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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 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 management of patients. Inadequate knowledge and poor practice of health professionals towards Venous thromboembolism prophylaxis increased patients' complications. The aim of this study assess nurses' knowledge and practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19. Design: A descriptive expletory design. Setting: The study was conducted at New Al Kasr Al Einy Teaching Hospital (Cairo University Hospitals. Egypt). Subject: A convenient sample included 100 nurses from the previously mentioned setting. Tools: Data were collected using two tools; a self-administrated questionnaire and, an observational checklist. 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. About three quadrants of them had unsatisfactory level of knowledge and incompetent level of practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19. There was highly statically significant correlation between nurses' knowledge level and practices level and sociodemographic data. Conclusion: The

findings of this study indicated about three quadrants of studied nurses were an unsatisfactory level of knowledge and the majority of them had an incompetent level of practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19. Recommendations: Continuous educational programs to enhance the nurse's knowledge and practices regarding deep venous thrombosis prevention among hospitalized patients with COVID-19.

**Keywords**---nurses, knowledge, practice, deep venous thrombosis, coronavirus 2019.

## **Introduction**

The role of nurse is imperative for the prevention and management of diseases as well as the provision of the best quality care to the patients. The role of the nurse changed from just bedside to greater responsibility of identification of risks and prevention of patients from different diseases. Among preventive diseases, thrombotic disorders are the one leading cause of high mortality and morbidity throughout the world (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, et al., 2021).

Deep vein thrombosis is a blood clot that forms deep in the vein. It occurs when a blood clot (thrombus) or multiple clots form in the deep veins of the body. Unlike the superficial veins that lie close to the surface of the skin, deep veins are located close to the bone. Most of the time deep vein thrombosis occurs in the lower extremities, but it can also occur in other areas of the body and the most common risk factors are lack of movement or vein injury (Yale, et al., 2021). Virchow's triad in the thrombo-genesis in COVID-19 consists of the abnormal vessel wall (endothelium, 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, et al., 2020).

Clinical nurses are a key group that can serve as first-line health care providers to identify and respond to risks of VTE. A Canadian study indicated that nurses are the most suitable candidates to perform a daily assessment of DVT prophylaxis. Direct care nurses, who have a primary obligation to patients' advocacy, can help bridge gaps between patients' specific situations and physicians' knowledge. An assessment in the US demonstrated that morbidity and mortality rates could be decreased through systematic, and consistent patient education by nurses (Ma, et al., 2018). 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).

### **Significance of the study**

The coronavirus disease 2019 (COVID-19) is reported to be associated with a high risk of venous thromboembolism (VTE), which occurs in approximately 20% of COVID-19 patients and tends to be more common in critically ill patients 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% (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**

- Q1: What is the nurses' level of knowledge for prevention of deep Venous thrombosis among hospitalized patients with COVID-19?
- Q2: What is the nurses' level of practice for 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) in Egypt 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 Einy Teaching Hospital affiliated to (Cairo University Hospitals) in Egypt.

### **Study Duration**

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

### **Tools for data collection**

Data that collected used the following tool:

