






# Awareness and Perception of Hospitalized Patients on Thromboembolism and Thromboprophylaxis: A Cross-Sectional Study in Sana'a-Yemen

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**Purpose:** Patients' awareness toward VTE and thromboprophylaxis is critical for medication adherence. This study aimed to evaluate the patient's awareness and perception towards VTE and its prophylaxis and to assess patient's satisfaction towards the information given by the medical staff.

**Participants and Methods:** A cross-sectional survey was conducted among hospitalized patients who received VTE prophylaxis in public and private hospitals in Sana'a, Yemen. Besides sociodemographic variables, participants' awareness and perception of VTE and its prophylaxis were evaluated. Variables' association with VTE awareness were analyzed using univariable and multivariable logistic regression using SPSS.

**Results:** A total of 396 of the hospitalized patients agreed to participate in the study, with 31% (n = 121) have ever heard about VTE. The multivariable logistic regression findings revealed that the participants who did not have a profession had OR = 17.182 ( $P < 0.001$ ) of being unaware of VTE compared with those who had one. Participants who did not have a personal history of VTE had OR = 7.580 ( $P < 0.001$ ) of being unaware of DVT/PE compared with the participants who had a personal history of VTE. Male participants had OR = 2.839 ( $P < 0.005$ ) of being unaware of DVT/PE compared with female participants. Participants who were illiterate had OR = 2.832 ( $P < 0.022$ ) of being unaware of DVT/PE compared with participants with a higher level of education.

**Conclusion:** The study revealed lack of awareness and perception of VTE and its prophylaxis among hospitalized patients in Yemen. The patients who are unaware of the disease have wrong perception about their role in DVT prophylaxis. Patient's education must be considered in healthcare setting to improve patient's health outcomes.

**Keywords:** anticoagulation, deep vein thrombosis, pulmonary embolism, patient's knowledge, patient's perception

## Introduction

Venous thromboembolism (VTE) encompasses pulmonary embolism (PE) and deep vein thrombosis (DVT). Long-term hospitalization is frequently complicated by VTE, causing prolonged hospital stay. Globally, VTE is also the leading cause of preventable hospital death.<sup>1-4</sup> Evidence-based strategies were implemented to determine the patients at high risk for VTE, such as elderly persons and those with congestive heart failure, cancer, or patients who undergo major surgery.<sup>5</sup> Typically, patients who are recognized to be at high risk of VTE should be provided with pharmacological prophylaxis on admission. Low dose anticoagulants, such as unfractionated heparin (5000 IU every 8–12 hours) or low-molecular weight heparin (40 mg every day or 30 mg twice a day), are the most commonly used anticoagulants prophylaxis for

hospitalized medical and general surgical patients and should be continued throughout the period of VTE risk factors.<sup>6</sup> Non-vitamin K antagonist oral anticoagulants (NOACs) are becoming more appealing for long-term VTE prophylaxis. Evidence shows that NOACs exert more clinical benefits without increase in hemorrhage in Total Hip and Knee Arthroplasty compared with traditional non-NOACs.<sup>7</sup> Mechanical prophylaxis (eg, antiembolism stockings or intermittent pneumatic compression) can be provided to the hospitalized patients in whom pharmacological prophylaxis is contraindicated, and they as well should be extended until the patient is adequately able to walk.<sup>8</sup>

Evidence supports that all hospitalized patients should be counselled about the risk factors and consequences of VTE, the adverse effects of thromboprophylaxis medications, and the appropriate risk-reduction modalities prior to initiating thromboprophylaxis.<sup>9</sup> Studies have shown that limited patient knowledge may negatively impact patient involvement in VTE treatment and prophylaxis.<sup>10–14</sup> Educating the patient before medication initiation may enhance adherence, especially when the patients appreciate their medication purpose and the consequences of refusing thromboprophylaxis. A case in point, a study by Piazza et al found that a pharmacist-led individualized patient education program was associated with higher medication compliance and reduction in patient refusal. Thus, VTE has been recognized as a public health problem, and the priority of raising public knowledge of this condition is necessary to reduce mortality and morbidity.<sup>15</sup>

No studies have evaluated public awareness of thromboembolism and thromboprophylaxis in Yemen. This indicates a vital necessity to conduct this research to obtain information about the level of VTE knowledge among patients. This information will help the medical staff consider the value of educational programs for VTE patients to increase patients' awareness. Therefore, this study aimed to assess the extent of public awareness about VTE and its prophylaxis among hospitalized patients in public and private hospitals in Sana'a, Yemen. Further, this study will also determine the awareness level of thromboembolism and thromboprophylaxis predictors.

