

## Raising the Awareness of Pregnant Women Relying on Anticoagulant Agents for Improving Uteroplacental Circulation

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### Abstract

**Background:** Managing anticoagulant therapy during pregnancy requires a comprehensive and individualized approach to ensure the safety and well-being. Maternal nurses play a pivotal role in managing pregnant women undergoing anticoagulant therapy. Their responsibilities encompass comprehensive patient education, meticulous monitoring, and collaborative care coordination. **Aim:** To raise awareness of pregnant women who rely on anticoagulant agents for improving uteroplacental circulation. **Research Design:** A quasi-experimental research design was utilized in this study. **Setting:** This study was conducted at Om El Masryeen Hospital in Giza, Egypt. **Subjects:** A convenient sample (seventy) of pregnant women. **Tools:** Three tools were used to collect data in this study. The first tool was a structured interviewing questionnaire of pregnant women. The second tool was the pregnant women's knowledge assessment questionnaire. The third tool was a checklist to assess pregnant women's practices toward the administration of anticoagulant agents. **Results:** more than half (54.3%) of women had unsatisfactory knowledge pre-intervention, and the majority (87.1%) of women had satisfactory knowledge post-intervention. more than two-thirds (64.3%) had unsatisfactory practices pre-intervention and increased to the majority (81.4%) post-intervention. **Conclusion:** There was a statistically significant improvement in women's knowledge and practices post-intervention. Additionally, there was a highly statistically significant positive correlation between total women's knowledge and reported practices regarding anti-coagulant use pre-& post-intervention. **Recommendations:** Re-study women with similar circumstances.

**Keywords:** Anticoagulant, Awareness, Pregnant Women.

### Introduction

Pregnancy lasts about 40 weeks from the first day of the last menstrual period and is divided into three trimesters, each with unique developmental milestones. During this time, a woman's body undergoes several physiological changes to support the fetus, including hormonal fluctuations and increased blood volume. Common early signs of pregnancy include missed periods, tender breasts, nausea, and fatigue (Swanson & Liu, 2022). Pregnancy leads to increased blood clotting, or hypercoagulability, due to elevated levels of coagulation factors such as fibrinogen, factors VII and VIII, von Willebrand factor, and factor X. Additionally, there is a decrease in free protein S, a natural anticoagulant, along with increased resistance to activated protein C and reduced fibrinolysis from higher levels of plasminogen activator inhibitors. D-dimer levels are also elevated during pregnancy (Alsaeed et al., 2024).

Hypercoagulability develops in pregnancy to protect women from major hemorrhage at the time of miscarriage or childbirth. The risk of venous thromboembolism (VTE) in pregnancy is increased fivefold and continues into the postpartum period. Therefore, thrombotic complications in pregnancy are a major cause of morbidity and mortality for both the mother and the child (Zachariah et al., 2024). Managing anticoagulant therapy during pregnancy

requires a tailored approach to ensure the safety of both mother and child. Low Molecular Weight Heparins (LMWHs), like enoxaparin, are preferred due to their safety and minimal placental transfer. Unfractionated Heparin (UFH) may be used for specific cases, such as women with mechanical heart valves. Vitamin K antagonists, such as Warfarin, are generally avoided because of their teratogenic risks (Obeagu et al., 2023).

Anticoagulant therapy during pregnancy is essential for preventing thromboembolic events but poses risks for both mother and fetus. Maternal complications include a higher likelihood of bleeding, requiring careful monitoring and dose adjustments. Prolonged use of heparin-based anticoagulants may also decrease bone density, increasing fracture risk. (Varrias et al., 2023). Fetal complications are particularly concerning with certain anticoagulants. Warfarin, for instance, crosses the placenta and has been linked to congenital malformations, especially when exposure occurs during the first trimester. These malformations can include facial abnormalities, hypoplastic digits, and central nervous system defects. Furthermore, exposure to anticoagulants, particularly oral anticoagulants like warfarin, has been associated with increased risks of miscarriage, stillbirth, prematurity, and low birth weight (Bukhari et al., 2022).

