Effect of Education Program about Deep Venous Thrombosis among Pregnant Women in Antenatal Clinic

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ABSTRACT

Background: Deep venous thrombosis is an acute condition resulting in maternal morbidity and death. **Aim:** To evaluate the effect of education program about deep venous thrombosis among pregnant women in antenatal clinic. **Design:** A quasi-experimental pretest-posttest control group design. **Setting:** The study was conducted at the antenatal outpatient clinic at Woman's Health Hospital, Assiut Governorate. **Subjects:** A purposive sample of 200 pregnant women (100 pregnant women for each study and control groups). **Tool I:** A Structured interview questionnaire: divided to 3 parts. Part (1): Personal data, part (2): Medical and obstetric history, part (3): Pregnant women knowledge about deep venous thrombosis (DVT). **Tool II:** Reported checklist for pregnant women regarding DVT preventive measures practices. **Tool III:** Post-natal maternal outcomes' follow up. **Results:** The majority of pregnant women were more than 35 years. There were highly statistical significant differences between knowledge and practice scores regarding DVT preventive measures pre and post program**. Conclusion:** It could be inferred that the level of pregnant women's knowledge and practices toward DVT preventive measures in the study group was significantly improved by the effect of the educational program when compared with the control group. **Recommendation:** Integration of education programs regarding DVT preventive measures among pregnant women in the antenatal routine care.

Keywords: Education Program, Deep Venous Thrombosis &Pregnant Women.

INTRODUCTION

Deep venous thrombosis (DVT) is one of the common causes of maternal mortality however; it could be a preventable condition. DVT complications can be fatal. Venous thromboembolism (VTE) is classified into two categories; DVT and pulmonary embolism (PE), both are considered symptoms of same disease. DVT is more common than PE in pregnancy **(Ahmed et al., 2020).** Pregnant women are four times more likely to develop DVT than others of childbearing age, with the highest rate during the third trimester. So the pregnancy itself is considered one of the major risk factors of DVT **(Khan et al., 2017).**

Thrombotic embolism represents 9% of the pregnancy-related deaths, as the fifth cause coming after mental conditions, hemorrhage, cardiac cause and infection. More than 80% of pregnancy-related mortalities can be preventable conditions, according to the Centers for Disease Control and Prevention (CDC) statistics which counts and review all the potential measures to prevent future deaths through studying the pregnancy-related deaths' circumstances to identify the best recommendations **(CDC, 2022).**

DVT is defined as the development of blood clots in the deep veins. If these lower limbs' blood clots traveled to the lungs' blood vessels and blocked it, this can result in developing PE which is a life threatening status. DVT is always clinically manifested by limb swelling, warmth, pain, redness, fever which may be in low-grade, and pallor or even cyanosis in the affected limbs because of the inflammation caused by the thrombus formation. In the pregnant women, DVT related-discomfort or pain often represents from 80% to 95% of cases and edema represents 80% to 88% in the lower extremities **(Razan et al., 2019).**

DVT related risk factors are recurrent deliveries, Diabetes Mellitus, presence of varicose veins, inflammatory bowel syndrome (IBS), urinary tract infections, chronic hospitalization, increased body mass index (BMI) equal or exceeding 30 kg/m2, age of 35 years or above, all

have been found to have a strong link with DVT development in pregnancy. Mechanical prophylaxis is one of the most important components of Virchow's triad which increases lower limbs venous flow and prevents stasis of venous blood. It involves also practicing exercises and physiotherapy, using the graduated compression stockings, foot pumps, and devices causing an intermittent pneumatic compression as well **(Bagaria & Bagaria, 2011).**

Nurses are considered always the frontline in managing pregnancy related and even the post-delivery conditions through applying prevention, monitoring the therapeutic regimens and DVT treatment as well. The nursing staff can utilize can use numerous measures for DVT prevention among the high-risk group which include: planned mobility, limb exercises, breathing exercises, application of compression stocking, or intermittent calf muscle compression as well as the maintenance of proper hydration as a non-pharmacological measures. In addition, the pharmacological measures which include the administration of anticoagulant or antithrombotic medications **(Malk et al., 2022).**

Significance of study:

DVT or thrombo-embolic condition is one of the 80% avoidable illnesses during pregnancy which have a higher prevalence in pregnant women than non-pregnant. This condition is insidious, rapidly developing and life threatening

(**Malk et al., 2022**). There are limited studies that worked on the DVT awareness improvement among the risk pregnant women. Therefore, it is essential to develop and implement an educational program for pregnant women for enhancing their knowledge and practices regarding DVT preventive measures.

