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RESEARCH ARTICLE

PREVALENCE AND RISK FACTORS OF VENOUS THROMBO-EMBOLISM AMONG CRITICALLY ILL PATIENTS IN NAJRAN- SAUDI ARABIA

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ABSTRACT

Background: Venous thromboembolism (VTE) is a serious and fatal disease, that can significantly impair the recovery of the hospitalized patients.
The aim of this study was to determine the prevalence rate, beside identifying the most common risk factors that associated with VTE among critically ill and hospitalized patients at King Khalid hospital in Najran.
Materials and methods: It was a cross sectional study that conducted during the period from October, 2017 up to February, 2018. 194 patients were chosen randomly from 4 areas in the hospital. A questionnaire as a tool was used to collect personal data, while the rest of the information were obtained from the patients' records as well as from the health personnel. **Results:** The participants' mean age was 35 ±13.6 years old for those with VTE, while the mean age for those without VTE was 33± 14.1 respectively. The majority of patients were above 40 years old, among them 54.6% were male. The results show that most of the studied subjects 156 (80.4%) were hospitalized for various medical illness, while the rest 38(19.6%) had undergone surgery respectively. Moreover, 37.1% of the respondents had been hospitalized for more than four weeks. The overall VTE prevalence was 3.1%. Multiple risk factors had been identified to be associated significantly with VTE. These factors including advanced age that over 40 years old (OR 1.04; CI 0.39 – 2.08), stroke (OR 0.56; CI 0.71-1.53 and *P*-value 0.04), Renal diseases and on dialysis (OR 0.55; CI 0.63-1.04 and *P*-value 0.001), Positive personal or family history of VTE (OR 0.81; CI 0.76-2.01 and *P*-value 0.001), Immobility (OR 1.11; CI 1.16-2.07 and *P*-value 0.02), as well as malignancy (OR 0.92; CI 1.47-2.35 and *P*-value 0.03). Patients with renal problems showed the highest prevalence rate in relation to other medical problems among the studied sample (27.8%). Most of respondents (57.7%) had either personal or family history of PE, DVT or both. The findings of the current study show that males have higher prevalence of VTE (2.1%) than females(1%) with (OR 1.89 and CI 0.48- 2.01), while for men (OR 2.06; CI 0.51- 1.99) respectively. On the other hand, sex, length of hospital stay, Diabetes M., hypertension, congestive heart failure, wounds' infection, mechanical ventilation and central vein catheterization were not significantly associated with VTE.
Conclusion and recommendation: It was concluded that critically ill patients have an increased risk of developing VTE due to multiple factors. Therefore, adherence to clinical practice guidelines for VTE prophylaxis could have contributed to lower the incidence rate.

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INTRODUCTION

Venous thromboemolism (VTE) is a serious and fatal disease, that can significantly impair the recovery of hospitalized patients (Condliffe, 2009). Critically ill patients have an increased risk of developing VTE due to multiple factors which could be present prior to intensive care unit (ICU) admission, such as previous recent surgery, trauma, sepsis, prolonged bed ridden, malignancy, cardiac or respiratory disorders and stroke (Bang, 2014). In addition, other risk factors may be acquired during ICU stay, that including mechanical ventilation, central line catheters and paralytic agents (El Margoushy, 2017). Although, some researchers proposed three basic factors that including stasis of blood flow, intimal injury and hypercoagulability which lead to thrombus formation (Spencer, 2008 and Anderson, 2007). Venous thromboembolism (VTE) is a condition in which blood clots in the deep veins of the leg (known as deep vein thrombosis, DVT) and can travel in the circulation and lodge in the lungs (known as pulmonary embolism, PE). Together, DVT and PE are known as VTE which is one of the major causes of

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morbidity and mortality in both hospital and community settings. VTE has an incidence of approximately 1/1000 persons annually (White, 2003 and Haines, Haines, 2003). The diagnosis of VTE continues to be a challenge. It often has no specific clinical presentation, so it can be asymptomatic and may go undiagnosed. However, the majority of DVTs are related to specific identifiable trigger factors (Haines, 2007). Although, independent risk factors and predictors of VTE recurrence have been identified, and effective primary and secondary prophylaxis is available, the occurrence of VTE is generally increasing (Heit, 2015). Identifying of the risk factors for venous thrombosis is necessary in order to determine the prevention strategies to those at high risk. As illustrated in figure one, venous thrombosis tends to be a multifactorial disease, involving interactions between clinical risk factors and predispositions to thrombosis, either acquired or inherited (Rosendaal, 1999 and Samama, 2006).

