

**Deep Venous Thrombosis among hypertensive patients in King Abdulaziz University (KAU) Hospital, Jeddah, Kingdom of Saudi Arabia**

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**Abstract**

**Background:** Deep venous thrombosis (DVT) is a frequent cardiovascular disorder. It is among the main causes of morbidity and mortality among hospitalized patients and, at the same time, can be easily avoided. Studies clarified that there are a variety of factors which can be significantly associated with the development of DVT in hospitalized patients.

**Objective:** to identify frequency and factors associated with occurrence of DVT among hypertensive patients referred to KAU hospital, Jeddah, Kingdom of Saudi Arabia.

**Methods:** A cross-sectional hospital-based study was conducted from October 2016 to March, 2017. All hypertensive patients referred to or admitted to the hospital departments and who were suspected to have DVT and subjected to Doppler examination were included in the study. A questionnaire was designed to obtain data about DVT frequency among participants and factors associated with the development of DVT among them. Data was collected through face to face interviews of patients included in the study.

**Results:** DVT was detected in 13.5 % of the studied hypertensive patients. Increased age and gender had no significant association with the development of DVT among the studied patients. In addition, other studied factors and comorbidities had no significant role in DVT development among the study participants.

**Conclusion:** Knowing the most common risk factors and their significance in developing DVT is essential for early detection of DVT to prevent it, especially for hypertensive patients. Awareness campaigns should be held more often in different neighborhoods of the city.

**Keywords:** DVT, Hypertension, Risk factor

**1. Introduction**

Deep venous thrombosis (DVT) is a frequent cardiovascular disorder (1, 2). It is among the main causes of morbidity and mortality among hospitalized patients worldwide and, at the same time, can be easily avoided (3, 4). The principle predisposing factors for DVT development include damage of the vein wall, a hypercoagulable state and slow blood flow (2). Studies clarified that there are a variety of factors which can be significantly associated with the development of DVT in hospitalized patients (5). Hypertension is one of these factors, and its association with the development of DVT is a controversial issue addressed in many studies. Some studies revealed that hypertension could increase the risk of DVT occurrence (6, 7). On the other hand, other studies concluded that there

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was no statistically significant association between DVT and hypertension (8, 9) Therefore, further investigation in this area is required. Other factors documented to be associated with increased risk of DVT include old age, prolonged immobility, history of previous DVT, infection, pregnancy or puerperium, the use of oral contraceptive pills, cancer, congestive heart failure, varicosities, rheumatological disease and nephrotic syndrome (5, 10). In addition, obesity, dyslipidemia may play a role in venous thrombosis occurrence (7). Several complications and deleterious sequelae of DVT have been reported. These complications include post phlebitis syndrome, pulmonary embolism, chronic thromboembolic pulmonary hypertension and even death (11). Due to the difficult detection of suspected cases of DVT who may be overlooked and the high economic burden and the serious complications associated with DVT development, focusing on primary prevention of DVT is essential (5, 12). So, this study was conducted to identify the frequency and factors associated with occurrence of DVT among hypertensive patients referred to King Abdulaziz University (KAU) Hospital, Jeddah, Kingdom of Saudi Arabia.

## **2. Material and Methods**

### **2.1. Study design and participants**

The current study is a hospital based cross sectional study conducted in King Abdulaziz University (KAU) Hospital, Jeddah, Kingdom of Saudi Arabia (the emergency, inpatient's and outpatient's departments). The emergency, inpatient's and outpatient's departments in KAU Hospital, Jeddah, Kingdom of Saudi Arabia were reviewed for a period of 6 months (from October 2016 through March, 2017). All hypertensive patients referred to or admitted to the hospital departments and who were clinically suspected to have DVT (paralysis, paresis or recent plaster immobilization of the lower extremities, localized tenderness along the distribution of the deep venous system, entire leg swollen, calf swelling at least 3 cm larger than asymptomatic side, calf pain, pitting edema confined to the symptomatic leg, erythema and warmth in the lower extremities or previously documented DVT) and subjected to Doppler examination were included in the study after obtaining an informed consent from them. Exclusion criteria included patients who refused to participate in the study.