- 1st tool: Nurses' self-administrated interview questionnaire: It was constructed by the researcher after reviewing relevant literature (Al-Mugeed, 2017, Ma, et al., 2018, and Olaimat, et al., 2020). It was written in simple Arabic language for assessing nurses' knowledge regarding the prevention of DVT among hospitalized patients with COVID-19. It included two parts:
  - Part I: Sociodemographic characteristics of nurses; It included: age, gender, level of education, years of experience, and previous attendance of training courses related to preventing DVT and covered-19 disease.
  - Part II: Nurses' Knowledge Assessment questionnaire: It was constructed by the researcher after reviewing relevant literature. It included four main sections that represented the following:
    - Section I: It concerned with the nurses' knowledge of DVT and consisted of (8) questions.
    - Section II: It was concerned with the nurses' knowledge of coronavirus and consisted of (12) questions.
    - Section III: It is concerned with the nurses' knowledge of risk factors of DVT and consists of (24) questions.
    - Section IV: It concerned with the nurses' knowledge of the prevention of DVT and consisted of (13) questions.
- 2nd tool: Nurses' practice observational checklist: It was adapted from (Al-Mugeed, 2017 & Yu-Fen, et al., 2018) and modified by the researcher. It was designed in the English language and consisted of 25 nursing actions on DVT prevention among Hospitalized Patients with COVID-19, with two choices (Done, Not done), under main three sections that represented the following:
  - Section I: It is concerned with the nurses' actions on DVT basic prophylaxis consisted of (7) nurses' actions.
  - Section II: It is concerned with the nurses' actions on DVT Mechanical prophylaxis consisted of (12) nurses' actions.
  - Section III: It is concerned with the nurses' actions on DVT Pharmacological prophylaxis consisted of (6) nurses' actions.

### **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.

### **Fieldwork**

Filed work includes the following;

Firstly, the researcher 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 researcher 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 researcher to ensure that the questions were answered completely by the nurse. They were delivered tools immediately to the researcher 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.

### **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 researcher 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 researcher 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.

### **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 ( $\chi^2$ ) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between three ranked variables.

## Results

Part I: The sociodemographic characteristics of the studied subjects

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

Socio-demographic characteristics	Items	N	%
Age ( in years)	من ٢٠ ≤ 30 سنه	19	19.0
	من ٣1 ≤ 40 سنه	40	40.0
	من 41 ≤ 60 سنه	41	41.0
	Mean ± SD	39.65± 12.2	
Educational level	Diploma	22	22.0
	Technical Institute	52	52.0
	Bachelor	26	26.0
Years of experience	≤ 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 their age in group 41-60 years with mean age (39.65+12.2). 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 regarding COVID-19. While, (56.0%) of them did not attend training courses about DVT, respectively.

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

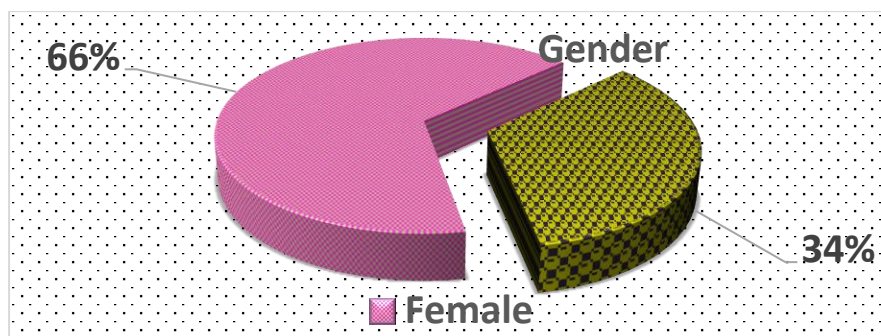


Figure 1. Shows that (66.0%) of the studied nurses were female, respectively

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

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

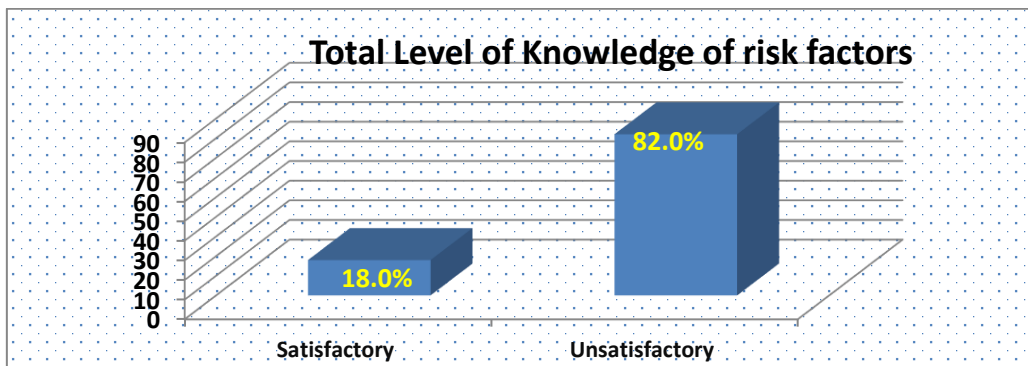


Figure 2. illustrates that (18%) of the studied nurses had satisfactory total level of knowledge regarding risk factors of deep venous thrombosis

Figure 3 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).

