

## The prevalence of deep Venous thrombosis of the lower extremity in hospitalised bedridden orthopaedic patients: a pilot study

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### Abstract

**Objective:** To determine the prevalence of objectively confirmed deep vein thrombosis of lower extremities in bedridden hospitalised orthopaedic patients who received no thromboprophylaxis.

**Method:** The prospective cross-sectional study was conducted at Dr Ruth Pfau Civil Hospital, Karachi, from April to June 2021, and included all patients aged  $\geq 40$  years admitted for intended major lower limb surgery and expected to be confined to the bed for at least 4 days. Duplex ultrasound scanning of both legs was used to confirm deep vein thrombosis. Data was analysed using SPSS 22.

**Results:** Of the 104 subjects, 60(57.6%) were males and 44(42.3%) were females. The overall mean age was  $51.9 \pm 7.4$  years. The most common type of fracture was the neck of femur 28(26.9%). The mean delay between the fracture and admission was  $6.44 \pm 4.9$  days. The mean length of hospital stay was  $12.76 \pm 3.8$  days. The overall prevalence of deep vein thrombosis was 16(15.3%) and none of these patients had any symptom at all.

**Conclusion:** There was 15.3% prevalence of deep vein thrombosis. Considering that the condition is potentially lethal, routine prophylaxis for all at-risk patients should be encouraged.

**Key Words:** Prevalence, Deep venous thrombosis, Lower extremity, Orthopaedic patients.

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### Introduction

Deep venous thrombosis (DVT) is preventable, but is still a major cause of death and disability among hospitalised orthopaedic bedridden patients<sup>1-3</sup>. In the Western world, without any prophylaxis, the reported prevalence of DVT in hospitalised bedridden patients undergoing major orthopaedic surgery ranged 40-60%<sup>4-6</sup>.

Pooled data from recent clinical trials indicate that venous stasis is often the primary causative factor, leading to blood clot formation<sup>7,8</sup>. In patients undergoing orthopaedic surgery, all three factors described in 1884 in Virchow's triad<sup>6, 7</sup> are present: venous blood stasis due to the use of tourniquet, prolonged immobilisation and bed rest; vascular wall injuries due to surgical manipulation of limb; and hypercoagulability due to the use of polymethylmethacrylate (PMMA) bone cement and increase in thromboplastin agents in trauma patients. Therefore, DVT prophylaxis, mechanical and/or pharmacological, is paramount in bedridden hospitalised orthopaedic patients. Published data from randomised controlled trials (RCTs) assessing surgical patients claim that perioperative use of adequate thromboprophylaxis for at-risk inpatients can prevent about half of all

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pulmonary emboli (PE) and about two-thirds of all DVTs<sup>4,9</sup>.

Despite such overwhelming evidence, in Pakistan, most orthopaedic surgeons are reluctant to use venous thromboprophylaxis due to the concern of perioperative haemorrhage or haematoma formation, and the possible need for blood transfusion. Another reason that is frequently implicated in the reluctance of surgeons to use DVT prophylaxis is general mistrust and the perception that DVT and its complications are uncommon in Asians, although recent reports claim that the prevalence of DVT in Asian populations is similar to the Western<sup>3, 4, 10-13</sup>.

The current study was planned to determine objectively the prevalence of DVT of lower extremities in bedridden hospitalised orthopaedic patients who received no thromboprophylaxis.

### Patients and Methods

The prospective cross-sectional study was conducted from April to June 2021 at Dr Ruth Pfau Civil Hospital, Karachi (CHK), which is affiliated with the Dow University of Health sciences (DUHS), Karachi. After approval from the institutional ethics review board, the sample was raised using convenience sampling technique. Those included were consecutive patients aged  $\geq 40$  years who were admitted for intended major lower limb surgery and expected to be confined to the bed for at least 4 days.

Duplex ultrasound of both legs on the 4th post-admission day was used for screening and diagnosis of DVT<sup>14</sup>. Patients were excluded if they were ambulatory, had prior DVT, or had been treated with anticoagulants. After taking informed consent from all the subjects, demographic and clinical data was collected on a pre-designed questionnaire. The sample size was calculated using EpiTools<sup>15</sup>, with an anticipated prevalence of DVT among Asians of 6.8%<sup>16</sup>, confidence interval (CI) 95% and absolute precision 5%. The body mass index (BMI) of the subjects was categorised according to the Asia-Pacific classification<sup>17</sup>.

Data was analysed using SPSS 22. Data was expressed as mean  $\pm$  standard deviation (SD) for numerical variables and as frequencies and percentages for categorical variables.

