

Effect of in-service training program on Improving Nurses' performance Regarding Venous thromboembolism prophylaxis during pregnancy and postpartum

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Abstract

Background: The risk of Venous thromboembolism is to a great extent during pregnancy and the early postpartum period. Risk assessment, Clinical factors, and investigation of Venous thromboembolism during these times should integrate pregnancy-specific risk factors and postpartum considerations. **Aim of the study aimed:** investigate the effect of the structured in-service training program on Improving Nurses' performance Regarding Venous thromboembolism (VTE) prophylaxis during pregnancy and postpartum. **Study Design:** A quasi-experimental (one group pre-test post-test) design. **Setting:** The study was conducted in the obstetrics and gynecology departments. The hospitals involved in this study are (Al Salam Hospital, June Thirty Hospital, and Port Fouad Hospital, Port Said City, Egypt). **Subjects:** Convenience sample consisting of 141 nurses in this study. **Tools of data collection:** Structured interviewing questionnaire regarding Antenatal, intrapartum and postpartum Venous thromboembolism; an observational checklist; the standard instrument used to assess the barrier regarding performing the Venous thromboembolism prophylaxis during pregnancy and postpartum period and satisfaction tool. **Results:** A highly statistically significant improvements in all items of total knowledge of the studied sample before and after the intervention regarding the Venous thromboembolism risk factors, manifestation and investigations. Also, a highly statistically significant improvements in all items of the total knowledge of a studied sample before and after the intervention regarding the Venous thromboembolism prevention. Moreover, a statistically significant improvements in all items of the total practice and attitude of the studied sample before and after the intervention regarding the prevention of venous thromboembolism. The lack of professional competencies besides the work conditions challenges seems to be the main barriers that prevent the studied sample from performing Venous thromboembolism prophylaxis in the clinical area. Moreover, the research results show that the participating nurses were highly satisfied with current in service training program. **Conclusion:** The in service training program gain its anticipated results as the studied nurses' knowledge, practice and attitudes towards the venous thromboembolism prophylaxis during pregnancy and postpartum will be improved after the implementation of the in-service training program. **Recommendations:** Whereas a professional in-service training program affects the patient outcome and inpatient services. It is important to give the education chance to the nurses to attain new professional in-service education regarding venous thromboembolism.

Keywords: in-service training program, venous thromboembolism, pregnancy, post-partum, nursing performance

Introduction:

Venous thromboembolism (VTE), which includes both pulmonary embolism (PE) and deep vein thrombosis (DVT), was one of the vital causes of direct forthright pregnant woman death. Moreover, the rate of mortality did not decrease consistently during the past 20 years. The cause of this may be the use of an inefficient tool for risk assessment of Venous thromboembolism, and deficiency of recommended care moreover, the possible

changes in the characteristics of women after having birth (Al-Mugheed, Dikmen, Bayraktar, Abdelaliem, & Alsenany, 2023). One of the primary causes of pregnant woman death or postpartum death is thromboembolism and thrombosis. Moreover, Pregnancy increases the risk of Venous thromboembolism six-fold compared to the non-pregnant population and causes complications for 1to2:1000 pregnancies (Knight et al., 2018). Many nations, especially those categorized as developing, lack adequate population-based

evaluations for VTE disorders. Although the overall incidence of VTE become low in the industrialized countries, it is remained high in underdeveloped nations (**Wendelboe & Raskob, 2016**).

One of the main factors that helped to the increased incidence of venous thromboembolism during pregnancy and thus increased mortality is the failure to recognize and identify risk factors specific to women and risk factors associated with pregnancy (Centers for Disease Control and Prevention(CDC), 2023). Post-thrombotic syndrome is one of the most common complications resulting from acute venous thromboembolism, as its incidence is about 30%, and it occurs about 10 to 20 years after the incidence, which causes chronic pain in the extremities accompanied by swelling and ulcers in the affected leg (**Nishimoto et al., 2019**). According to **Dawoud et al. (2018)**, the estimated monthly cost of treating DVT in the United States ranges from 700\$ to 1400\$, while non-pharmacological prophylaxis costs 465\$ to 875\$ per patient. In developing nations, the cost is significantly higher.

Maughan et al. (2022) concluded factors that are contributed to increase the risk of thrombosis for pregnant woman are a physiological change that led to a change in a balance of the hemostasis in service of thrombosis, which is considered a physiological adaptation to reduce blood loss during childbirth. 89% of women who have preeclamptic toxemia have high risk factors for clotting during pregnancy and after childbirth. Activity of Fibrinolytic reduces during pregnancy because of the rise of production of plasminogen activator inhibitor types 1 and 2 (PAI-1, PAI-2). The onset of Hormone-mediated vasodilation originates in first trimester of pregnancy and the exacerbation of the venous stasis by the uterine pushing of the pelvic veins and the inferior vena cava subsequent during pregnancy period.

The focused goal of using prophylaxis methods is to prevent the faetal pulmonary embolism. About twenty four percent of the patients with pulmonary embolism have a sudden death. Also, a rate of fatality for venous thromboembolism ranged from 2.8% to

12% for one month (**Nicholson, Chan, Bhagirath, & Ginsberg, 2020**). It is reported that the application of a protocol to assess the risk of venous thromboembolism reduces the associated morbidity and mortality. The estimated reduction in the venous thromboembolism incidence is about 90 % in this high-risk population, with the reduction of its adverse effects. Guidelines programs for pregnancy and postpartum Thromboprophylaxis are mostly expert based (**Gassmann et al., 2021**).

The identified a risk assessment and the risk stratification as a main point to improve venous thromboembolism prevention in all the generally hospitalized patients (**Woller, 2022**). It has been established that the pregnancy increases the risk of venous thromboembolism by about 4 to 6 times compared to non-pregnancy state. It is noted that the risk of venous thromboembolism begins in the first trimester of pregnancy and continues as the pregnancy continues. Moreover, the risk of venous blood clots increases significantly after birth, starting from the first week after birth. It has been proven that venous thromboembolism is one of the main causes of increased morbidity and mortality during childbirth, which increases the need to improve health care to prevent these complications (**Gassmann et al., 2021**).

Programs for an in service staff training on venous thromboembolism risk factors and prevention can augment the performance, practice, knowledge, and attitude of nurses while also improving the quality of treatment provided (**Al-Mugheed et al., 2023**). When it comes to the primary prevention of VTE, nurses are crucial. The shortage of the knowledge is the primary hindrance to performing venous thromboembolism risk evaluation. A study discovered that after receiving nursing education, both knowledge and practice increase. Furthermore, their mindset can influence their knowledge and skills, and education has the power to alter their mindset. These findings suggest that attitudes and behaviors are important components of VTE prevention. Moreover, the way VTE prophylaxis is managed determines the results (**Gris et al., 2018**). As of right present, very few research have concentrated on the nurses'

knowledge, attitudes, and practices regarding the prevention of VTE. Therefore, there is a lack of a comprehensive survey that includes all professional nurses (Yan et al., 2021).

Significance of the study:

The discovery of women with risk factors for venous thromboembolism during pregnancy, labor, and the puerperium has been recommended, thereby, use of thromboprophylaxis in women during pregnancy identified as being at increased the risk. Also, Maternity and Obstetric staff members are required to remain up to date with the guidance about Venous thromboembolism. Therefore, it is important to train the nursing team working in the labor and delivery department on the necessary instructions to deal with these cases, detect them early, and provide the necessary early care and treatment.

Moreover, informing them of risk factors so that they can provide counseling to all women during pregnancy and after childbirth. It known that the clinical nurses are target that can play the first mark in providing care for risk assessment of VTE, so the inservice training program is developed to assist nurses in obstetrics and gynecology departments with decisions on appropriate care regarding venous thromboembolism. The program sessions should be used to assist the nurses in obstetrics and gynecology departments in practicing their clinical decisions for the patient's benefit and reduce unnecessary variations in clinical practice. The program sessions have been adopted to supply nurses in the obstetrics and gynecology department with the necessary information to identify patients who are at risk for venous thromboembolism (VTE) and provide the suitable management of the cases.

Aim of the Study

The study aims to investigate the effect of the in-service training program on improving nurses' performance regarding venous thromboembolism (VTE) prophylaxis during pregnancy and postpartum according to following;

- a. Assess the effect of the in service training program on improving nurses' knowledge regarding venous thromboembolism (VTE)

prophylaxis during pregnancy and postpartum

- b. assess the effect of the in-service training program on improving nurses' practice regarding venous thromboembolism (VTE) prophylaxis during pregnancy and postpartum
- c. assess the effect of the in-service training program on improving nurses' attitude regarding venous thromboembolism (VTE) prophylaxis during pregnancy and postpartum
- d. assess the barrier regarding performing the Venous thromboembolism prophylaxis
- e. Assess the satisfaction of the studied sample eight weeks' post-intervention regarding the implementation of the in-service training program

Research Hypothesis

The nurses' clinical performance Regarding Venous thromboembolism (VTE) prophylaxis during pregnancy and the postpartum period will be improved after the implementation of the in-service training program as the follows.

