strong risk factor in previous studies[21]. In our study, the risk was modest, possibly due to the use of heparin flushes, which are known to reduce catheter-related thrombus formation. Platelet transfusion emerged as the strongest predictor of upper body DVT in our study similar to earlier studies [4,22]. Prophylactic platelet transfusion prior to procedures has been linked with a higher risk of DVT[23]. Platelet transfusions may promote thrombogenesis *via* proinflammatory and prothrombotic mediators like sCD40L, microparticles, and activated platelets[24]. These components may enhance endothelial adhesion and coagulation[25]. Our findings of higher platelet count correlating with DVT risk reinforce this hypothesis.

Vasopressor administration was associated with upper body DVT only in univariate analysis. A study showed that vasopressor also increases the odds of DVT by 2.8 times (95% CI, 1.1 to 7.2)[4]. Vasopressor

Table V. Outcome of patients developing deep vein thrombosis (DVT) during ICU stay

Outcome variables	Total (n=241)	UBDVT (n=39)	LE DVT (n=8)	No DVT (n=194)	*P* value
Death n (%)	111 (46.1)	19 (48.7)	6 (75)	86 (44.3)	0.247
Duration of mechanical ventilation Days, median (IQR)	7 (3-16)	33 (14-46)	14 (6-26)	5 (2-10)	<0.001
Duration of ICU stay(days), median (IQR)	10 (6-21)	41 (24-59)	14 (10-26)	8 (6-14)	<0.001
Duration of hospitalisation (days), median (IQR)	19 (13-35)	54 (36-84)	22 (17-37)	17 (12-27)	<0.001

Data are expressed as number (n) percentage (%), median and IQR

use can reduce subcutaneous heparin absorption due to cutaneous vasoconstriction. This was corroborated in another study which showed lower anti-Xa factor activity in ICU patients on vasopressors receiving nadroparin[26].

Our findings also suggest that prolonged hospitalization may be secondary to the underlying critical illness rather than the thrombosis itself. Literature on upper body-DVT outcomes is mixed—Karabay *et al*[17] reported no mortality or PE, while Bleker *et al*[27] noted a 26 per cent mortality and nine per cent VTE recurrence in cancer patients over 3.5 yr. Our data add nuance, indicating longer ICU burden without affecting mortality

Our study has limitations. The diagnosis of DVT was based on point-of-care ultrasonography by a single intensivist without confirmation by a second observer or a radiologist, raising the possibility of missed thrombi. Duplex ultrasonography is operator-dependent, and a small thrombus could have been missed. Weekly ultrasonography may have missed early-onset DVT. Thrombus size was not recorded, limiting the ability to stratify severity. We did not perform post hoc comparisons between upper & lower extremity DVT due to the small number of cases. Unsuspected pulmonary embolism could have been missed as only symptomatic patients underwent CTPA.

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***Conflicts of Interest*:** None.

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