### **2.2. Measurement tool**

A questionnaire (consisting of check lists and yes / no items) was designed to obtain data about DVT frequency among hypertensive patients referred to KAU Hospital, Jeddah, Kingdom of Saudi Arabia and factors associated with the development of DVT among them. The checklist included the age, sex, department, affected site, result of Doppler examination, being bed ridden, using orthopedic casting, history of previous deep venous thrombosis, diabetes mellitus, ischemic heart disease, cancers (primary or metastasis), and they were also asked if there were any other risk factors. We tested the questionnaire by conducting a pilot study. Twenty cases were interviewed and asked to fill the questionnaire to test it and to insure clarity of questions. The 20 cases in the pilot study were not included in the study sample.

### **2.3. Data Collection Method**

Data was collected through face to face interviews of patients included in the study. The questionnaire included questions about age and sex of participants, department, site and result of Doppler examination, whether being bed ridden or using orthopedic casting and the history of previous DVT. In addition, the questionnaire included inquiries about presence of comorbidities such as diabetes, ischemic heart disease, and cancer in the participating patients.

### **2.4. Ethical consideration**

Before starting data collection, ethical approval was obtained from the Research Ethics Committee of the Faculty of Medicine, Northern Border University. During data collection stage, informed consent was secured from each participant. The questionnaires used in data collection were anonymous and confidentiality of data was assured.

### **2.5. Statistical analysis**

The statistical analysis was carried out using SPSS version 16 (SPSS Inc., Chicago, Illinois, USA). Sample characteristics were summarized as numbers and percentages for categorical variables. Chi-Square test was used for comparing qualitative variables. A 5% level was chosen as a level of statistical significance in all statistical tests used in the study.

## **3. Results**

The current study included 200 hypertensive patients admitted to the hospital departments during the study period and accepted to participate in the study. They were clinically suspected to have DVT and subjected to Doppler examination. Females constituted more than half (53%) of the studied patients. Regarding age, 126 (63%) of the

participants were  $\geq 60$  years old and only 13 (6.5%) were younger than 40 years old. More than half (55.5%) of the studied patients were admitted to inpatients departments of the hospital and more than one third (36%) of them were interviewed in the emergency department. Regarding the site of Doppler examination, 54% of the participants were subjected to examination of the right lower limb, 45.5% were subjected to left lower limb examination and bilateral examination was done only for 0.5% of the studied patients (Table 1). Regarding development of DVT among the studied patients, based on the results of Doppler examination, DVT was detected in 13.5 % of the examined patients and 86.5% of them were negative. Table 2 shows distribution of the studied patients regarding history of previous DVT, the presence of comorbidities, using orthopedic casting, and whether the patient was bed ridden or elderly. As illustrated by the presented data, 42.5% of the participants were elderly ( $\geq 60$  years old), 9.5% of them were bed ridden and most of them (99.5%) were not using orthopedic casting. Only 1.5% of the studied patients reported a history of previous DVT. As regards comorbidities, 82% of the participants were diabetic, 15.5% had ischemic heart disease and 3.5% had malignancies (whether primary or metastasis). According to Table 3, no significant gender differences were observed between patients who developed DVT and those who were negative by Doppler examination ( $p=0.470$ ). Additionally, old age had no significant effect on the development of DVT ( $p=0.5$ ). Other comorbidities such as diabetes, IHD and cancer were not significantly associated with the occurrence of DVT among the participants ( $p=0.215$ ,  $0.168$ , and  $0.053$  respectively). Furthermore, the other investigated factors such as being bed ridden ( $p=0.511$ ) were not significantly associated with the development of DVT among the studied patients.

**Table 1.** Sex, age group, patient’s department and site of Doppler examination of the studied patients, KAU Hospital, Jeddah, 2016 (n=200).

Variable		n	%
Sex	Female	106	53.0
	Male	94	47.0
Age (Mean $\pm$ SD: 64.08 $\pm$ 14.15)	>40	13	6.5
	40-	23	11.5
	50-	38	19.0
	60+	126	63.0
Patient’s department	Emergency	72	36.0
	In patient	111	55.5
	Out patient	17	8.5
Site of the Doppler examination	Bilateral	1	0.5
	Left	91	45.5
	Right	108	54.0