## Materials and Methods

### Study Design and Location

This is a cross-sectional study where a validated questionnaire was distributed among hospitalized patients in two public hospitals (Kuwait Teaching Hospital, Aljomhori Teaching hospital) and five private hospitals (University of Science and Technology Hospital, Al-Khazan Hospital, Yemeni German Hospital, Saudi German Hospital and C-Plas Hospital) in Sanaa, the capital of Yemen. The above-mentioned hospitals were selected since they are the major teaching hospitals and cover the public and the private health sectors. The study was carried out from June to November 2020.

### Ethics Approval and Consent to Participate

The protocol of this study was approved by the Ethical Committee of the Medical Research at the University of Science and Technology (Ref no: EAC/UST180). All participants were informed about the study objectives and consented to participate. This study complies with the Declaration of Helsinki, and all its amendments and revisions.

### Study Population, Sample Size and Sampling Method

The number of hospital beds in both public and private sectors in Sana'a city was 2765 beds.<sup>16</sup> Assuming a confidence level of 95%, a margin of error of 5%, and a response distribution of 50%, the minimum representative sample size was 338 based on Raosoft software (Raosoft. Inc., Seattle, USA). The sample size was increased by 22%, ie, n = 413, to account for the non-response rate. Patients were chosen by convenient sampling.

### Inclusion and Exclusion Criteria

Participants who were hospitalized in the internal medicine wards and received DVT prophylactic dose of low molecular weight heparin (enoxaparin 30 mg twice daily or 40 mg once daily) or unfractionated heparin (5000 units two to three times a day) were recruited in the study. Those who were admitted to the critical care unit, emergency and those who were on the first day of their admission were excluded from the study.

## Study Instrument

Previously validated questionnaires were used with slight modifications on their items.<sup>10,14</sup> A forward translation from English to Arabic was performed. To ensure the validity of the content, the study instrument was reviewed by a multidisciplinary panel of experts: two cardiologists, one community medicine physician, and two holding a master's in Clinical Pharmacy. The instrument of the study was piloted on a sample (n = 24) of hospitalized patients who were excluded from the final analysis of the study. In addition, the reliability of the survey was examined using Cronbach's alpha, where the overall Cronbach's alpha value was 0.766. The questionnaire involved twenty-nine closed-ended questions prepared to determine: patients' sociodemographic data, including age, gender, educational level (low level is secondary school and less), smoking status, the reason for admission, comorbidities, and personal/family history of VTE or using thromboprophylaxis. In addition to more questions were incorporated to assess patients' knowledge about the definition, clinical presentations, risk factors, underlying causes, potential complications, and prevention measures of VTE. These questions were incorporated as multiple-choice questions, and an option "I don't know/not sure" was inserted as a last choice for each question so that the percent demonstrating the knowledge was not overestimated through guessing the correct answer. The rest of the questions assessed patients' perception towards VTE and thromboprophylaxis, their satisfaction with thromboprophylaxis, and the information they received from health-care providers. Perception and satisfaction items were assessed using the nominal scale with "yes" or "no" questions. The patients who answered "yes" to these questions were classified as satisfied and those who answered "no" were classified as unsatisfied.

## Statistical Analysis

Categorical variables, ie, the demographic characteristics, comorbidity, the reason for admission, personal and family history of DVT and PE, participants' awareness of the correct risk factors, signs and symptoms, complications, preventive measures of DVT and PE, participants' positive perception of VTE and satisfaction about thromboprophylaxis (indicated by a response of yes or no) were represented as frequency and percentage. Participants were classified as "aware" of VTE when they correctly answered four or more questions related to awareness of VTE including definition, causes, sign and symptoms, complications, risk factors, and preventive strategies of VTE. Those who answered less than four questions were classified as "unaware" of VTE. Univariable logistic regression was utilized to investigate the association between participants' variables and the awareness of VTE. Variables with p value of less than 0.25 in univariable logistic regression were included in the multivariable logistic regression to create a model of variables that best predict participants' awareness toward PE and DVT. To measure the effect of each predictor on the awareness level, odd ratios were calculated. All statistical analyses were performed using SPSS (Release 21.0; IBM Corp., Armonk, NY, USA). Statistical significance was set at  $p < 0.05$ .