- A. Knowledge regarding the care of women during pregnancy and the postpartum period who are at risk of Venous thromboembolism.
- B. Practice regarding the care of women during pregnancy and the postpartum period who are at risk of Venous thromboembolism.
- C. Attitude regarding the care of women during pregnancy and the postpartum period who are at risk of Venous thromboembolism.
- D. Perform the Venous thromboembolism risk Assessment scoring to identify the prophylactic options in pregnancy and the puerperium
- E. The studied sample satisfied with the the implementation of the in-service training program
- F. Knowledges, attitude, and practice before and after the program intervention correlate with the demographic characteristics of the studied sample

Methods

Study design: A quasi-experimental (one group pre-test/ post-test) design was used.

Settings and subject:

This study was carried out in the obstetrics-gynecology departments which include (Obe & Gyne departments, delivery rooms, postpartum units, and outpatient clinics). The hospitals involved in this study are (Al Salam Hospital, June Thirty Hospital, and Al Haya Hospital, Port Said, Egypt). A total of 141 nurses working in the departments mentioned earlier were collected by the convenience sample. Fifty-two nurses were collected from Al Salam Hospital, thirty-six nurses were collected from June Thirty Hospital, and fifty-three nurses were collected from Al Haya Hospital.

Variables of the study:

Dependent variables:

- Knowledge on Venous thromboembolism
- Practice on Venous thromboembolism
- Attitudes of Venous thromboembolism

Independent variables:

- Socio-demographic variables as age of the studied sample, marital status, educational status, years of experiences and Training course for venous thromboembolism
- Health organizational factors on prevention of venous thromboembolism as training, and in services training or protocol on venous thromboembolism prevention.

Operational definitions:

In-service training program: in-service training programs include a group of training guides taken to increase the nurses' competence and power so that they can perform their tasks more effectively and thereby assist the health agency in fulfilling its goals (Chaghari, Saffari, Ebadi, & Ameryoun, 2017).

Nurses' performance is the nurses' skills, knowledge and attitudes utilized in real health situations and based on a certain grouping of criteria after their certain standard of training in the clinical area (Rojo, Ramjan, Hunt, & Salamonson, 2020).

Adequate knowledge: Nurses, who scored more than the mean score of the knowledge questions, were recognized to have good knowledge of venous thromboembolism.

Inadequate knowledge: Nurses, who scored below the mean score of the knowledge questions, were recognized to have poor knowledge of venous thromboembolism.

Positive attitude: Nurses, who scored more than the mean score of the attitude questions, were recognized to have good attitude of venous thromboembolism.

Negative attitude: Nurses, who scored less than the mean score of the attitude questions, were recognized to have poor attitude of venous thromboembolism.

Satisfactory practice: Nurses, who scored more than the mean score of the practice questions, were recognized to have good practice of venous thromboembolism.

Unsatisfactory practice: Nurses, who scored less than the mean score of the practice questions, were recognized to have poor practice of venous thromboembolism.

Data collection tools

The research tools were correct after a careful and in-depth review of the literature related to the research manuscript (Kearsley and Stocks, 2021; Yan et al., 2021, Middleton, Shepherd, & Gomersall, 2021; Maughan et al., 2022 and Obstetric Written Control Documentation Group, 2022).

Tool 1: A self-administered questionnaire about demographic and job characteristics

It includes the demographic and job characteristics of the studied nurses as age, education, working department, years of job, working experience years in the current department, marital status, and job descriptions for each nurse. The previous training programs/workshops regarding Venous thromboembolism (VTE). Source of the previous training programs.

Tool II: Structured Questionnaire about the Nurses' Knowledge regarding Antenatal, intrapartum, and postpartum Venous thromboembolism.

It was developed by researchers in the Arabic language based on literature. The reliability of the instrument was evaluated by Cronbach alpha 0.89. Which contain the following:

Antenatal, intrapartum, and postpartum Venous thromboembolism risk factors, as ; definition and types of Venous thromboembolism, pre-existing risk factors as; obstetric risk factors, and transient risk factors. Antenatal, intrapartum, and postpartum Venous thromboembolism manifestations and investigations. Antenatal, intrapartum, and postpartum Venous Thromboembolism Venous thromboembolism prevention are as; general prophylaxis; mechanical prophylaxis and pharmacological prophylaxis. The grades of knowledge were calculated according to the binary system, where the grades are distributed into two types according to the answer. The correct answer takes 1 and considered adequate, and the incorrect answer takes 0 and considered inadequate. The resulting correct items are collected all of them, and then divided the result by the total number of questions, and the result is multiplied by one hundred to calculate the

Tool III: Observational checklist about nurses performance:

It developed by **Al-Mugheed et al., (2023)** in Arabic language and adopted by the researchers after revision and modifications to assess the nurses' practical performance while giving care to the women for twenty-five minutes. The observational checklist was used to assess the practice of the studied sample according to the following: greater than or equal to 60% for satisfactory performance and less than 60% for unsatisfactory performance. The reliability of the instrument was evaluated by Cronbach alpha 0.79.

Tool IV: attitude assessment tool: It developed by **Yan et al. (2021):** - Using a Likert-type scale: the nurses' attitudes toward the venous thromboembolism prophylaxis were evaluated through questions means all answers in a Likert-type scale items were calculated; the higher the score, the more positive attitude regarding the venous thromboembolism prophylaxis. The studied nurse had positive attitude when the total score equal or above 60% but

negative attitude when it below 60%. The reliability of the instrument was evaluated by Cronbach alpha 0.89.

Tool V: The barrier assessment tool: - the standard instrument used to assess the barrier regarding performing the Venous thromboembolism prophylaxis (**Al-Mugheed et al., 2023**). This tool includes the items regarding the barrier of the compliance of patients, lack of professional, a deficient of acceptance and Work condition challenges. The total items are calculated, and the mean and standard deviation of each item was calculated. The reliability of the instrument was evaluated by Cronbach alpha 0.85.

Tool VI: The satisfaction tool, established by **Mohammed (2019)** and **Balay-odao, Marbella, & Capili (2019)** evaluates the nurses' satisfaction regarding the in-service training program sessions according to nurses' responses as satisfied and dissatisfied. This tool include the following items in service training time and environment, the in-service training method of teaching, behavior and language, updated knowledge and practice and the recommendation to repeat the in-service training program related prevention of venous thromboembolism for another health institutions. The total nurse's responses were calculated the mean and standard deviation were used. The reliability of the instrument was evaluated by Cronbach alpha 0.80.

Validity and reliability of the tools:

The research tools were prepared, reviewed, and developed by the researchers, and after completion, they were sent to five university professors who were subject matter experts in the fields of nursing administration, obstetrics, and gynecological nursing. They assessed the program's contents and the validity of the research instruments, and changes were made in response to their suggestions. After the specialist reviewers finished, the comments were included, and the research forms were modified according to the reviewers' opinions. The program session sessions were held according to the appropriate times for the nurses' work and the suitable place for them.

A pilot study:

A pilot study was applied to 10 nurses working in obstetrics and gynecology departments to test the tools' applicability, stability, and objectivity, and to determine the time required to fill out and complete the collection of all questionnaires. Therefore, adjustments were made according to the results of the experimental sample.

Fieldwork:

The educational program for in-service training was designed and structured to meet the requirements of the maternity ward nurses. The sample was split up into 18 groups, each including 8–9 nurses, by the researchers. Ten sessions were required for each group to complete the in-service training program course. The courses in the program met for one hour each, four times a week on four separate days. Three practical components and seven knowledge-based sessions comprised the in-service training program intervention. Every practical session included a thirty-minute educational presentation followed by a free discussion centered on nurses, with the remaining time dedicated to training nurses to carry out the practice.

The nurses' in-service training program was ready. The session place is well-ventilated, enough for the number of trained nurses, appropriate, and wide enough for attendees. Teaching methods suitable for practical and theoretical sessions are available such as PowerPoint, video, flip chart, YouTube, and illustrative images, in addition to the availability of posters and teaching models for demonstrations.

The in-service training program was carried out through three phases: preparation, implementation, and evaluation.

Phase one (preparatory and planning phase):

- The researcher reviewed the available updated literature concerning the study and tools for data collection.
- In the preparation stage, all teaching and explanation tools and methods were prepared, such as presentation devices and PowerPoint. The researchers and department supervisors checked the place designated for the in-

service training program and determined its appropriateness in terms of providing teaching and evaluation components.

- All tools for the in-service training data collection were used pre- and post-nurse training programs, except satisfaction and barriers tools were applied post-training. The in-service training program guide booklet has been prepared, which involves the proper instructions to cover all theoretical and practical portions and contains an evaluation tool and checklist performance.