**Table 2.** Distribution of the studied patients regarding suspected risk factors, KAU hospital, Jeddah, 2016 (n=200).

Variable		n	%
Being elderly	Yes	85	42.5
	No	115	57.5
Diabetes Mellitus	Yes	164	82.0
	No	36	18.0
Being bed ridden	Yes	19	9.5
	No	181	90.5
Ischemic heart disease (IHD)	Yes	31	15.5
	No	169	84.5
Cancers (primary or metastasis)	Yes	7	3.5
	No	193	96.5
Previous DVT	Yes	3	1.5
	No	197	98.5
Orthopedic casting	Yes	1	.5
	No	199	99.5
Other risk factors	Yes	20	10.0
	No	180	90.0

**Table 3.** The relationship between presence of DVT and suspected risk factors in the studied hypertensive patients (n=200)

Suspected risk factors	Deep venous thrombosis (DVT), n (%)		Total (n=200); n (%)	Chi-square	p-value
	Negative (n=173)	Positive (n=27)			
Gender (male)	82 (41.0)	12 (6.0)	94 (47.0)	0.08	0.470
Being elderly	74 (37.0)	11 (5.5)	85 (42.5)	0.04	0.50
DM	23 (11.5)	4 (2.0)	27 (13.5)	0.440	0.215
Bed ridden	17 (8.5)	2 (1.0)	19 (9.5)	0.159	0.511
IHD	29 (14.5)	2 (1.0)	31 (15.5)	1.56	0.168
Cancers	4 (2.0)	3 (1.5)	7 (3.5)	5.35	0.053
Previous DVT	3 (1.5)	0	3 (1.5)	NA*	NA*
Orthopedic cast	1 (0.5)	0	1 (0.5)	NA*	NA*
Others	17 (8.5)	3 (1.5)	20 (10.0)	0.04	0.527

\*Not applicable

#### 4. Discussion

Deep venous thrombosis is a condition that occurs frequently among surgical as well as acutely ill hospitalized medical patients (13). The current study included 200 hypertensive patients admitted to hospital departments and accepted to participate in the study. They were clinically suspected to have DVT and subjected to Doppler examination during the study period, and were interviewed to identify frequency and factors associated with occurrence of DVT among them. The current study revealed that, based on the results of Doppler examination, 13.5 % of the examined patients had DVT and 86.5% of them were negative. This frequency was lower than the findings of a study (14) that reported that the DVT frequency among patients with hypertension was 17.3% and another study (15) that found that DVT frequency among the studied hypertensive patients was 33%. A higher DVT development frequency among hypertensive patients (41.7%) was observed by other research (16). On the other hand, the findings of the current study were higher than the results reported by (17) who found that DVT frequency among the participating hypertensive patients was only 9.1% and (18) who reported that 9.3% of hypertensive patients developed DVT. According to the results of the present study, no significant association was observed between old age and gender and the development of DVT among the studied patients. In support of our findings (15, 18, 19) viewed that both age and gender were not significantly associated with DVT development. Another study conducted by (20) found no significant association between age and the development of DVT. On the other hand, (21-25) found a highly significant association between age and DVT development. The studied comorbidities, diabetes, ischemic heart diseases and cancer, were not significantly associated with the occurrence of DVT among the participants in the current study. These findings are in line with what was reported by (16, 18, 23, 24) where these comorbidities had no significant effect on DVT development in the studied population. Furthermore, another study conducted by (17, 26) found that diabetes and ischemic heart diseases were not significantly associated with the occurrence of DVT. On the other hand, (27) viewed a significant association between heart diseases and myocardial infarction and the risk of venous thromboembolism and (26) clarified a significant association between cancer and DVT. The current study found no significant association between being bedridden and the development of DVT among the studied patients. In line with our findings, (28) revealed that immobility was not significantly associated with DVT occurrence. On contrast, these findings were inconsistent with the results revealed by (29, 30) where being bedridden was among the independent risk factors of DVT. The present study has some limitations. First, the small sample size, so additional investigation in a larger sample size is required. Further, as a cross-sectional survey, causality cannot be tested.

#### 5. Conclusions

The current study revealed that the frequency of DVT development among the studied hypertensive patients was 13.5 % and 86.5% of them were negative. Increased age and gender had no significant association with the development of DVT among the studied patients. In addition, other studied factors and comorbidities had no significant role in DVT development among the study participants.

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**Conflict of Interest:**

There is no conflict of interest to be declared.