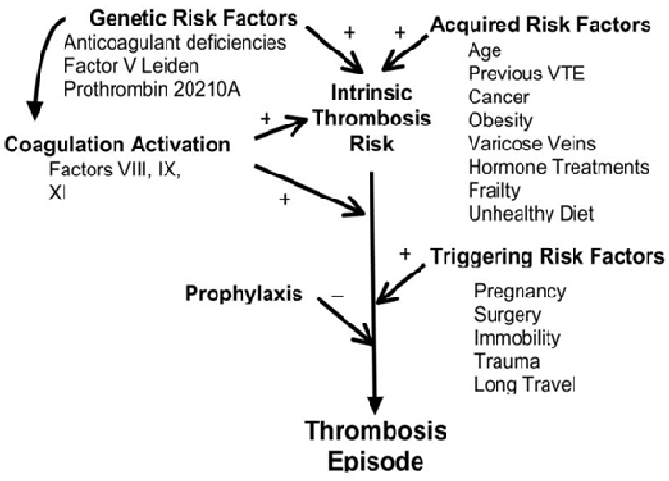

Figure 1. Possible risk factors for venous thrombosis

Table 1. Characteristics of the studied sample (n=194)

Variable	Characteristics	Frequency	%
	≤24 years old	46	23.7%
Age	25 – 44	68	35.1%
	≥45	80	41.2%
Sex	Male	106	54.6%
	Female	88	45.4%
	ICU (medical cases)	98	50.6%
Area of admission	ICU (Surgical cases)	42	21.6%
	Renal dialysis unit	54	27.8%
Length of hospital stay	1-2 weeks	57	29.4%
	3-4 weeks	65	33.5%
	>4 weeks	72	37.1%
	Stroke	35	18%
Diagnosis	Renal diseases& on dialysis	54	27.8%
	Congestive heart failure	29	14.9%
	Hypertension	13	6.7%
	Diabetes Mellitus	18	9.3%
	Operative sites' infections	06	3.1%
	Malignancy	39	20.1%
Personal/ Family history of VTE	Yes	112	57.7%
	No	82	42.3%

Table 2. Multivariate logistic regression analysis (n=194)

Factor	PE no (%)	DVT no (%)	VTE no (%)	Free of VTE	Odds Ratio (OR)	Confidence Interval (CI)	*P*-value
Age							
≤24 years old	1(0.5%)	0(0%)	1(0.5%)	45(23.2%)	0.32	0.42-2.03	
25 – 44	1(0.5)	1(0.5)	2(1%)	66(34%)	1.01	0.28-1.69	0.02*
≥45	2(1%)	1(0.5%)	3(1.5%)	77(39.7%)	1.04	0.39 -2.08	
Sex							
Male	3(1.5%)	1(0.5%)	4(2.1%)	102(52.6%)	2.06	0.51 – 1.99	0.08
Female	1(0.5%)	1(0.5%)	2(1%)	86(44.3%)	1.89	0.48 – 2.01	
Lenmgth of hospital stay							
1-2 weeks	0(0%)	0(0%)	0(0%)	57(29.4%)	0.04	0.81 – 1.11	
3-4 weeks	1(2.1%)	1(0.5%)	2(1%)	63(32.5%)	0.71	0.38-2.09	0.61
>4 weeks	3(3.1%)	1(0.5%)	4(2.1%)	68(35.1%)	1.01	0.41 -1.38	
Diagnosis							
Stroke	1(0.5%)	0(0%)	1(0.5%)	34(17.5%)	0.65	0.71-1.53	0.04*
Renal diseases & on dialysis	2(1%)	1(0.5%)	3(2.1%)	51(26.3%)	0.55	0.63 – 1.04	0.001*
Congestive heart failure	0(0%)	0(0%)	0(0%)	29(14.9%)	1.18	1.01-2.11	0.16
Hypertension	0(0%)	0(0%)	0(0%)	13(6.7%)	2.01	0.91-2.03	0.08
Diabetes Mellitus	0(0%)	0(0%)	0(0%)	18(9.3%)	1.33	1.15 – 1.91	0.11
Wounds' infections	0(0%)	0(0%)	0(0%)	6(3.1%)	1.08	1.72-2.04	0.09
Malignancy	1(0.5%)	1(0.5%)	2(1%)	37(19.1%)	0.92	1.47 – 2.35	0.03*
Personal/ Family history of VTE							
Yes	3(1.5%)	1(0.5%)	4(2.1%)	108(55.7%)	0.81	0.76-2.01	0.001*
No	1(0.5%)	1(0.5%)	2(1%)	80(41.2%	1.32	1.21-3.61	
General condition of the patient							
Bed-ridden / immobile patient	2(1%)	1(0.5%)	3(1.5%)	8(4.1%)	1.11	1.16 – 2.07	0.02*
On mechanical ventilation	1(0.5%)	1(0.5%)	2(1%)	26(13.4%)	0.93	0.82 – 1.79	0.14
With central vein catheterization	1(0.5%)	0(0%)	1(0.5%)	6(3.1%)	1.07	1.13 – 2.02	0.07