Phase two (implementation phase):

- Initially, the researchers interviewed from 8 to 9 nurses per day according to their hospital duties. After the researchers received the nurses, they explained the program's steps to them and gave their approval (The duration of each interview was 25 minutes).
- The course for the theoretical section includes (The opening session, registration for nurses, welcoming and introduction, pre-test, and the objectives of the course were listed, and then the items of the theoretical part were discussed as the following: Antenatal, intrapartum, and postpartum Venous thromboembolism risk factors are as follows; definition and types of Venous thromboembolism, pre-existing risk factors as; obstetric risk factors and transient risk Factors. Also, antenatal, intrapartum, and postpartum Venous Thromboembolism Venous thromboembolism prevention are as follows; General prophylaxis; Mechanical prophylaxis, and Pharmacological prophylaxis. Antenatal, intrapartum and postpartum Venous Thromboembolism Venous thromboembolism pharmacological prophylaxis are as follows, the indications and contraindications of medications prophylaxis.

Second, the nurse's practical performance was checked out using an observational checklist, while they were performing the procedure for the women (The duration of each observation before and after conducting the session was 15 minutes) using the standardized checklist. Each day, four nurses' practical performance was checked out from 8 Am to 8 p.m.

Third, the nurse's attitude the nurses' attitudes toward venous thromboembolism prophylaxis were evaluated using a standardized questionnaire.

- The researchers explained to the research study nurses the date of the first post-test, which was immediately after completing the program, and the second post-test was 8 weeks after the completion of the second post-test.
- The in-service training guide booklet has been distributed to all participant nurses.
- After a complete assessment of practice performance for all nurses who participated in the research study. The in-service training practice sessions were carried out.
- During the implementation of the program the following methods of teaching were used; bedside teaching, PowerPoint, video, Flip chart, YouTube, illustrative images, brainstorming, addition to the presence of posters teaching model demonstrations, and role play.
- The researchers gave about 15 minutes to the participant's nurses at the end of each session to ask questions and inquiries regarding the discussed content, and the questions were answered properly.

Phase three (evaluation Phase):

- At this stage, the evaluation was carried out to see how the in-service training program affected the nurses' performance. .
- The nurses' performance was assessed three times and then the mean was obtained for the last performance.
- The effectiveness of the in-service training program's teaching and assessment techniques was assessed.
- The nurses' satisfaction with the in-service training program was evaluated as well as the barrier regarding performing the venous thromboembolism prophylaxis.

Ethical considerations.

- The ethical approval was given by the research ethics committee of the faculty of nursing Port Said university with code number NUR (3-12-2023). The researcher

clarified the aim of the study to each nurse who participated in the research study and written consent was obtained from each nurse. Anonymity consent was obtained from nurses to participate confidentiality of the information collected, and anonymity is guaranteed, the studied nurses were informed that their participation is voluntary, and they have the right to withdraw from the study at any time. Privacy of the study sample was assured the results were used as component of the necessary research, as well as, for future publications and education.

Statistical analysis

The statistical package version 22 of the SPSS statistical program was used to analyze the data. Numerical and percentage methods were used to express categorical data. Before and after the intervention, continuous data were collected, and the results were reported as mean standard deviation (SD). The chi-square test was used to assess the relationship between two variables in the case of noncontiguous data. A P value of less than 0.05 was necessary for statistical significance.

Results:

Characteristics of the studied nurses:

Table (1) Shows that the mean age of the studied nurses is mean± SD 27.12 ± 4.66, (83%) of them married. 18.4 % of them have years of experience from 1-<5, 35.5 of them from 5-<10, meanwhile, 46.1 had 10 ≥ years of work experience with a mean of 9.5±3.4. 45% have bachelor's degrees in nursing and postgraduate education, 35% have technical education, and 20% have secondary nursing school, figure 1. Moreover, 70% have no previous training program in venous thromboembolism, figure 2. According to the job description of the studied nurses, 85% are bedside nurses, 5 % are department supervisors and 10% are department supervisors' assistants figure 3.

The effectiveness of the in-service training program:

Figure (4) Portrays that there were statistically significant improvements in all items of Total Knowledge of the studied sample before and after the intervention regarding the Venous thromboembolism risk

factors, manifestation and investigations. Additionally, it demonstrates that 31% had adequate knowledge regarding Venous thromboembolism risk factors, manifestation and investigations pre-in-service training program intervention which increases to 75% immediately after post-in-service training program intervention and to 95% after 8 weeks from interventions.

Figure (5) shown that there were statistically significant improvements in all items of Total Knowledge of the studied sample before and after the intervention regarding the Venous thromboembolism prevention. Additionally, it demonstrates that 35% had adequate knowledge regarding Venous thromboembolism risk factors, manifestation and investigations pre-in-service training program intervention which increases to 90% immediately after post-in-service training program intervention and to 98% after 8 weeks from interventions

Figure (6) revealed that there were statistically significant improvements in all items of the total practice of the studied sample before and after the intervention regarding the prevention of venous thromboembolism. Additionally, it shows that 45% had satisfactory practice regarding Venous thromboembolism risk factors pre-in-service training program intervention which increases to 95% immediately after post-in-service training program intervention and to 99% after 8 weeks from interventions.

Figure (7): demonstrates that there were statistically significant improvements in all

items of the total attitude of the studied sample before and after the intervention regarding the prevention of venous thromboembolism. Additionally, it demonstrates that 25% had a positive attitude regarding Venous thromboembolism prevention pre-in-service training program intervention which increases to 90% immediately after post-in-service training program intervention and to 98% after 8 weeks from interventions.

Table 5 concludes that a strong significant relationship exists between knowledge, attitude and practice before and after the program intervention and the demographic characteristics of the studied sample.

The barrier regarding performing the Venous thromboembolism prophylaxis:

Concerning the barriers that prevent the studied sample from performing Venous thromboembolism prophylaxis in the clinical area, the compliance of patients such as refusal by the patients, Increased nurses-patient conflicts and the costs of prophylaxis treatment. Also, barriers related to the lack of professional competencies besides the Work conditions challenges, as shown in Table 6

Satisfaction of the study sample regarding the implementation of the in-service training program:

Table 7 reveals that 95.7% of the studied sample was satisfied with the in-service training program eight weeks post-intervention, compared to 4.3 % dissatisfied with a Mean satisfaction of 2.09 (0.56).

Table 1: Demographic characteristics of the studied sample (141)

Demographic Characteristics	Studied nurses (n=141)	
	No.	%
Age of the sample Mean±SD	27.12 ± 4.66	
Marital status: -		
Single	10	7.1
Married	117	83
Divorced	4	2.8
widow	10	7.1
Years of experience: -		
1-<5	26	18.4
5-<10	50	35.5
10 ≥	65	46.1
Mean±SD	9.5±3.4	

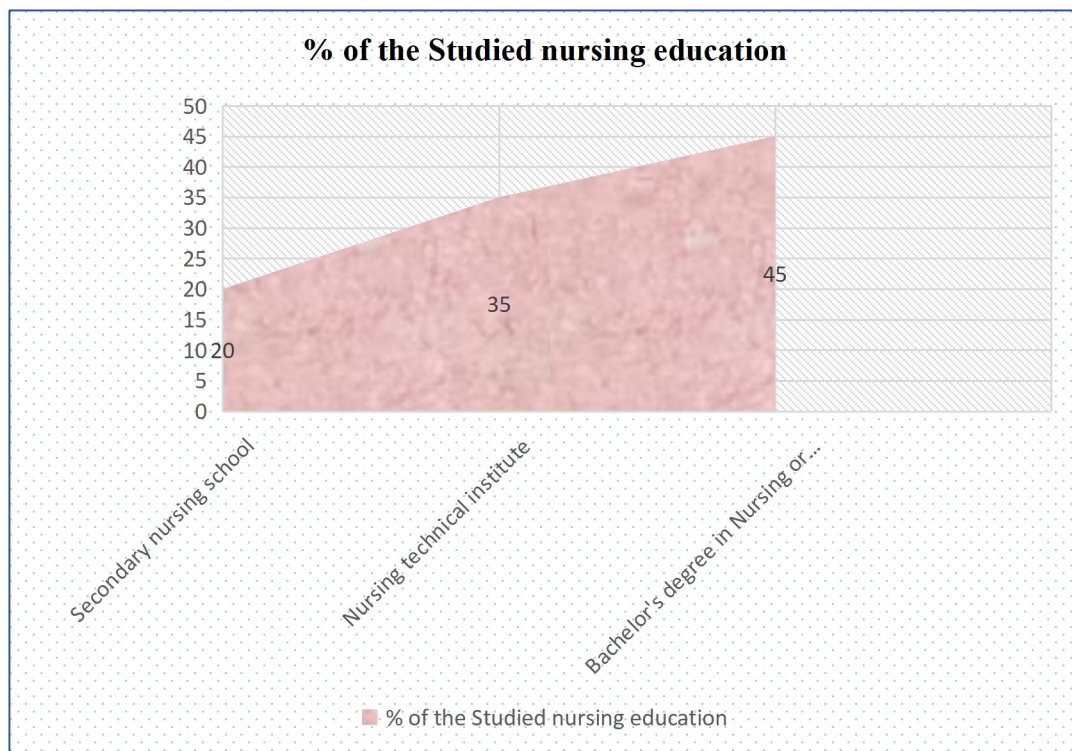


Figure 1. Distribution of the study nurses according to their education (n=141)