## Results

Of the 413 patients who received thromboprophylaxis, 396 agreed to complete the study questionnaire, comprising a response rate of 94%. **Table 1** demonstrates the sociodemographic data of the study participants. Most participants were between 18- and 40-year-old (41%, n = 164), females (73%, n = 289), had no profession (74%, n = 293), had a low education level (49%, n = 194), non-smokers (70%, n = 277), and had at least one chronic disease (32%, n = 125). The main reasons for hospital admission were surgery (57%, n = 226) or medical treatment (33%, n = 129). Majority of the participants denied personal history (92%, n = 351) and/or family history (86%, n = 282) of VTE.

As shown in **Table 2**, only 31% (n = 121) of the participants knew what a blood clot is. Among the participants who were interviewed, only 27 (7%) of the hospitalized patients recognized that DVT is a thrombus in the leg veins. Unilateral leg pain/tenderness (11%, n = 45), swelling (11%, n = 42), changes in the leg's color (5%, n = 20), and warming of the leg (2%, n = 6) were properly recognized as signs/symptoms of DVT. However, 9% (n = 34) of the participants partially recognized the signs and symptoms of PE. Regarding VTE complications, proportions of 26% (n = 106) and 13% (n = 49) of the participants recognized the correct complications of DVT and PE, respectively.

**Table 1** Characteristic of Participants. Data are Presented as Frequency and Percentage

Variables		Frequency (%)
Age (years)		
	18–40	164 (41)
	41–64	129 (33)
	>65	103 (26)
Gender		
	Female	289 (73)
	Male	107 (27)
Education		
	High level	98 (25)
	Low level	194 (49)
	Illiterate	104 (26)
Profession		
	Yes	103 (26)
	No	293 (74)
Marital status		
	Single	35 (9)
	Married	352 (91)
Personal History		
	Yes	30 (8)
	No	351 (92)
Family history		
	Yes	46 (14)
	No	282 (86)
Smoking Habit		
	Yes	119 (30)
	No	277 (70)
Have chronic diseases		
	Yes	125 (32)
	No	271 (68)
Reason for admission		
	Surgical	226 (57)
	Oncology (nonsurgical)	30 (8)
	Medical treatment	129 (33)
	Other	11 (3)

**Table 2** Participants' Awareness of Venous Thromboembolism. Data are Presented as Frequency and Percentage

Items		Awareness
		N (%)
Do you know what a blood clot is?		
	Yes	121 (31)
	No	275 (69)
One of the following is a cause of DVT		
	Blood clot in the vein*	27 (7)
	Lack of oxygen in the vein	2 (1)
	Tumor in the vein	8 (2)
	Not moving	96 (24)
	None of the above	263 (66)
Clinical presentations of DVT**		
	Swelling of leg*	42 (11)
	Itching of leg	6 (2)
	Pain/ tenderness in leg*	45 (11)
	Noticeable changes in color of leg*	20 (5)
	The leg feels warm*	6 (2)
	Leg paralysis	10 (3)
	Others	3 (1)
	Not sure	264 (67)
Most encountered complications of DVT**		
	PE*	25 (6)
	Recurrent DVT*	5 (1)
	Post thrombotic syndrome*	5 (1)
	Death*	71 (18)
	Not sure	290 (73)
Clinical presentations of PE**		
	Shortness of breath*	17 (4)
	Rapid breathing *	7 (2)
	Chest pain*	10 (3)
	Rapid heart rate *	1 (0.3)
	Lightheadedness/Passing out*	1 (0.3)

(Continued)

Table 2 (Continued).

Items		Awareness
		N (%)
	Pain radiating to the arm	0 (0)
	Coughing up blood *	0 (0)
	Frequent headache	1 (0.3)
	Others	12 (3.0)
	None of the above	347 (88)
Most common complications of PE**		
	Pulmonary hypertension*	2 (1)
	Pleural effusion	7 (2)
	Death*	47 (12)
	I do not know	340 (86)
The most frequent risk factors of VTE**		
	Hospital stay*	32 (8)
	Surgery*	45 (11)
	Cancer*	23 (6)
	Not moving for a long time*	108 (27)
	Pregnancy/giving birth*	17 (4)
	Using estrogen-based medications*	2 (1)
	Family history of blood clots*	5 (1)
	Age older than 65 years*	8 (2)
	Too much exercise	3 (1)
	High blood cholesterol*	3 (1)
	Donating blood	2 (1)
	I do not Know	148 (37)
	How to prevent VTE	
	Bed rest	11 (3)
	Walking/Stretching legs*	127 (32)
	Drinking plenty of fluids	6 (2)
	Eating lots of fiber	1 (0.3)
	Washing/bathing regularly	0 (0)
	I do not Know	251 (63)

