# Factors associated with deep vein thrombosis recurrence at a cardiology department in sub-Saharan Africa

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## ABSTRACT

**Objective: Deep vein thrombosis (DVT), once rare, has become increasingly common in Africa. This study aimed to identify factors associated with DVT recurrence.**

**Methodology: We conducted a descriptive and analytical cross-sectional study from 1 January 2020 to 31 December 2024 at the cardiology department of Bogodogo University Hospital (CHU-B). Patients admitted to the department for DVT on venous echo-Doppler were included. Epidemiological, clinical, and paraclinical parameters were crossed in univariate and multivariate analyses.**

**Results: During the study period, 164 cases of DVT were recorded out of 2 637 hospitalised patients, with a 6.22% hospital prevalence rate. The mean age was 51.4 years. Women were predominant (90, 55%), with a sex ratio of 0.8. Recurrences occurred in 27.44% of cases ($n$ = 45). A sedentary lifestyle, prior DVT, and obesity were the most frequent thromboembolic risk factors. Multivariate analysis showed that a personal history of DVT (odds ratio [OR] 3; $p$ = 0.03), obesity (OR 3.8; $p$ = 0.005), and the femoral thrombus location (OR 2; $p$ = 0.004) were significantly associated with DVT recurrence.**

**Conclusion: DVT recurrences are becoming increasingly frequent, and their management requires accurate identification of the risk factors.**

**Keywords: deep vein thrombosis, recurrence, associated factors, Burkina Faso.**

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## INTRODUCTION

DVT is the partial obstruction of a deep vein by a thrombus formed in situ.[1] Along with pulmonary embolism (PE), it is the main form of venous thromboembolism (VTE), with an estimated incidence of 115–269 per 100 000 people.[2] DVT can affect the entire venous network, with a preferential location in the veins of the lower limbs.[3] It is often the prelude to PE, can recur in 30% of patients, and 25–40% of cases can develop post-thrombotic syndrome (PTS).[4] Once thought rare in Africa, VTE, and specifically PE, has become one of the leading causes of consultation and hospitalisation in cardiology departments in sub-Saharan Africa, especially in Burkina Faso.[5-7] Isolated DVT has not been well documented, and factors associated with recurrence remain unknown in our context. This study aimed to determine the prevalence of DVT and identify the predictors of recurrence at the cardiology department of CHU-B to promote better curative and prophylactic management.

## PATIENTS AND METHODS

### Study setting and period

This was a descriptive and analytical cross-sectional study conducted from 1 January 2020 to 31 December 2024 at the cardiology department of CHU-B in Burkina Faso. CHU-B is a third-level hospital in Burkina Faso's health pyramid and receives many patients. The cardiology department is a centre of excellence, with a 24-hour on-duty cardiologist facilitating adequate management of cardiovascular pathologies, particularly thromboembolism.

### Inclusion and exclusion criteria

All patients admitted during the study period for DVT of the lower limbs detected by venous Doppler ultrasound were included. Other thrombotic locations and cases with suspected diagnoses not confirmed by Doppler ultrasound were excluded.

### Study variables and operational definitions

Recurrent DVT was considered the dependent variable. The subordinate variables were:

- Socio-demographic data, including age and sex.
- Thromboembolic risk factors, such as a sedentary lifestyle, obesity, prolonged immobilisation, recent surgery or trauma, pregnancy or postpartum.
- Clinical variables, particularly the presence of a large painful leg, paraesthesia, fever, tachycardia, Mahler's climbing pulse, and local signs of inflammation (oedema, redness or cyanosis, warmth).
- Homans' sign, reduced calf balloting.
- Ultrasound data, including thrombosis location, extent, etc.
- Therapeutic parameters, evolution, and complications.

DVT is defined as thrombotic obstruction (often of fibrinocrural origin) of a deep venous trunk, often located in the lower limbs.[8] DVT recurrence is defined as the occurrence of a new thrombotic event in a subject with a history of DVT.[9] PTS was defined as the presence of chronic venous symptoms and/or signs secondary to DVT of the lower limbs.[10]

### Data processing and analysis

All data were entered on a microcomputer and analysed using Epi Info software, French version 7.2.5.0. All patients were divided into 2 groups according to DVT recurrence: "DVT recurrence positive (+)" versus "DVT recurrence negative (-)". Positional parameters were used to characterise the quantitative variables. The chi-square test was used in a univariate analysis to determine which qualitative variables were associated with DVT recurrence. All variables with univariate *p*-values < 0.2 were included in a multivariate logistic regression model to determine independent predictors of DVT recurrence. A *p*-value < 0.05 defined the significance threshold.