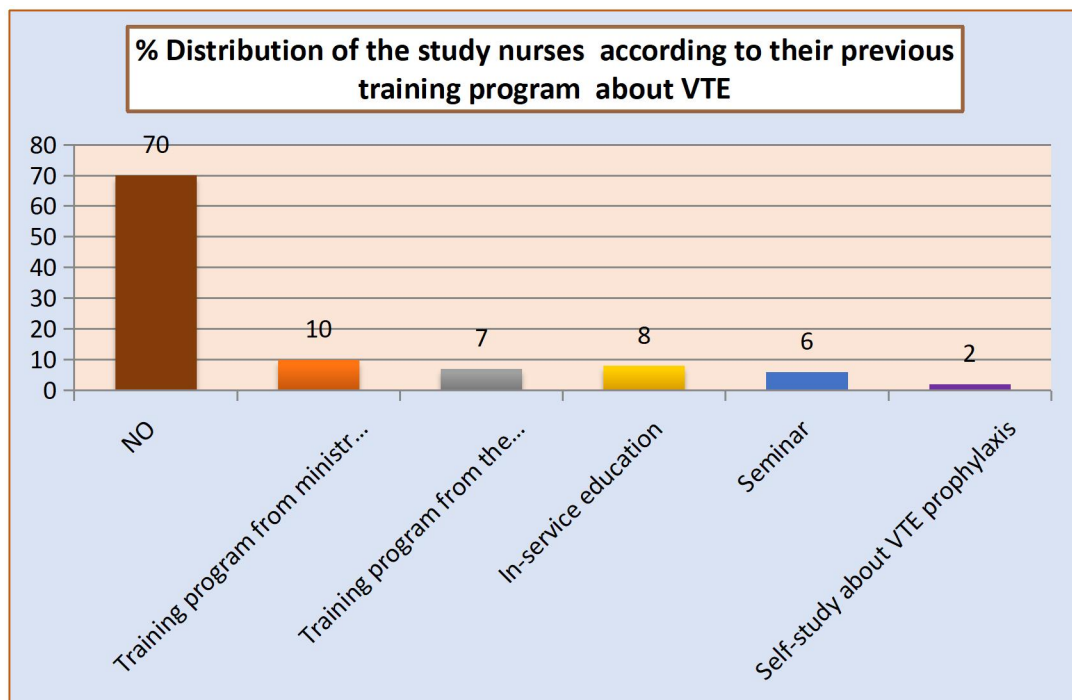


Figure 2. Distribution of the study nurses according to previous training program about VTE (n=141).

Table 2. The Knowledge of the studied sample before and after the intervention regarding the antenatal, intrapartum, and post-partum Venous thromboembolism risk factors, manifestation and investigations (n=141)

Items	Pre-program intervention	Immediate Post-program intervention	Eight weeks post-program intervention	Significant	
	Mean \pm SD	Mean \pm SD	Mean \pm SD	X2	p-value
Definition of Venous thromboembolism	44 \pm .52	2.85 \pm .53	1.94 \pm .60	16.4	<0.001
Types of thromboembolism	43 \pm .52	2.82 \pm .52	1.64 \pm .56	19.8	<0.001
Pre-Existing Risk Factors.	.36\pm.50	3.03\pm.33	1.63\pm.33	13.7	<0.001
Previous Venous thromboembolism Except one previous episode related to major surgery	73 \pm .48	2.85 \pm .52	1.46 \pm .47	9.05	<0.009
Previous Venous thromboembolism related to the major surgery	46 \pm .49	2.75 \pm .53	1.38 \pm .33	15.8	<0.001
The woman has high-risk thrombophilia	73 \pm .48	2.85 \pm .52	1.46 \pm .47	9.05	<0.009
Current Medical problems	44 \pm .52	2.85 \pm .53	1.94 \pm .60	16.4	<0.001
Family history of Venous thromboembolism for unknown causes	73 \pm .48	2.85 \pm .52	1.46 \pm .47	9.05	<0.009
Estrogen-related Venous thromboembolism in a first-degree relative	73 \pm .48	2.85 \pm .52	1.46 \pm .47	9.05	<0.009
The woman has low-risk thrombophilia	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
A woman with a body mass \geq 40	73 \pm .48	2.85 \pm .52	1.46 \pm .47	9.06	<0.009
A woman with a body mass index \geq 30	46 \pm .49	2.75 \pm .53	1.38 \pm .33	15.8	<0.001
A woman with a parity \geq 3	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
A smoker woman	44 \pm .52	2.85 \pm .53	1.94 \pm .60 =	16.4	<0.001
Evident Varicose Veins	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
Obstetric Risk Factors	.36\pm.50	3.03\pm.33	1.63\pm.33	13.7	<0.001
Woman with current pregnancy pre-eclampsia	73 \pm .48	2.85 \pm .52	1.46 \pm .47	19.6	<0.001
Assisted reproductive technology	38 \pm .48	2.85 \pm .52	1.77 \pm .33	12.8	<0.001
Multiple pregnancies woman	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
Woman with stillbirth in present pregnancy	46 \pm .49	2.75 \pm .53	1.38 \pm .33	15.8	<0.001
Cesarean section in current labor	73 \pm .48	2.85 \pm .52	1.46 \pm .47	19.6	<0.001
Current prolonged labor of more than 24 hours	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
Current postpartum hemorrhage of more than 1 liter or transfusion	46 \pm .49	2.75 \pm .53	1.38 \pm .33	15.8	<0.001
Current preterm birth < less than 37 weeks	73 \pm .48	2.85 \pm .52	1.46 \pm .47	19.6	<0.001
Transient Risk Factors	.59\pm.41	3.50\pm.39	1.53\pm.39	7.09	<0.001
Any surgical measures in pregnancy or postpartum excluding immediate perineum repair	44 \pm .52	2.85 \pm .53	1.94 \pm .60	16.4	<0.001
Woman with Hyperemesis gravidarum	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
Women with ovarian Hyperstimulation Syndrome in the First trimester only	44 \pm .52	2.85 \pm .53	1.94 \pm .60	16.4	<0.001
woman with present systemic infection	43 \pm .52	2.82 \pm .52	1.64 \pm .56	13.7	<0.001
Woman with dehydration or Immobility	56 \pm .40	2.01 \pm .54	1.68 \pm .40	19.5	<0.001
DVT occurs most frequently in the veins of the lower extremities	46 \pm .49	2.90 \pm .53	1.38 \pm .33	15.7	<0.001
Deep Vein Thrombosis	.75 \pm .60	3.90 \pm .53	1.66 \pm .35	12.6	<0.001
Low grade fever	.56 \pm .60	2.77 \pm .41	2.77 \pm .42	16.4	<0.001
pain of the calf	44 \pm .52	2.85 \pm .53	1.94 \pm .60	16.4	<0.001
feeling of calf heaves	43 \pm .52	2.82 \pm .52	1.64 \pm .56	13.7	<0.001
leg edema	46 \pm .49	2.90 \pm .53	1.38 \pm .33	15.7	<0.001
Change the temperature and color of the leg	.56 \pm .61	2.76 \pm .41	2.87 \pm .42	17.4	<0.001
Calf pain on dorsiflexion (Positive Homan's sign)	.56 \pm .60	2.77 \pm .41	2.77 \pm .42	16.4	<0.001
swollen limb and back pain if iliac vein thrombosis	.59 \pm .41	3.50 \pm .39	1.53 \pm .39	7.09	<0.001
Investigations: -	.59\pm.41	3.50\pm.39	1.53\pm.39	7.09	<0.001

Items	Pre-program intervention	Immediate Post-program intervention	Eight weeks post-program intervention	Significant	
	Mean ±SD	Mean ±SD	Mean ±SD	X2	p-value
Doppler ultrasound leg studies	.75±.60	3.90±.53	1.66±.35	12.6	<0.001
renal and hepatic function	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
coagulation screen	.59±.41	3.50±.39	1.53±.39	7.09	<0.001
Urea and electrolytes	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
liver function tests	.59±.41	3.50±.39	1.53±.39	7.09	<0.001
A thrombophilia screen	.75±.60	3.90±.53	1.66±.35	12.6	<0.001
Pulmonary Embolism	.50±.48	1.46±.48	2.87±.43	9.06	<0.009
collapse and central chest pain	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Sudden onset dyspnea	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Tachypnoea	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Tachycardia	.59±.41	3.50±.39	1.53±.39	7.09	<0.001
Pleuritic chest pain	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
cough	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
hemoptysis	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Pyrexia	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Dizziness	.75±.60	3.90±.53	1.66±.35	12.6	<0.001
Feeling flu-like	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Jugular venous distension	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Crepitations and pleural rub	.59±.41	3.50±.39	1.53±.39	7.09	<0.001
Investigation	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Chest x-ray	.75±.60	3.90±.53	1.66±.35	12.6	<0.001
D-dimers	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
coagulation screen	.59±.41	3.50±.39	1.53±.39	7.09	<0.001
ECG	.75±.60	3.90±.53	1.66±.35	12.6	<0.001
ventilation perfusion scan	.59±.41	3.50±.39	1.53±.39	7.09	<0.001