**Notes:** \*Indicates the correct option; \*\*Indicates more than one answer are allowed.

**Abbreviations:** DVT, deep vein thrombosis; VTE, venous thromboembolism; PE, pulmonary embolism.

Regarding the risk factors of developing VTE, 27% (n = 108) of the participants recognized not moving for a long time as a risk of VTE, followed by surgery, hospital admission, cancer, and pregnancy, comprising 11% (n = 45), 8% (n = 32), 6% (n = 23), and 4% (n = 17), respectively. On the other hand, walking was correctly recognized by nearly one-third (32%, n = 127) of the participants as a VTE prevention strategy.

## Perception of Participants About VTE

Most of the participants, 89% (n = 351) believed that a blood clot is a medical emergency that needs further consideration and that a clot might be prevented (66%, n = 261). Sixty percent (n = 239) of the participants believed that blood clots might cause death, and more than half (55%, n = 218) of them were aware that, if not treated appropriately, a blood clot can pass into the lungs (Table 3).

Regarding thromboprophylaxis perception, most participants (67%, n = 266) believed in the safety and efficacy of thromboprophylaxis. More than two-thirds (70%, n = 276) of participants never minded receiving injectable thromboprophylaxis, and almost one-third (31%, n = 124) of them reported that the prophylactic heparin had tolerable adverse effects (Table 3).

Regarding participants' satisfaction with thromboprophylaxis, majority the participants (69%, n = 274) were satisfied with the dose scheduling of heparin or enoxaparin, which did not interfere with their daily activities or sleep pattern. However, only 35% (n = 137) and 33% (n = 129) of the participants, respectively, were satisfied with the explanation and the information they received about VTE thromboprophylaxis.

## Results of the Association Between Demographic Factors and the Awareness of VTE Using Univariable Logistic Regression

The factors that might affect participants' awareness about VTE were subjected to a univariable logistic regression. The proportion of participants who reported unawareness of VTE was significantly higher among the participants who were not receiving enough information about VTE (OR = 7.254,  $P < 0.001$ ), were unsatisfied with information provided about VTE

**Table 3** Participants' Perception of VTE and Their Satisfaction About Thromboprophylaxis. Data are Presented as Frequency and Percentage

Items	Agree (%)
<b>Participants' perception of VTE</b>	
Need to worry about blood clots	351 (89)
Most blood clots are preventable	261 (66)
Untreated blood clots will pass into the lung	218 (55)
Blood clots can cause death	239 (60)
<b>Participants' perception of thromboprophylaxis</b>	
VTE prophylaxis is safe and effective	266 (67)
In favor of receiving injections	276 (70)
Side effects of VTE prophylaxis are tolerable	124 (31)
<b>Participants' Satisfaction about thromboprophylaxis</b>	
Time of receiving injections is acceptable	274 (69)
Reasons for injections adequately explained	137 (35)
Received any information about DVT/ PE	123 (31)
Satisfied with the information given on DVT/ PE	129 (33)

**Abbreviations:** DVT, deep vein thrombosis; VTE, venous thromboembolism; PE, pulmonary embolism.

(OR = 6.877,  $P < 0.001$ ), had no personal history of VTE (OR = 5.717,  $P < 0.001$ ), disagreed with the time of receiving the injection (OR = 5.106,  $P < 0.001$ ), had no profession (OR = 4.884,  $P < 0.001$ ), were not being counselled about the rationale of the use of VTE prophylaxis (OR = 4.797,  $P < 0.001$ ), and those who were illiterate (OR = 3.871,  $P < 0.001$ ; Table 4).