AIM OF THE STUDY

To evaluate the effect of education program about deep venous thrombosis among pregnant women in antenatal clinic.

Research hypothesis:
H0: The implemented education program is expected to have no effect on pregnant women's knowledge and practices regarding DVT preventive measures than who didn't receive.
H1: The implemented education program is expected to have an effect on improving pregnant women's knowledge and practices regarding DVT preventive measures than who didn't receive.

SUBJECTS AND METHODS

Research design

A quasi-experimental (Pretest-posttest control group design).

Quasi-experimental designs included both a control and treatment group. It differs from true experimental design in that there are no random assignments to groups. In this design, the pretest and posttest to both the treatment and control groups were done. The advantage of the pretest-posttest design is that not only can the researcher determine if there is a difference between experimental and the control group, but also can determine how much of a change or how much growth there was between the pretest and the posttest (**Cook et al., 2020).**

Setting:

The study was conducted at the antenatal clinic at Woman's Health Hospital, Assiut, Egypt. It is a tertiary hospital and the largest one in Upper Egypt which provides Antenatal care and follow-up for pregnant women from Assiut Governorate.

Subjects:

The current study recruited 200 pregnant women in the third trimester, attending to the Antenatal Clinic. (100) were assigned for the study group and (100) for the control group.

Sampling technique: A purposive sample of 200 pregnant women was used. The researchers selected the women based on the following inclusion criteria.

Inclusion criteria: Pregnant women who had previous history of thromboembolic disorders, chronic diseases as hypertension, DM, varicose veins and agreed to participate in the study.

Exclusion criteria: women who diagnosed with DVT in the current pregnancy, critical illness and psychiatric disorders.

Regarding sample size; was calculated using G power software

version 3.1.3 **(Faul et al., 2007)**, using student t test for comparing the difference of mean of knowledge between two independent groups under the study (receiving health education program and control group) with the following parameters, effect size 0.5 (assumed), alpha error 0.05, power (1- beta error prob) 0.95, one tailed. The required sample size will be 88 subjects in each group with total 176 subjects with additional 10% to compensate non responsive rate. A sample size of 200 was obtained and utilized for the study.

Data collection tools:
Three tools were used.
Tool I: A Structured interview questionnaire.

This tool was designed by the researchers included three parts.

Part (1): Personal data as (age, level of education, occupation, residence, reported weight and height before pregnancy, BMI calculation, and telephone number).

Part (2): Medical and obstetric history: As (parity, type of delivery & number of caesarean sections (CS), past thromboembolic disorders, taking any medications during pregnancy for thrombo-prophylaxis treatment, history of using contraceptive methods, weeks of gestation, ante natal follow up, risk factors of DVT with current pregnancy).

Part (3): Pregnant women knowledge about DVT (pre/post): It consisted of 33 different types; open ended, yes or no, and multiple choice questions as, what is DVT, sign and symptoms, the risky group,

preventive measures for DVT, what is PE, and main source of information **(Lim et al., 2022)**.

Scoring system of tool I: Each response was determined by the researcher against model answer as correct or incorrect and scored as follows: correct answer was given (1 point) and incorrect answer was given (zero) with a total score (33) classified into three levels as follows: <60% (19 of total score 33) considered low level of knowledge. 60-80% (20- 27 of total score 33) considered moderate level of knowledge, and >80% (≥28 of total score 33) considered high level of knowledge.

Tool II: Reported checklist for pregnant women regarding DVT preventive measures practices: (pre- post) adopted from **(Craven et al., 2020),** and consisted of (32 statements) mainly encompassed of two domains range of motion (ROM) exercise practice (14 statements), and application of compression stocking (18 statements).