### Ethical considerations

Data were collected on anonymised, individual survey forms to maintain patient confidentiality. We obtained approval from the CHU-B ethics committee (number 2025-01-35) before patient inclusion. All included patients freely agreed to participate after understanding the rationale of the study. The remainder of the study was conducted in accordance with the principles of good clinical practice.

## RESULTS

### General characteristics of the study population

During the study period, 2 637 patients were admitted to the department, including 164 patients with DVT. The prevalence of DVT recurrence was 27.43% (*n* = 45). Women accounted for 55% (*n* = 90), with a sex ratio of 0.8. The mean age was 51.4 ± 17.3 years, with extremes of 17 and 94 years. The 41–60 age group was the most represented (*n* = 59, 36%), with a higher recurrence rate in the 61–80 age group (Figure 1). In 2023, there were 38 DVT cases, including 13 patients with at least one previous similar episode. Figure 2 shows the annual distribution of DVT and recurrences.

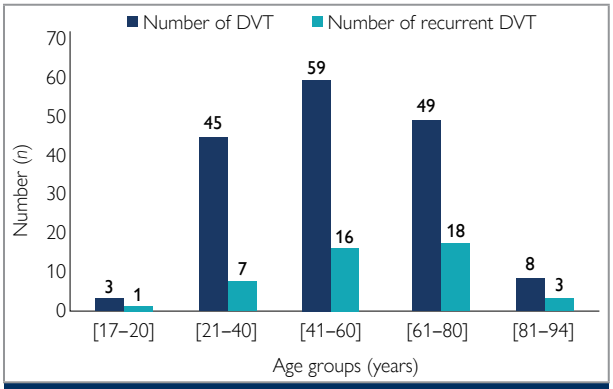


**FIGURE 1: Distribution and recurrence of deep vein thrombosis by age group.**

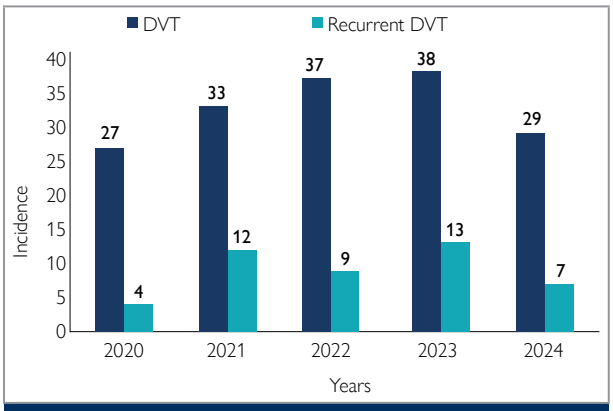


**FIGURE 2: Annual distribution and recurrence of deep vein thrombosis.**

### Comparison of clinical characteristics in univariate analysis

For the univariate comparative analysis of "DVT recurrence +" versus "DVT recurrence -", the thromboembolic risk factors associated with recurrence were bed rest for more than 3 days ($p = 0.18$), a sedentary lifestyle ($p = 0.14$), obesity ($p = 0.02$), infection ($p = 0.006$), age ≥ 65 years ($p = 0.002$), and prior DVT ($p = 0.004$) (Table I). Pelvic limb swelling ($p = 0.003$), decreased calf bouncing ($p = 0.18$), and Homans' sign ($p = 0.15$) were the associated clinical signs in univariate analysis (Table I).

### Comparison of paraclinical characteristics in univariate analysis

At the paraclinical level, anaemia ($p = 0.16$), popliteal location ($p = 0.076$), and femoral location ($p = 0.002$) were the parameters associated with DVT recurrence in univariate analysis (Table II).

