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ASSESSMENT OF NURSES' KNOWLEDGE AND PRACTICE REGARDING PREVENTION OF DEEP VENOUS THROMBOSIS AMONG HOSPITALIZED PATIENTS WITH COVID-19

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ABSTRACT ***Background:*** *Venous thromboembolism (VTE) is a leading cause of patient morbidity in hospitalized patients with COVID-19; it is a common and potentially fatal complication. Knowledge and effective practice on VTE prophylaxis are vital for the proper patients' management. Inadequate knowledge and poor practice of health professionals towards VTE prophylaxis increased patients' complications.* ***The aim of the study:*** *assess nurses' knowledge and practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.* ***Design****: A descriptive exploratory design.* ***Setting:*** *The study was conducted at Al Kasr Al Einy Teaching Hospital (Cairo University Hospitals).* ***Subject:*** *A convenient sample includes 100 nurses from the previously mentioned setting.* ***Tools:*** *Data were collected using two tools; a Knowledge self-administrated questionnaire and a practical observational checklist.* ***Results:*** *results showed that less than half of the studied nurses were more than 30 years. Majority of them were female, more than half had Institute of nursing, and majority of them had experience more than 6 years. There was no a statically significant correlation between nurses' knowledge and practices and the demographic data.* ***Conclusion:*** *The findings of this study indicated about two-thirds of studied nurses were an unsatisfactory level of knowledge and the majority of them had an incompetent level of practice regarding prevention of DVT among hospitalized patients with COVID-19. Furthermore, there was a statically significant correlation ($P<0.05$) between total nurses' knowledge and practices.* ***Recommendations:*** *Continuous educational programs to enhance the nurse's knowledge and practices regarding DVT prevention among hospitalized patients with COVID-19.*

KEYWORDS: Nurses, Knowledge, Practice, Deep Venous Thrombosis, Coronavirus 2019

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INTRODUCTION

There are many occur in inpatient health care and disease prevention. The role of nurses has evolved from a single bedside nurse to greater responsibility for risk identification and prevention (Hermes, 2020). Among preventive diseases, thrombotic disorders are the leading cause of high mortality and morbidity in the world. The most critical and dangerous vascular diseases among patients are deep vein thrombosis, which is considered the third master vascular diagnosis after stroke and heart attack (Parveen, Kousar-Parveen & Afzal, 2021).

Venous thromboembolism (VTE), consisting of deep vein thrombosis (DVT) and pulmonary embolism (PE), occurs in approximately 1 out of 1000 individuals in the general population but is often secondary to other clinical conditions. DVT is the formation or presence of a thrombus in the deep veins. Pulmonary embolism (PE) is an obstruction of the pulmonary artery or its branches by a thrombus. The source of thrombus in pulmonary arteries is an embolization from deep veins of the legs. This occurs in one-third of patients with DVT. Prevention of DVT thereby decreases the incidence of PE, a serious and life-threatening condition (Badireddy & Mudipalli, 2021).

A high incidence of thrombotic events has been reported in hospitalized COVID-19 patients. Most patients suffer venous thromboembolic events with pulmonary embolism (PE) playing a significant role; this can have a major impact on disease outcome (Baccellieri, et al., 2021). where COVID-19 patients are at high risk for VTE, particularly those with multiple risk factors, highly a CURB-65 score, a Padua prediction score and D-dimer >1.0 μg/mL. Most VTE are asymptomatic and whether they are the cause of death or only concurrent events remains controversial (Zhang, et al., 2020).

The novel coronavirus disease of 2019 (COVID-19) pandemic, is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2). COVID-19 may predispose to both venous and arterial thromboembolic disease due to excessive inflammation, hypoxia, immobilization, and diffuse intravascular coagulation (DIC) (Klok et al., 2020). The diagnosis of VTE using standardized objective testing is problematic in these patients, given the risk of infecting non-COVID-19 hospitalized patients and hospital personnel, coupled with the usual challenges of performing diagnostic testing in critically-ill patients (Spyropoulos et al., 2020).

Patients with COVID-19 are at increased risk of a hypercoagulable state in the venous and arterial circulation systems, due to the excessive inflammation process, platelet activation, and endothelial injury. That increases a patient's risk for deep vein thrombosis (DVT), pulmonary embolism (PE), microvascular thrombosis, stroke, and clotting of catheters, resulting in higher mortality (Pavoni et al., 2021). The cumulative incidence of deep venous thrombosis and pulmonary embolism in Covid-19 patients varies from 7.7% up to 69%. DVT is common in hospitalized patients with COVID-19, ultrasound screening of high-risk patients (Gomez-Mesa et al., 2021).

Key markers of inflammation and coagulopathy have been associated with morbidity and increased mortality in hospitalized patients with COVID-19, suggesting that either the severe acute respiratory syndrome (coronavirus infection) itself or the cytokine storm produced by the hyper-inflammatory state induces a pro-thrombotic state. COVID-19 is associated with a coagulopathy characterized by mild thrombocytopenia, elevated levels of d-dimer and

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fibrinogen degradation products, slight prolongation of the prothrombin time, and elevated levels of fibrinogen and factor VIII (Spyropoulos & Weitz, 2020).

Virchow's triad in the thrombo-genesis in COVID-19 consists of the abnormal vessel wall (endothelitis, endothelial dysfunction with loss of glycocalyx, endothelial disruption), abnormal flow (due to hyper-viscosity, immune activation, high fibrinogen, impaired microcirculation due to hypoxia, and turbulent flow due to microthrombi), and hyper-coagulable state (inhibition of plasminogen system due to unopposed canonical renin-angiotensin pathway, platelet dysfunction, complement activation (not shown), and hyper-immune response) (Mehta, Calcaterra & Bassareo, 2020).

Deep vein thrombosis occurs mostly in the lower extremities and to a lesser extent in the upper extremities. The signs and symptoms increase upper or lower extremity pain, tenderness, warmth, redness, or swelling of the extremity. The majority leads to long-term complications. Most cases of DVT remain undiagnosed and are considered silent killers. It is a fatal condition resulting in poor patient outcomes. Therefore, methods to improve nurses' use of preventive measures for DVT are paramount (Hebeshy et al., 2020).

One of the life threatening complications of deep vein thrombosis is the venous thromboembolism which leads to pulmonary embolism and eventual death among patients. Pulmonary embolism is the third leading cause of death among adults. Moreover, the chronic complications are post thrombotic syndrome and recurrent deep vein thrombosis. This put significant burden on the patients both socially and economically. Despite massive advancement in medical diagnosis and treatment, the diagnosed case rate is less than the actual occurrences of pulmonary embolism (Parveen, Kousar-Parveen & Afzal, 2021).

Nurses are on the frontline of thrombosis prevention, they play a crucial role in diagnosis and risk assessment, applying timely preventive methods, and providing vital educational and psychological support for patients with venous thromboembolism, so skilled nursing intervention can be lifesaving, they have positively affected outcomes in mechanical or physical DVT prophylaxis. They educate patients regarding the importance of physical therapy and early movement through early ambulation, leg elevation, leg flexing, active and passive range of motion exercises (Amin, Mahmoud, & Omran, 2022).