Regarding Scoring System of tool II: The correctly done reported practices were scored (1point) incomplete or incorrect reported practices scored (zero). Total practice score was (32) classified into:
≥75% (≥ 24) considered satisfactory reported practices
<75% (<24) considered unsatisfactory reported practices

Tool III: Post-natal maternal outcomes' follow up (post): It consisted of 8 questions adopted from **(Youness et al., 2016)** as (mode of

delivery, type of anesthesia, duration of hospital stays after CS, medications used after labor, mobility in first and second day after delivery, patient's hydration state, develop of any DVT or PE signs and symptoms as previous, any complications after delivery).

Validity and reliability:

Validity: The tools were reviewed by three experts (one professor of community health nursing and 2 professors of woman health and midwifery nursing) to ascertain validity clarity, relevance, comprehensiveness, understanding and applicability.

Reliability: The value of Cronbach's alpha for tool 1 was 0.86 and for tool 2 was 0.75.

Pilot study:

A pilot study was conducted on 20 women to test the simplicity, clarity, applicability of the tools and to estimate the needed time to fill in. Minimal modifications were done and the participants were included to the study sample.

Ethical Considerations:

The research proposal was approved by the ethical committee of the Faculty of Nursing, Assiut University. The necessary approval was obtained from the director of Women's Health Hospital to carry out the study. The study followed the common clinical research ethical principles. Informed consent was obtained from the pregnant women who were willing to participate in the study after explaining the nature and purpose. Confidentiality and anonymity was assured. Study subjects told that they have the right to refuse to participate or withdraw from the study at any time without harm.

Field work:

It was done through three phases; assessment and planning, implementation, and evaluation. The present study was conducted along eight months started from the beginning of December 2021 to the end of July 2022, to accommodate with drop out cases and postpartum follow up. The meeting was three days per week, Sunday, Tuesday, and Thursday.

Assessment and planning phase:

• The target group was met for obtaining the informed consent after explanation of the aim.

• The baseline data were collected by the study tools through interviewing each woman individually at the predetermined setting as a pre-intervention assessment. The researchers asked them to give comments on the questionnaire items in term of clarity and completeness. Each woman took about 10 to 15 minutes to complete the sheet.

• Interpretation of the collected information was accurately done for determining the individualized needs to be a base for giving the program contents accordingly.

The overall goal of the education program was to enrich the pregnant

women's knowledge and to improve their practices regarding DVT.

- Planning was achieved through equipping, acquiring knowledge, applying practice, and scheduling of program as: the teaching place, session's time and frequency, audiovisual aids, and handouts, etc.

- The teaching sessions were scheduled to be for small groups involve (3-7women per group) conducting one session for each small group and the meeting was scheduled 3 days per week. The time was decided according to the antenatal clinic working hours, from 9 am to 1 pm.

Program Development:

- The education program content was designed by the researchers based on the baseline data obtained from the needs' assessment and after an extensive review done for the recent, current, national and international related literature **(Mbibi& Monsen, 2016 and Lim et al., 2022).** The program content was accurately revised by the 3 experts from various academic specialties; one professor at community health nursing specialty, and two professors from woman health and midwifery specialty, Assiut University.

Implementation phase:

- The program was held in a separate room beside the examination room at the antenatal

clinic which was quite, well ventilated, had enough seats for mothers arranged in a half circle design and had a power supply for the researcher PC needed for PPT and playing videos.

- Greeting firstly, participate motivation through oral expressions for reinforcement, identifying the objectives, discussing the subject outline then getting feedback and facilitating inquires and discussions.

- The sessions were discussed in a simple Arabic language, repeated for each small group to cover the women in all groups according to the schedule to be sure that all were given the same content.

- Each session divided into theory part lasted from 15 to 20 minutes and 5 to 10 minutes for discussions clarifications and questions and the practical part lasted from 15-20 minutes included re-demonstration and role play. Following that, study group participants were handed Arabic colored pictures added brochure including the essential brief information about DVT. On the other hand, the control group was receiving the routine hospital care and instructions.

- Teaching methods and materials: Interactive lectures, group discussions, demonstration, re-demonstration and a role play. The used media was included power point presentation PPT, colored pictures, videos and handouts.

- Each small group (3-7 women) took one educational session to achieve the educational objectives of the program. Each session included: Introduction about the topic, and illustration of main points (etiology, signs and symptoms, risk factors, complication and preventive measures as, early movement e.g., immediate ambulation after delivery and get up and walk around every 20 minutes, drink plenty of fluids as water, active and passive range of motion exercise, leg elevation and use of elastic stockings.

