Efficacy of Training Program on Nurses Performance regarding Preventive Measures of Venous Thromboembolism among Critical Pregnant Women

Rasha Nabil Malk [1], Eman Mawed Fahem[2], Hanan Elzeblawy Hassan [3], Asmaa Abouda Abdelhamed Soultan [4]

[1&2] Medical Surgical Nursing, Faculty of Nursing, Beni-Suef University, Egypt
[3] Maternal and Newborn Health Nursing, Faculty of Nursing, Beni-Suef University, Egypt
[4] Medical- Surgical Nursing Faculty of Nursing, Damietta University, Egypt

Abstract

Background: Venous thromboembolism is the most common cause of preventable death in hospitalized patients worldwide. More than 80% of thromboembolic illnesses in pregnant women are venous thromboembolism (VTE), and the prevalence of VTE is significantly higher in pregnant women than in non-pregnant women. The disease is highly insidious, develops rapidly and seriously endangers the health and life of the pregnant women. It is important that maternity and critical care nurses to have sufficient knowledge and skills about preventive measures of VTE. **Aim:** evaluate the effect of training program on maternity and high-risk nurses' performance (knowledge and practice) regarding preventive measures of VTE. **Design:** A quasi-experimental design was used. **Setting**: The study was conducted in high-risk pregnancy units and intensive care unit at Beni-Suef University Hospital. **Sample**: All convenient samples 50 nurses. **Tools:** Two tools were used (1) a self-administered questionnaire sheet to assess knowledge, (2) an observational checklist to assess practice regarding preventive measures of VTE. **Results**: preprogram; the majority of the nurses had unsatisfactory knowledge and practice regarding preventive measures of VTE (82% and 92% respectively). A significant improvement was found immediately post-program (86% and 88%, respectively) while this improvement lowered slightly post 3 months at follow up (72%and 70% respectively). **Conclusion:** A statistically significant improvement in nurses' performance had got after implementation of the program which supported the study hypothesis. **Recommendation:** Continuous in-service training programs about preventive measures of VTE.

Key word: venous thromboembolism, Training Program, Preventive Measures.

Introduction

Venous thromboembolism (VTE) remains one of the leading causes of maternal mortality in the developed world. (**Crosby et al., 2021**).

Venous Thromboembolism is a disease that includes deep vein thrombosis a blood clot lodged in the deep veins, and pulmonary embolus a blood clot that has damaged free and traveled to the lungs (**Lee et al., 2019**). This carries both the risk of sudden death and long-term morbidity (**Marrochi, 2017**).

Venous Thromboembolism is a common complication of immobility occurs during prolonged bed rest such as when a patient is confined to bed for an extensive illness. (**Ignatavicius et al., 2020**). Hospitalized patients with acute medical illnesses are at risk for venous thromboembolism during and after a hospital stay. (**Barkoudah et al., 2020**)

Amongst hospitalized patients, critical care admission is the strongest risk factor for VTE. This is a function of both the patient's underlying disease process and acquired risk factors during an intensive care unit (ICU) stay, including prolonged immobility, use of neuromuscular blockage and vasopressors, central venous catheter insertion and sepsis. (**Elkattan. and Elderiny, 2019**).

Risk for VTE increase with age, individual or family history of VTE, smoking, dehydration, cancer, obesity, neurological deficit, varicose veins, surgery or other hospitalization, certain heart or respiratory disease, obesity and pregnancy (**Marissa, 2016**).

Pregnancy is a prothrombotic state; it has wholly components of Virchow's triad: venous stasis, endothelial damage and hypercoagulability. Venous stasis consequences a hormonally induced

decrease in venous tone and obstruction of venous flow by the enlarging uterus. Endothelial damage in pelvic veins from venous hypertension, a hyper-coagulable state is the most important risk factor contributing to thrombosis during pregnancy. **(Devis and Knuttinen, 2017).**

The relative risk of antenatal VTE is approximately 5-fold higher in pregnant women than in non-pregnant women of the same age due to the changes in the coagulation and venous systems associated with pregnancy **(Youness et al., 2016).**

Increased risk in pregnancy 4 to 5-fold increased risk of developing a VTE in pregnancy due to: hyper-coagulability, increased venous stasis, decreased venous outflow, compression of the inferior vena cava and pelvic veins by the gravid uterus, decreased mobility and altered levels of coagulation factors responsible for haemostasis **(Queensland Clinical Guidelines, 2020).**

Moreover, Pregnant women are prone to forming blood clots, leading to an increased risk of developing DVT, pulmonary embolism, or thrombosis at other more rare sites which can be caused by hormonal changes and pressure on the veins by the uterus. **(Elhefnawy and Elsabagh, 2019).**

There is a need to improve thrombus-prophylaxis use to enhance patient safety and quality of care, for instance by issuing local guidelines. **(Sandström et al., 2017)**

There are numerous measures that nursing staff can utilize to prevent VTE in high-risk group includes: mechanical methods such as planned ambulation, leg exercises, deep breathing exercise, application of compression stocking or intermittent calf muscle compression, hydration maintenance. Pharmacologic methods which include use of anticoagulant medication **(Hussein et al., 2020).**