Prevention of DVT is a patient safety issue. Patients must be evaluated by nursing as a routine, guided by institutional protocols and preventive measures must be implemented. As for pharmacological measures, it is up to the nurse to double check. The non-pharmacological measures are competence of nurses, and must be implemented with initiative, based on evidence, supported by protocols, without waiting for the prescription of another professional (Gomes et al., 2021).

DVT knowledge and compliance exhibited a positive relationship, meaning that nurses with high knowledge also had high compliance. Nurses play a key role in the detection, treatment, and prevention of DVT. Including the DVT risk assessment as a routine daily practice is critical to preventing hospital-acquired DVT. Direct care nurses are patients' advocacy and can help bridge gaps between patients' specific situations and physicians' knowledge. That a lack of knowledge was the main barrier to performing DVT risk assessment (Ma, et al., 2018).

Venous thromboembolism is the third most frequent acute cardiovascular disease, following myocardial infarction and stroke, with an annual incidence rate of 39–115 per 100,000

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populations for pulmonary embolism (PE) and an incidence rate of 53–162 per 100,000 populations for DVT. It is the cause of over 100,000 deaths annually and is considered the most preventable cause of death in hospitalized patients in the United States of America (Tal, et al., 2020).

The incidence of deep venous thrombosis (DVT) founded in the intensive care unit despite systematic thrombo-prophylaxis up to 31% of patients. A recent report has also addressed the incidence of asymptomatic DVT among hospitalized patients with COVID-19, where screening by ultrasound examination was reported > 72 h after admission, describing DVT prevalence as high as 46.1%. Interestingly, 37.1% of patients were only given DVT prophylaxis, and 41.3% of patients received full-dose low- molecular-weight heparin (LMWH) therapy only after DVT ultrasound findings (Torres-Machorro et al., 2020).

SUBJECT AND METHODOLOGY

Aim of the study:

This study aims to assess nurses' knowledge and practice regarding the prevention of deep venous thrombosis among hospitalized patients with COVID-19.

Research questions:

1- What is the knowledge level of nurses regarding risk factors and prevention of deep venous thrombosis among hospitalized patients with COVID-19?

2- What is the level of nurses' practices regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19?

Operational definitions:

Deep vein thrombosis: It refers to developing a blood clot in a deep vein.

Research design:

A descriptive exploratory design was utilized for conduction for this study.

Setting:

The study was conducted at the isolation floor in Al Kasr Al Einy Teaching Hospital (Cairo University Hospitals) was located on 8th floor in hospital.

Subjects:

A convenient sample of all (100 nurses) that provided care for COVID-19 patients at Al Kasr Al Ainy Teaching Hospital affiliated to (Cairo University Hospitals).

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Study Duration:

The total data collections were collected through six months, from the beginning of June 2021to the end of November 2021. The investigator was available at each study setting three days per week throughout the morning shift from 9 am to 12 pm.

The sample size determination

$N= 2 (Z\alpha + Z [1- \beta]) 2 = 2/d\ 2\times SD$

Where: n is the sample size, Zα and Z (1-β) are constant values for convention values of α and β values where Zα =1.96 when α=0.05 and Z (1-β) =1.036 when β =0.20, SD is the standard deviation obtained from previous study and d is the effect size.

$n = 2 (1.96 + 1.03)2 \times 11.8\ 2 /52 = 99.5$

Therefore, the minimal sample size was found to be =100 participants.

Tools for data collection:

Data that collected used the following tool:

1st tool: Nurses self-administrated interview questionnaire:

It was constructed by the investigator after reviewing relevant literature **(Al-Mugeed, 2017, Ma et al., 2018, Olaimat et al., 2020)**. It was written in simple Arabic language for assessing nurses' knowledge regarding preventing of DVT among hospitalized patients with COVID-19. It included two parts:

- **Part I: Demographic characteristics of nurses:** It was included: age, gender, level of education, years of experiences and previous attendance of training courses related to preventing DVT and covied-19 disease, the number of months' experience of caring for patients with covied-19.
- **Part II: Nurses' Knowledge Assessment questionnaire:** This part was

  developed to assess nurses' knowledge of DVT, nurses' knowledge of coronavirus, nurses' knowledge of risk factor of DVT, and nurses' knowledge on prevention of DVT.

Scoring System:

This tool was scored according the following. The tool contained of (57) questions, the total sores of the questionnaire were 57 grades. Knowledge obtained from the studied nurses was checked with a model key answer, (1) grade was given for the correct answers and (zero) grades were given for incorrect answers. The total scores of knowledge were summed and converted into a percentage score. It was classified into 2 categories:

- **The satisfactory knowledge** if total score ≥ 70%
- **The unsatisfactory knowledge** if total score <70%

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2nd tool: Nurses' practice observational checklist:

This tool was adapted from (Al-Mugeed, 2017 & Yu-Fen, et al., 2018) and modified by the investigator. It was designed in English language and consisted of 25 nursing actions to assess nursing practice regarding prevention of DVT prevention among Hospitalized Patients with COVID-19**.** It consists of three Section concerned with nurses' actions on DVT basic prophylaxis, nurses' actions on DVT Mechanical prophylaxis, and nurses' actions on DVT Pharmacological prophylaxis.

Scoring System:

This tool was scored according the following. Each competency skill was assigned a score according to sup-items. The total score of studied nurses' practices was 25 grades, which equal was (1) grade for done and (zero) for not done. These scores were summed and converted into a percentage score.

- **The competent practice** If total score ≥ 70 %
- **The incompetent practice** if total score < 70 %

Content Validity

It was ascertained by three of experts in pediatric nursing. Their opinions elicited regarding the format, layout, consistency, accuracy and relevancy of the tools.

Reliability

Reliability analysis is measuring of internal consistency of the tool through Cronbach's Alpha test.

Items	Cronbach alpha
An Interviewing questionnaire	0.85
Observational checklist	0.912

Pilot study:

A pilot study was carried out on (10%) (n= 10 nurses) of the subjects under the study was included and chosen randomly from the previously mentioned settings then later included to the sample. Which test the applicability, feasibility, practicability, and clarity of the constructed tools. The pilot study had also served to estimate the time needed for each subject to fill in the questionnaire. According to the results of the pilot, no omissions of items were performed, so the nurses were included in the study sample.

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Fieldwork:

Filed work includes the following;

- Firstly, the investigator met and introduced herself to the nurses with the studied nurses at the previously mentioned settings, explained the purpose of the study after introducing herself, and assessed individually using the previously mentioned tools.
- Then the investigator observes the actual practice of every nurse who used the observational checklist to ensure maximum realistic knowledge. The observational checklist was filled by the researcher in 20-30 minutes.
- After that, the knowledge questionnaire tools were distributed to all nurses and filled in the presence of the investigator to ensure that the questions were answered completely by the nurse.
- They were delivered tools immediately to the investigator after completion to avoid any biases resulting from the interaction of nurses with each other. The time required to complete the knowledge questionnaire was around 15-20 minutes.

III- Administrative item:

An official permission was obtained by submission of a formal letter issued from the Dean of Faculty of Nursing Helwan University to the director of French Kasr Al-Aini Teaching Hospital(Cairo University Hospitals). Collect the necessary data for current study after a brief explanation of the purpose of the study and its expected outcomes, using proper channels of communication from authorized personnel.