Evaluation phase: It was done through immediate posttest (using tool I part 3 and tool II) and finally post-natal follow up of maternal outcomes (tool III) after two weeks of delivery for both control and study groups.

Statistical design:
Statistical Package for Social Sciences (SPSS) V.26 was used to analyze the acquired data after proper organizing, categorizing, and coding. Numbers, percentages, averages, and standard deviations were used to portray data in tables and charts. Independent t-test, paired sample test and Chi-square Test were used. The linear regression model was done to detect factors that independently influence participants' knowledge regarding DVT. P-value considered statistically significant when ($p < 0.05$).

RESULTS

Table (1): Illustrates personal data among the study and control groups respectively, the mean age was (36.1 ± 6.62, 35.9 ± 6.14), 48.0%, 47.0% had basic education, 92.0%, 95.0% of both groups were house wives, 63.0%, 69.0% were from rural areas and 32.36 ± 6.79, 30.46 ± 6.37 of BMI mean scores before pregnancy indicating obesity in both groups.

Figure (1): Shows 96%, 94% of study and control groups, respectively had a low level of knowledge pre-program.

Table (2): Demonstrates the medical and obstetric history linear regression analysis which highlighted that; maternal age ≥35 years, BMI before pregnancy ≥25 kg/m2, regular ante natal visits, chronic disease history were significantly influencing participants' knowledge regarding DVT.

Figure (2): Illustrates that 50%, 60% among the study and control groups respectively reported having no source of information, while 20% of the study group had more than one source.

Figure (3): Illustrates that 86%, 90% of the study and control groups respectively had unsatisfactory practices regarding DVT preventive measures in the pre-program phase.

Table (3): Illustrates there were significant differences in mean scores of knowledge among both groups regarding DVT post-program.

Table (4): Shows a significant difference in the levels of practice between study and control groups post program at (P≤0.05).

Table (5): Shows statistical significant differences between pre and post knowledge mean score among the study group 3.7±1.5 pre to 27.4±6.9 post at (P≤0.05).

Table (6): Shows statistical significant difference between levels of knowledge mean scores pre and post (3.7 ±1.5, 27.4 ±6.9 respectively) among the study group, also there was a significant difference between

levels of practice mean scores pre and post (2.6 ±1.3, 25.2 ±4.4 respectively) among the study group at (P≤0.05).

Table (7): Illustrates statistical significant differences in the maternal outcomes between the study and control groups post program in relation to; duration of hospital stay, mobility, hydration and developing DVT or PE signs and symptoms at (P≤0.05).

Table (1): Pregnant women personal data (n=200)

Personal data	Study group (n=100)		Control group (n=100)		P value
	N	%	N	%	
Age					
• 15<20 years	9	9.0	5	5.0	
• 20-35 years	16	16.0	11	11.0	0.276
• more than 35 years	75	**75.0**	84	**84.0**	
Means ± SD	**36.1±6.62**		**35.9±6.14**		
Education:					
• Illiterate	12	12.0	25	25.0	
• Basic education	48	**48.0**	47	**47.0**	
• Secondary	27	27.0	20	20.0	0.078
• University	13	13.0	8	8.0	
Occupation					
• House Wife	92	**92.0**	95	**95.0**	
• Employer	8	8.0	5	5.0	0.390
Residence					
• Urban areas	37	37.0	31	31.0	
• Rural areas	63	**63.0**	69	**69.0**	0.370
BMI before pregnancy					
• Normal weight	15	15.0	13	13.0	
• Over weight	17	17.0	19	19.0	
• Obese	45	45.0	39	39.0	0.542
• Very obese	23	23.0	29	29.0	
Means ± SD	**32.36± 6.79,**		**30.46± 6.37**		