Significance of the study:-

More than 80% of thrombo-embolic illnesses in pregnant women are venous thromboembolism (VTE), and the prevalence of VTE is significantly higher in pregnant women than in non-pregnant women. The disease is highly insidious, develops rapidly and seriously endangers the health and life of the pregnant women. VTE is one of the most common critical illnesses in obstetrics **(Zhang and Sun, 2020).**

Venous Thromboembolism is the most common cause of preventable death in worldwide hospitalized patients **(Rocher et al., 2019).** The incidence of VTE is 10% to 20% in general medical patients and up to 80% in critically ill patients **(Hinkle and Cheever, 2018).**

In Egypt, more than one-third of all patients hospitalized for surgery or acute medical conditions are at high risk for developing VTE. However, only a small fraction of these patients receive appropriate VTE prophylaxis. Corrective measures are necessary for preventing VTE morbidity and mortality in these high risk patients **(Goubran, H. A, et al 2012)**

Clinical nurses are a significant group that can serve as first-line health care providers to identify and respond to risks of VTE. Although the perfect treatment of VTE is determined by doctors, there is a clear consensus that nurses have the responsibility for primary prevention, so that the nurses play an important role in thromboprophylaxis **(Yu-Fen et al., 2018).**

Therefore, it is essential to developing implementing and evaluating educational program for nurses for enhancing their performance about preventive measures of VTE.

Aim of the study:

The aim of the current study is to evaluate the effect of training program on nurses' performance regarding preventive measures of VTE.

Research Hypothesis:

Nurse's performance will be improved post-implementation of training program.

Subjects and Methods

Research Design:

A quasi-experimental design was used in this study.

The study is portrayed under four designs:-

- Technical design.
- Operational design.
- Administrative design.
- Statistical design.

Technical design:

The technical design included setting, subjects and tools of data collection which used in this study.

A. Setting:

The study was conducted in high-risk pregnancy unit and intensive care unit at Beni-Suef University.

B. Subject:

All convenient samples included 50 nurses working in high-risk pregnancy unit and intensive care unit at Beni-Suef University Hospital and agreed to participate in this study.

C. Tools of data collection:

Two tools were constructed to collect data pertinent to this study, these tools are:-

I. A self-administered questionnaire sheet:

It was used to assess nurses' level of knowledge regarding preventive measures of VTE. It was developed by the researcher based on review of related literature. It compromised Arabic structured items related to different aspects of assessment knowledge about preventive measures of VTE. It was including two parts:

➤ **Part one:**

It concerned with demographic characteristics of the nurses involved in the study (age, gender, marital status, level of education and years of experience in high-risk pregnancy unit and intensive care unit at Beni-Suef University Hospital.

❖ **Part two:**

It concerned with assessment knowledge regarding the following issues:

1- Anatomy and physiology of vascular system (3 questions) (3 grades).

2- Definition and causes of VTE (7 questions) (7 grades).

3- Risk factors of VTE (7 questions) (7 grades).

4- Signs and Symptoms of VTE (5 questions) (5 grades).

5- Diagnostic investigation and complication of VTE (3questions) (3 grades).

6- Prevention of VTE (7 questions) (7 grades).

7- Prophylactic anticoagulant medication (8 questions) (8 grades)

8- Antiembolic stockings (6questions) (6 grades).

9- A Sequential Compression Device (5 questions) (5 grades)

This tool was filled three times; the first time before the program implementation, the second time immediately after program implementation and the third time after 3 months later (follow up).

Scoring system:

All knowledge variables were closed ended questions. The total numbers were 51questions; they were scored as the following.

• Each correct answer was given one grade

• The incorrect answer was given zero.

Total knowledge score was classified as the following:

• ≥75% satisfactory

• <75%% unsatisfactory.

II. Observational checklist for nurse practice regarding preventive measures of VTE: (Appendix II):

It was adopted from **(Lynn, 2019 and Craven, et al 2020)**. It was used to assess nurses' practices regarding preventive measures of VTE. This tool was filled three times; the first time before the program implementation, the second time immediately after program implementation and the third time after 3 months later (follow up).

Scoring system:

• Complete correct done was assigned a score of (2)

• Incomplete correct done was assigned a score of (1)

• Not done was assigned a score of (0)

Total practice score was 52*2=104

Total score of practice was classified into:

• ≥75% satisfactory practice level.

• <75%% unsatisfactory practice level.

The total score was distributed as the following:

• Assessment of the patient (5 grades).

• General preventive measures (3 grades)

• Nurses' role regarding prophylactic anticoagulant drug (9 grades)

• Nurses' role regarding ROM exercise (6 grades).

• Nurses' role regarding apply compression stocking (11 grades).

• Nurses' role regarding apply a Sequential Compression Device (15 grades).

• Patient education (3grades).

Tools validity and reliability:

• **Content validity:**

The tools were revised for content validity by a group of seven experts of Medical-Surgical Nursing Specialties. The expertise reviewed the tool for objectivity, clarity, appropriately and comprehensiveness, minor modification was done.

• **The reliability:**

Was tested for tool one (Knowledge assessment tool), and tool two practice assessment tool) by using alpha Cronbach's test (r = 0.947, 0. 976)

Operational design

The operational design included a preparatory phase, pilot study, ethical consideration and field work.

• **Pilot study:**

It was carried out on 10% of the total study (5 nurses). This was done to test applicability, clarity and efficiency of the tools. No modification was done, so the nurses who shared in the pilot study were excluded from the sample.