Anticoagulant therapy is crucial for pregnant women at risk of thromboembolic events, but its effectiveness relies on their understanding of the treatment. Limited knowledge often leads to non-adherence, improper dosing, and increased risks of complications. This highlights the need for comprehensive education and counseling from healthcare providers to ensure pregnant women are informed about the purpose, benefits, and risks of anticoagulant use during pregnancy (Capecci et al., 2024).

Maternal nurses play a pivotal role in managing pregnant women undergoing anticoagulant therapy, ensuring both maternal and fetal well-being. Their responsibilities encompass comprehensive patient education, meticulous monitoring, and collaborative care coordination. Educating patients is paramount; nurses provide detailed information about the purpose, benefits, and potential risks of anticoagulant therapy during pregnancy. Nurses instruct on proper medication administration, adherence to prescribed dosages, and recognition of signs indicating complications such as bleeding or thrombosis (Yeomans & Gilstrap, 2021).

Monitoring involves regular assessment of the patient's clinical status, including observing for any signs of bleeding or thrombotic events. Nurses coordinate laboratory testing, such as anti-Xa levels for those on low molecular weight heparin, to ensure therapeutic efficacy and safety. They also evaluate the patient's understanding and adherence to the therapy, addressing any concerns or misconceptions that may arise (Villa et al., 2022). Maternal nurses serve as liaisons between obstetricians, hematologists, and other healthcare professionals to develop and implement personalized care plans. They ensure that all aspects of the patient's health are taken into account, particularly when planning for labor and delivery. Effective anticoagulation management is crucial during this time to minimize the risk of bleeding. Additionally, postpartum care is part of their responsibilities, as the risk of thromboembolism remains elevated. This underscores the need for ongoing vigilance and support for the patient (Dwyer et al., 2024).

Educating patients is paramount; nurses provide detailed information about the purpose, benefits, and potential risks of anticoagulant therapy during pregnancy. Nurses instruct on proper medication administration, adherence to prescribed dosages, and recognition of signs indicating complications such as bleeding or thrombosis. This education empowers pregnant women to actively participate in their care, promoting compliance and early detection of adverse events. Nurses also evaluate the patient's understanding and adherence to the therapy, addressing any concerns or misconceptions that may arise (Obeagu et al., 2023).

### Significance of the study:

Pregnancy increases the risk of VTE by approximately five to ten times compared to non-pregnant women, and the postpartum risk is 15 to 20 times higher. The risk persists for nearly 12 weeks postpartum. Studies indicate that the overall morbidity of thrombosis during pregnancy is approximately 0.2%, with 20% attributed to arterial thrombosis and 80% to venous thrombosis. Venous thrombosis accounts for a mortality rate of 1.1 per 100,000 cases and is responsible for approximately 10% of maternal deaths (Bukhari et al., 2019).

In Egypt, the incidence of women perceived at VTE risk is reported to be 8.22%, with nearly half categorized as mild cases. The risk of VTE is notably higher during the postpartum period than during pregnancy (Ibrahim et al.,

2024). This emphasizes the growing need to address awareness and proper management of anticoagulant use to improve maternal and fetal outcomes.

LMWH and thrombolytic therapy play a crucial role in reducing the risk of VTE and improving both maternal and fetal health outcomes during pregnancy. Their use is pivotal in managing high-risk pregnancies and preventing the potentially fatal complications associated with thromboembolic events. It is especially important in the postpartum period, where the risk of VTE is 15-20 times higher (Linnemann et al., 2020).

Recently, the incidence of pregnant women relying on anticoagulant agents in Egypt has increased. As a result, there is a growing need to raise awareness among these women about the proper use and administration of these medications to prevent potential side effects and complications. This study aims to educate pregnant women who use anticoagulant agents, providing them with the necessary information to improve the administration of these medications and enhance uteroplacental circulation.