*T-test was used to compare the mean difference between the two groups

**Chi-square test was used to compare the difference in proportions
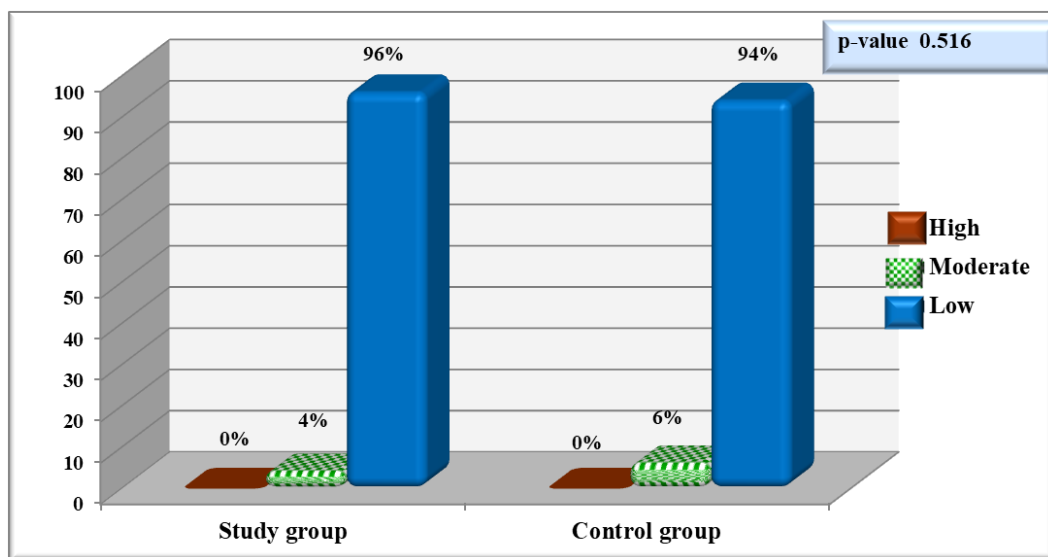
Figure (1): Level of knowledge regarding DVT among both groups pre-program.

Table (2): Linear regression shows the predictors of knowledge regarding DVT among pregnant women.

Variables	β	t	SE	p-value
Age in years	-0.40	-6.19	1.27	0.000
Parity (multipara)	-0.013	-0.19	1.22	0.84
BMI before pregnancy	-0.403	1.206	-6.204	0.000*
Antenatal visits (regular)	-0.500	-8.127	1.0231	0.000*
Chronic diseases(yes)	-0.292	-4.30	1.681	0.000*
Previous thromboembolic disorders (DVT, PE) (yes)	0.033	0.472	1.168	0.636
Previous used of Hormonal contraceptive methods (yes)	-0.015	-0.215	1.055	0.829