Ethical consideration:

1.The researcher was clarifying the objective and aim of the study to the nurses included in the study.

2.The researcher was assured maintaining privacy of the subject's data for the purpose of this research only and will not be used again without new consent.

3.Nurses were informed about their rights to participate or withdraw from the study at any time without any rational. As well, the results of this study will not have any effect on their job.

Field work:

Data were collected from the beginning July 2020 to the end of September 2021. The program was implemented for nurses working in high-risk pregnancy units and intensive care unit at Beni-Suef University Hospital.

Program phase:

1.Preparatory phase:

It was involved reviewing of related literature and theoretical knowledge of various aspect of the study using books, articles, internet, periodicals and magazines to develop tools for data collection and the training program for nurses.

The program application schedule was designed by the researcher. Goals, teaching methods, learning activity, and media were prepared. The content of the training program was divided into 7 sessions; the duration of each session is one hours.

Permission for data collection and implementation of the study in Beni-Suef University hospital was obtained from the hospital administrative personnel by the submission of a formal letter from the faculty of nursing, Beni-Suef University. Meeting and discussions were held by the researcher and nurses to describe the aims, the nature and the objectives of the study and take their approval to participate in the study prior to any data collection.

Educational booklet:

It was designed in Arabic language by researcher based on the results obtained from assessment of the nurses' knowledge and practice. which included anatomy and physiology of the vascular system (definition, causes, risk factor, signs and symptoms, diagnostic investigation, prevention and complication of VTE), role of the nurse regarding assessment of patient for VTE, role of the nurse regarding apply compression stocking, role of the nurse regarding apply a Sequential Compression Device and patient education. The content was developed by the researcher after reviewing the related literature

Program assessment:

The researcher was assessing of nurse's knowledge and practice about preventive measures of VTE at Beni-Suef University Hospital by used questionnaire sheet and observational checklist. The researcher was attended to the setting 3 days per week in the morning and afternoon shift.

1) As regards to the observational checklist the evaluation was done firstly to assess of nurse's practice regarding preventive measures of VTE.

2) As regards to the questionnaire sheet was carried to assess of nurse's knowledge regarding preventive measures of VTE that was filled by the nurse.

Assess of nurse's knowledge and practice was carried out three times firstly before training program, secondly immediately and thirdly after three months.

The observational checklist was filled by the researcher thru observing the nurses. The time allowed for answers took about 30- 40 minutes.

• **Program implementation:**

This was based on the studied nurses. The content of training program sessions was organized as the following.

The theoretical part:

• Introduction of training program and anatomy, physiology of the vascular system including objective of training program, anatomy of the vascular system, function, component and characteristics of vein.

• General information about VTE (definition, causes, risk factors, signs and symptoms, diagnostic investigation and complication of VTE).

• Preventive measures of VTE (Fluid intake, Mobility, Raise leg and Exercise)

• Role of the nurse with prophylactic anticoagulant medication (meaning, route, action, purpose, contraindication, side effects, precaution, nursing care).

• Role of the nurse with antiembolic stockings (definition, patient position, precaution when applied, evaluate and documentation).

• Role of the nurse with A Sequential Compression Device (definition, precaution before, during and after apply).

The practical part:

• Assessment of the patient (past history, family history, risk factor, sign and symptoms and life style)

• General preventive measures (mobility, encourage fluid intake and elevate leg).

• Nurses' role regarding prophylactic anticoagulant drug

• Nurses' role regarding ROM exercise

• Nurses' role regarding apply compression stocking

• Nurses' role regarding apply a Sequential Compression Device.

• Patient education

Teaching methods:

• Lecture

• Discussion

• Demonstration

Teaching media:

• Hand out of the program

• Data show

• Booklet

• Picture

After the official permission were taken from director of Beni-Suef university hospital and nursing director, the implementation phase started.

The program was implemented over 14-week period. The duration of each session is one hours, including periods of discussion according to nurses' progress and feedback. The researcher was available 3 days per week in the morning and afternoon shift in high-risk pregnancy units and intensive care unit at Beni-Suef University Hospital.

At the beginning of the first session, an orientation to the program and its aims took place. Simple words and Arabic language were used to outfit the nurses' level of understanding. Each session started by revision about what was given in previous session and the objective of new topics. The booklet was distributed to all nurses in the first day of program implementation.

The Evaluation stage:

After implementation of training program, the post test was administered to assess nurses' knowledge and practice using the same questionnaire sheet and same observational checklist of the pre- test. It was done twice, immediately after finishing training program and after three months from first evaluation, this helped to evaluate the effect of the implementing program

Administrative design:

To carry out the study, the necessary approval was obtained from the director of Beni-Suef university hospital. A letter was issued to him from the faculty of nursing explaining the aim of the study in order to obtain permission for collection of data.

Statistical Design:

An IBM compatible personal computer was used to store and analyze data and to produce graphic presentation for some important results. Statistical package for the social science (SPSS) version 22 was used for statistical analysis of data, as it contains the test of significance given in standard statistical books.

▪ **Descriptive statistics**

Data were summarized using the arithmetic mean as an average, central tendency, the standard deviation as a measure of dispersion of results around the mean and frequency and percentage of observations.

