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

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Type of article: Original

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...
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 ± SD: 64.08±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.

Acknowledgments:
The authors would like to acknowledge all patients participating in the study and the hospital health workers who motivated them to take part in the study.
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.

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