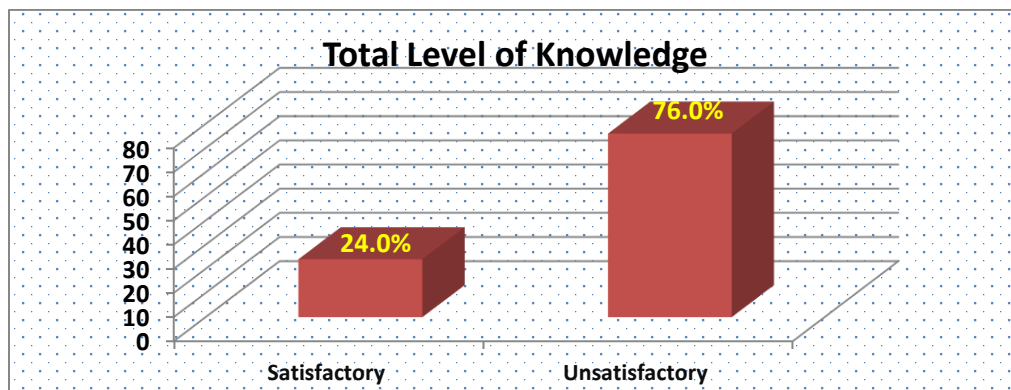


Figure 3. illustrates that (24.0%) of the studied nurses had satisfactory total level of knowledge regarding prevention of deep venous thrombosis

Part III: Nurses' practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.

Figure 4, Frequency and percentage distribution of the studied nurses' level of practice regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19 (n=100).

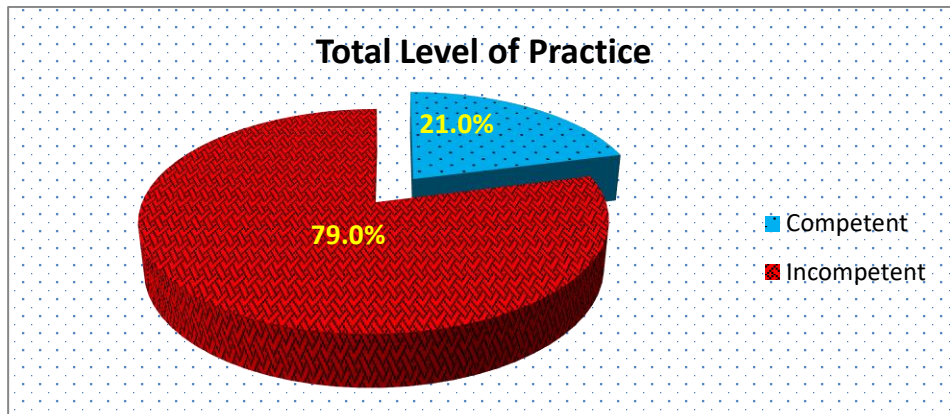


Figure 3. illustrates that (21.0%) of the studied nurses had competent level of practice

Part IV: The correlation between the studied variables.