Other statistical tests such as correlation coefficient were calculated and p value was used to determine the relation between total knowledge score and total practice score. Also, Alpha Cronbach test was used to test reliability of tools.

Results

Table (1): Demonstrates that about half of the studied nurses' (48%) their aged ranged between (25- 30) with a mean age was (26.00±3.239) years. Also, this table show that most (86%) of the studied nurses' were females, as well more than half (60%) of nurses were married. Regarding educational qualification this table shows that two third (66%) of the studied nurses' had Institute nursing education.

As regard of the nurse's year of experience more than half of the studied nurses' (56%) were from 5-10 years of experience with a mean year of experience was (5.76±3.631) years.

Fig. (1) This figure illustrates that the majority of the studied subjects (92%) didn't attend any training courses related to preventive measures of VTE.

Fig. (2) This Fig. illustrates that 82% of the studied nurses had unsatisfactory knowledge pre-program implementation which improved immediately post program and follow up program (86% and 72%) of the studied nurses had satisfactory knowledge regarding preventive measures of VTE respectively.

Fig. (3) This Fig. illustrates that 92% of the studied nurses had unsatisfactory practice pre-program implementation which improved immediately post program and follow up program (88% and 70%) of the studied nurses had satisfactory practice regarding preventive measures of VTE respectively.

Fig. (4,5,6) and table 2: demonstrates that a highly significant positive correlation between nurses knowledge and practice at different phases of program (pre, post and follow up program) with r and p value (.873**/ 0.000, .439/.001, .854/ .000) respectively.

Table (1): Percentage distribution of the study nurses according to their demographic characteristics

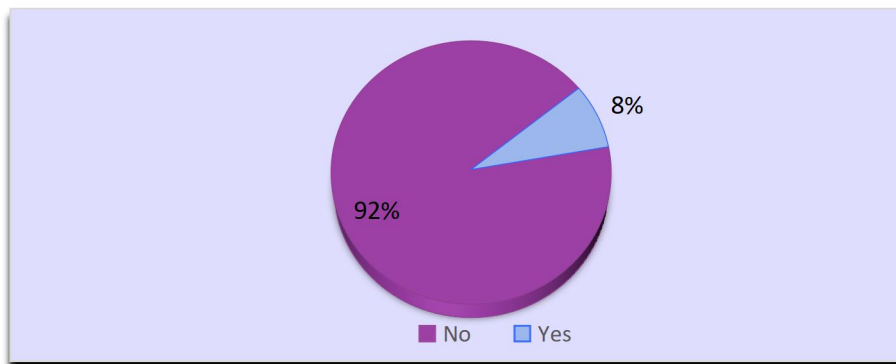| Variable	Frequency	%
Age in years		
<25	17	34
25-<30	24	48
30≥	9	18
Mean ±SD	26.00±3.239	
Gender		
Male	7	14
Female	43	86
Marital status		
Single	10	20
Married	30	60
Divorced	7	14
Widowed	3	6
Educational qualification		
Diploma nursing	7	14
Institute nursing education	33	66
Bachelor of nursing	10	20
Years of experience in critical care units		
1-	30	40
5-	28	56
≥10	2	4
Mean ±SD	5.76±3.631	

Fig. (1): Distribution of the studied nurses according to their attending training courses about preventive measures of VTE (n=50).
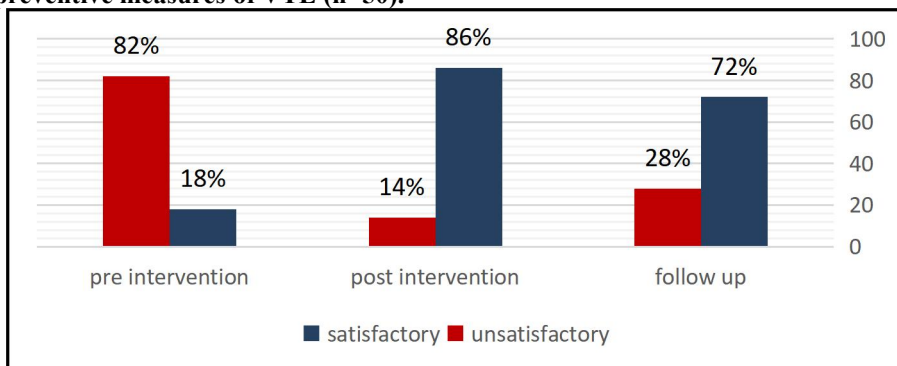

Fig. (2): Percentage distribution of studied nurses' total practice score regarding preventive measures of VTE at different phases of program.
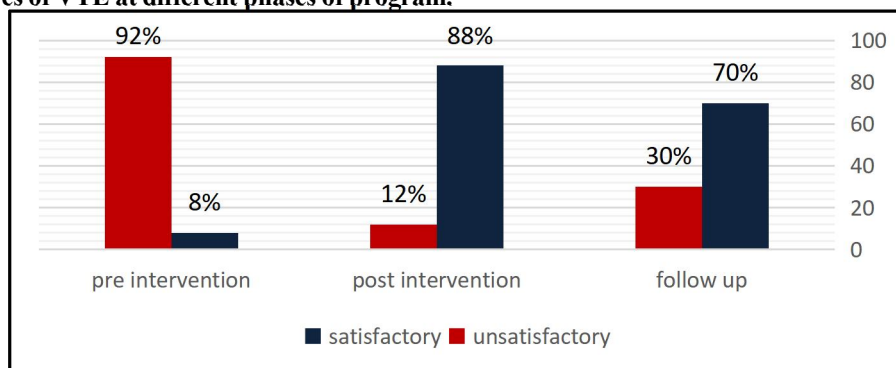