**Table 4** Variables Associated with Unawareness of DVT/PE Using Univariable Binary Logistic Regression

Variable		Unaware of DVT/PE	Univariable Logistic Regression	
		N (%)	OR (95% CI)	P value
Age	18–40	121 (74)	Reference	
	41–64	83 (64)	0.641 (0.389–1.058)	0.082
	>65	51 (50)	0.349 (0.207–0.586)	<0.001*
Gender	Female	192 (66)	Reference	
	Male	63 (59)	0.723 (0.876–2.181)	0.164
Education	High level	51 (52)	Reference	
	Low level	120 (62)	1.494 (0.915–2.442)	0.109
	Illiterate	84 (81)	3.871 (3.028–7.877)	<0.001*
Profession	Yes	38 (37)	Reference	
	No	217 (74)	4.884 (1.309–3.344)	<0.001*
Marital Status	Single	21 (60)	Reference	
	Married	227 (64)	1.211 (0.595–2.464)	0.598
Personal History	Yes	8 (27)	Reference	
	No	237 (68)	5.717 (2.469–13.236)	<0.001*
Family History	Yes	24 (52)	Reference	
	No	174 (62)	1.477 (0.789–2.763)	0.222
Smoking Habit	Yes	74 (62)	Reference	
	No	181 (65)	1.147 (0.734–1.790)	0.547
Have chronic diseases	Yes	78 (62)	Reference	
	No	177 (65)	1.135 (0.731–1.762)	0.574
Received any information about DVT/ PE	Yes	41 (33)	Reference	
	No	214 (78)	7.254 (4.521–11.640)	<0.001*
Reasons for injections adequately explained	Yes	56 (41)	Reference	
	No	199 (77)	4.797 (3.070–7.497)	<0.001*
Time of receiving injections is acceptable	Yes	150 (55)	Reference	
	No	105 (86)	5.106 (2.902–8.983)	<0.001*
Satisfied with the information given on DVT/ PE	Yes	45 (35)	Reference	
	No	210 (79)	6.877 (4.317–10.955)	<0.001*

**Note:** \*Indicates significant association.

**Abbreviations:** DVT, deep vein thrombosis; PE, pulmonary embolism; CI, confidence interval.



## Results of the Association Between Different Variables and VTE Awareness Using Multivariable Logistic Regression

Nine variables were included in the model of multivariable logistic regression as shown in Table 5. Participants who did not have a profession had OR = 17.182 ( $P < 0.001$ ) of being unaware of DVT/PE compared with respondents who had a certain profession. Those who were illiterate had OR = 2.832 ( $P < 0.022$ ) of being unaware of DVT/PE compared with those who had a higher level of education. Respondents who had no personal history of DVT/PE had a OR = 7.580 of being unaware about VTE compared with those who had a personal history of DVT/PE. Finally, male participants had OR = 2.839 ( $P < 0.005$ ) of being unaware of DVT/PE compared with female.

**Table 5** Variables Associated with Unawareness of DVT/PE Using Multivariable Binary Logistic Regression

Variable		Multivariable Binary Logistic Regression <sup>a</sup>	
		OR (95% CI)	P value
Age	18–40	Reference	
	41–64	0.469 (0.220–1.002)	0.051
	>65	0.233 (0.109–0.499)	<0.001*
Gender	Female	Reference	
	Male	2.839 (1.306–6.169)	0.005*
Education	High level	Reference	
	Low level	1.115 (0.522–2.382)	0.779
	Illiterate	2.832 (1.156–6.936)	0.022
Profession	Yes	Reference	
	No	17.182 (7.000–42.176)	<0.001*
Personal History	Yes	Reference	
	No	7.580 (2.744–20.937)	<0.001*
Received any information about DVT/ PE	Yes	Reference	
	No	3.846 (0.922–16.037)	0.064
Reasons for injections adequately explained	Yes	Reference	
	No	0.956 (0.394–2.316)	0.920
Time of receiving injections is acceptable	Yes	Reference	
	No	1.694 (0.818–3.508)	0.156
Satisfied with the information given on DVT/ PE	Yes	Reference	
	No	2.970 (0.693–12.726)	0.143

**Notes:** \*Indicates significant association. <sup>a</sup>Variables with a p-value of <0.25 in bivariable logistic regression were included in the final multivariable logistic regression model.