Ethical considerations:

The investigator approval was obtained from the ethical committee of the Faculty of Nursing Helwan University. Then went to the director of the French Kasr Al-Aini Teaching Hospital was interviewed with him, read the protocol papers and research tools, then signed with approval, then was transferred to the Director of Nursing, who also signed the approval. Then the investigator was directed to the training unit in the hospital, who coordinated the entry into the isolation unit with the infection control unit in the hospital.

The investigator has clarified the objectives and aim of the study to nurses included in the study before starting. Oral consent was obtained from the investigator assured that all the gathered data as confidential and used for research purposes only. The investigator was assuring maintaining anonymity and confidentiality of subjects' data included in the study. The studied nurses were informed that they have the right to withdrawal from the study at any time.

IV. Statistical Analysis:

Data collected from the studied nurses was revised, coded, and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 24. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X^2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between three ranked variables.

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RESULTS

Part I: The demographic characteristics of the studied subjects

Table (1): Frequency and percentage distribution of demographic characteristics of the studied nurses (n=100).

Socio-demographic characteristics	Items	N	%
Age (in years)	20-30	19	19.0
	31-40	40	40.0
	41-60	41	**41.0**
	Mean ± SD	39.65± 12.2	
Educational level	Diploma	22	22.0
	Institute	52	**52.0**
	Bachelor	26	26.0
Years of experience	Less 5	22	22.0
	6-10	40	**40.0**
	> 11	38	38.0
	Mean ± SD	9.64± 5.03	
Attended training courses about COVID-19	Yes	85	**85.0**
	No	15	15.0
Attended training courses about DVT	Yes	44	44.0
	No	56	**56.0**

Table (1) Shows that, (41.0 %) of the studied nurses were in age group 41-60 years with mean age (39.65+12.2) and (66.0%) of them were female. Also, (52.0%) of them had institute level of education. Additionally, (40.0%) of them had years of experience ranged from (6-10) years with mean years (9.64+5.03). Moreover, (85.0%) of the studied nurses had attended training courses about COVID-19. While, (56.0%) of them did not attend training courses about DVT

Figure (1): Frequency and percentage distribution of the studied nurses according to their gender. (n=100).

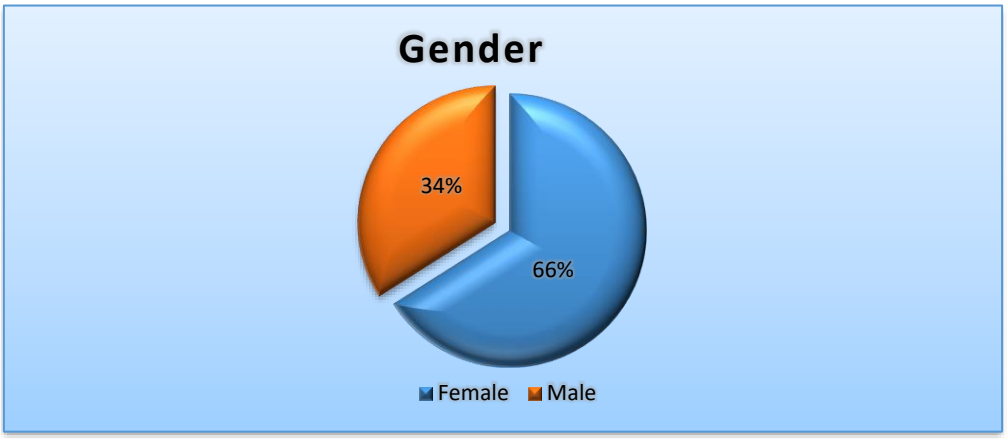

Figure (1): Shows that, (66.0%) of the studied nurses were female.

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Part II: The nurses' knowledge regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.

Table (2): Frequency and percentage distribution of the studied nurses' level of knowledge regarding deep venous thrombosis (n=100).

Knowledge about DVT	Satisfactory		Unsatisfactory	
	N	%	N	%
DVT is the formation of a blood clot in a deep vein	25	25.0	75	**75.0**
DVT occurs most frequently in the veins of the lower extremities.	83	**83.0**	17	17.0
Deep vein thrombosis also occurs in the upper limbs	20	20.0	80	**80.0**
Causes of DVT	59	**59.0**	41	41.0
Manifestations of DVT	85	**85.0**	15	15.0
The diagnosis of DVT is by ultrasound only.	67	**67.0**	33	33.0
Pulmonary Embolism is a fatal complication of DVT	74	**74.0**	26	26.0
Damage to the blood vessels in the leg is a complication of deep vein thrombosis.	37	37.0	63	**63.0**

Table (2) reveals that, (85.0%, 83.0%, 74.0%, 67.0% & 59.0%), of the studied nurses had satisfactory knowledge regarding Manifestations of DVT, DVT occurs most frequently in the veins of the lower extremities, pulmonary embolism is a fatal complication of DVT, the diagnosis of DVT is by ultrasound only and Causes of DVT, respectively.

Table (3): Frequency and percentage distribution of the studied nurses' level of knowledge regarding to COVID-19 (n=100).

Knowledge about COVID-19	Satisfactory		Unsatisfactory	
	N	%	N	%
The new coronavirus is like the common flu	80	**80.0**	20	20.0
COVID-19 caused by the emerging coronavirus called SARS-CoV-2.	27	27.0	73	**73.0**
Older adults and people of any age who have serious underlying medical conditions may be at higher risk for more serious complications from the new coronavirus.	94	**94.0**	6	6.0
Coronavirus can be transmitted when touch contaminated infected surfaces and touch eyes, mouth, or face.	88	**88.0**	12	12.0
The coronavirus transmitted through diffused droplets in the air from those infected.	89	**89.0**	11	11.0
Symptoms of the coronavirus disease (COVID-19) appear two to 14 days after exposure.	86	**86.0**	14	14.0

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Fever, Cough and Shortness of Breath that are Signs and Symptoms of coronavirus only.	62	62.0	38	38.0
DVT is Complications from coronavirus.	36	36.0	64	**64.0**
VTE is a major cause of sudden death in hospitalized patients with covied-19.	75	75.0	25	25.0
Multi organ failure is complications from coronavirus.	69	69.0	31	31.0
There is currently a vaccine available that protects against infection with the coronavirus.	65	65.0	35	35.0
There is a treatment for the new coronavirus.	74	74.0	26	26.0

Table (3) illustrates that, (94.0%, 89.0%, 88%, 86.0% & 80.0%) of the studied nurses had satisfactory knowledge regarding to older adults and people of any age who have serious underlying medical conditions may be at higher risk for more serious complications from the new coronavirus, The coronavirus transmitted through diffused droplets in the air from those infected, coronavirus can be transmitted when touch contaminated infected surfaces and touch eyes, mouth, or face, symptoms of the coronavirus disease (COVID-19) appear two to 14 days after exposure and the new coronavirus is like the common flu, respectively.

While illustrates that, (73.0%, and 64.0%) of the studied nurses had unsatisfactory knowledge regarding to COVID-19 is caused by the emerging coronavirus called SARS-CoV-2 and DVT is complications from coronavirus, respectively.

Table (4): Frequency and percentage distribution of the studied nurses' level of knowledge regarding to risk factors of deep venous thrombosis (n=100).