## Results

Of the 104 subjects, 60(57.6%) were males and 44(42.3%) were females. The overall mean age was  $51.9 \pm 7.4$  years, and 58(56%) were aged  $>50$  years. In BMI categories, 12(11.5%) were overweight and 5(4.8%) were obese. The most common type of fracture was neck of femur 28(26.9%), followed by trochanteric femur 24(23%), distal femur 16(15.3%), femur shaft 14(13.4%), proximal tibia 12(11.5%), pelvic and acetabulum 7(6.7%) and ankle and foot 3(2.8%).

Further, 40(38.4%) patients were admitted within 4 days of trauma, and 64(61.5 %) after the 4th day. The mean delay between the fracture and admission was  $6.44 \pm 4.9$  days. Of the total, 29(27.8%) patients underwent surgery within 7 days of admission, and 75(72%) had it after 7 days. The mean delay between the admission and surgery was  $9.3 \pm 3.3$  days. The mean length of hospital stay was  $12.76 \pm 3.8$  days. The reasons behind such a delay in admission were late reporting of patients, advanced age with multiple co-morbid conditions, and overcrowding in hospital.

DVT on the 4th post operative day was detected in 16(15.3%) patients. Proximal DVT was present in 13 patients, i.e. 81.2%. Of them, 10 (62.5%) had an isolated proximal DVT; popliteal vein and superficial femoral vein in 3(23%) subjects each, common femoral vein in 2(15.4%) subjects, and both common femoral and superficial femoral vein in 2(15.4%) subjects, the remaining 3(18.8%) patients had both proximal and distal (calf) DVT. However, 3(18.8%) patients had only isolated distal (calf) DVT; soleus veins in 2(66.6%) subjects and peroneal vein in 1(33.3%). All 16(100%) patients were asymptomatic and no suspicion of pulmonary embolism (PE) was noted.

## Discussion

Lower limb DVT is a frequent yet preventable cause of long-term morbidity and mortality following major orthopaedic surgery<sup>1-3</sup>. Despite evidence-based recommendations and available international guidelines, there is no clear documentation of any guidelines or protocols at the study site, and, more so, most surgeons often do not prescribe thromboprophylaxis after major orthopaedic surgery, thinking that DVT and its complications are uncommon among Asians, and it is unnecessary to administer routine anticoagulants to all patients<sup>18-20</sup>.

At the CHK Orthopaedic Department, 4 patients died suddenly a few days after admission over a two-month period in 2021, and all were suspected to be victims of fatal PE.

"On the one hand, we perceived that DVT and its complications are rare among Asian<sup>18-20</sup>", and, on the other hand, we claimed that DVT is still the 3rd leading cause of in-hospital death<sup>7</sup>."

These observations led us to carry out the current prospective, hospital-based, cross-sectional study. There are only a few reports on the prevalence of DVT in Pakistan<sup>21, 22</sup>.

However, more recently published reports on Asian patients challenged the above view, and claimed that rates of hospital-associated DVT and post-surgical DVT were similar in Asian and Western countries<sup>4, 10, 11</sup>.

A Chinese study<sup>23</sup> reported DVT incidence in elderly patients with femur neck fracture to be 28%. Among them, the incidence of preoperative DVT was 71.7% and that of postoperative DVT was 28.3%. The frequency of DVT in patients who underwent joint arthroplasty was higher than those who underwent reduction and screw fixation. Besides, similar to another study<sup>12</sup>, the incidence of DVT following intertrochanteric femur fracture in the elderly was 20.1%<sup>22</sup>. Likewise, a study<sup>24</sup> found that the 19.78% of elderly patients after total hip arthroplasty showed evidence of DVT.

In a Malaysian study<sup>11</sup>, the prevalence of DVT of the lower extremity and symptomatic PE in patients admitted for orthopaedic surgery was 62% and 1% respectively without prophylaxis; the prevalence was 76.5% after total knee arthroplasty, 64.3% after total hip arthroplasty, and 50% in the fracture group.

A 2004 prospective, multicentre, observational cohort study of Asian patients undergoing major lower-limb orthopaedic surgery without thromboprophylaxis is in 39

centres in 11 Asian countries concluded that the incidence of symptomatic venous thromboembolism (VTE) in Asian patients was similar to that in Western countries<sup>10</sup>.

Another large Asian multinational study in 2005<sup>4</sup> concluded that the incidence of symptomatic VTE in Asian patients after major orthopaedic surgery was not low, and recommended thromboprophylaxis drugs in Asian patients.

Despite the aforementioned data on Asians, DVT prophylaxis is not routinely offered to hospitalised orthopaedic patients after major lower limb surgery at the CHK.

DVT is a silent killer that can kill, with little or no warning. Important international guidelines on DVT emphasise that prevention is better and cheaper than seeking a remedy after the damage has been done<sup>4</sup>.

Data from RCTs assessing surgical patients suggests that adequate thromboprophylaxis in at-risk patients can prevent VTE in 1 out of 10 patients, and save the life of 1 out of 200 patients<sup>4, 9</sup>.