Reference group: age, parity (primipara), BMI ≤25 kg/m2, antenatal visits (irregular), previous thromboembolic disorders (no), chronic disease history (no) Previous use of Hormonal contraceptive methods (no).
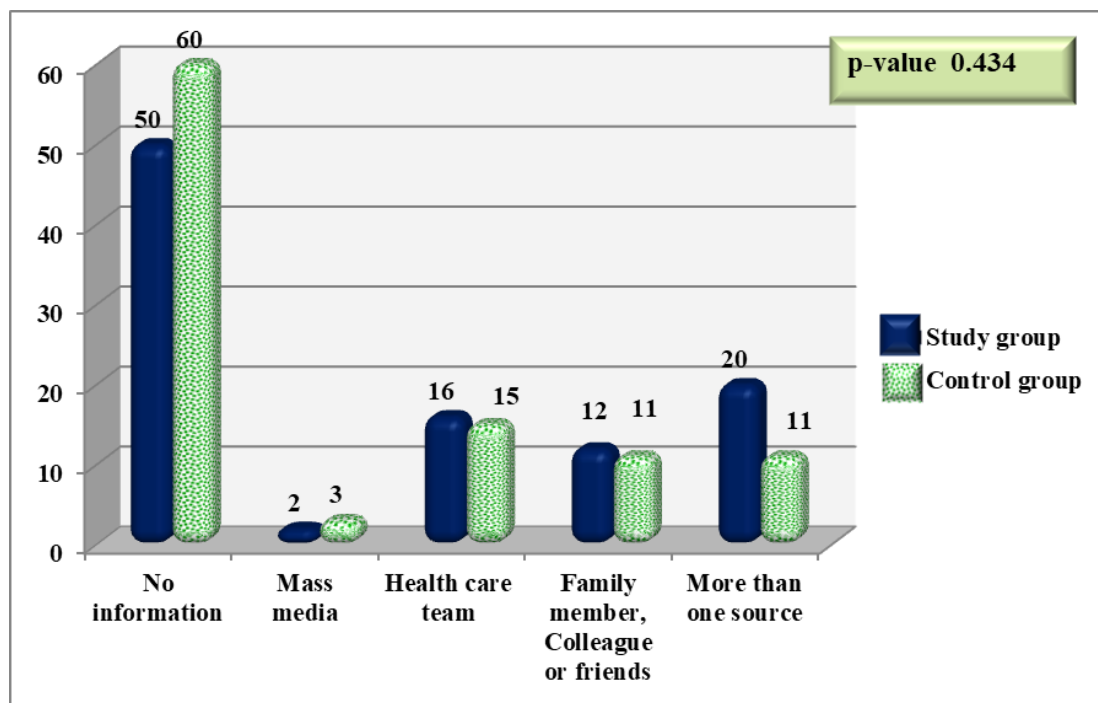
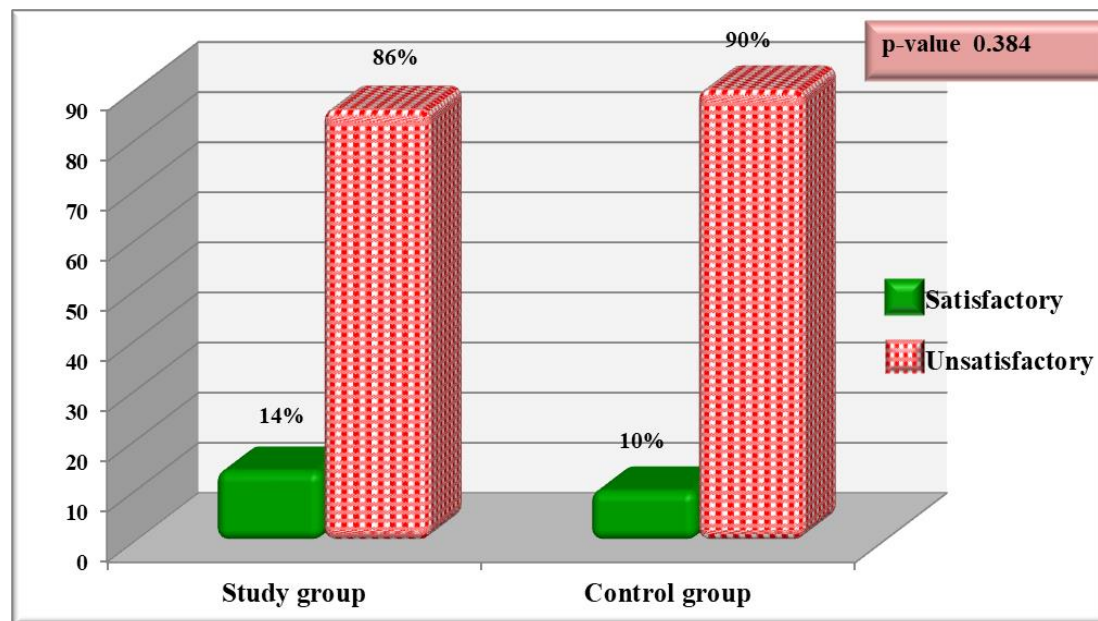**Figure (2): Study and control groups' sources of knowledge regarding DVT pre-program.**

Figure (3): Study and control groups' practices pre-program.

Table (3): Comparison between study and control groups' knowledge post-program

Items	Study (n= 100)	Control (n= 100)	Mean Difference	P value
	Mean± SD	Mean± SD		
Definition of DVT	1.0±0.2	0.88±0.32	0.12	0.002*
Definition of PE	0.9±0.2	0.53±0.20	0.37	<0.001**
Sign and symptoms of DVT	5.5±1.4	0.61±0.23	4.89	0.002**
Sign and symptoms of PE	4.9±1.2	3.2±1.5	1.7	<0.001**
Risky factor groups for DVT	9.6±3.4	7.48±2.25	2.12	<0.001**
Preventive measures	5.5±1.5	2.87±1.61	2.63	<0.001**
Mean± SD	27.4±6.9	13.7±5.3	13.7	<0.001**

Table (4): Comparison between study and control groups' levels of practice pre and post-program.