Risk factors knowledge of DVT	Satisfactory		Unsatisfactory	
	N	%	N	%
Prolonged immobilization predisposes to DVT in patients with COVID-19.	40	40.0	60	**60.0**
Surgical patients are more prone than medical patients to DVT/VTE.	56	56.0	44	44.0
Indwelling IV devices may predispose to DVT in patients with COVID-19.	57	57.0	43	43.0
Paralysis, paresis, or recent plaster cast on lower extremities may predispose to DVT	47	47.0	53	**53.0**
Obesity may predispose to DVT in patients with COVID-19.	81	**81.0**	19	19.0
Low body mass index may predispose to DVT in patients with COVID-19.	72	**72.0**	28	28.0
There is relationship between a family history of DVT and its occurrence?	41	41.0	59	**59.0**
Advancing age may predispose to DVT in patients with COVID-19.	67	67.0	33	33.0
There is relationship between respiratory diseases and DVT.	62	62.0	38	38.0

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There is relationship between COVID-19 diseases and DVT.	82	**82.0**	18	18.0
Previous DVT/PE history may predispose to DVT in patients with COVID-19.	61	61.0	39	39.0
Major surgery may predispose to DVT in patients with COVID-19.	74	**74.0**	26	26.0
Varicose veins may predispose to DVT in patients with COVID-19.	78	**78.0**	22	22.0
Trauma may predispose to DVT in patients with COVID-19.	58	58.0	42	42.0

Table (4) illustrates that, (82.0%, 81.0%, 78.0%, 74.0% & 72.0%) of the studied nurses had satisfactory knowledge regarding to there is relationship between COVID-19 diseases and DVT, obesity may predispose to DVT in patients with COVID-19, varicose veins may predispose to DVT in patients with COVID-19, major surgery may predispose to DVT in patients with COVID-19 and low body mass index may predispose to DVT in patients with COVID-19, respectively.

While illustrates that, (60.0%, 59.0% & 53.0%) of the studied nurses had unsatisfactory knowledge regarding to Prolonged immobilization predisposes to DVT in patients with COVID-19, is relationship between a family history of DVT and its occurrence and Paralysis, paresis, or recent plaster cast on lower extremities may predispose to DVT, respectively.

Figure (2): Frequency and percentage distribution of the studied nurses' satisfactory level according to total knowledge regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19. (n=100).

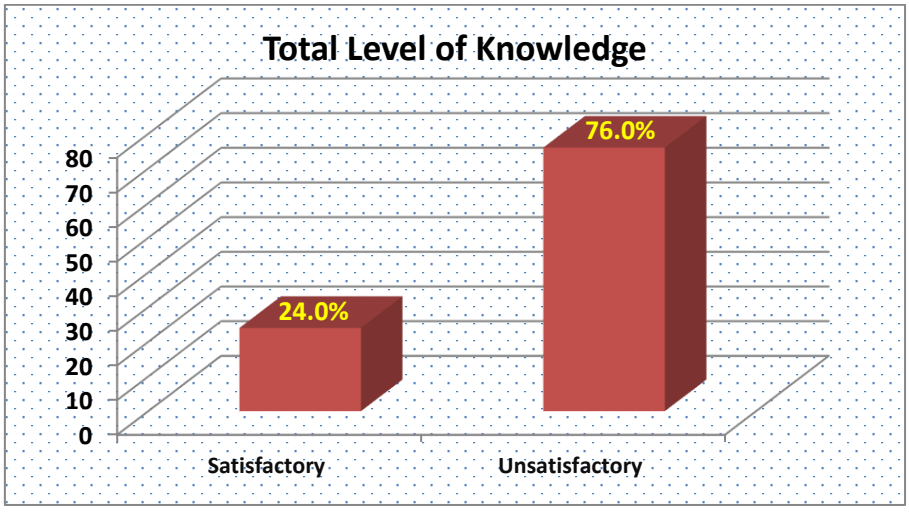

Figure (2) illustrates that, (24.0%) of them had satisfactory level of knowledge. While, (76.0%) of the studied nurses had unsatisfactory level of knowledge regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.

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Figure (3): Frequency and percentage distribution of the studied nurses' level of practical skills regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19 (n=100).

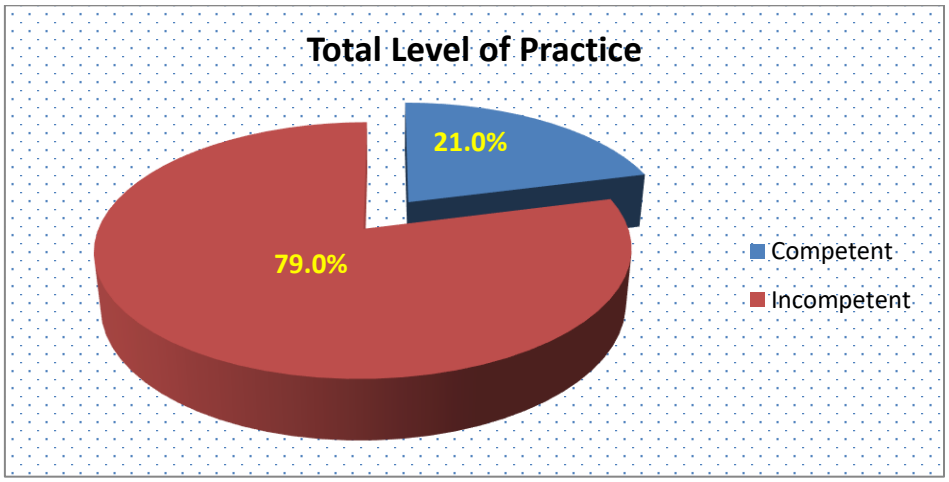

Figure (3) illustrates that, (21.0%) of them had competent level of practice. While (79.0%) of the studied nurses had incompetent level of practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.

Part IV: The correlation between the studied variables.

Table (9): Correlation between demographic characteristics of the studied nurses and their total level of knowledge (N=100).

Demographic characteristics		Total level of knowledge				X^2	P-value
		Satisfactory		Unsatisfactory			
		N	%	N	%		
Age (in years)	20-30	5	5.0	14	14.0	0.172	0.918
	31-40	10	10.0	30	30.0		
	41-60	9	9.0	32	32.0		
Gender	Male	9	9.0	25	25.0	0.172	0.678
	Female	15	15.0	51	51.0		
Educational level	Diploma	7	7.0	15	15.0	0.182	**0.024***
	Institute	13	13.0	39	39.0		
	Bachelor	4	4.0	22	22.0		
Years of experience	Less 5	6	6.0	16	16.0	0.332	0.847
	6-10	10	10.0	30	30.0		
	> 11	8	8.0	30	30.0		
Attending Training courses COVID	Yes	20	20.0	65	65.0	0.069	**0.037***
	No	4	4.0	11	11.0		
Attending Training courses DVT	Yes	9	9.0	35	35.0	0.541	**0.046***
	No	15	15.0	41	41.0		

P ≥ 0.05: Not statistically significant. P < 0.05: * statistically significant

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Table (9) reveals that, there was a statistically significant statistical correlation between nurse's total level of knowledge and their educational level, attending training courses about COVID-19 and attending training courses about DVT at (P- value=0.024, 0.037 and 0.046, respectively).