**Abbreviations:** DVT, deep vein thrombosis; PE, pulmonary embolism; OR, odd ratio; CI, confidence interval.

## Discussion

The current study's findings indicated a lack of awareness about VTE among the majority of the hospitalized patients in both the public and the private hospitals in Sana'a, Yemen. Nearly one-third of hospitalized Yemeni patients answered questions related to the nature of blood clots correctly. Nevertheless, most patients could not recognize the signs and symptoms of DVT and PE. This might have had a consequence on self-assessment and self-reporting of possible VTE episodes. The findings of this study agree with the finding of studies conducted in other countries in the Middle East. For example, a study from Saudi Arabia by Almodaimegh et al found that only 32% and 15% of patients had awareness about DVT and PE, respectively.<sup>14</sup> Similarly, awareness about DVT and PE among hospitalized Jordanian patients were 38% and 22%, respectively.<sup>11</sup> Another study from Jordan conducted by Alzoubi et al, which assessed awareness of female patients who undergone cesarean section showed that there was poor knowledge about VTE among participants, particularly young females, with awareness of 46% and 18.7% about DVT and PE, respectively.<sup>17</sup> Another study that was conducted in Saudi Arabia by Almegren et al showed low knowledge and awareness of VTE among the Saudi females who used or had been using oral contraceptive pills.<sup>18</sup> In the current study, the participants showed a higher awareness level about DVT compared to PE. This result could be attributed to the fact that Yemeni patients were unaware that PE is considered a complication of DVT. This finding agrees with the study conducted in Jordan by Jarab et al.<sup>10</sup> On the other hand in developed countries, a study from Canada by Saga et al found that most hospitalized patients (81.2%) had good knowledge of both DVT and PE.<sup>13</sup> Another study from the United States by Koniecznyńska et al reported that younger patients had good knowledge about VTE in general.<sup>19</sup> In the current study, lack of awareness among participants could be attributed in part to the fact that hospitalized patients in Yemen were not educated enough about their medications and illness nor actively engaged in the management of their diseases.

This study revealed that respondents had poor knowledge about the risk factors of VTE and the necessary strategies to prevent VTE in hospitalized patients. Thus, those patients will not actively participate in DVT self-management. Epidemiological data estimate that unhealthy lifestyle risk factors, including obesity, western dietary pattern, physical inactivity, may contribute to 48% of the unprovoked VTE. Thus, improving high-risk individuals and general populations' awareness about VTE risk factors was shown to reduce the incidence of unprovoked VTE in the whole population by 12%.<sup>20</sup> In the current study, the most frequently reported risk factor for VTE is prolonged limited mobility. This finding shed light on the vital role of health-care providers in educating their patients about the benefits of ambulating during hospitalization. This finding is in agreement with other studies that were conducted in Jordan,<sup>10</sup> Saudi Arabia,<sup>14,21</sup> and Canada.<sup>13</sup> Another study that was conducted to measure global public awareness of nine countries, including the United States, the United Kingdom, the Netherlands, Thailand, Japan, Germany, Canada, Australia, and Argentina, showed that immobility is the most recognized VTE risk factor in these countries.<sup>22</sup> The study participants poorly recognized other risk factors of VTE, such as pregnancy, malignancy, surgery, and family history. As a result, more health education about VTE in hospitalized patients is crucial to make them active participants in VTE prophylaxis, thus, shifting VTE risk factors downward. In the line with the following studies,<sup>10,13</sup> the finding of this study showed that walking or stretching the legs is the nonpharmacologic strategy to prevent VTE. Generally, insufficient knowledge about VTE is a common international concern, particularly for developing countries such as Yemen. A probable reason is the low education and not engaging the hospitalized patients in VTE self-management.

Improving awareness of hospitalized patients to DVT/PE is critical since such practice would have direct benefit on the patients' health outcomes. For example, when a hospitalized patient knows that walking in the hospital corridor would have positive impact on risk reduction, he would start walking to reduce the risk instead of staying in his bed. Moreover, since the health system and insurance in Yemen is fragile due to the continuous political conflict, most patients in Yemen buy their medications from community pharmacies. This practice makes them underestimate the importance of thromboprophylaxis medication and leaving them unaware of VTE and its consequences.

The appropriate intervention to achieve high-level awareness about of VTE may be achieved by establishing patient-physician counseling session before initiating thromboprophylaxis. This practice might enhance patient's role in VTE risk reduction and improve thromboprophylaxis adherence. Additionally, establishing VTE awareness campaign using different platforms for those at elevated risk of VTE would have positive impact on patients' health outcome. Moreover,

implementing clinical pharmacy services in both the public and the private sectors are necessary since clinical pharmacists review patients' medications on daily basis, provide face-to-face counselling, and, thus, help in reducing drug-related problems.