Fig. (3): Percentage distribution of studied nurses' total practice score regarding preventive measures of VTE at different phases of program.
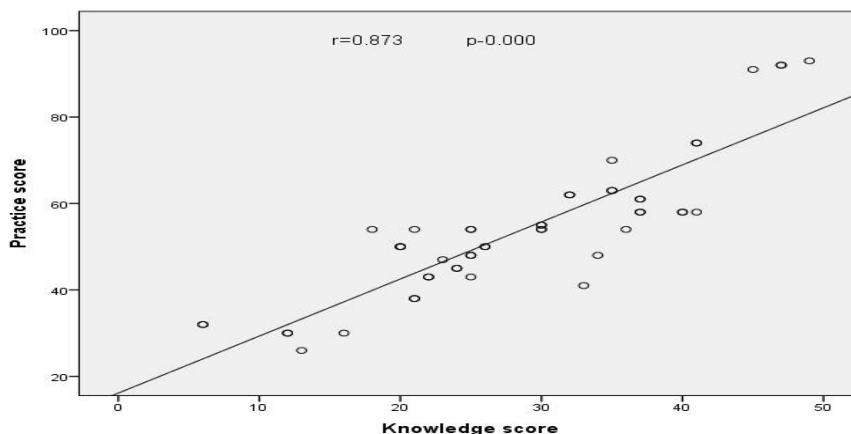
Fig. (4): Correlation between total nurses' knowledge score and total of nurses' practices score before implementation of the training program.

Table 2: Correlation between total nurses' knowledge score and total of nurses' practices score before, immediate, and follow up implementation of the training program.

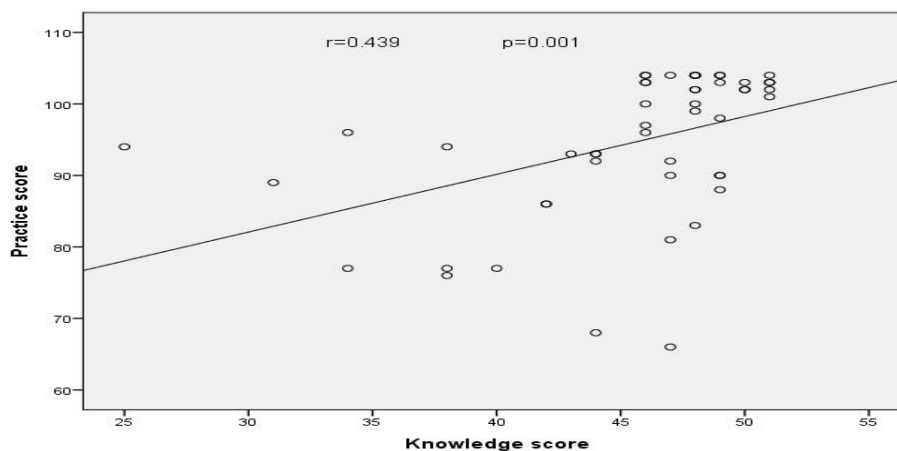| Variable	Total knowledge score					
	Pre-program		Immediate post		Follow –up	
	r	P value	r	P value	R	P value
Total practice pre-program	.873**	.000	.476**	.000	.682**	.000
Total practice immediate post	.646**	.000	.439**	.001	.605**	.000
Total practice follow -up	.740**	.000	. .712**	.000	.854**	.000

Fig. (5): Correlation between total nurses' knowledge score and total of nurses' practices score post implementation of the training program.
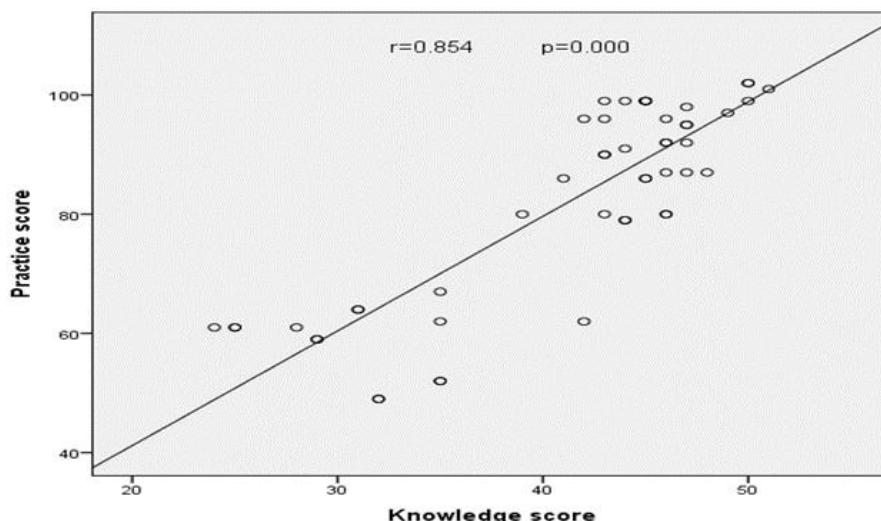
Fig. (6): Correlation between total nurses' knowledge score and total of nurses' practices score follow up implementation of the training program.