While there was no statistically significant correlation between nurse's total level of knowledge and their age, gender, and years of experience at (P-value =0.918, 0.678 and 0.847, respectively).

Table (10): Correlation between demographic characteristics of the studied nurses and their total level of practice (N=100).

Demographic characteristics		Total level of practice				X^2	P-value
		Competent		Incompetent			
		N	%	N	%		
Age (in years)	20-30	3	3.0	16	16.0	0.381	**0.014***
	31-40	5	5.0	35	35.0		
	41-60	12	12.0	29	29.0		
Gender	Male	6	6.0	28	28.0	0.178	0.673
	Female	14	14.0	52	52.0		
Educational level	Diploma	3	3.0	19	19.0	0.754	**0.048***
	Institute	11	11.0	41	41.0		
	Bachelor	6	6.0	20	20.0		
Years of experience	Less 5	3	3.0	19	19.0	5.14	0.076
	6-10	5	5.0	35	35.0		
	> 11	12	12.0	36	36.0		
Training courses COVID	Yes	20	20.0	65	65.0	4.41	**0.036***
	No	0	0.0	15	15.0		
Training courses DVT	Yes	7	7.0	37	37.0	0.822	0.365
	No	13	13.0	43	43.0		

P ≥ 0.05: Not statistically significant. P < 0.05: * statistically significant

Table (10) displays that, there was a statistically significant correlation between nurse's total level of practice and their age, educational level and attending training courses about COVID-19 at (P- value=0.014, 0.048 and 0.036), respectively.

While there was no statistically significant correlation between nurse's total level of practice and their gender, years of experience and attending training courses about DVT at (P-value =0.673, 0.076 and 0.365), respectively.

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Table (11): Correlation between level of knowledge and level of practice.

Variables	level of knowledge	
	R	P-value
level of practice	0.678	0.042*

*** P-value ≤ 0.05 Significant**

Table (11) shows that, there was a significant positive correlation between nurse's total level of practice and their total level of knowledge at (P- value=0.042).

Significance of the Results:

- P > 0.05: Not statistically significant.
- P ≤ 0.05: * statistically significant
- P ≤ 0.01: ** Highly statistically significant.

DISCUSSION

Deep vein thrombosis (DVT) is a common largely preventable condition. The Agency for Healthcare Research and Quality reports that, DVT prophylaxis is among the top ten strongly suggested practices for improving patient safety (Mosa et al., 2019).

The aim of the study was conducted to assess nurses' knowledge and practice regarding the prevention of deep venous thrombosis among hospitalized patients with COVID-19.

The study was conducted on 100 nurses of varied ages, experiences, and levels of education. Regarding age reveals that more than one-third of the studied nurses were in the age group (41-60) years. In a study conducted by Mohammed, Taha and Abdel-Aziz (2018) in their titled "Nurses' Performance Regarding Venous Thromboembolism Prophylaxis at Intensive Care Unit" who's reported two-thirds of the studied nurses were more than 30 years, which revealed similarities with our findings.

In addition, contradicted with the resulting conduct by Al-Mugeed (2017) in their study titled "Evaluating hospital nurses' perceived knowledge and practices of venous thromboembolism assessment and prevention" which shows less than half the frequent age group was <25 years and the mean ages of the participants were 27.7 years.

Also, this result disagreed with Mokadem and El-Sayed (2019) in their study entitled "Effect of educational intervention on critical care nurses' adherence to the clinical practice guidelines for preventing venous thromboembolism in critically ill patients" whose results revealed that more than half of the studied nurses' ages were less than 25 years.

From the investigator's point of view, this might be The French Kasr Al-Ainy Teaching Hospital is one of the oldest hospitals in Egypt that provided health care services and follow

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the government. However, the youngest staff follows the private hospital because of the salaries pattern.

Regarding gender, the present study revealed the majority of nurses were females. These findings agree with various studies about VTE in different settings in Egypt, the result conducted by Ahmed, Ghanem and Khalil (2020) who reported that all nurses involved in the study were females. Also, this result is compatible with Elsayedead et al. (2016), Hebeshy (2020) and AL-Jumaily and Khudur (2019) revealed that the majority of the nurses' sample was females.

This finding is contraindicated with the result conducted by Park et al., (2016) in their study titled "Risk factors for venous thromboembolism after acute trauma: A population-based case-cohort study" who reported that two-thirds of the participants were males.

From the investigator's point of view, this might be due to the overall ratio of male nurses to female nurses being less in the nursing profession. The French Kasr Al-Ainy Hospital is one of the oldest hospitals in Egypt that has a nursing institute, which in turn graduates' batches to work in the hospital, all of whom are female. This may be a result of increasing the acceptance and graduation of females more than males in all educational institutions for nursing in Egypt.

Concerning the nurses' level of education, the current study revealed more than half of the studied nurses had graduated from the Technical Institute of Nursing. In the same line, Ahmed, Ghanem and Khalil (2020) mentioned that most of his study sample was from the nursing institute. These result in the same line with Shehab (2018). This result disagreed with Abdellnaser et al. (2018) performed a study aimed to assess nurses' knowledge and practice about measures to prevent pulmonary embolism among patients in Aga general hospital who revealed that, more than half of the studied nurses were graduated from nursing schools with diploma degree and at age group 20-30 years.

From the investigator's point of view, this result may be due to most bachelor nurses working as a supervisor or head nurses in Governmental Hospitals, but technical institute nurses are working as bedside nurses.

According to nurses' years' experience, more than one-third of them had experience ranging from six to ten years, which leads to most of the nurses' participants having veteran employees. This result is consistent with Chen, et al., (2018), in their study entitled "Nurses' objective knowledge regarding venous thromboembolism prophylaxis" who reported that the mean nursing experience was between 8.96 ±7.37 years.

This result is in the same line with Mohammed, Taha and Abd El-Aziz (2018), Yan et al. (2021) and Haza'a et al. (2020) revealed that near half of the studied nurses had experienced between 5-10 years of working in the Intensive Care Units. From the investigator's point of view, this may be due to most newly graduated nurses preferring to work in private hospitals over government hospitals, because there are many privileges, most importantly a better salary.

Concerning attendance of training courses, the current study reported that the majority of the studied nurses had attended training courses about COVID-19. While more than, half of them did not attend training courses about DVT. This result is compatible with Zhou et al. (2019) in their study entitled " Venous thromboembolism in the emergency department: A survey of

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current best practice awareness in physicians and nurses in China" whose results revealed that the majority of nurses did not receive any training courses about venous thromboembolism and its prevention.

This finding agrees with the study conducted by Li et al. (2018) in their study entitled "Nurses' knowledge and attitudes regarding major immobility complications among bedridden patients" who reported that not all nurses had attended any previous training courses about nursing care standards for preventing DVT. This result was consistent with Bhatti et al. (2017) in their study entitled "Knowledge, attitude and practices of healthcare providers towards deep vein thrombosis prophylaxis in five teaching hospitals of Rawalpindi", who found that the medical/surgical units have no policies for DVT prophylaxis.

From the investigator's point of view, this is due to the lack of interest shown by the training center in the subjects of disease prevention, particularly the prevention of deep venous thrombosis. The focus is on the prevention of infection. This demonstrates that there are courses on coronaviruses, but no courses on deep venous thrombosis.