Practice	Study (n= 100)		Control (n= 100)		P – value
	N	%	N	%	
Pre – Intervention					
• Unsatisfactory	86	86.0	88	90.0	0.384
• Satisfactory	14	14.0	12	10.0	
Post – Intervention					
• Unsatisfactory	21	21.0	80	80.0	<0.001**
• Satisfactory	79	79.0	20	20.0	

Table (5): Study group knowledge pre and post program regarding DVT.

Items	Pre	Post	p-value
	Mean± SD	**Mean± SD**	
Definition of DVT	0.3±0.1	1.0±0.2	0.001**
Definition of Pulmonary embolism (PE)	0.2±0.1	0.9±.0.2	0.001**
Sign and symptoms of DVT	1.1±0.5	5.5±1.4	0.001**
Sign and symptoms of PE	0.2±0.1	4.9±1.2	0.001**
Risky factor groups for DVT	1.0±1.94	9.6±3.4	0.001**
Preventive measures	0.9±0.3	5.5±1.5	0.001**
Mean± SD	3.7±1.5	27.4±6.9	0.001**

**** Paired samples t-test

Table (6): Relation between levels of knowledge and practices among the study group regarding DVT pre and post program.

Items	Pre		Post		P-value
Knowledge levels	**N**	**(%)**	**N**	**(%)**	
Low	96	96	14	14	**0.001****
Moderate	4	4	69	69	
High	0	0.0	17	17	
Mean± SD	**3.7 ±1.5**		**27.4 ±6.9**		**0.001****
Practice					
• Unsatisfactory	86	86	21	21	**0.001****
• Satisfactory	14	14	79	79	
Mean± SD	**2.6 ±1.3, 25.2 ±4.4**				**0.001****

**** Independent samples t-test

Table (7): Maternal outcomes for the study and control groups

Items	Study group (n=100)		Control group (n=100)		P value
	N	%	N	%	
Mode of delivery:					
• Normal	52	52.0	39	39.0	0.065
• CS	48	48.0	61	61.0	
Types of anesthesia:					
• Spinal	36	36.0	44	44.0	
• General	12	12.0	17	17.0	0.172
• No	52	52.0	39	39.0	
Number of hospital stays after CS:	3.77 ± 0.4		7.27 ± 0.6		**0.001**[**]
Mobility in first and second day after delivery:	45	45.0	24	24.0	
• Ambulant	39	39.0	44	44.0	**0.002**[**]
• Limited	16	16.0	32	32.0	
• Very limited					
Mean± SD	1.97 ± 0.3		3.45 ± 0.4		
Patient's hydration state:	12	12.0	29	29.0	
• Dehydrated	88	88.0	71	71.0	**0.003**[**]
• Hydrated					
Develop any of DVT or PE signs and symptoms:					
• Yes	2	2.0	11	11.0	**0.010**[**]
• No	98	98.0	89	89.0	
Developing complications after delivery:					
• No	90	90.0	81	81.0	
• Bleeding	5	5.0	10	10.0	0.150
• Eclampsia	2	2.0	8	8.0	
• Still birth	3	3.0	1	1.0	

Chi-square test and T-test was used to compare the proportions among groups.
([**]) highly statistical significant difference

DISCUSSION

Deep vein thrombosis (DVT) is a fatal and expensive illness that raises the mortality rate for expectant moms and new mothers **Mbibi & Monsen (2016) and Kalaitzopoulos et al., (2022).** The purpose of the current study was to evaluate the effect of education program about deep venous thrombosis among pregnant women in antenatal clinic.

According to the current findings, there were no appreciable differences in mean age between the study and control groups. About two thirds of both groups were over 35 years' which is considered a high risk age for developing DVT, the mean of

BMI before pregnancy was around 32 kg/m2, means obesity and which is a major risk factor for developing DVT. From researchers' point of view, this risky group was in need for the implementation of the current study educational program to highlight the points of prevention as knowledge and practices regarding DVT. It could also be shown that women with obstetric risk factors such as age above 35 years and a history of medical illnesses were more knowledge seekers than other groups, having an increased risk perception and recognition of DVT complications.