Inconsistent with reported data, however, DVT prevalence in the current study was 15.3%. In addition, out of 16 DVT patients, 56.2% were aged >50 years, and had presented 10 days after trauma. Along with advanced age, prolonged immobility after trauma and delayed patient admission were found to be the major risk factors for DVT. Similar findings have been reported earlier<sup>25</sup>. Bengoa et al.<sup>26</sup> investigated the relationship between DVT prevalence and delay to hospital admission, and reported 17.1% DVT prevalence in elderly patients admitted at least  $\geq 48$  hours after the hip fracture. Consistently, Zuo et al.<sup>12</sup> found that the risk of DVT was increased by 37% with each day of delay to admission after intertrochanteric fractures. The current results are slightly lower than those of previous reports from Western populations<sup>4-6</sup>. Although, 15.3% is less than the expected value, it cannot be neglected. The study found no conclusive reason for reluctance in initiating DVT prophylaxis in at-risk elderly bedridden patients due for intended major lower limb surgery.

The clinical use of thromboprophylaxis is justified because in orthopaedic traumatic patients, all three factors described in the Virchow triad are present, >70-80% of such DVTs are asymptomatic, and PE is detected by perfusion lung scanning in 60% patients with documented DVT even though >50% are silent clinically. Although PE has a relatively low prevalence, it is still the 3rd leading cause of in-hospital death<sup>7</sup>. Finally, 30% of

untreated patients with PE die within the first hour of the event, which does not leave enough time for any conventional treatment to take effect<sup>24, 27</sup>.

The current study has limitations as it was a single-centre cross-sectional study with a relatively small sample size. Large multicentre studies are recommended. Also, the study only evaluated lower extremities and, therefore, cases involving upper extremities were not assessed. The study used Duplex ultrasonography when the sensitivity of venography happens to be higher. Finally, the scanning was done on the 4th day of admission and, therefore, it is possible that late DVTs might have been missed as DVTs can occur up to 90 days after a patient has left the hospital<sup>28</sup>. These could be the likely reasons for the low DVT prevalence compared to the rates reported from Western studies.

## Conclusion

DVT prevalence was fund to be 15.3%. Considering that DVT is a potentially lethal clinical condition that may lead to sudden death owing to PE, routine prophylaxis for all hospitalised at-risk patients on admission, during hospitalisation, and even after hospital discharge is recommended.

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## References

1. Krauss ES, Segal A, Cronin M, Dengler N, Lesser ML, Ahn S, et al. Implementation and Validation of the 2013 Caprini Score for Risk Stratification of Arthroplasty Patients in the Prevention of Venous Thrombosis. *Clin Appl Thromb Hemost* 2019; 25: 1076029619838066.
2. Lin HY, Lin CY, Huang YC, Hsieh HN, Yang YW, Chang IL, et al. Deep vein thrombosis after major orthopedic surgery in Taiwan: A prospective cross-sectional study and literature review. *J Formos Med Assoc* 2022; 121: 1541-9.
3. Xing F, Li L, Long Y, Xiang Z. Admission prevalence of deep vein thrombosis in elderly Chinese patients with hip fracture and a new predictor based on risk factors for thrombosis screening. *BMC Musculoskelet Disord* 2018; 19: 444.
4. Piovella F, Wang CJ, Lu H, Lee K, Lee LH, Lee WC, et al. Deep-vein thrombosis rates after major orthopedic surgery in Asia. An epidemiological study based on postoperative screening with centrally adjudicated bilateral venography. *J Thromb Haemost* 2005; 3: 2664-70.
5. Geerts W, Code Ki, Jay RM, Chen E, Szalai JP. A prospective study of venous thromboembolism after major trauma. *N Eng J Med* 1994; 331: 1601-6.
6. Flevas DA, Megaloikonomos PD, Dimopoulos L, Mitsiokapa E, Koulouvaris P, Mavrogenis AF. Thromboembolism prophylaxis in orthopaedics: an update. *EORT Open Rev* 2018; 3: 136-48.
7. Whiting PS, White-Dzuro GA, Greenberg SE, VanHouten JP, Avilucea FR, Obremskey WT, et al. Risk Factors for Deep Venous Thrombosis Following Orthopaedic Trauma Surgery: An Analysis

of 56,000 patients. *Arch Trauma Res* 2016; 5: e32915.