Therefore, the education of the nurses on DVT prevention issues inclusive of risk factors, nursing interventions, prophylaxis, and treatment is vital to improve their DVT knowledge and practice. Results of the present study showed that the majority of the participants had not received DVT education. Nurses who received DVT education reported the school as the resource with a higher percentage.

Regarding nurses' general knowledge about COVID-19 disease, the present study showed that most of the studied nurses had correct knowledge regarding (Older adults and people of any age who have serious underlying medical conditions may be at higher risk for more serious complications from the new coronavirus, The coronavirus transmitted through diffused droplets in the air from those infected, Coronavirus can be transmitted when touching contaminated infected surfaces and touch eyes, mouth, or face, Symptoms of the coronavirus disease (COVID-19) appear two to 14 days after exposure, and The new coronavirus is like the common flu).

This finding supported with the result conducted with Huynh et al. (2020) in their study titled "Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City" reported the health care workers (HCWs) had a high level of knowledge and a positive attitude towards the COVID-19 outbreak, they have good answers related "COVID-19 is a virus infection, COVID-19 is transmitted by close contact with the infected person, and fever, cough, sore throats, and shortness breath are possible symptoms of COVID19".

These findings disagree with the study conducted by Bhagavathula et al. (2020) in their study titled "Knowledge and perceptions of COVID-19 among health care workers: cross-sectional study" who reported the nurse's poor knowledge about the disease transmission, and the symptom was found in a significant proportion of HCWs.

Regarding risk factors knowledge of DVT, the result of the present study showed the majority and more than three-fifths of studied nurses had correct knowledge regarding "There is the relationship between COVID-19 diseases and DVT, Obesity may predispose to DVT in patients with COVID-19, Varicose veins may predispose to DVT in patients with COVID-19,

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Major surgery may predispose to DVT in patients with COVID-19, and Low body mass index may predispose to DVT in patients with COVID-19".

These findings agree with the study conducted by Shah et al. (2020) in their study titled "The rational use of thrombo-prophylaxis therapy in hospitalized patients and the perspectives of health care providers in Northern Cyprus" who reported that most of the respondents had correct answers for questions (Surgical patients are more prone than medical patients to DVT/VTE) and (VTE is the most common cause of sudden death in hospitalized patients).

On the other hand, the result of the present study showed a low level of nurses' knowledge of nurses on risk factors of deep vein thrombosis among hospitalized patients with COVID-19. The statistics of the present study revealed the majority of nurses have wrong answers were found to be higher in questions reveals that "Prolonged immobilization predisposes to DVT in patients with COVID-19, Is the relationship between a family history of DVT and its occurrence, and Paralysis, paresis, or recent plaster cast on lower extremities may predispose to DVT".

This finding is similar to a study conducted by Al-Mugeed (2017) who reported the nurses showed poor or fair VTE risk assessment at overall knowledge and recommended revisiting in-service continuous education about VTE risk assessment, especially in acute care settings.

These findings contradicted with the study conducted by Ma et al. (2018) in their study titled "Nurses' objective knowledge regarding venous thromboembolism prophylaxis", who reported the majority of respondents correct understanding for (Bedridden status & Leg plaster or splint fixation is a risk factor for VTE) whereas half of the respondent's correct answers including inflammatory bowel disease, oral contraceptives, hormone therapy, stillbirth, or miscarriage, and obesity.

Regarding preventive knowledge of DVT, the study reveals the majority of the studied nurses had correct knowledge regarding, "Heparin or low molecular weight heparin (LMWH) may prevent DVT development, elastic compression stockings may prevent DVT development, early ambulation after surgery may prevent DVT development and the correct way to wear graduated compression stockings is to gradually roll them from the far end to the proximal end".

This finding agree with Yesuf et al. (2021) who reported the majority of the nurses had correct answers for "Foot and leg exercises may prevent DVT, elevating legs is necessary to prevent DVT/ VTE, and early ambulation after surgery may prevent DVT development".

Regarding the total level of nurses' knowledge, it was determined about two-thirds of the studied nurses had an unsatisfactory level of knowledge regarding the prevention of deep venous thrombosis among hospitalized patients with COVID-19. This finding was supported by the study conducted by Al-Mugeed (2017) that showed about two-thirds of them had a weak knowledge.

Also, agree with Shah et al. (2020) who reported that most of the nurses had a low score of knowledge, in the same line with the results conducted by Antony, Moly and Dharan (2016) among 100 staff nurses working in critical care units; it was revealed that half of the nurses had poor knowledge on the prevention on DVT among hospitalized patients.

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This finding contradicted the study conducted by Yu-Fen et al. (2018) stated that the average rate of correct responses regarding VTE prevention knowledge was majority knowledge good knowledge.

From the investigator's point of view, this is due to a lack of continuing education programs or sessions about this disorder or lack of supervision, cooperation between multidisciplinary health care team members (nurses - physicians), and not any standard to develop their knowledge about prevention of venous thromboembolism. The standard for special care required to develop specific written policies. In addition, lack of availability of books by the hospital and the nurses had not to time for reading due to workload.

Regarding the total level of practice, our finding illustrates that the majority of staff nurses had an incompetent level of practice about DVT prevention among hospitalized patients with COVID-19. The finding goes in the same line with Feng et al. (2021) in their titled "Knowledge, attitudes, and practices regarding venous thromboembolism prophylaxis" who reported that the rate of affirmative responses for practice items was low and this may be related to the relatively low level of knowledge among the medical staff. The finding goes in the same line with Antony, Moly and Dharan (2016) and Mohammed, Taha and Abd El-Aziz (2018) their study findings revealed that no staff nurses were having a good practice about DVT prevention.

Moreover, Mohamed et al. (2017) found that the majority of nurses had satisfactory level of practice in there titled "Effect of Implementing Nursing Care Guidelines on the Occurrence of Deep Vein Thrombosis among Orthopedic Patients". Also contradicted the study conducted by Ma et al. (2018) that showed the average correct response rate was only 59.90±15.63percentage. Whereas the majority of subjects answered more than half of the survey items correctly, the correct rate was distributed between 60% and 70%.

From the investigator's point of view, the possible justification might be several barriers that have contributed to lack of guideline adherence, lack of supportive systems, lack of knowledge, lack of individual responsibility for implementation, lack of acceptance, perceived lack of need in some clinical areas, no oversight or incentives, and conflicting guideline recommendations.

Regarding the correlation between nurses' total level of knowledge and their age, gender, and years of experience, Relation's analysis showed no significant statistical relationship between nurses' total level of knowledge and their age, gender, and years of experience at this result is an agreement with Najm et al. (2020) in there titled "Critical Care Nurses' Knowledge about Pulmonary embolism in Respiratory Care Unit in Baghdad Teaching Hospitals", who indicated that there is no significant association between age, gender, years of experience and nurses' knowledge.

Regarding the comparison of nurses' total level of practice and their age, educational level, and attending training courses about COVID-19, the result showed there were highly statistically significant relations between nurses' total level of practice and their age, educational level, and attending training courses about COVID-19.

While there was no significant statistical relationship between nurses' total level of practice and their gender, years of experience, and attending training courses about DVT. This means that registered nurses might have good readiness for learning and practicing new things as well their awareness about continuing education.