Table 2  
Correlation between sociodemographic characteristics of the studied nurses and their total level of knowledge (N=100)

Sociodemographic characteristics		Total level of knowledge				X2	P-value
		Satisfactory		Unsatisfactory			
		N	%	N	%		
Age (in years)	من ٢٠ ≤ 30 سنه	5	5.0	14	14.0	76.0	0.000**
	من ٣1 ≤ 40 سنه	10	10.0	30	30.0		
	من 41 ≤ 60 سنه	9	9.0	32	32.0		
Gender	Male	9	9.0	25	25.0	61.3	0.000**
	Female	15	15.0	51	51.0		
Educational level	Diploma	7	7.0	15	15.0	89.4	0.000**
	Institute	13	13.0	39	39.0		
	Bachelor	4	4.0	22	22.0		
Years of experience	≤ 5	6	6.0	16	16.0	89.5	0.000**
	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	5.57	0.01**
	No	4	4.0	11	11.0		
Attending Training courses DVT	Yes	9	9.0	35	35.0	40.1	0.000**
	No	15	15.0	41	41.0		

P < 0.05: \* statistically significant. p < 0.001: \*\*highly statistical significance

Table (2) reveals that, there was highly statistically significant correlation between nurse's total level of knowledge and their sociodemographic data at (P-value=0.000), respectively.

Table 3  
Correlation between sociodemographic characteristics of the studied nurses and their total level of practice (N=100)

Sociodemographic characteristics		Total level of practice				X2	P-value
		Competent		Incompetent			
		N	%	N	%		
Age ( in years)	من ٢٠ ≤ 30 سنه	3	3.0	16	16.0	88.5	0.000**
	من ٣1 ≤ 40 سنه	5	5.0	35	35.0		
	من 41 ≤ 60 سنه	12	12.0	29	29.0		
Gender	Male	6	6.0	28	28.0	51.6	0.000**
	Female	14	14.0	52	52.0		
Educational level	Diploma	3	3.0	19	19.0	94.2	0.000**
	Institute	11	11.0	41	41.0		
	Bachelor	6	6.0	20	20.0		
Years of experience	≤ 5	3	3.0	19	19.0	94.2	0.000**
	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	4.69	0.03
	No	0	0.0	15	15.0		
Training courses DVT	Yes	7	7.0	37	37.0	33.8	0.000**
	No	13	13.0	43	43.0		

P < 0.05: \* statistically significant. p < 0.001: \*\*highly statistical significance

Table (3) displays that, there was highly statistically significant correlation between nurse's total level of practice and their age, gender, educational level, years of experience, and attending training courses about DVT at (P- value=0.00), and statistically significant correlation between nurse's total level of practice and their training courses COVID, respectively.

Table 4  
Correlation between level of knowledge and level of practice

Variables	level of knowledge	
	R	P-value
level of practice	0.91	0.000**

\* P-value ≤ 0.05 Significant. p < 0.001: \*\*highly statistical significance

Table (4) shows that, there was highly statistically significant correlation between nurse's total level of practice and their total level of knowledge at (P- value=0.000).

## Discussion

Part I: The sociodemographic characteristics of the studied subjects.  
The study was conducted on 100 nurses of varied ages, experiences, and levels of education. Regarding age revealed that more than one-third of the studied nurses

were in the age group (41-60) years. This finding was in the same line with Mohammed, et al., (2018) who conducted a study about "Nurses' Performance Regarding Venous Thromboembolism Prophylaxis at ICU " and presented that two-thirds of the studied nurses were more than 30 years, and which revealed similarities with our findings. From the researcher's point of view, this might be The New Kasr Al-Einy Teaching Hospital is one of the oldest hospitals in Egypt that provided health care services and follow the government. However, the youngest staff follows the private hospital because of the salary pattern.

Regarding gender, the current study revealed the majority of nurses were females. These findings agree with numerous studies about VTE in different settings in Egypt like the result conducted by Ahmed, et al., (2020) who reported that all nurses involved in the study were females. Also, this result was compatible with Hebeshy, (2020), and AL-Jumaily & Khudur, (2019) who 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.