Discussion

Critically ill patients have an increased risk of VTE during their stay in the intensive care unit. Implementation of VTE prevention programs was associated with a decrease in thrombolytic events **(Zhen et al., 2021)**.

So, the aim of the current study was to evaluate the effect of training program on nurses' performance regarding preventive measures of VTE. based on achieves the following hypothesis: Nurse's performance will be improved post-implementation of training program. that was supported by the study results.

Firstly, demographic characteristics of the studied nurses:

This study indicated that about half of nurses were at the age (25- 30 years). In the same line with **Haza'a1, et al., (2021)** who stated that 46.7% of nurse's age group was 25 and less than 30 years of age,

As regard of the gender the study revealed that the most (86%) of nurses were females. This result agreed with **Abo El-Ata, et al., (2019)** who stated that the 88.8% of them were female.

As regards to marital status, the present study indicated more than half (60%) of nurses were married**.** Supported by **Ahmed, et al. (2020)** who stated that more than half (56.7) of nurses were married

Related to nurses' educational qualification that two third (66%) of the studied nurses' had Institute nursing education (53.3%). Agreed with **Ahmed, et al. (2020).** Who stated that three quarter of the nurses had Institute nursing education.

Disagree with **Bahrambeygi, et al. (2018).** Who stated that Most participants had earned a bachelor's in nursing.

Regarding the nurses' years of experience more than half of the studied nurses' (56%) were from 5-10 years. Agreed with **Yesuf et al. (2021).** Who stated that 46.8% of the studied sample were from 6- 10 years of experience.

Regarding the training program the present study found that the majority of the studied subjects (92%) didn't attend any training courses related to preventive measures of VTE. In the same line with **Oh, et al. (2017)** who reported that only 9·3% of participants reported having received in-service venous thromboembolism education from their hospital.

Secondly: effect of training regarding preventive measures of VTE.

The study revealed that 82% of the study nurse had unsatisfactory level of knowledge regarding preventive measures of VTE pre program implementation this may be due to workload, lack of concentration and insufficient knowledge overloaded by more duties and having

more work hours. Agreed with **Al-Mugheed, & Bayraktar, (2018)** who stated that they had inadequate knowledge on deep vein thrombosis risks, preventive measures, and poor practices with respect to the prevention of deep vein thrombosis.

    Supported by Yan et al., (2021) who stated that the overall knowledge level of the nurses was not optimistic. In the same line with **Gao, et al (2021) and Wang, et al (2021).** Who found that the of the studied nurses had low knowledge.

    The current study revealed a significant improvement post program implementation. Agreed with **Mugheed, and Bayraktar, (2021)** who found that a significant post-intervention improvement in knowledge, skills, attitudes, self-learning, study satisfaction, critical thinking and problem-solving skills of the nursing students.

    Thirdly: effect of training program on nurses' practices regarding preventive measures of VTE:

    The study revealed that (92%) of the study nurse had unsatisfactory level of practice regarding preventive measures of VTE pre program implementation this may be due to poor skills, lack of concentration and interruptions.

    Supported by **Zhou, et al (2019).** who showed that deficiencies among medical staff in knowledge and awareness of the management of VTE. Disagreed with **Zheng, et al (2017)** who found that the clinical staff have already realized the importance of VTE prevention.

    The current study revealed that there was improved post program implementation. In the same line with **Lau, et al (2017)** who illustrated that education for nurses significantly improves their practice.

    Fourthly: Relation between total nurses knowledge and their practices regarding preventive measures of VTE

    The current study revealed that were a positive correlation between total nurses' knowledge and practice at pre, post and follow up program implementation. This might due to the training program improved the nurses' knowledge and practice regarding preventive measures of VTE.

    This result agreed with **Hami, and Hussein (2020**) who stated that there is a highly significant differences related to nurses' knowledge regarding

nursing management for thrombolytic treatment for acute myocardial infarction patients; between pre and post-test in the study group.

    On the other hand, this result disagreed with **Mohammed et al., 2018).** Who found that there is no statistically significant relation between total knowledge scores and items of practice.

    This result is contraindicated with **Sun, et al. (2018)** who found that A wide gap exists with regards to the knowledge and application of mechanical thromboprophylaxis for venous thromboembolism.

Conclusion

    Based on the findings of the current study, it can be included that majority of the nurses were having an unsatisfactory performance (knowledge and practice) regarding preventive measures of VTE pre the program implementation. Meanwhile, the majority of the studied nurses had got statistically significant improvement in their performance post the program implementation, while this improvement lowered slightly post three months at follow up, which supported the study hypothesis.

Recommendations

    Based on results of the present study the following recommendations can be suggested:

    1.Continuous in-service training programs about preventive measures of VTE.

    2.The importance of establishing booklet guideline for critical care nurses regarding preventive measures of VTE.

    3.Regular meetings between nurses and their supervision should be conducted to evaluate and find way for improvement.

    4.Further studies and researches are recommended

References

Abo El_Ata, A. B., Baghdady, E. G. and Khedr, F. A. (2019). Nurses' performance regarding preventive measures of pulmonary embolism in port said hospital. scientific journal of nursing Vol (6), No(2).