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Regarding the correlation between total nurses' knowledge and their practices scores, the current study result showed that there was a significant positive correlation between nurses' total level of practice and their total level of knowledge at P- value=0.042. This result indicated that the level of knowledge influences the level of practice and both are attracted and interconnected to each other, which affected on quality of nursing care for hospitalized patients with COVID-19.

This finding indicated that practices could be easily improved especially if linked with a relevant scientific base of knowledge. This finding was congruent with Elkattan and Elderiny (2017), who studied "Effect of Nursing Care Guidelines on Preventing Deep Venous Thrombosis among Patients Undergoing Arthroplasty Surgery ", and documented there was a highly statistically significant relationship between nurses' knowledge and their practices.

This result disagrees with Antony, Moly and Dharan (2016) mentioned that there was no significant correlation between nurses' knowledge and the level of their practice regarding the prevention of deep vein thrombosis among hospitalized patients with COVID-19. Also, disagree with Mohammed, Taha and Abd El-Aziz (2018) who indicated that no statistically significant relation was between total knowledge scores and items of practice.

This study showed the nurses had lower knowledge and practices of DVT prevention furthermore which shows unsatisfying findings. These might be due to the absence of guidelines and poor service training, lack of experience, and Periodical containing training program up to date knowledge. This in turn leads inhibits staff improvement and development, also may prevent motivations of them and increase incidences of DVT complications. Professional training program affects the outcome of the patient and inpatients' services. It is necessary to give the chance of education to the nurses with a higher opportunity to achieve and exposure to professional new in-service education related to DVT.

And last but not least, Prevention is better than cure. For DVT prevention is essential for patient safety and one of the quality standards in hospitals. It is responsible for ensuring that patients are treated safely and no harm for patients and in the isolation unit, the nurse plays a vital role in the early detection and prevention of DVT. Hence, it should provide them with adequate knowledge and practice about the preventive measures from DVT that can use to improve patient outcomes. Thus, the current study could help improve nurses' knowledge and practice regarding patient safety in intensive care units.

Finally, the study will broader the literature on the knowledge and practice of nurses regarding the prevention of deep venous thrombosis among hospitalized patients with COVID-19. which will help to prevent complications and improve the quality of nursing care.

CONCLUSIONS

The findings of this study indicated about two-thirds of studied nurses were an unsatisfactory level of knowledge and the majority of staff nurses had an incompetent level of practice regarding prevention of DVT among hospitalized patients with COVID-19. Furthermore, there was a statically significant correlation ($P<0.05$) between total nurses' knowledge and practices regarding prevention of DVT among hospitalized patients with COVID-19.

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RECOMMENDATION

Based on the results of the study following recommendations were made;

- Continuous educational programs in order to enhance the nurse's knowledge and practices regarding DVT prevention among hospitalized patients with COVID-19.
- Establish in-service training nursing education to update nurses' knowledge and skills about DVT preventive measures using the evidence based nursing and medicine.
- A simple illustrated booklet, written in the Arabic language, and posters of DVT nursing guidelines should be developed for DVT prevention among hospitalized patients with COVID-19.
- Further researches studies develop an ongoing comprehensive assessment of nurses' knowledge and practices regarding DVT prevention among hospitalized patients with COVID-19 and in-services training programs.

REFERENCES

[1]. Ahmed, M.H., Ghanem, H.M., & Khalil, S.S. (2020). Assessment of Nurses' Knowledge and Practice about Venous Thrombo Embolism for Cancer Surgery Patients. *Assiut Scientific Nursing Journal*, *8*(20), 13-20.

[2]. Al-Mugeed, K. (2017): Knowledge and Practices of Nurses about Deep Vein Thrombosis (DVT) Risks and Prophylaxis. *NICOSIA.* Master Thesis.

[3]. AL-Jumaily, A., & Khudur, K., (2019). Effectiveness of an Education Program on Nurses knowledge concerning in Nursing Management for patients with Third degree and bundle branch block in Kirkuk Teaching Hospitals. *Mosul Journal of Nursing*, 7(1), 7– 19.

[4]. Antony, A.M., Moly, K.T., & Dharan, D.R. (2016). Assessment of knowledge and self reported clinical practice on prevention of Deep Vein Thrombosis (DVT) among staff nurses. *Journal of Nursing and Health Science*, *5*(1), 18.

[5]. Baccellieri, D., Bertoglio, L., Apruzzi, L., Ardita, V., D'Angelo, A., Bossi, M., & Chiesa, R. (2021). Incidence of deep venous thrombosis in COVID-19 hospitalized patients during the first peak of the Italian outbreak. *Phlebology*, *36*(5), 375-383.

[6]. Badireddy, M., & Mudipalli, V.R. (2021). Deep Venous Thrombosis Prophylaxis. *StatPearls [Internet]*.

[7]. Bhagavathula, A.S., Aldhaleei, W.A., Rahmani, J., Mahabadi, M.A., & Bandari, D.K. (2020). Knowledge and perceptions of COVID-19 among health care workers: cross-sectional study. *JMIR public health and surveillance*, 6(2), e19160. https://doi.org/10.2196/19160.

[8]. Chen, S., Zhang, D., Zheng, T., Yu, Y., & Jiang, J. (2021). DVT incidence and risk factors in critically ill patients with COVID-19. *Journal of Thrombosis and Thrombolysis*, *51*(1), 33-39.

Article DOI: 10.52589/AJHNM-PAAXKOGI
DOI URL: https://doi.org/10.52589/AJHNM-PAAXKOGI

[9]. Elkattan, B. & Elderiny, S. (2017). Effect of Nursing Care Guidelines on Preventing Deep Venous Thrombosis among Critically Ill Patients. *International Journal of Novel Research in Healthcare and Nursing,* 6(2), 757- 774.

[10]. El-sayedead, D., Fouad Abdallah, K., Hegazi, M., & Mohammed, S. (2016). Effect of Nursing Care Standards for Preventing Deep Vein Thrombosis among Patients Undergoing Hip Surgery on Nurses Performance and Patients Outcome. *Journal of Nursing and Health Science*, 5(4), 1-12.

[11]. Feng, S., Li, M., Wang, K., Hang, C., Xu, D., Jiang, Y., & Jia, Z. (2021). Knowledge, attitudes, and practices regarding venous thromboembolism prophylaxis: A survey of medical staff at a tertiary hospital in China. *Medicine,* 100(49).

[12]. Gomes, E.T., Assunção, M. C.T., Lins, E.M., & Püschel, V.A.d. A. (2021). Nursing in mechanical prevention of venous thromboembolism in surgical patients. *Revista da Escola de Enfermagem da USP*, 55.

[13]. Gomez-Mesa, J.E., Galindo-Coral, S., Montes, M.C., & Martin, A.J.M. (2021). Thrombosis and Coagulopathy in COVID-19. Current problems in cardiology, 46(3), 100742.

[14]. Hebeshy, M.I., Hansen, D.M., Broome, B., Abou Abdou, S., Murrock, C., & Bernert, D. (2020). Development of the Nurses' Intention to Use Deep Vein Thrombosis Preventive Measures Questionnaire, *Journal of Nursing Measurement.* DOI: 10.1891/JNM-D-19-00011.