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. These findings were in the same line with Ahmed, et al., (2020) who mentioned that most of their study sample was from the nursing institute. These results are in the same line as Shehab, (2018). This result disagreed with Yee, et al., (2022) who performed a study aimed to assess knowledge and awareness among registered nurses in the prevention of venous thromboembolism for high-risk antenatal and postnatal mothers who revealed that all of the studied nurses were graduated from nursing schools with diploma degree. From the researcher'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. This result was 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  $8.96 \pm 7.37$  years. 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 was compatible with Zhou, et al., (2019) in their study entitled " Venous thromboembolism in the emergency department: A survey of 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.

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

Regarding total level of knowledge regarding general knowledge about deep venous thrombosis, the present study showed that the majority of nurses had unsatisfactory total level of knowledge regarding general knowledge about deep

venous thrombosis. This finding contradicted with the result conducted by Al-Mugheed & Bayraktar (2018) who reported about two-thirds of nurses had good knowledge. Regarding total level of knowledge regarding general knowledge about COVID-19, the present study showed that less than half of the studied nurses had satisfactory total level of knowledge regarding general knowledge about COVID-19. From the researcher's point of view, this is due to the infection control department in the hospital being concerned with giving training courses on the coronavirus, the concern was on how to deal with patients, and how to protect themselves from infection. Nevertheless, the part of the disease's onset, its effect on the body, and the consequences that occur from it had little interest from the department of infection control.

According to total level of knowledge regarding risk factors of deep venous thrombosis, the present study showed that majority of the studied nurses had unsatisfactory total level of knowledge regarding risk factors of deep venous thrombosis among hospitalized patients with COVID-19. This outcome was in harmony with Malk, et al., (2022) who conducted a study entitled "Efficacy of Training Program on Nurses Performance regarding Preventive Measures of Venous Thromboembolism among Critical Pregnant Women" and revealed that the majority of the study nurses had an unsatisfactory level of knowledge regarding preventive measures of VTE preprogram implementation. Cornering total level knowledge about preventive knowledge of DVT, the current study illustrated that majority of the studied nurses had unsatisfactory total level knowledge about preventive knowledge of DVT. From the researcher's point of view, this is due to the weak capabilities and the lack of these devices, the nurses do not know about them, as they follow the old traditional methods or medicines. In addition, the only thing nurses know is the anti-embolism stockings, and they do not use them properly.

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 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, et al., (2016) about "Assessment of knowledge and self-reported clinical practice on prevention of Deep Vein Thrombosis (DVT) among staff nurses" 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. Also, was supported by the study conducted by Al-Mugeed (2017) that showed about two-thirds of them had a weak knowledge.

Part III: The nurses' level of practical skills regarding prevention of deep venous thrombosis among hospitalized patients with COVID-19.

Regarding the total level of practice, the present study illustrated that the majority of staff nurses had an incompetent level of practice in DVT prevention among hospitalized patients with COVID-19. From the researcher'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.

Part IV: The correlation between the studied variables among the studied nurses. Regarding the correlation between nurses' total level of knowledge and their sociodemographic characteristics, Relation's analysis showed there was highly statistically significant correlation between nurse's total level of knowledge and their age, gender, educational level, years of experience, attending training courses about COVID-19 and attending training courses about DVT. According to the comparison of nurses' total level of practice and their Sociodemographic characteristics, in the current study, the result showed there were highly statistically significant relations between nurses' total level of practice and their age, gender, educational level, years of experience, and attending training courses about DVT and COVID-19. This finding agreed with the study conducted by Ali & Hassan (2016).

Concerning the correlation between total nurses' knowledge and their practice scores, the current study result showed that there highly statistically significant relations between nurses' total level of practice and their total level of knowledge at P- value=0.000. 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 & 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.

### **Conclusions**

The findings of this study indicated more than three quadrants of studied nurses were an unsatisfactory level of knowledge and that the majority of staff nurses had an incompetent level of practice regarding prevention of DVT among the hospitalized patients with COVID-19. Furthermore, there was highly statistically significant relations between total nurses' knowledge and practices regarding the prevention of DVT among hospitalized patients with COVID-19.

### **Recommendation**

Continuous educational programs in order to enhance the nurse's knowledge and practices regarding 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.

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