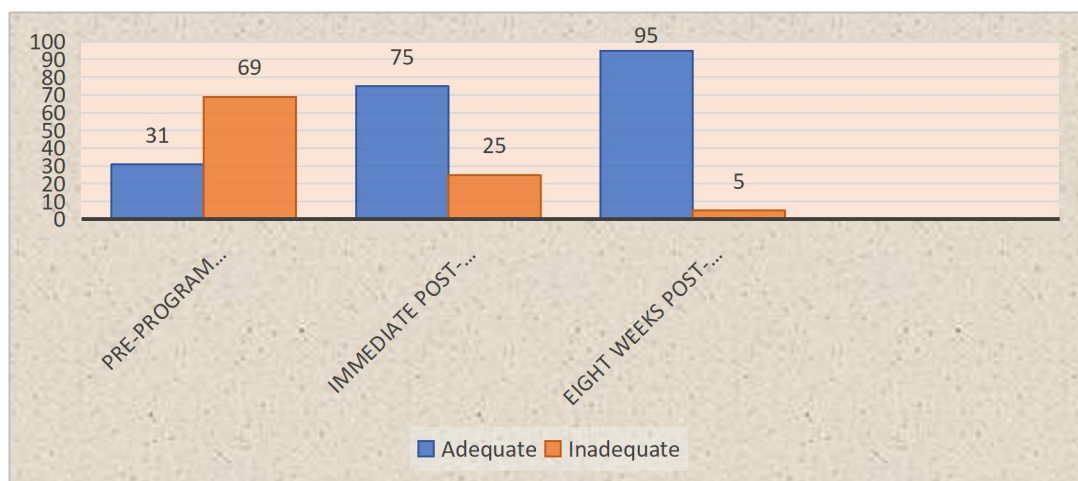


Figure 3. Total Knowledge of the studied sample before and after the intervention regarding the Venous thromboembolism risk factors, manifestation, and investigations (141).

Table 2. The Knowledge of the studied sample before and after the intervention regarding Venous thromboembolism prevention (141)

Items	Pre-program intervention	Immediate Post-program intervention	Eight weeks post-program intervention	Significant	
	Mean ±SD	Mean ±SD	Mean ±SD	X2	p-value
General prophylaxis	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Awareness and proper risk assessment	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Understand the Venous thromboembolism risk assessment scales	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Elevation of the leg while setting leg and foot exercises	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Frequent changing position	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Control pain	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
Enough hydration	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Prompt ambulation	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
managing blood lipids and glucose	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Mechanical prophylaxis	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
The use of precisely utilized anti-embolism stockings of proper size for women has a contraindication to heparin	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
prophylactic medications can be given 12 to 24 hours after delivery or caesarean section	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
The use of intermittent pneumatic compression devices	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
proper measurements should be made when selecting the size of graduated compression stockings	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Intermittent pneumatic compression devices can be used after the Venous thromboembolism occurrence	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Intermittent pneumatic compression devices should be used 24 hours a day for immobilized women	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Pharmacological prophylaxis	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Types of pharmacological prophylaxis	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Knowledge about indications	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Knowledge about contraindications	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Knowledge about side effects	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Knowledge about mode of indications	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Knowledge about precautions of using the medications.	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Indications of pharmacological prophylaxis	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
History of established venous thromboembolism	.56±.61	2.76±.41	2.87±.42	17.4	<0.001
Anyone needed antenatal low molecular weight heparin	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Family history of venous thromboembolism especially during pregnancy or due to hormone and a recognized thrombophilia	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
deficiency of Antithrombin	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Antiphospholipid syndrome	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
Risk for thrombophilia	.36±.50	3.03±.33	1.63±.33	13.7	<0.001

Contraindications of pharmacological prophylaxis	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Recognized bleeding disorder as hemophilia	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
Active bleeding during antenatal or postnatal	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Risk for major hemorrhage as placenta previa	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Thrombocytopenia	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
hemorrhagic or ischemic acute stroke for past four weeks	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Renal disease	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Liver disease	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Uncontrolled hypertension	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
Precautions of using medications	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
Discontinue prophylaxis doses in the last 12-24 hours before labor to prevent postpartum hemorrhage.	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Active the third stage of labor is recommended	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
Discontinued medication about 24 hours before labor in case of induction	.55±.42	2.62±.43	1.52±.44	9.05	<0.001
The angle for anticoagulant injection is 90 degrees	.78±.20	2.90±.52	1.26±.52	17.6	<0.001



Figure 4. Total Knowledge of the studied sample before and after the intervention regarding the Venous thromboembolism prevention (141).

Table 3. The practice of the studied sample before and after the intervention regarding postpartum Venous thromboembolism prevention (141)

Items	Pre-program intervention	Immediate Post-program intervention	Eight weeks post-program intervention	Significant	
	Mean \pm SD	Mean \pm SD	Mean \pm SD	X2	p-value
Assessed regularly the Venous thromboembolism risks	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Providing health education about Venous thromboembolism prophylaxis to women	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
Performed the Venous thromboembolism risk assessment scales	.36 \pm .50	3.03 \pm .33	1.63 \pm .33	13.7	<0.001
Scoring the risk assessment scale during pregnancy	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Scoring the risk assessment scale immediately postpartum	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
Encourage the woman to increase the mobilization	.75 \pm .60	2.90 \pm .38	1.66 \pm .35	12.7	<0.001
Encourage the woman to elevate her leg	.36 \pm .50	3.03 \pm .33	1.63 \pm .33	13.7	<0.001
Encourage the woman to maintain hydration and take sufficient fluids	.74 \pm .20	2.29 \pm .47	1.22 \pm .47	13.8	<0.001
Encourage the woman to apply for graduate elastic stocking	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Giving information about the risk of Venous thromboembolism to patients and/or relatives	.75 \pm .60	2.90 \pm .38	1.66 \pm .35	12.7	<0.001
Encouraging the women to do leg and foot exercises by themselves or relatives help if woman are unable to do so.	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
giving information about early ambulation	.74 \pm .20	2.29 \pm .47	1.22 \pm .47	13.8	<0.001
Administering anticoagulants for the woman as preventive	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
checking the side effects of the anticoagulants	.75 \pm .60	2.90 \pm .38	1.66 \pm .35	12.7	<0.001
Educating the woman on anticoagulants					
Educating the woman to avoid injury	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Teaching the woman about the appropriate use of graduated compression stockings	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
Encourage the woman to select the proper size of graduated compression stockings	.74 \pm .20	2.29 \pm .47	1.22 \pm .47	13.8	<0.001
Teaching the woman about the intermittent pneumatic compression devices can be used after the Venous thromboembolism occurrence	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Teaching the woman that intermittent pneumatic compression devices should be used 24 hours a day for immobilized women	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
Assessing the side effects of the anticoagulants	.75 \pm .60	2.90 \pm .38	1.66 \pm .35	12.7	<0.001
Educate the woman to avoid injuries	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Encourage women to perform deep-breathing exercises for 10 seconds at least /2 hours throughout the day	.39 \pm .49	3.00 \pm .31	1.64 \pm .33	11.5	<0.001
Encourage the woman to wear loose clothing especially lower of the body	.36 \pm .50	3.03 \pm .33	1.63 \pm .33	13.7	<0.001
Encourage women to eat healthy diets to prevent obesity	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Implement the Homan's sign for high-risk women	.78 \pm .20	2.90 \pm .52	1.26 \pm .52	17.6	<0.001
Teaching discharge plan for high-risk patients	.36 \pm .50	3.03 \pm .33	1.63 \pm .33	13.7	<0.001

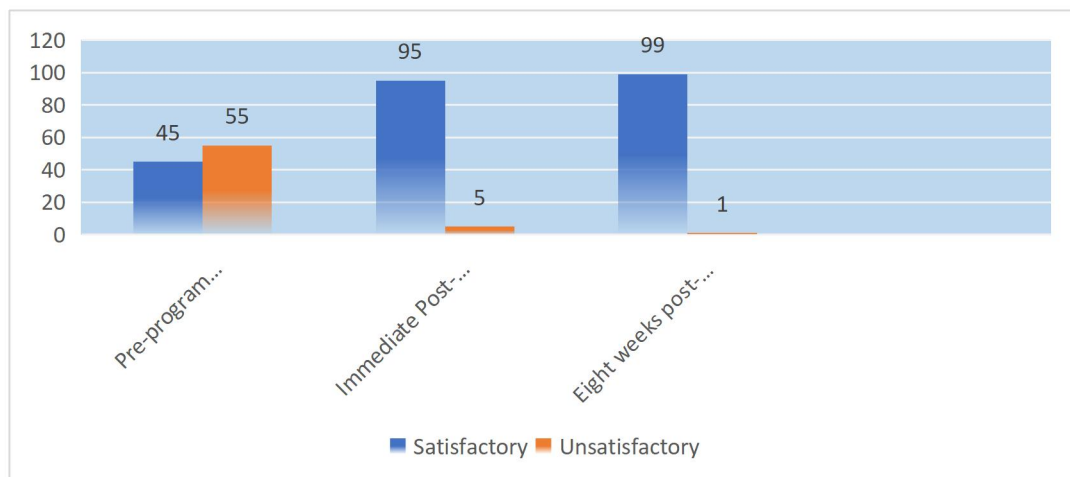


Figure 5. Total practice of the studied sample before and after the intervention regarding Venous thromboembolism prevention (141).