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. Vol, (8) No, (20), March, 2020, pp (13- 20).

Ahmed, N. M., Ahmed, G. H. & Khalil, S. S. (2020). Effect of Nursing Protocol on Nurses' Performance and Venous Thromboembolism Risks Among the Patients with Cancer Undergoing Surgery. Assiut Scientific Nursing Journal. Vol, 8(22): 22-35

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.

Bahrambeygi, F, Shojaeizadeh, D., Sadeghi, R., Nasiri, S. and Ghazanchaei, E. (2018) The Effectiveness of an E-Learning Program on Nurse's Knowledge and Behavior for Caring of Patients with Thromboembolism: A Comparative Study. Journal of Nursing and Healthcare Management ISSN: 2639-7293 Page:4

Barkoudah, E.,Piazza, G., Hecht, T. E. H., Grant, P., Deitelzweig, S., Fang, M. C., Fanikos, J., Kao, C. K., Barnes, G. D., Chen, T., Ramishvili, T., Schnipper, J. L., Goldstein, J. N., Ruff, C. T., Kaatz, S., Schwartz, A., Connors, J. M., and Goldhaber, S. Z. (2020). Extended Venous Thromboembolism Prophylaxis in Medically Ill Patients: An NATF Anticoagulation Action Initiative. 2020 May;133 Suppl 1:1-27.

Craven, R. F, Constance, J. and Henshaw, C. (2020). Fundamentals of Nursing: Concepts and Competencies for Practice. 9th ed. Wolters Kluwer Health/Lippincott Williams & Wilkins. Pp. 78, 102:104.

Crosby DA, McHugh A, Ryan K, Byrne B. (2021). Antenatal venous thromboembolism. The Obstetrician & Gynaecologist.; 23:206–12.

Devis P, Knuttinen MG. (2017). Deep venous thrombosis in pregnancy: incidence, pathogenesis and endovascular management. Cardiovasc Diagn Ther; 7Suppl 3:S309–19.

Elhefnawy, K. A. and Elsabagh, E. E.(2019)" Effect of Mechanical Measures on Prevention of Deep Vein Thrombosis among postpartum cesarean section" .IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 8, no.05, 2019, pp. 61-74.

Elkattan. B, A. and Elderiny, S. N. (2019). Effect of Nursing Care Guidelines on Preventing Deep Venous Thrombosis among Patients Undergoing Arthroplastic Surgery. International Journal of Novel Research in Healthcare and Nursing Vol. 6, Issue 2, May – August; 758-763.

Gao, X., Qin, H., Hang C, Wang, K., Shi Y, Qian L, Zhou, Y., Lie, Y. and Yan T., (2021). Knowledge, Behaviors, and Attitudes Regarding Venous Thromboembolism Prophylaxis: A Survey of Clinicians at a Tertiary Hospital of China 2021 Apr;72:365-372.

Goubran, H. A., Sholkamy, S., El-Haddad, A., Mahmoud, A., Rizkallah, M. A., & Sobhy, G. (2012). Venous thromboembolism risk and prophylaxis in the acute hospital care setting: report from the ENDORSE study in Egypt. Thrombosis journal, 10(1), 20. https://doi.org/10.1186/1477-9560-10-20

Hami, H. B. and Hussein H. A. (2020) Effectiveness of an Educational Program on Nurse's Knowledge Regarding Nursing Management of Thrombolytic Therapy for Patients with Acute Myocardial Infraction at Teaching Hospitals and Cardiac Care Centers in Baghdad City Volume 24 - Issue 9. May 2020 Pages: 1609-1620.

Haza'a1, A. A., Al-Qubati, F. A., Mohammed, M. A., AbdEL-Aziz, M. M. and Mehany, M. M. (2021) Effect of An Educational Program on Critical Care nurse's Knowledge and Practice Regarding Complications of Pulmonary Embolism. International Journal of Novel Research in Healthcare and Nursing. Vol. 8, Issue 2, pp: (370-383).

Hinkle, J. L. and Cheever, K. H. (2018). Brunner and Suddarth's textbook of medical surgical nursing.14th ed. Wolters Kluwer Health/ Lippincott Williams and Wilkins. P. 2351.china

Hussein, A. A., Mohammad, Z.A., Elkady, H. and Ghanem, H.M. (2020). Effect of Educational Nursing Protocol on Minimizing Venous Thromboembolism for Patients Undergoing Simultaneously Arthroscopic ACLR and High Tibial Osteotomy. Assiut Scientific Nursing Journal; 8(20): 75-84.

Ignatavicius, D.D., Workman, M. L Rebar,C. R., & Heimgartner, N. M.(2020). Medical-surgical nursing concept of inter-professional collaborative care. 9th ed. Saunders, an imprint of Elsevier Inc. pp. 799.

Lau, B. D., Shaffer, D. L., Hobson, D. B., Yenokyan , G., Wang, J., Sugar, E. A., Canner, J. K., Bongiovanni, D., Kraus, P. S., Victor O Popoola, V. O., Shihab, H. M., Farrow, N. E., Aboagye, J. K., Pronovost, P. J., Streiff, M. B. and Haut, E. R. (2017). Effectiveness of two distinct web-based education tools for bedside nurses on medication administration practice for venous thromboembolism prevention: A randomized clinical trial 2017 Aug 16;12(8):e0181664.