### Therapeutic and evolutionary aspects

In this study, all patients received heparin therapy and venous restraint. Vitamin K antagonists were the most indicated oral

**TABLE I: Univariate analysis of clinical parameters.**

| Variables | General population *n* = 164 | DVT recurrence + *n* = 45 (%) | DVT recurrence - *n* = 119 (%) | OR (95% CI) | *p*-value |
|---|---|---|---|---|---|
| Recent travel | 10 | 3 (30) | 7 (70) | 0.9 (0.2 to 3.7) | 0.956 |
| **Thromboembolic risk factors** | | | | | |
| Recent trauma | 11 | 1 (9.1) | 10 (90.90) | 4.0 (0.5 to 7) | 0.730 |
| Postpartum | 10 | 3 (30) | 7 (70) | 1.6 (0.3 to 7.6) | 0.541 |
| Cancer | 10 | 6 (60) | 4 (40) | 0.4 (0.1 to 1.7) | 0.356 |
| Recent surgery | 11 | 1 (9.10) | 10 (90.90) | 4.0 (0.5 to 34) | 0.345 |
| Chemotherapy | 4 | 2 (50) | 2 (50) | 0.4 (0.1 to 2.8) | 0.307 |
| HIV | 6 | 4 (66.70) | 2 (33.30) | 0.3 (0.1 to 2.0) | 0.269 |
| **Breastfeeding ≥ 3 days** | 19 | 7(36.80) | 12 (63.20) | 0.6 (0.2 to 1.7) | 0.186 |
| Sedentary lifestyle | 117 | 35 (29.90) | 82 (70.10) | 0.7 (0.3 to 1.7) | 0.146 |
| Obesity | 43 | 10 (23.30) | 33 (76.70) | 4.1 (1.7 to 10) | 0.020 |
| Infection | 10 | 7 (70) | **3 (30)** | **7.1 (1.7 to 2.8)** | **0.006** |
| **DVT history** | **45** | **45 (100)** | **0 (0)** | **1.7 (1.0 to 2.4)** | **0.004** |
| **General signs** | | | | | |
| PGM | 17 | 4 (23.50) | 13 (76.50) | 1.3 (0.4 to 4.0) | 1.00 |
| Tachycardia | 30 | 9 (30.00) | 21 (70.00) | 0.9 (0.4 to 2.1) | 0.722 |
| Fever | 33 | 12 (25.20) | 21 (74.80) | 0.6 (0.3 to 1.3) | 0.244 |
| **Swelling of the LP** | **147** | **41 (27.90)** | **106 (72.10)** | **0.3 (0.1 to 1.5)** | **0.003** |
| **Physical signs** | | | | | |
| Erythematous plaque | 14 | 1 (07.15) | 13 (92.85) | 1.2 (0.7 to 2.0) | 0.860 |
| Satellite adenopathy | 73 | 26 (35.62) | 47 (64.38) | 0.6 (0.3 to 1.2) | 0.706 |
| Local heat | 140 | 10 (07.10) | 130 (92.90) | 0.5 (0.2 to 1.8) | 0.608 |
| Redness | 99 | 31 (31.30) | 68 (68.70) | 0.8 (0.4 to 1.6) | 0.502 |
| Paraesthesia | 33 | 26 (78.79) | 7 (21.21) | 3.0 (1.1 to 10) | 0.430 |
| **BC reduction** | **125** | **33 (26.40)** | **92 (73.60)** | **1.6 (0.8 to 3.7)** | **0.180** |
| **Homans' sign** | **138** | **45 (32.61)** | **93 (63.39)** | **0.4 (0.1 to 1.3)** | **0.156** |

*CI: confidence interval, DVT: deep vein thrombosis, HIV: human immunodeficiency virus, OR: odds ratio, PGM: Mahler climbing pulse , LP: pelvic limb, BC: Calf bouncing*

**TABLE II: Univariate analysis of paraclinical parameters.**

| Variables | General population *n* = 164 | DVT recurrence + *n* = 45 (%) | DVT recurrence - *n* = 119 (%) | OR (95% CI) | *p*-value |
|---|---|---|---|---|---|
| High D-dimer | 88 | 35 (39.80) | 53 (60.20) | 1.6 (1.4 to 1.9) | 0.860 |
| Sural thrombus | 51 | 28(54.91) | 23 (45.09) | 1.3 (0.6 to 2.9) | 0.777 |
| Leucopaenia | 21 | 7 (33.34) | 14 (66.66) | 0.7 (0.3 to 1.9) | 0.544 |
| Iliac thrombus | 83 | 36 (43.38) | 47 (56.62) | 0.5 (0.4 to 1.2) | 0.476 |
| Elevated CRP | 87 | 29 (33.30) | 58 (66.70) | 0.8 (0.4 to 1.6) | 0.378 |
| Hyperleucocytosis | 16 | 6 (37.50) | 10 (62.50) | 0.7 (0.1 to 4.1) | 0.356 |
| Thrombocytosis | 11 | 1 (90.90) | 10 (90.90) | 3 (0.5 to 3.0) | 0.311 |
| Thrombocytopaenia | 16 | 7 (43.70) | 9 (56.30) | 0.5 (0.2 to 1.4) | 0.205 |
| **Anaemia** | 85 | 25 (29.40) | 60 (70.60) | 0.8 (0.4 to 0.8) | 0.160 |
| Popliteal thrombus | 111 | 32 (28.29) | 79 (71.71) | 0.7 (0.3 to 1.5) | 0.076 |
| Femoral thrombus | 113 | 37 (32.75) | 76 (67.25) | 0.5 (0.2 to 1.2) | 0.002 |