Table 4. The attitude of the studied sample before and after the intervention regarding postpartum Venous thromboembolism prevention (141)

Items	Pre-program intervention	Immediate Post-program intervention	Eight weeks post-program intervention	Significant	
	Mean ±SD	Mean ±SD	Mean ±SD	X ²	p-value
The Necessity of assessing the Venous thromboembolism risks for women	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
The necessity of managing Venous thromboembolism patients by a multidisciplinary team	.78±.20	2.90±.52	1.26±.52	17.6	<0.001
The necessity of continuous training for medical staff regarding Venous thromboembolism	.39±.49	3.00±.31	1.64±.33	11.5	<0.001
The Necessity of Updating Information Construction regarding Venous thromboembolism	.75±.60	2.90±.38	1.66±.35	12.7	<0.001
The prevention and control actions for Venous thromboembolism to enhance the scientific research	.36±.50	3.03±.33	1.63±.33	13.7	<0.001
The necessity for Teaching Discharge Plans for high-risk Patients	.39±.49	3.00±.31	1.64±.33	11.5	<0.001

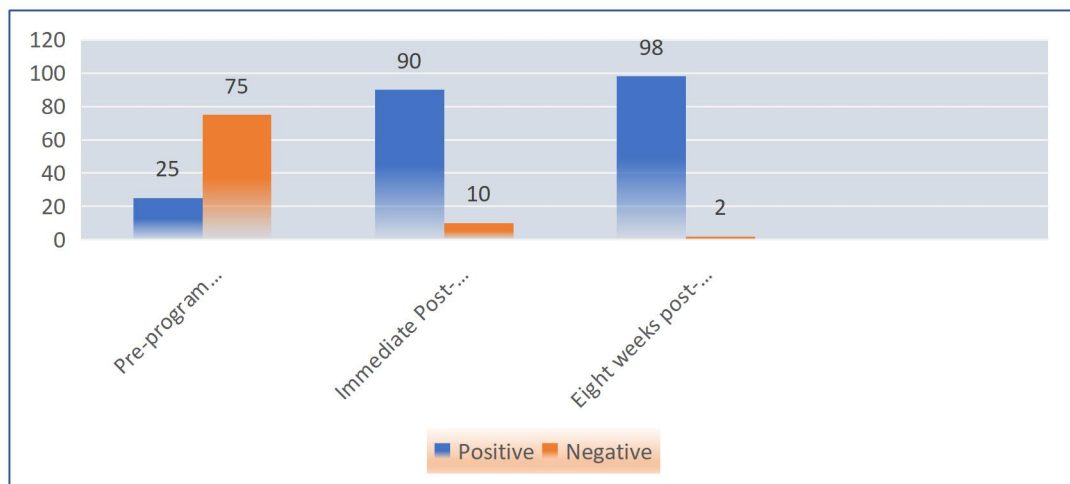


Figure 6. Total attitude of the studied sample before and after the intervention regarding the Venous thromboembolism prevention (141).

Table 5. Correlations between scores of knowledges, attitude, and practice before and after the program intervention and the demographic characteristics of the studied sample

Items		Knowledge		Practice		Attitude	
		r	P	r	P	r	P
Before the intervention	Age of the studied sample	0.388**	<0.001**	0.308	0.001*	0.207	0.030*
	Marital status	0.308	0.001*	0.142	<0.0001*	0.547	<0.0001*
	Years of experience	0.207	0.030*	0.547	<0.0001*	0.116	<0.0001*
	Education	0.166-	<0.0001*	-0.158-	<0.0001*	0.253	<0.000*
	previous training program about VTE	-0.243*	<0.0001*	-0.036-	<0.0001*	-0.158-	<0.0001*
Immediate Post-program intervention	Age of the studied sample	0.388**	<0.001**	0.170	0.075	0.012	<0.001**
	Marital status	0.170	0.075	0.112	<0.05*	0.324	0.001*
	Years of experience	0.012	0.902	0.324	0.001*	0.112	<0.000*
	Education	-0.071-	<0.0001*	-0.036-	<0.0001*	0.253	<0.0001*
	previous training program about VTE	-0.289**	<0.0001*	-0.158-	<0.0001*	0.166-	<0.0001*
Eight weeks post-program intervention	Age of the studied sample	0.389**	<0.001**	0.057	<0.0001*	-0.158-	<0.0001*
	Marital status	0.057	<0.0001*	-0.071-	<0.0001*	0.057	<0.0001*
	Years of experience	0.166-	<0.0001*	-0.158-	<0.0001*	-0.036-	<0.0001*
	Education	-0.036-	<0.0001*	0.057	<0.0001*	0.116	<0.0001*
	previous training program about VTE	-0.289**	<0.0001*	-0.158-	<0.0001*	0.057	<0.0001*

Table 6. The barrier regarding performing the Venous thromboembolism prophylaxis (141)

Items	Mean \pm SD
The compliance of patients as:	1.94\pm 4.21
Refusal by the patients	30.34 \pm 5.80
Increased the nurses-patient conflicts	13.22 \pm 2.12
The costs of prophylaxis treatment	13.48 \pm 2.31
Lack of professional competencies as:	1.95\pm 6.61
Lack of knowledge and participation from other healthcare providers	6.94 \pm 4.20
Workload increased	13.22 \pm 2.13
A deficient of acceptance	1.46\pm 4.47
Penalty when an error occurs when carrying out prophylaxis treatment	2 6.94 \pm 4.21
Lack of time	30.34 \pm 5.83
Work condition challenges:	1.68\pm 4.40
a deficient of supportive systems	13.48 \pm 2.35
a deficient of individual responsibility for performance	13.22 \pm 2.8
no oversight or rewards	13.48 \pm 2.34
incompatible guideline recommendations	13.22 \pm 2.18

Table7. The studied sample satisfaction eight weeks' post-intervention regarding the implementation of the in-service training program (n=141).

Items	Frequency	Percentage
Total satisfaction:		
Satisfied	135	95.7
Dissatisfied	6	4.3
Mean satisfaction 2.09 (0.56)		
In-service training time and environment.		
Satisfied	136	96.4
Dissatisfied	5	4.6
Mean satisfaction 2.08 (0.53)		
The in-service training method of teaching		
Satisfied	136	96.4
Dissatisfied	5	4.6
Mean satisfaction 2.08 (0.53)		
Behavior and language		
Satisfied	140	99.0
Dissatisfied	1	1.0
Mean satisfaction 3.03(0.64)		
Updated knowledge and practice		
Satisfied	141	100
Dissatisfied	0	00
Mean satisfaction 2.01 (0.50)		
The recommendation to repeat the in-service training program related prevention of venous thromboembolism for other health institutions:		
Satisfied	138	98.0
Dissatisfied	3	2.0
Mean satisfaction 2.10 (0.50)		

Discussion

Venous thromboembolism is the direct cause of maternal death. So, the assessment of risk and initiating suitable thromboprophylaxis is significant for decreasing morbidity and mortality in pregnancy. A meaningful section of thromboembolic cases occurs during the first trimester of pregnancy and risk assessment and thromboprophylaxis must be initiated as early as possible. The risk assessment should also be checked out if there is an alteration in the pregnancy and the intrapartum or immediate postpartum periods' clinical manifestations (Kearsley and Stocks., 2021). Venous thromboembolism (VTE) prophylaxis in pregnancy and postpartum is necessary and needs serious clinical decisions so clinical practice programs and guidelines are needed (Bates et al., 2018)

To increase patient safety, nursing performance, and clinical care, it is critical to provide high-quality nursing care. To avoid venous thromboembolism, nurses are essential.

According to reports, prevention of pregnancy-associated high-risk venous thromboembolism (VTE) boosted the mother's survival probability from 57% to 94% (Maughan et al., 2022). A valuable strategy to lower lengthy hospital stays, excessive medical expenses, and venous thromboembolism (VTE) is through proper prophylaxis (Yan et al., 2021). According to a prior study, nurses are the best medical professionals to evaluate DVT prophylaxis daily (Elwyn et al., 2012). Another study shows that after nurses taught VTE patients, there was a decrease in the morbidity and death rates of DVT (Lavall & Costello, 2015). The results of the present study for pre- and post-in-service training intervention scores demonstrated that the nurses' knowledge regarding the Venous thromboembolism risk factors, manifestation and investigations post-intervention were better than pre-intervention. Additionally, it proves that 31% had adequate knowledge regarding Venous thromboembolism risk factors, manifestation and investigations pre-in-service

training program intervention which increases to 75% immediately after post-in-service training program intervention and to 95% after 8 weeks from interventions.