**Authors' contributions:**

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

**References:**

- 1) Aranda-Lara P, Martínez-Esteban MD, Muñoz JJ, Hernández-Marrero D, Segarra-Medrano A, Carnicer-Cáceres C, et al. Renal sympathetic denervation: a new treatment strategy in the management of refractory arterial hypertension. *Nefrologia*. 2012; 32(5): 555-7.
- 2) Dong T, Cheng YW, Yang F, Sun PW, Zhu CJ, Zhu L, et al. Chronic stress facilitates the development of deep venous thrombosis. *Oxidative medicine and cellular longevity*. 2015; 2015.
- 3) Okuhara A, Navarro TP, Procópio RJ, Bernardes RDC, Oliveira LDCC, Nishiyama MP. Incidence of deep vein thrombosis and quality of venous thromboembolism prophylaxis. *Revista do Colégio Brasileiro de Cirurgiões*. 2014; 41(1): 02-6. doi: 10.1590/S0100-69912014000100002.
- 4) Geerts WH, Bergqvist D, Pineo GF, Heit JA, Samama CM, Lassen MR, et al. Prevention of venous thromboembolism: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. 2008; 133(6\_suppl): 381S-453.
- 5) Awolesi D, Naidoo M, Cassimjee MH. The profile and frequency of known risk factors or comorbidities for deep vein thrombosis in an urban district hospital in KwaZulu-Natal. *Southern African Journal of HIV Medicine*. 2016; 17(1): 1-5. doi: 10.4102/sajhivmed.v17i1.425.
- 6) Huang L, Li J, Jiang Y. Association between hypertension and deep vein thrombosis after orthopedic surgery: a meta-analysis. *European journal of medical research*. 2016; 21(1): 13. doi: 10.1186/s40001-016-0207-z. PMID: 27004410, PMCID: PMC4802612.
- 7) Ageno W, Becattini C, Brighton T, Selby R, Kamphuisen PW. Cardiovascular risk factors and venous thromboembolism. *Circulation*. 2008; 117(1): 93-102. doi: 10.1161/CIRCULATIONAHA.107.709204. PMID: 18086925.
- 8) Song EK, Kim JK, Lee KB, Seon JK. Deep vein thrombosis after total knee replacement: incidence and correlation with clinical risk factors. *J Korean Knee Soc*. 1998; 10(1): 18.
- 9) Wang CJ, Wang JW, Chen LM, Chen HS, Yang BY, Cheng SM. Deep vein thrombosis after total knee arthroplasty. *J Formos Med Assoc*. 2000; 99(11): 848-53. PMID: 11155775.
- 10) Anderson FA, Spencer FA. Risk factors for venous thromboembolism. *Circulation*. 2003; 107(23 suppl 1): I-9. doi: 10.1161/01.CIR.0000078469.07362.E6.
- 11) Kahn SR, Ginsberg JS. Relationship between deep venous thrombosis and the postthrombotic syndrome. *Arch Intern Med*. 2004; 164(1): 17-26. doi: 10.1001/archinte.164.1.17. PMID: 14718318. doi: 10.1001/archinte.164.1.17.
- 12) Anand SS, Wells PS, Hunt D, Brill-Edwards P, Cook D, Ginsberg JS. Does this patient have deep vein thrombosis? *JAMA*. 1998; 279(14): 1094-9. doi: 10.1001/jama.279.14.1094. PMID: 9546569.
- 13) Guyatt GH, Akl EA, Crowther M, Gutterman DD, Schünemann HJ. American College of Chest Physicians Antithrombotic Therapy and Prevention of Thrombosis Panel. Executive summary: antithrombotic therapy and prevention of thrombosis: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. 2012; 141(2 Suppl): 7S-47. doi: 10.1378/chest.1412S3. PMID: 22315257, PMCID: PMC3278060.
- 14) Alotaibi GS. The Epidemiology of Venous Thromboembolism in Alberta, Canada: A Population Based Cohort Study. University of Alberta; 2016.
- 15) Balogun IO, Roberts LN, Patel R, Pathansali R, Kalra L, Arya R. Clinical and laboratory predictors of deep vein thrombosis after acute stroke. *Thrombosis research*. 2016; 142: 33-9. doi: 10.1016/j.thromres.2016.04.002. PMID: 27115860.
- 16) Matsuo H, Matsumura M, Nakajima Y, Ogawa T, Tazaki J, Doi T, et al. Frequency of deep vein thrombosis among hospitalized non-surgical Japanese patients with congestive heart failure. *Journal of cardiology*. 2014; 64(6): 430-4. doi: 10.1016/j.jjcc.2014.02.028. PMID: 24755201.
- 17) Wei J, Li W, Pei Y, Shen Y, Li J. Clinical analysis of preoperative risk factors for the incidence of deep venous thromboembolism in patients undergoing posterior lumbar interbody fusion. *J Orthop Surg Res*. 2016; 11(1): 68. doi: 10.1186/s13018-016-0403-0. PMID: 27297081, PMCID: PMC4907081.