*CI: confidence interval, DVT: deep vein thrombosis, OR: odds ratio, CRP: C-reactive protein*

**TABLE III: Results of multivariate analysis of factors associated with DVT recurrence.**

| Variables | Univariate analysis | | Multivariate analysis | |
|---|---|---|---|---|
| | OR (95% CI) | *p*-value | OR (95% CI) | *p*-value |
| Sedentary lifestyle | 0.7(0.3 to 1.7) | 0.146 | 1.8(0.7 to 3.8) | 0.950 |
| Age ≥ 65 years | 1.5 (0.2 to 2.1) | 0.002 | 1.8(0.3 to 4.6) | 0.687 |
| Age 61–80 years | 2 (0.3 to 2.2) | 0.004 | 1 (0.4 to 2.2) | 0.634 |
| Bed rest | 0.6 (0.2 to 1.7) | 0.186 | 2.6(0.5 to 7.03) | 0.410 |
| Homans' sign | 0.4 (0.1 to 1.3) | 0.156 | 1.6(0.7 to 3.84) | 0.410 |
| Pelvic limb oedema | 0.3 (0.1 to 1.5) | 0.003 | 0.4(0.1 to 1.6) | 0.329 |
| Popliteal thrombus | 0.7 (0.3 to 1.5) | 0.076 | 0.9(0.1 to 3.7) | 0.304 |
| Infection | 7.1 (1.7 to 2.8) | 0.006 | 1.4(0.7 to 3.5) | 0.295 |
| Anaemia | 0.8 (0.4 to 0.8) | 0.160 | 1.6(1.0 to 3.5) | 0.130 |
| DVT history | 1.7 (1.0 to 2.4) | 0.004 | 3 (1.1 to 2.2) | 0.030 |
| Obesity | 4.1 (1.7 to 10) | 0.020 | 3.8(1.7 to 6.0) | 0.005 |
| Femoral thrombus | 0.5 (0.2 to 1.2) | 0.002 | 2 (1.1 to 3.7) | 0.004 |

*CI: confidence interval, DVT: deep vein thrombosis, OR: odds ratio*

anticoagulant in 81.10% of patients (*n* = 133). Complications were noted in 11 patients (6.71%): infection (*n* = 6), venous insufficiency (*n* = 3), and PTS (*n* = 2).

### Multivariate analysis of variables associated with thrombosis recurrence

In multivariate logistic regression, the variables significantly associated with DVT recurrence were obesity ($p = 0.005$), prior DVT ($p = 0.03$), and femoral thrombus location ($p = 0.004$). Table III presents the results of the multivariate analysis of factors associated with DVT recurrence.

## DISCUSSION

### Epidemiological aspects

During the study period, DVT accounted for 6.21% of hospitalisations at the cardiology department of CHU-B. The prevalence of recurrent DVT was 27.43%. In fact, DVT is a real public health problem, with its prevalence increasing markedly in all series. Although this prevalence is higher than in previous Burkina Faso studies (4.71%), it is still lower than Western rates.[3,4,11] Presently, the increasing availability of diagnostics has substantially improved DVT management, even though the disease often recurs. Previous sub-Saharan series reported DVT recurrence rates of 10.2–16.24%.[12,13] This high prevalence is part of a context marked by an outbreak of multiple anticoagulant classes with variable protocols, often making compliance difficult in our population.