These results were consistent with **Devis & Knuttinen (2017)** who noted in the study entitled "Deep venous thrombosis in pregnancy: incidence, pathogenesis and endovascular management" that a number of factors have been linked to the high risk of pregnancy related DVT which are women at age of 35 and older, numerous pregnancies, obesity, and inactivity all at 1.5 to 2 folds of risk. Also, these results were congruent with **Solymoss, (2011) and Youness et al., (2016)** as they reported; the highest risk factor among the studied women was caesarean section followed by age more than 35 years old and prolonged immobilization.

According to the current study findings, less than fifth of women reported that they received their information about DVT from the healthcare team, while half of them had no knowledge regarding the condition. These findings could be clarified that, in our Egyptian culture

most of persons does not prefer to talk about problems or complications it may happen as a sort of pessimism. These results were consistent with **Youness et al., (2016)** study, which denoted that nurses account for 38.0% of women's knowledge sources, followed by doctors by 29.5%.

The current study findings highlighted no significant difference between the study and control groups regarding knowledge, pre-program, as both groups had a low level of knowledge. It might be as a result of the lack in education programs on venous thromboembolism as a problem appearing during pregnancy. This study agreed with **Lim et al., (2022)** who reported that more than three-quarters of participants had lack of knowledge and only one quarter had high level of knowledge.

In the current study, significant differences were found among the study group pre and post knowledge indicating that the intervention had improved the study group's knowledge. This finding was similar to **Youness et al., (2016)** who found that postpartum women's awareness and knowledge about venous thromboembolism were significantly higher after a health educational program.

Concerning the pregnant women's practices toward DVT preventive measures, the current findings revealed no statistical significance differences between the study and control groups regarding levels of practice in the pre-program

phase. This might be due to slightly half of studied sample were from a low educational level. Regarding the relation between pre, posttest of practices of DVT preventive measures, the results clarified; minority of the studied women had a satisfactory practice level pre-program, which was improved post program to more than three quarters. This could clarify the poor skills among women about the range of motion exercises and wearing elastic compression stockings.

This highlighted that the current study was effective in making a change in women healthy practices toward prevention of one of the major complications which may be a life threatening condition. Therefore, this underlies the need for keeping more attention and consideration from healthcare professionals particularly the nurses or midwives during antenatal care in form of giving education sessions to enhance their practice regarding DVT, or at least to distribute a guiding brochure.

These findings were supported by **Malk et al., (2022)** in the study entitled "Efficacy of Training Program on Nurses Performance regarding Preventive Measures of Venous Thrombo-embolism among Critical Pregnant Women" which revealed (92%) of the studied sample had unsatisfactory level of practice regarding preventive measures of VTE pre implementation of program.

In accordance to the relation between the categories of knowledge and practices regarding DVT preventive measures, the present findings clear a significant difference between categories of knowledge and practice during the two phases of the study pre and post at p-values = 0.001. This finding was in same line with **Malk et al., (2022)** where it indicated that there was a significant positive relation between participants' knowledge and practice at different stages of the program (pre, post program and follow up).

The current study denoted that CS deliveries accounted for less than half of deliveries among the study group vs. more than one third in the control group. This finding was in line with **Youness et al., (2016)**, who found that nearly half of the study women in the intervention and control groups, respectively, had caesarean deliveries (42.0 vs. 45.5%).

Regarding the effect of the educational program on the prevalence of DVT in expectant women, the current study revealed; among the 100 pregnant women who represented the study group and received the education program, only two women had complained from the signs and symptoms of DVT, compared to 11 in the control group. This difference between the two groups was highly statistically significant.

These findings were in line with **Youness et al., (2016)** where highlighted that postpartum women are more likely to experience VTE. As a result of the nursing educational program, it was shown that the

intervention group had just one case of DVT out of total number of cases, whereas the control group had three new cases of VTE; two DVT and one case of PE.

CONCLUSION

It could be inferred that the level of pregnant women's knowledge and practices toward DVT preventive measures in the study group was significantly improved by the effect of the educational program when compared with the control group, which support the research hypothesis.

RECOMMENDATIONS

1. Integration of education programs regarding DVT preventive measures among pregnant women in the antenatal routine care.
2. The Arabic booklet regarding preventive measures of DVT as an education material should be available in all antenatal clinics.
3. Further studies are needed using large samples to assess women's awareness regarding DVT.

Conflict of interest: The authors have no conflict of interest to disclose.

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