- 18) Chua K, Kong KH, Chan SP. Prevalence and risk factors of asymptomatic lower extremity deep venous thrombosis in Asian neurorehabilitation admissions in Singapore. *Arch Phys Med Rehabil.* 2008; 89(12): 2316-23. doi: 10.1016/j.apmr.2008.05.025. PMID: 19061744.
- 19) Ota S, Yamada N, Tsuji A, Ishikura K, Nakamura M, Ito M. Incidence and clinical predictors of deep vein thrombosis in patients hospitalized with heart failure in Japan. *Circulation Journal.* 2009; 73(8): 1513-7. doi: 10.1253/circj.CJ-08-0990. PMID: 19521019.
- 20) Fekri MS, Zade MK, Fatehi S. The association of deep vein thrombosis with cancer treatment modality: chemotherapy or surgery? *Iranian Red Crescent Medical Journal.* 2014; 16(9).
- 21) Holst AG, Jensen G, Prescott E. Risk Factors for Venous Thromboembolism: Results From the Copenhagen City Heart Study. *Circulation.* 2010; 121(17): 1896-903. doi: 10.1161/CIRCULATIONAHA.109.921460. PMID: 20404252.
- 22) García-Raso A, Sillero PL. Elevated body fat is a risk factor for venous thromboembolism and thrombotic complications. *Epidemiology Reports.* 2014; 2(1): 3. doi: 10.7243/2054-9911-2-3.
- 23) Lu DY, Huang CC, Huang PH, Chung CM, Lin SJ, Chen JW, et al. Metformin use in patients with type 2 diabetes mellitus is associated with reduced risk of deep vein thrombosis: a non-randomized, pair-matched cohort study. *BMC cardiovascular disorders.* 2014; 14(1): 187. doi: 10.1186/1471-2261-14-187. PMID: 25510597, PMCID: PMC4274716.
- 24) Yamada N, Hanzawa K, Ota S, Nakamura M, Sato K, Ikura M, et al. Occurrence of deep vein thrombosis among hospitalized non-surgical Japanese patients. *Ann Vasc Dis.* 2015; 8(3): 203-9. doi: 10.3400/avd.oa.14-00132. PMID: 26421068, PMCID: PMC4575331.
- 25) Miri M, Goharani R, Sistanizad M. Deep Vein Thrombosis among Intensive Care Unit Patients; an Epidemiologic Study. *Emergency.* 2017; 51)).
- 26) Kang JH, Keller JJ, Lin YK, Lin HC. A population-based case-control study on the association between rheumatoid arthritis and deep vein thrombosis. *Journal of vascular surgery.* 2012; 56(6): 1642-8. doi: 10.1016/j.jvs.2012.05.087. PMID: 23085092.
- 27) Keenan CR, Murin S, White RH. High risk for venous thromboembolism in diabetics with hyperosmolar state: comparison with other acute medical illnesses. *J Thromb Haemost.* 2007; 5(6): 1185-90. doi: 10.1111/j.1538-7836.2007.02553.x. PMID: 17403099.
- 28) Fletcher H, Wharfe G, Williams N, Pedican M, Brooks A, Scott P, et al. Venous thromboembolism in Jamaican women: experience in a university hospital in Kingston. *West Indian Medical Journal.* 2009; 58(3): 243-9. PMID: 20043532.
- 29) Sun K, Wang C, Pang B, Yang Y, He W, Chen T, et al. Study on the risk factors of deep venous thrombosis in acute hospitalized stroke patients. *Zhonghua Liu Xing Bing Xue Za Zhi.* 2004; 25(12): 1019-23.
- 30) Low FZ, Yeow RCH, Yap HK, Lim JH. Study on the use of soft ankle-foot exoskeleton for alternative mechanical prophylaxis of deep vein thrombosis. 2015 IEEE International Conference on Rehabilitation Robotics (ICORR). 2015. doi: 10.1109/ICORR.2015.7281264.