The current study results were cohesive with the other preceding studies that handled, to some range, the same factors in Egypt (**Elgendy et al., 2022; Abd ELmoniem et al., 2023 and Hashem et al., 2023**), as other studies on the other region (**Abboud et al.,2020; Dyke et al.,2023**). The in service training develops the nurses' staff's knowledge and professional skills, as well as the best practices for performing various tasks. in-service training is giving continuously new and scientifically based education programs for nursing staff to make them familiar with the environment, and systems of the hospital and to improve their performance (**Chaghari et al., 2017**).

The literature reported that the in service training and other intervention guidelines assist in putting patient care in standard, decreasing variance in clinical care practice, upgrading and maintaining the quality of care, raising the competency in services to the patients, can measure benefits and risks to guide decision-making for treatment and promoting patient comment and management of health care (**Abboud et al.,2020**). In line with what is stated in the literature, the present results revealed that the nurses improved their knowledge regarding venous thromboembolism prevention after they finished training in the in-service program which was evident by the result that 35% had adequate knowledge regarding Venous thromboembolism risk factors, manifestation and investigations pre-in-service training program intervention which increases to 90% immediately after post-in-service training program intervention and to 98% after 8 weeks from interventions.

The most frequent reasons for the rise in venous thromboembolism (VTE) prevalence globally are inadequate practice and awareness (**Silva et al., 2020**). According to certain research, people do not know enough about the danger of deep vein thrombosis and do not avoid deep vein thrombosis in the right ways (**Ahmed et al., 2020**). Furthermore, research has demonstrated that positive behaviors,

attitudes, and levels of self-efficacy enhance the standard of treatment for patients with venous thromboembolism (VTE). Increasing awareness and addressing this serious public health issue will be made possible by expanding understanding and improving practices regarding the dangers of venous thromboembolism (VTE) and how to prevent complications (**Silva et al., 2020; Yan et al., 2021**).

According to what was stated in the scientific works of literature, the application of the in-service training included in the current study worked to improve the practice and attitudes of nurses toward preventing the occurrence of venous thrombosis, and this was evident from the results of the current research, which are as follows: 45% of the studied nurses had adequate practice regarding Venous thromboembolism risk factors pre-in-service training program intervention which increases to 95% immediately after post-in-service training program intervention and to 99% after 8 weeks from interventions. Additionally, it demonstrates that 25% had a positive attitude regarding Venous thromboembolism prevention pre-in-service training program intervention which increases to 90% immediately after post-in-service training program intervention and to 98% after 8 weeks from interventions. The current results indicate a marked improvement in the practice and attitude of the studied nurses besides the in-service training booklet used in the current study can assist nurses in determining early venous thromboembolism problems and thereby prevent and minimize the complications. The training education programs are considered to enhance the knowledge, practice, and attitudes of nurses toward patients' health problems (**Elkashif et al., 2023; Elsabaa et al., 2022 and ElKashif et al., 2021 & Soliman et al., 2020**).

It became clear from the results of the current study that there is a strong statistically significant relationship between the age of the sample, marital status, the number of years of work experience, the degree of education, previous courses and programs related to venous thrombosis and the degree of knowledge, the practice and attitudes of the sample regarding prevention of venous

thromboembolism. This result is rational and acceptable, as increasing the degree of education is associated with increasing the degree of achievement, professional competition, and the development of cognition and attitudes. This is in addition to increasing years of experience and obtaining training programs and guidance regarding these issues. It increases the level of exempt and practical achievement, increases awareness, and enhances positive attitudes regarding venous thromboembolism prevention. Some previous research has talked about this and has reached the same results (Awad & Hashem, 2019; El-gendy et al., 2022 and Yohannes et al., 2022)

A lack of compliance with guidelines has been linked to a number of barriers in developing nations, such as inadequate support systems, a lack of individual accountability for performance, a lack of acceptance, a belief that certain clinical areas are unnecessary, a lack of oversight or incentives, and inconsistent guideline recommendations (Yesuf et al, 2021). Even though nurses have an essential setting to prevent complications related to venous thromboembolism, the extent to which the performance toward venous thromboembolism (VTE) prevention is still in its no weight in developing countries. Recognition and handling of barriers can increase the nurses' impact on the prevention of the complications of venous thromboembolism.

Although the availability of guidelines for venous thromboembolism prophylaxis, the conveying of prophylaxis guidelines into real clinical nursing practice resumes to be challenging. previous studies' results mentioned that most patients do not properly receive venous thromboembolism preventive prophylaxis during their hospitalization, influencing their security and health (Al-Mugheed & Bayraktar 2018 and Silva et al., 2020). The literature reported that nurses face many barriers linked to venous thromboembolism prophylaxis. In one study, two-thirds of nurses stated that the absence of a standardized prevention protocol was the key barrier to venous thromboembolism preventive risk assessment (Silva et al., 2020). Other studies declared that a lack of knowledge regarding venous thromboembolism (VTE)

elevated the patient-to-nurse proportion and the lack of clear instruction regarding the indications and contraindications for venous thromboembolism (VTE) pharmacology prophylaxis and the preventing risk of bleeding were barriers (Al-Mugheed et al., 2023) .

As for the barriers that the nurses in the presently studied sample encountered while carrying out preventive measures for venous thrombosis, most of them were factors related to professional competence related to this aspect, the fear of punishment when mistakes occur, the patient's challenge, and his commitment to the instructions related to aspect, in addition to the challenges in the workplace from the lack of Insufficient support from the administration, with the lack of financial appreciation necessary when carrying out these procedures, in addition to the loss of the availability of systematic guidelines for prevention. Therefore, these results agreed with the results that were mentioned in the previous literature (Kim & Lee 2020 and Yan et al., 2021)

Implications of the study

For Patients

The patients will properly receive venous thromboembolism preventive prophylaxis during their follow-up and hospitalization, maintaining their security and health and improving their quality of life by reducing prolonged hospitalizations and high medical costs after nurses perceive the proper knowledge and practice Regarding Venous thromboembolism prophylaxis during pregnancy and postpartum. Furthermore, there is a serious need to establish a more specific structured program with strategies to address the venous thromboembolism prophylaxis protocol for risk patients.

For Health practice

The present study results may support decision-making managers in developing the proper policies and standards for venous thromboembolism. The program sessions will assist the nurses in obstetrics and gynecology departments in practicing their clinical decisions for the patient's benefit and reduce unnecessary variations in clinical practice. The in-service training Booklet applied in this study

can be used to provide necessary instruction and guide nursing practice to deal with these cases, detect them early, and provide the necessary early care and treatment. Moreover, informing them of risk factors so that they can provide counseling to all women during pregnancy and after childbirth

For Research

The present study results can be used as the foundation for knowledge and practice for future research to explore aspects of venous thromboembolism prophylaxis in-depth way. Further study is recommended to highlight the magnitude of venous thromboembolism and the challenges it creates in health sectors

Conclusion:

In conclusion, establishing an in-service training program regarding venous thromboembolism prophylaxis during pregnancy and postpartum has a significant healthcare provision. It enriches the nurse's performance, (practice, knowledge, and attitude) and improves quality of care. This is noticeable from an improvement in nurses' knowledge, practice, and attitudes regarding venous thromboembolism prophylaxis during pregnancy and postpartum post intervention of current in-service training program compared to pre-intervention. Lack of professional competencies besides the work conditions challenges seems to be the main barriers that prevent the studied sample from performing venous thromboembolism prophylaxis in the clinical area. Moreover, the research results show that the participating nurses were highly satisfied with the in-service training program.

Recommendations:

The following recommendations were suggested according to the research results:

- 1- Barriers that prevent the studied sample from performing Venous thromboembolism prophylaxis in the clinical area need to be addressed and continuing education programs to be done to eradicate nearly all these recognized barriers.
- 2- Implementing in-service training programs regarding venous thromboembolism prophylaxis during pregnancy and

postpartum is recommended in different maternity healthcare placements.

- 3- Whereas a professional in service training program affects patient outcome and in-patient services; it is important to give the chance for education to nurses to attain new professional in-service education regarding venous thromboembolism.
- 4- Continuous education programs that include updating theoretical understanding and venous thromboembolism prevention practices have to be reflected in the patient's health services.
- 5- ongoing education initiatives that include updating theoretical understanding and venous thromboembolism prevention practices.
- 6- Further study is recommended in all health departments, including all health staff, to shed light on the extent of venous thromboembolism and the challenges it creates in health sectors.