**Aim of the Study:** The study aimed to raise awareness among pregnant women who rely on anticoagulant agents to improve uteroplacental circulation. Through the following objectives

- Assess the pregnant woman's knowledge regarding anticoagulant agents during pregnancy.
- Assess the pregnant women's practices toward the administration of anticoagulant agents during pregnancy.
- Design an educational booklet regarding the administration of anticoagulant agents during pregnancy.
- Evaluate the effect of the educational booklet on pregnant women who rely on anticoagulant agents for improving uteroplacental circulation.

**Research Hypothesis:** The awareness of pregnant women who rely on anticoagulant agents during pregnancy will improve after receiving the educational booklet.

## Subjects and Method

**Research design :** A quasi-experimental research design was utilized in this study.

**Research setting :** This study was conducted at Om El Masryeen Hospital in Giza which consists of four buildings Administrative Building, a general Building, an emergency Building, and a diabetes Clinics Building, which considers the later modern was renovated eight years ago, it well equipped, and consist of two floors, the first floor contains the central sterilization unit, the laundry, and stores, and the upper floor consist of many different clinics.

**Sample type:** A convenient sample.

**Sample size:** Seventy pregnant women at Om El Masryeen Hospital in Giza. They attended for three months from the beginning of April to the end of June.

**Sample technique:** the researcher visited the study setting three days per week (Saturday, Monday, and Wednesday), and attended from 9.00 a.m. to 12:00 p.m. to collect data. The number of women ranged from 2 to 3 times, and sometimes may reach 4.

**Tools for data collection :** Three tools were used for data collection.

**Tool I: A structured interviewing questionnaire of pregnant women:** Data was collected through a structured interview questionnaire. It was developed by the researcher. It was written in English and translated into simple Arabic for assessing pregnant women's characteristics, health history, of knowledge regarding the use of anticoagulant agents for improving uteroplacental circulation. It consisted of two parts.

**Part (I): Socio-demographic characteristics of pregnant women,** which included age, level of education, occupational status, residence, and family income.

**Part (II): Health history of the studied pregnant women,** which consisted of past obstetrical history including previous pregnancy, number of abortions, previous pregnancy complications, types of complications, type of labor, receiving anticoagulant agents during a previous pregnancy, and their types. Current pregnancy history as

weeks of pregnancy, number of follow-up visits, problems during the current pregnancy, types of problems, receiving anticoagulant agents, frequency, and route of anticoagulants administration.

**Tool II: Pregnant women's Knowledge assessment questionnaire:** This tool was developed by the researcher to assess the pregnant women's knowledge regarding the anticoagulant agents during pregnancy which included 12 MCQ questions as definition, importance, causes, types, route, side effect, primary manifestation, complication of overdose, laboratory investigation, precautions during administration, measure while taking overdose of anti-coagulant and warning signs that require medical consultation, and source of knowledge.

**Tool III: Checklist to assess pregnant women's practices toward the administration of anticoagulant agents:** It was developed by the researcher after reviewing related literature and was concerned with pregnant women's reported practices toward the administration of anticoagulant agents and included 2 parts:

**Part one:** Self-injection of anticoagulant agents checklist, which included 22 steps: 7 before the procedure, 11 during the procedure, and 4 after the procedure

**Part two:** Administration of anticoagulant agents through oral intake, which included 16 steps: 7 before the procedure, 7 during the procedure, and 2 after the procedure.

**Tools validity :**Revision of the tools for clarity, relevance, comprehensiveness, understanding, and applicability was done by a panel of experts composed of one assistant professor and two lecturers of maternal and newborn health nursing to measure the content validity of the tools.