Our study shows an average age of 51.4 years, with most DVT recurrences between 61 and 80 years. While it is accepted that the risk of a first VTE event increases with age, the link with recurrence remains controversial.[14,15] It varied between our study and the studies by Soya, et al. in the Ivory Coast and Kaboré, et al. in Burkina Faso.[12,13] This controversy aligns with the increase in thromboembolic risk factors linked to the westernisation of lifestyles, with its corollary of chronic inflammatory and malignant tumours responsible for hypercoagulability.[16,17]

Females predominated in our study, accounting for 55% of DVT cases and 57.77% of recurrences (26/45). These results correspond with most previous series.[12,13] The strong female predominance is not specific to DVT but extends to all venous thromboembolic diseases.[6,18] Women are exposed to an increased risk of thrombosis due to their hormonal physiology, sedentary lifestyle, obesity, and use of oral contraceptives.

### Risk factors for DVT recurrence

Although responsible for permanent thrombotic risk, active cancer (*n* = 10) and human immunodeficiency virus (HIV) infection (*n* = 6) did not correlate with DVT recurrence. This contrasts with data in the literature, where the risk of VTE recurrence is multiplied 2–4 times in patients with one of these major thrombotic factors.[14,19] Active research into these factors is not part of routine practice in our context, although it is extremely necessary. Moreover, these patients have not received long-term follow-up. In the presence of these factors, the pathophysiological thrombotic mechanisms are inherent in the secretion of procoagulant factors, certain thrombogenic antitumour and antiretroviral therapies, and the reduction in the levels of physiological anticoagulant proteins.[20,21]

Series studying the link between thrombotic location and recurrence have produced conflicting results. Femoral location was significantly associated with DVT recurrence in this study (OR 2, 95% confidence interval [CI] 1.1 to 3.7; $p = 0.004$). In a study of 738 patients followed up for 3–8 years, Hansson, et al. also found that proximal thrombosis was associated with recurrence (relative risk [RR] 2.40, 95% CI 1.48 to 3.88; $p < 0.001$).[19] In fact, it is clearly established in the literature that the risk of recurrence correlates with the level of DVT and the location of the anterior site.[14] The more proximal a venous thrombosis, the higher the risk of VTE. Proximal DVT doubles

the risk of recurrence compared with distal (sub-popliteal) DVT.[19]

In our series, the recurrence rate was statistically significant in patients with a history of proximal DVT (OR 3, 95% CI 1.1 to 2.2; $p$ = 0.03). This result is consistent with several series in the literature, particularly those by Hansson, et al., who also demonstrated the same association.[19] During the first episode of DVT, valve damage leads to a disturbance in plasma rheology, thus favouring recurrent thrombotic events, especially in the presence of a defect in the coagulation or fibrinolytic system.[22]

Finally, as in most venous thromboembolic disease studies, a sedentary lifestyle and obesity were the most frequent thromboembolic risk factors in patients with thrombotic recurrence in this study. Obesity was also associated with recurrence (OR 3.8, 95% CI 1.7 to 6.0; $p$ = 0.003). Previously considered rare in Africa, obesity is now increasingly becoming a public health problem in our region.[23] In the Ivory Coast, its prevalence was 29% in the study by Soya, et al. in 2019, and was associated with DVT recurrence after 2 years (OR 4.51; $p$ = 0.0012).[12] This physiological state induces chronic inflammation, hypercoagulability, and venous stasis, particularly in the lower limbs, contributing to thrombotic recurrence.

### Limitations and future directions

Although our study has many strengths, specifically its analytical and original nature, it may be subject to bias; however, this does not affect its quality. A selection bias could exist in our study due to the organisation of the patient referral system in our country. Peripheral centres, which do not always have qualified staff, often refer patients with venous thrombosis to the central level. The second limitation concerns the study's cross-sectional design. The lack of long-term patient follow-up prevents establishing the necessary duration of curative anticoagulation in black Africans, limiting the recommendations from this study. An information bias is also possible since the investigator was informed of the results of the investigations for DVT diagnosis. Multicentre cohort studies incorporating the risk prediction for recurrence would increase the relevance of these results.

## CONCLUSION

DVT is a frequent pathology with significant morbidity and mortality due to the immediate risk of PE. Its incidence is increasing rapidly in Africa, particularly in Burkina Faso. Recurrence was one of the complications encountered and was associated with obesity, prior venous thrombosis, and femoral thrombus location in this study. Larger, more in-depth multicentre studies using prospective cohorts to assess the probability of recurrence using validated scores are needed to confirm and enrich this data.

Conflict of interest: none declared.

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