References:

- Awad, W. H. A., & Hashem, E. S. (2019). In-service training program regarding nurses' performance for non-pharmacological pain management among orthopedic patients. *Egyptian Journal of Health Care*, 10(3), 330-344
- Abboud, J., Abdel Rahman, A., Kahale, L., Dempster, M., & Adair, P. (2020). Prevention of health care associated venous thromboembolism through implementing VTE prevention clinical practice guidelines in hospitalized medical patients: a systematic review and meta-analysis. *Implementation Science*, 15, 1-11..
- Abd ELmoniem , S.O., EL Sayed, A F., Emam, A M M .(2023). Effect of Implementing Evidence-Based Nursing Practices Guidelines on Prevention of Deep Venous Thrombosis among Postpartum Women. *Egyptian Journal of Health Care*, 14(4), 611-631.
- 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.
- Al-Mugheed, K. A., & Bayraktar, N. (2018).** Knowledge and practices of nurses on deep vein thrombosis risks and prophylaxis: A descriptive cross sectional study. *Journal of Vascular Nursing*, 36(2), 71-80.
- Al-Mugheed, K., Totur Dikmen, B T., Bayraktar, N., Farghaly Abdelallem, S. M., & Ahmed Alsenany, S. (2023).** Nursing care and barriers for prevention of venous thromboembolism in total knee and hip arthroplasty patients: a qualitative study. *Journal of Multidisciplinary Healthcare*, 547-556.
- Balay-odao, E., Marbella, I., & Capili, M. (2019).** Satisfaction of student nurses on the academic services in the School of Nursing. *Journal of Basic and Applied Research in Biomedicine*, 5(2), 64-72.
- Bates, S. M., Rajasekhar, A., Middeldorp, S., McLintock, C., Rodger, M. A., James, A. H., ... & Rochweg, B. (2018).** American Society of Hematology 2018 guidelines for management of venous thromboembolism: venous thromboembolism in the context of pregnancy. *Blood advances*, 2(22), 3317-3359.
- Chaghari, M., Saffari, M., Ebadi, A., & Ameryoun, A. (2017).** Empowering education: A new model for in-service training of nursing staff. *Journal of advances in medical education & professionalism*, 5(1), 26.
- Dawoud, D. M., Wonderling, D., Glen, J., Lewis, S., Griffin, X. L., Hunt, B. J., ... & Barry, P. (2018).** Cost-utility analysis of venous thromboembolism prophylaxis strategies for people undergoing elective total hip and total knee replacement surgeries in the English National Health Service. *Frontiers in pharmacology*, 9, 1370.
- Dyke, E. V., Jauncey-Cooke, J., & Johnston, A. N. (2023).** e-Learning interventions for nurses to prevent venous thromboembolism in patients: A realist review. *Journal of clinical nursing*, 32(15-16), 4441-4453.
- El-gendy, G. H. A, Mahmoud, M H., and Omran, E.S. (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.
- El-Kashif, M. L., Abd-El Hady, R. M., Samir Abd El-Aziz Elsaiaid, H., Fathy Heiba Eid Baker, M., & Ahmed Thabet, H. (2023).** Effect of Evidence-Based Practice Program on Internship Students' Performance at the Maternity Nursing Departments. *Egyptian Journal of Health Care*, 14(3), 883-903.
- Elkashif, M. M. L., Mahdy, A. Y., & Elgazzar, S. E. (2021).** Evaluating the effect of establishing protocol for self-care practice of diabetic foot patients regarding their needs, concerns and medication use: a quasi-experimental study. *Saudi Journal of Biological Sciences*, 28(6), 3343-3350.
- Elsabaa, H A F., Fathy, A M., Abd-El hady, T R M., El-Kashif , M M L.(2022) .** The effect of the staff development program on nursing evidence-based performance regarding Covid-19 pandemic in the obstetrics-gynaecology and paediatrics departments. *Egyptian Journal of Health Care*, 13(2), 1420-1439.
- Elwyn, G., Lloyd, A., Williams, N. J., Beasley, A., & Tomkinson, A. (2012).** Shared decision-making in a multidisciplinary head and neck cancer team: a case study of developing Option Grids. *International Journal of Person Centered Medicine*, 2(3), 421-426.
- Gassmann, N., Viviano, M., Righini, M., Fontana, P., de Tejada, B. M., & Blondon, M. (2021).** Estimating the risk thresholds used by guidelines to recommend postpartum thromboprophylaxis. *Journal of Thrombosis and Haemostasis*, 19(2), 452-459.

- Gris, J. C., Aoun, J., Rzaguliyeva, L., Begum, R., Salah, H., Tugushi, T., ... & SAVE Study Group. (2018). Risk assessment and management of venous thromboembolism in women during pregnancy and puerperium (SAVE): an international, cross-sectional study. *TH Open*, 2(02), e116-e130.
- Hashem, S. M., Abdelmenem, E. E., & EL-Said, F. M. (2023). Effect of Nursing Intervention on Nurses' Performance regarding the Prevention of Deep Vein Thrombosis among Postpartum Women. *Tanta Scientific Nursing Journal*, 32(4), 318-341.
- Kearsley, R., & Stocks, G. (2021). Venous thromboembolism in pregnancy—diagnosis, management, and treatment. *BJA education*, 21(3), 117-123.
- Kim, C., & Lee, Y. (2020). Effects of compassion competence on missed nursing care, professional quality of life and quality of life among Korean nurses. *Journal of nursing management*, 28(8), 2118-2127.
- Knight, M., Bunch, K., Tuffnell, D., Jayakody, H., Shakespeare, J., Kotnis, R., ... & Kurinczuk, J. (2018). Saving Lives, Improving Mothers' Care—Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2014-16.
- Lavall, K. A., & Costello, J. F. (2015). Assessment of the public's knowledge of venous thromboembolism. *Journal of Vascular Nursing*, 33(2), 68-71.
- Maughan, B. C., Marin, M., Han, J., Gibbins, K. J., Brixey, A. G., Caughey, A. B., ... & Jarman, A. F. (2022). Venous thromboembolism during pregnancy and the postpartum period: risk factors, diagnostic testing, and treatment. *Obstetrical & gynecological survey*, 77(7), 433-444.
- Middleton, P., Shepherd, E., & Gomersall, J. C. (2021). Venous thromboembolism prophylaxis for women at risk during pregnancy and the early postnatal period. *Cochrane Database of Systematic Reviews*, (3).
- Mohammed, A. K. (2019). Student satisfaction with nursing program at the Sulaimani College of Nursing. *Journal of Nursing & Healthcare*, 4(4), 1-7.
- Nicholson, M., Chan, N., Bhagirath, V., & Ginsberg, J. (2020). Prevention of venous thromboembolism in 2020 and beyond. *Journal of clinical medicine*, 9(8), 2467.
- Nishimoto, Y., Yamashita, Y., Morimoto, T., Saga, S., Amano, H., Takase, T., ... & COMMAND VTE Registry Investigators. (2019). Risk factors for post-thrombotic syndrome in patients with deep vein thrombosis: from the COMMAND VTE registry. *Heart and vessels*, 34, 669-677.
- Obstetric Written Control Documentation Group. (2022). Thromboprophylaxis in the Antenatal and Postpartum Period Guideline. Database No: 620. Version 3.
- Rojo, J., Ramjan, L. M., Hunt, L., & Salamonson, Y. (2020). Nursing students' clinical performance issues and the facilitator's perspective: A scoping review. *Nurse education in practice*, 48, 102890.
- Silva, J. S. D., Lee, J. A., Grisante, D. L., Lopes, J. D. L., & Lopes, C. T. (2020). Nurses' knowledge, risk assessment, and self-efficacy regarding venous thromboembolism. *Acta Paulista de Enfermagem*, 33, eAPE20190125.
- Soliman, M. A., Elsabaa, H. A. H. F., & El-Kashif, M. M. L. (2020). The Effect of On-job Training Sessions on Improving Nurses' Information, Practical Achievement and Their Satisfaction Regarding Patients Suffering from Early Postpartum Hemorrhage. *American Journal of Nursing*, 8(3), 344-351.

Wendelboe, A. M., & Raskob, G. E. (2016).

Global burden of thrombosis: epidemiologic aspects. *Circulation research*, 118(9), 1340-1347.

Woller S. CDC, Joint Commission Engage in

VTE Prevention Research. The Joint Commission. Published 10 August 19, 2021. Accessed August 10, 2022. [https://www.jointcommission.org/resources/news-and](https://www.jointcommission.org/resources/news-and-multimedia/blogs/improvement-insights/2021/08/cdc-and-joint-commission-engage-in-vte-prevention-research)

[multimedia/blogs/improvement-insights/2021/08/cdc-and-joint-commission-engage-in-vte-prevention-research](https://www.jointcommission.org/resources/news-and-multimedia/blogs/improvement-insights/2021/08/cdc-and-joint-commission-engage-in-vte-prevention-research).

Yan, T., He, W., Hang, C., Qin, L., Qian, L.,

Jia, Z., ... & Xu, Y. (2021). Nurses' knowledge, attitudes, and behaviors toward venous thromboembolism prophylaxis: how to do better. *Vascular*, 29(1), 78-84.

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.

Yohannes, S., Abebe, T., Endalkachew, K.,

& Endeshaw, D. (2022). Nurses' Knowledge, Perceived Practice, and their Associated Factors regarding Deep Venous Thrombosis (DVT) Prevention in Amhara Region Comprehensive Specialized Hospitals, Northwest Ethiopia, 2021: A Cross-Sectional Study. *Critical Care Research and Practice*, 2022(1), 7386597.