[15]. Hermes, S., Riasanow, T., Clemons, E.K., Böhm, M., & Krcmar, H. (2020). The digital transformation of the healthcare industry: exploring the rise of emerging platform ecosystems and their influence on the role of patients. *Business Research*, 13(3), 1033-1069.

[16]. Amin, H.G., Mahmoud, H.M., & Omran, S.E. (2022). Effect of An Educational Program on Nurses' Performance regarding Prevention of Venous Thromboembolism among Critically Ill Patients. *Journal of Nursing Science Benha University*, 3(1), 225-272.

[17]. Huynh, G., Nguyen, T.N.H., Vo, K.N., & Pham, L.A. (2020): Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. Asian Pacific *Journal of Tropical Medicine,* 13(6), 260

[18]. Klok, F.A., Kruip, M.J.H.A., Van der Meer, N.J.M., Arbous, M.S., Gommers, D.A.M.P.J., Kant, K.M., & Endeman, H. (2020). Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thrombosis research*, *191*, 145-147.

[19]. Lee, J.A., Grochow, D., Drake, D., Johnson, L., Reed, P., & van Servellen, G. (2014). Evaluation of hospital nurses' perceived knowledge and practices of venous thromboembolism assessment and prevention. *Journal of Vascular Nursing*, 32(1), 18-24.

[20]. Li, Z., Zhou, X., Cao, J., Li, Z., Wan, X., Li, J., ... & Wu, X. (2018). Nurses' knowledge and attitudes regarding major immobility complications among bedridden patients: A prospective multicentre study. *Journal of clinical nursing*, *27*(9-10), 1969-1980.

[21]. Ma, Y.F., Xu, Y., Chen, Y.P., Wang, X.J., Deng, H.B., He, Y., & Wu, X.J. (2018). Nurses' objective knowledge regarding venous thromboembolism prophylaxis. *Medicine,* 97(14), e0338-e0338.

Article DOI: 10.52589/AJHNM-PAAXKOGI
DOI URL: https://doi.org/10.52589/AJHNM-PAAXKOGI

[22]. Maleki, S., Najafi, F., Farhadi, K., Fakhri, M., Hosseini, F., & Naderi, M. (2020). Knowledge, aattitude,and behavior of health care workers in the prevention of COVID-19. *Research Square*. DOI: https://doi.org/10.21203/rs.3.rs-23113/v1.

[23]. Mehta, J. L., Calcaterra, G., & Bassareo, P. P. (2020). COVID-19, thromboembolic risk, and Virchow's triad: lesson from the past. Clinical Cardiology, 43(12), 1362-1367.

[24]. Mokadem, N., &El Sayed, sh. (2019). Effect of Educational Intervention on Critical Care Nurses' Adherence to the Clinical Practice Guidelines for Preventing Venous Thromboembolism in Critically Ill Patients. *American Journal of Nursing*, 7(6), 974-982.

[25]. Mohammed, A.S., Taha, N.M., & Abdel-Aziz, E.M. (2018). Nurses' Performance Regarding Venous Thromboembolism Prophylaxis at Intensive Care Unit. *Zagazig Nursing Journal*, 14(1), 1-17.

[26]. Mohamed, A., Othman, W., El Alphy, B., & Sheble, A. (2017). Effect of Implementing Nursing Care Guidelines on the Occurrence of Deep Vein Thrombosis among Orthopedic Patients. *IOSR Journal of Nursing and Health Science*, *6*(3), 28.

[27]. Najm, M.A., Jassim, A.H., & Mohammed, T.R. (2020). Critical Care Nurses' Knowledge about Pulmonary embolism in Respiratory Care Unit in Baghdad Teaching Hospitals. *Indian Journal of Forensic Medicine & Toxicology*, 14(3), 895.

[28]. Olaimat, A.N., Aolymat, I., Shahbaz, H.M., & Holley, R.A. (2020). Knowledge and information sources about COVID-19 among university students in Jordan: a cross-sectional study. *Frontiers in Public Health*, 8, 254 .

[29]. Oh, H., Boo, S., & Lee, J.A. (2017). Clinical nurses' knowledge and practice of venous thromboembolism risk assessment and prevention in South Korea: A cross-sectional survey. *Journal of Clinical Nursin*g, 26(3-4), 427-435.

[30]. Parveen, B., Kousar Parveen, M.H., & Afzal, M. (2021). Nurses knowledge and Practices regarding risk facttors and prevention of patients diagnosed with deep vein thrombosis. *Journal of Global Biosciences.* 10(6):8780-8800.

[31]. Pavoni, V., Gianesello, L., Pazzi, M., Dattolo, P., & Prisco, D. (2021). Questions about COVID-19 associated coagulopathy: panswersfrom the viscoelastic tests. Journal of Clinical Monitoring and Computing, 1-15.

[32]. Shehab, M., (2018). Impact of an Educational Program on Nurses â€TM Knowledge and Practice Regarding Care of Traumatic Brain İ njury Patients at Intensive Care Unit at Suez Canal University Hospital. *International Journal of Caring Sciences*, 11(2), 1104–1116.

[33]. Spyropoulos, A.C., Levy, J.H., Ageno, W., Connors, J.M., Hunt, B.J., Iba, T., Giannis, D. (2020). Scientific and standardization committee communication: Clinical guidance on the diagnosis, pprevention,and treatment of venous thromboembolism in hospitalized patients with COVID-19. J Thromb Haemost. doi: 10.1111/JTH.14929.

[34]. Tal, S., Spectre, G., Kornowski, R., & Perl, L. (2020). Venous thromboembolism complicated with COVID-19: what do we know so far?. *Acta haematologica*, 143(5): 417-424.

[35]. Torres-Machorro, A., Anguiano-Álvarez, V.M., Grimaldo-Gómez, F.A., Rodríguez-Zanella, H., dela Rosa, E.C., Mora-Canela, S., & Rojas-Velasco, G. (2020). Asymptomatic deep vein thrombosis in critically ill COVID-19 patients despite therapeutic levels of anti-Xa activity. *Thrombosis research*, *196*, 268-271.

Article DOI: 10.52589/AJHNM-PAAXKOGI
DOI URL: https://doi.org/10.52589/AJHNM-PAAXKOGI

[36]. Yesuf, N.N., Abebe, T., Adane, R., Lelisa, R., Asefa, M., Tessema, M., & Birhanu, Y. (2021). Nurses knowledge and practice towards prevention on deep vein thrombosis in University of Gondar Comprehensive Specialized Hospital, northwest Ethiopia. *International Journal of Africa Nursing Sciences*, 15, 100357.

[37]. Yu-Fen, M.A., Yuan, X.U., Ya-Ping Chen, X.J. W., Hai-Bo Deng, Y.H., & Xin-juan, W.U. (2018). Nurses' objective knowledge regarding venous thromboembolism prophylaxis: A national survey study. *Medicine*, *97*(14).

[38]. Zhang, L., Feng, X., Zhang, D., Jiang, C., Mei, H., Wang, J., & Xie, M. (2020). Deep vein thrombosis in hospitalized patients with COVID-19 in Wuhan, China: prevalence, risk factors, and outcome. *Circulation*, 142(2), 114-128.

Article DOI: 10.52589/AJHNM-PAAXKOGI
DOI URL: https://doi.org/10.52589/AJHNM-PAAXKOGI