*Chi-square test for comparing the prevalence between patients with and without disease history. Venous thromboembolism(VTE) ; Deep vein thrombosis(DVT); & Pulmonary embolism (PE). Correlations considered significant when *P*-value <0.05

MATERIALS AND METHODS

This is a descriptive, cross-sectional and facility based study that was carried out among in-patients at King Khalid hospital in Najran, Saudi Arabia, during the period between October 2017 up to February 2018. One hundred ninety four patients were recruited to participate in the current study. Informed verbal consent and confidentiality were assured for the participated individuals who agreed voluntary to participate, after receiving enough information. A questionnaire as a tool for data collection was completed from the patients, cases' records, as well as from the staff. Data include demographic information, diagnosis, co-morbid conditions, mechanical ventilation, use of central line and duration of hospital stay.
Identification of risk factors was based on a careful review of each record, including admission history, physical examination, nursing and progress notes.

Data Analysis

Data were collected and entered into SPSS software (Statistical Package for Social Sciences) version 19 for data management and statistical analysis. Chi-square test was used to compare differences in promotions between groups (Odds ratios with 95%, Confidence intervals). Differences at 5% level (P value ≤ 0.05) were considered significant. Descriptive statistics were stated as mean with standard deviation for continuous variables. And frequency with percentage for categorical variables.

RESULTS

A total of 194 cases were participated in the current study. The majority of patients were above 40 years old, among them 54.6% were males. The participants' mean age was 35 ±13.6 years old for those with VTE, while the mean age for those without VTE was 33 ±14.1 years respectively. The results show that most of the studied subjects 156 (80.4%) were hospitalized for various medical illnesses, while the rest 38(19.6%) had undergone surgery respectively. Moreover, 37.1% of respondents had been hospitalized for more than four weeks. The overall VTE prevalence was 3.1%. Multiple risk factors had been identified to be associated significantly with VTE. These factors including advanced age that over 40 years old (Odds Ratio {OR} 1.04; Confidence Interval {CI} 0.39 – 2.08), stroke (OR 0.56; CI 0.71 – 1.53 and *P*- value = 0.04), renal diseases and on dialysis (OR 0.55; CI 0.63 – 1.04 and *P*-value = 0.001), positive personal or family history of VTE (OR 0.81; CI 0.76 – 2.01 and *P* -value = 0.001), immobility (OR 1.11; CI 1.16 – 2.07 and *P* – value = 0.02), as well as malignancy (OR 0.92; CI 1.47 – 2.35 and *P*- value = 0.03). Patients with renal problems showed the highest prevalence rate in relation to other medicalproblems among the studied sample (27.8%). Most of respondents (57.7%) had either personal or family history of PE, DVT or both as shown in Table (1). The findings of the current study show that males have higher prevalence of VTE (2.1%) than females (1%) with {OR 2.06; CI 0.51- 1.99 for males and OR 1.89 and CI 0.48 – 2.01 for females) respectively. On the other hand, sex, length of hospital stay, diabetes mellitus, hypertension, congestive heart failure, wounds' infection, mechanical ventilation and central venous catheterization were not associated with VTE as presented in Table (2).

DISCUSSION

The current study attempted to identify the prevalence rate as well as the possiple risk factors that associated with VTE in Najran. The estimated prevalence of VTE in this study was (3.1%) among the surveyed sample. This obtained result is much lower than what had been reported in Europe and North America (14.9%) among hospitalized patients with acute illnesses (Turpie, 2000). And also lower than what had been concluded by Geerts et al, Hasan et al, Nesriene et al and Hadil et al in their studies (Greets, 2008; Hasan, 2013; El Margoushy, 2017 and Hadil, 2012). Nationally, and compared to results obtained from seven major hospitals around the Kingdom by Al-Hameed et al, our result was the lowest one. According to Al-Hameed et al the results show that the prevalence of VTE among hospitalized patients at King Fahad General Hospital –Jeddah was (11.8%), at King Khalid National Guard Hospital –Jeddah was (19.3%), at King Abdul-Aziz University Hospital-Jeddah was (13.5%), at King Saud University Hospital-Riyadh was (15.5%), at King Saud Medical City-Riyadh was (9.7%), at King Fahad National Guard Hospital –Riyadh was (10.9%) and at Prince Sultan Military Hospital-Riyadh was (19.3%) (Al-Hameed, 2017 and Fahad, 2017). The low prevalence of VTE in our study might be related to the higher compliance rate with the prophylaxis protocol at King Khalid Hospital in Najran.