Lee SI, Allen R and Garfin S (2019). Venous thromboembolism in spine surgery: Review of the current literature and future directions.Seminars in Spine Surgery 31: 1-5.

Lynn, P. (2018). Taylor's clinical nursing skills: a nursing process approach. Lippincott Williams & Wilkins.4th ed.,307-312.

Marrochi, L. C. (2017). Prophylaxis of Venous Thromboembolism in Home Care: An Integrative Review;35(5):268-276.

Marissa E (2016): Conventional and age-specific risk factors for venous thrombosis in older people: the AT-AGE. s Leiden University. http://hdl.handle.net/1887/37409. accessed in June, 2016.

Mohammed, A.S., Taha, N. M. and Abd El-Aziz, E. M. (2018). Nurses' Performance Regarding Venous Thromboembolism Prophylaxis at Intensive Care Unit. Zagazig Nursing Journal January; 2018 Vol. 14, No.1

Mugheed, K. A. and Bayraktar, N. (2021). Effectiveness of Flipped Classroom among Nursing Students on Venous Thrombo-embolism (VTE) Nigerian Journal of Clinical Practice ¦ Volume 24 ¦ Issue 10 ¦ October 2021

Oh, H., Boo, S. and Lee, J(2017). Clinical nurses' knowledge and practice of venous thromboembolism risk assessment and prevention in South Korea: a cross-sectional survey. 2017 Feb;26(3-4):427-435. doi: 10.1111/jocn.13424

Queensland Clinical Guidelines. Venous thromboembolism (VTE) in pregnancy and the puerperium. Guideline MN20.9-V7-R25. Queensland Health. 2020. Available from: http://www.health.qld.gov.au/qcg

Rocher, W. D., Page, T., Rocher, M. and Nel, D. (2019) Venous thromboembolism risk and prophylaxis prescription in surgical patients at a tertiary hospital in Eastern Cape Province, South Africa. Affiliations. 2019; 109(3):178-181.

Sandström, K., Guðnadóttir , G., Wilhelmson, K., Kristjánsdóttir,H., and Lennart Stigendal, L. (2017). Venous thromboembolism prophylaxis in medical patients at Sahlgrenska University Hospital] 2017 May 30;114:EH7X

Sun, B., Tang, X., Liang, L. and Tong, Z. (2018). A survey of knowledge and application of mechanical thromboprophylaxis among the medical staff of intensive care units in North China. 2018 Apr;12(4):1591-1597. doi: 10.1111/crj.12715

Wang, Y., Wu, X., Ma, Y., Xu, Y., Wang, X., Zhu, C., Cao, J., Jiao, J., Liu, G., Li, Z., Liu, Y. and Zhu, L. (2021). Chinese orthopaedic nurses' knowledge, attitude and venous thromboembolic prophylactic practices: A multicentric cross-sectional survey. 2021 Mar; 30(5-6): 773–782. Published online 2021 Jan 31. doi: 10.1111/jocn.15615

Yan T, He W, Hang C, Qin L, Qian L, Jia Z, Shi Y, Xu Y. (2021). Nurses' knowledge, attitudes, and behaviors toward venous thromboembolism prophylaxis: How to do better. Vascular. 2021 Feb;29(1):78-84. doi: 10.1177/1708538120933782.

Yesuf, N. N., Abebe, T., Adane, R., Lelisa, R., Asefa, M., Tessema, M. and 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 August (2021) 100357

Youness, E. M., Hassen, H. Y. and Azer, S. Z. (2016). Effect of Educational Nursing program on reducing the incidence of Venous Thromboembolism among postpartum women. IOSR Journal of Nursing and Health Science. Volume 5, Issue 4 Aug. PP 53.

Yu-Fen, M., Yuan, X., Ya-Ping Chen, X.-J.-W., Hai-Bo Deng, Y. H., & Xin-juan, W. (2018). Nurses' objective knowledge regarding venous thrombo-embolism prophylaxis: A national survey study. Medicine, 97(14).; 97(14): e0338

Zhang J and Sun J L. (2020). Severe venous thromboembolism in the puerperal period caused by thrombosis: A case report. World

Journal of Critical Cases. 2020 Apr 6; 8(7): 1311–1318

Zheng, E., Tang, Y., Yang , M., Che, G., Zhang, J., Du, N., Cheng, N., and Hu, X. (2017). Current Status of Prevention and Nursing on Venous Thromboembolism among Perioperative Patients with Lung Cancer. 2017 Oct 20;20(10):661-666. doi: 10.3779/j.issn.1009-3419.2017.10.01.

Zhen, K., Dong, F., Fang, F., Gao, Q., Zhang, Z., Xia, L., Wang, W., Yang, P., Jia, C., Liu, P., Zhai, Z. and Wang, C. (2021). Evaluation of In-Hospital Venous Thromboembolism Prevention and Management System Using Hospital-Level Metrics: A Nationwide Cross-Sectional Survey in China. 2021 Sep 24. doi: 10.1097/PTS.0000000000000900.

Zhou, W., He, J., Guo , S., Walline, J., Liu, X., Tian, L., Zhu, H., Yu, X. and Li, Y. (2019). Venous thrombo-embolism in the emergency department: A survey of current best practice awareness in physicians and nurses in China.; 10(1):5-13.