Regarding the perception of participants towards VTE, the majority of participants (66%) agreed that VTE could be prevented and that untreated DVT could pass into the lungs (55%). The attitudes of the participants toward these two previous points were similar to that of the study conducted by Jarab et al<sup>10</sup> but more than that reported by Almodaimegh et al from Saudi Arabia. Additionally, 89% of the current study participants believed that a blood clot is a medical emergency that they need to worry about it as it can lead to death, which agrees with Almodaimegh et al study.<sup>14</sup> Similarity in the VTE perception of these previous studies might be attributed in part to the similarity of the culture among the countries where these studies were conducted.

In this study, most respondents agreed that thromboprophylaxis is safe and effective since such a drug would not be provided unless it is safe and effective. Similar findings were reported from previous studies by Almodaimegh et al and Jarab et al.<sup>10,14</sup> Only a third of the participants reported their satisfaction with the clarification they received about the rationale of VTE prophylaxis. One-third of the patients received information and counselling about DVT/PE. These findings might justify the low awareness level of the participants about VTE, which in turn implies on the importance of providing the patients with the necessary counseling about VTE and its thromboprophylaxis. In this study, the effect of demographic factors on the awareness level of the participants was explored. Patients with a personal history or family history of VTE had significantly higher awareness levels since they were familiar with the clinical presentations of VTE. Additionally, patients who received information about VTE, or were exposed to explanations about thromboprophylaxis, had significantly higher awareness than those who did not. Moreover, participants who had a certain profession were likely to be educated, and thus they had higher awareness than those who had no profession. These groups of patients are likely to learn more about the disease and its signs and symptoms, which qualify them to adopt the risk reduction strategy of VTE.

Education also plays a significant role in the awareness level.<sup>16</sup> The current study revealed that educated patients had significantly higher awareness levels than low education levels or illiterate ones. The current study's findings are consistent with previous studies.<sup>10,14</sup> Association between education level of the participants, receiving information and the awareness of the disease was also confirmed by Oh et al. Their study revealed that awareness level about stroke and its clinical presentations was higher among educated respondents, and among those who received information about the stroke via different platforms, such as websites, public education, and campaigns.<sup>23</sup> In a randomized trial, the awareness level about VTE was significantly improved from 8% to 87% among postpartum women after implementing educational programs about VTE that were introduced by their nurses.<sup>24</sup> On the other hand, demographic characteristics such as marital status had no significant effect on the awareness level of the participants. These results are consistent with Green and Bernhofer.<sup>25</sup>

The current study outlines the lack of awareness about VTE in hospitalized patients, which indicates the importance of enrichment and improving patients' awareness of VTE. In a patient education program for VTE prevention in hospitalized patients by Piazza et al, it was found that pharmacist-led individualized patient education sessions were associated with higher medication adherence to clinician-ordered injectable pharmacological venous thromboembolism prophylaxis.<sup>15</sup>

This is the first study to explore hospitalized patients' perceptions and knowledge of VTE prophylaxis in Yemen as a step forward. This study included seven private and public hospitals in Sana'a, the capital of Yemen. Moreover, the data for this study was collected via face-to-face interviews that allowed researchers to listen and realize patient's desire to be educated about such medical issues. The current study had a limitation, as some study participants were illiterate, or their health barred them from cooperating; therefore, they were asked rather than given the survey to answer. Another potential drawback is social desirability bias on awareness and perception. Moreover, this study did not include questions related to the harm and complications of VTE prophylaxis, such as bleeding and heparin induced thrombocytopenia. One more limitation was that the pharmacological prophylaxis of VTE was commonly administered subcutaneously by health-care provider. Therefore, patients' knowledge and attitude might not have great impact on the practices. As well, it is worth to

mention that odds ratios measure used in the current study sometimes do not provide a good approximation of the relative increase in risk when the outcome is common.

## Conclusion

This study shows a low awareness level toward VTE and its prophylaxis among hospitalized patients in Yemen. The study reveals that those unaware of these diseases have a wrong perception about DVT that affects their roles in VTE management. Future VTE management programs should concentrate on patients' knowledge to improve their attitude and practice toward managing their disease. The rules for thromboprophylaxis should be clarified to patients by health care team.

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## Disclosure

The authors report no conflicts of interest in this work.

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