8. Hadizie D, Deyoi YB, Faisham WI, Yahaya S, Ghani SA, Ahmad-Mohd-Zain MR. Study of Deep Vein Thrombosis Screening by using Ultrasound Doppler in Patients with Pelvic and Acetabulum Fractures Requiring Operative Intervention. *Malays Orthop J* 2022; 16: 51-7.
9. Gritsiouk Y, Hegsted DA, Schlesinger P, Gardiner SK, Gubler KD. A retrospective analysis of the effectiveness of low molecular weight heparin for venous thromboembolism prophylaxis in trauma patients. *Am J Surg* 2014; 207: 648-51; discussion 651-2.
10. Leizorovicz A, Turpie AG, Cohen AT, Wong L, Yoo MC, Dans A; SMART Study Group. Epidemiology of venous thromboembolism in Asian patients undergoing major orthopedic surgery without thromboprophylaxis. The SMART study. *J Thromb Haemost* 2005; 3: 28-34.
11. Dhillon KS, Askander A, Doraismay S. Postoperative deep-vein thrombosis in Asian patients is not a rarity: a prospective study of 88 patients with no prophylaxis. *J Bone Joint Surg Br* 1996; 78: 427-30.
12. Zuo J, Hu Y. Admission deep venous thrombosis of lower extremity after intertrochanteric fracture in the elderly: a retrospective cohort study. *J Orthop Surg Res* 2020; 15: 549.
13. Fei C, Wang PF, Qu SW, Shang K, Yang K, Li Z, et al. Deep Vein Thrombosis in Patients with Intertrochanteric Fracture: A Retrospective Study. *Indian J Orthop* 2020; 54(Suppl 1): 101-8.
14. Cogo A, Lensing AW, Koopman MM, Piovella F, Siragusa S, Wells PS, et al. Compression ultrasonography for diagnostic management of patients with clinically suspected deep vein thrombosis: prospective cohort study. *BMJ* 1998; 316: 17-20.
15. Villarta Jr RL, Asaad AS. Sample size determination in an epidemiologic study using the EpiTools web-based calculator. *Acta Medica Philippina* 2014;48: 68-72
16. Nathan S, Aleem MA, Thiagarajan P, Das De S. The incidence of proximal deep vein thrombosis following total knee arthroplasty in an Asian population: a Doppler ultrasound study. *J Orthop Surg (Hong Kong)* 2003; 11: 184-9.
17. Lim JU, Lee JH, Kim JS, Hwang YI, Kim TH, Lim SY, et al. Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. *Int J Chron Obstruct Pulmon Dis* 2017; 12: 2465-75.
18. Khan MA, Pal S, Chinoy MA, Ahmed SK. The frequency of Deep Vein Thrombosis in patients with hip fractures. *J Pak Med Assoc* 2019; 69: S21-4.
19. Zeng Y, Si H, Wu Y, Yang J, Zhou Z, Kang P, et al. The incidence of symptomatic in-hospital VTEs in Asian patients undergoing joint arthroplasty was low: a prospective, multicenter, 17,660-patient-enrolled cohort study. *Knee Surg Sports Traumatol Arthrosc* 2019; 27: 1075-82.
20. Law Y, Chan YC, Cheng SWK. Epidemiological updates of venous thromboembolism in a Chinese population. *Asian J Surg* 2018; 41: 176-82.
21. Rathore MF, Hanif S, New PW, Butt AW, Aasi MH, Khan SU. The prevalence of deep vein thrombosis in a cohort of patients with spinal cord injury following the Pakistan earthquake of October 2005. *Spinal Cord* 2008; 46: 523-6.
22. Khan AA, Zafar SN. Venous thromboembolism in Pakistan: a neglected research agenda. *J Thromb Thrombolysis* 2013; 35: 234-42.
23. Dou C, Li T, Yang S, Geng Q, Lu Q, Zhang Y, et al. Epidemiological status and risk factors of deep vein thrombosis in patients with femoral neck fracture. *J Orthop Surg Res* 2022; 17: 41.
24. Yu X, Wu Y, Ning R. The deep vein thrombosis of lower limb after total hip arthroplasty: what should we care. *BMC Musculoskelet Disord* 2021; 22: 547.
25. Yang W, Wang H, Wei Q, Ding K, Jia Y, Li C, et al. Preoperative incidence and risk factors of deep vein thrombosis in patients with an isolated patellar fracture. *BMC Surg* 2022; 22: 83.
26. Bengoa F, Vicencio G, Schweitzer D, Lira MJ, Zamora T, Klaber I. High prevalence of deep vein thrombosis in elderly hip fracture patients with delayed hospital admission. *Eur J Trauma Emerg Surg* 2020; 46: 913-7.
27. Rajaganeshan R, Dussa CU, Sahni V. National survey in the United Kingdom of prophylaxis of deep vein thrombosis for patients with fracture of the neck of the femur. *Injury* 2006; 37: 721-6.
28. Planes A, Vochelle N, Darmon JY, Fagola M, Bellaud M, Huet Y. Risk of deep-venous thrombosis after hospital discharge in patients having undergone total hip replacement: double-blind randomised comparison of enoxaparin versus placebo. *Lancet*. 1996 ; 348: 224-8.