Numerous studies reported that immobility and malignancy were significant risk factors for VTE (Janku, 1996; Klatsky, 2004 and Bagaria, 2006). Nandi et al believe that immobility increases the risk of thrombosis presumably due to stasis of blood flow in the venous system (Nandi, 1980). The current study revealed that the prevalence of VTE due to immobility and malignancy was (1.5%) and (1%) respectively. This result is similar to what had been reported by Beasley et al who stated that immobility is a significant risk factor for VTE (Beasley, 2003). Cancer patients on the other hand have an increased risk of thrombosis due to a combination of factors. It was reported that tumor cells activate coagulation, tumors can compress veins which causing stasis. Additionally, cancer patients exposed to hospitalization due to many reasons, such as surgery or chemotherapy, which all increase their risk (Prandoni, 2008 and Khouli, 2006). In a recent cohort study conducted by Blom et al that was including 66,329 patients with cancer, the incidence of venous thrombosis during the first 6 months after cancer diagnosis was 12.4 per 1000 (Blom, 2006). Piccioli et al argue that tumors' cells activate coagulation and therefore, can compress veins which causing stasis, accordingly cancer patients expose to hospitalization, surgery and chemotherapy, which all increase their risk (Piccioli, 2006). This study clearly revealed that there was no significant association between sex and VTE. Although some studies reported that in women there are additional risk factors for VTE more than men, these factors include oral contraception hormonal therapy, pregnancy and puerperium (Gomes, 2004; Grady, 2000 and Barsoum, 2010). Moreover, in terms of kidney problems, some researchers reported that chronic kidney diseases with severely reduced glomerular filtration are among the major risk factors for VTE (Folsom, 2010 and Kayali, 2008). This fact goes with the findings of the current study that show renal problems was significantly associated with VTE (OR 0.55; CI 0.63 – 1.04 and *P*- value = 0.02). Naess et al concluded that VTE was predominantly a disease of older age (Naess, 2007). Similarly, the current study shows that the prevalence of VTE among the studied subjects

was highest among oldest patients, and significantly associated with VTE (OR 1.04; CI 0.39 – 2.08 and *P*- value = 0.02). Although, some studies argued that the reasons for an increased thrombosis risk with age are not understood, but could be related to increase presence of other illnesses that predisposing to thrombosis, increases in coagulation potential or some combination of these (Spencer, 2009 and Samuel, 2010). Regarding central venous catheterization (CVC) as a risk factor, the current study revealed that the prevalence of VTE due to CVC was (0.5%) among the surveyed subjects, which is much lower than what reported by Heit et al who concluded that CVC or trans-venous pacemaker accounts for 9% of all incident VTE occurring in the community (Heit, 2002). Mechanical ventilation was studied too as one of the risk factors that associated with VTE among hospitalized patients. This study presented that prevalence of VTE due to mechanical ventilation was accounted for only (1%) among the studied sample, this obtained result shows lower rate comparing to what reported by Ibrahim et al in their study (24%) (Heit, 2002).

Conclusion and Recommendation

As a result of this study, it was concluded that most of hospitalized patients whether medical or surgical are at risk for VTE. Therefore, identification of at risk patients before, on admission to hospital, or in the outpatient settings is a key to initiating appropriate preventive measures. Risk assessment process should be adopted for all emergency patients' admissions as well. This is likely to involve a multidisciplinary approach from the preoperative assessment setting to ICU/CCU assessment and involve nursing staff and clinicians depending on particular patient pathways. The findings of this study may also encourage healthcare providers to deliver more education programs to patients and public health organizations about VTE, DVT and PE and their risk factors, signs and symptoms and their preventive measures. Moreover, thromboprophylaxis is highly recommended for critically ill patients.

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List of used abbreviations

Abbreviation	Refer to
VTE	Venous Thromo-embolism
PE	Pulmonary Embolism
DVT	Deep Vein Thrombosis

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