**Tools' reliability :**The reliability was assessed by the Cronbach's Alpha coefficient test to ensure homogeneity of the tool, as follows:

Tool	No of questions	Cronbach's Alpha
Knowledge	12	0.992
Practices	38	0.994

**Ethical considerations:** Official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee. Faculty of Nursing, Helwan University. Participation in the study was voluntary, and subjects were given complete information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, and confidentiality of the information that wasn't accessed by any other party without getting permission of the participants. Ethics, values, culture, and beliefs were respected.

**Pilot study:** The pilot study will be done on 10 % (7 pregnant women) of the sample to examine the clarity of questions and the time needed to complete the study tools. Based on the results, no modifications were made. So, the seven women were included in the study sample.

**Fieldwork:** Fieldwork started at the beginning of April 2024, after getting official permission, and was completed by the end of June 2024, consuming three months. The study was carried out in the following stages: assessment & preparation, implementation, and evaluation.

**Assessment preparatory phase:** At this stage, tools of data collection were developed, and administrative permissions were obtained to carry out the study. The researcher reviewed related current and past, local and international literature and theoretical knowledge of various aspects of the study using books, articles internet, and magazines related to research points.

**The implementation phase:** The researchers visited the study setting and collected the data from pregnant women at Om El Masryeen Hospital in Giza. The aim of the study was explained to each pregnant woman to gain their confidence to participate in the study and obtained formal consent from them to participate in the study. The data collection was carried out as follows:

- During the pre-test, the interviewing questionnaire was distributed to the studied pregnant women to assess their knowledge and practices related to anticoagulant agents. In this phase, the researcher allocated three days each week (Saturday, Monday, and Wednesday), attended from 9.00 AM to 12.00 PM to collect data.
- An educational booklet regarding the administration of anticoagulant agents during pregnancy was discussed over 2 weeks; it was carried out in 4 sessions, and the duration of each session ranged from 45-60 minutes.

**The evaluation phase:** The researcher evaluated the effect of the educational booklet on pregnant women who relied on anticoagulant agents for improving uteroplacental circulation by post-test after session implementation immediately.

**Statistical design :** Recorded data were analyzed using the Statistical Package for Social Sciences (version 28). Quantitative data were expressed as mean  $\pm$  standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done: The Chi-square test was used to compare qualitative data. Pearson's correlation coefficient (r) test was used to assess the degree of association between two sets of variables. Cronbach's Alpha: Reliability statistics were used to assess using the Cronbach's Alpha test. The confidence interval was set to 95%, and the margin of error accepted was set at 5%. So, the p-value was considered significant as follows:

### Results:

**Table (1)** shows the Socio-demographic characteristics of the studied pregnant women. It detects that the highest percentage of study women were from 26-30 years old, with Mean  $\pm$ SD = 27.99 $\pm$ 2.936, 37.1% of them had secondary education, and 54.3% were working. Regarding the women's residence, the current table illustrates that 51.4% of women were from urban residences moreover, 74.3% had enough income.

**Table (2)** shows the past health history of the studied pregnant women. It indicates that 42.9% of women were primigravida, regarding the remaining percentage who had a previous pregnancy, 55.0% of them had one abortion, 52.0% of them had previous pregnancy complications, and bleeding was 47.6%. Concerning the type of labor, the current study indicates that 77.5% of them delivered by cesarean section. In addition, 80.0% of studied women received anticoagulants during the previous pregnancy, and 71.9% received clexane.

**Table (3)** reveals that 71.4% of the studied pregnant women were in the second trimester, and 82.9% of them had follow-ups twice /month. In addition, 71.4% of women had problems during their current pregnancy, and 68.0 % of these problems were anemia. Regarding anti-coagulant intake, 82.9 % of women received clexane, 82.9% received anticoagulant once daily, and 82.9 % received anticoagulants subcutaneously.

**Figure (1)** illustrates that there was a statistically significant improvement in women's knowledge post-intervention, as evidenced by 54.3% of women had unsatisfactory knowledge pre-intervention and 87.1% of women had satisfactory knowledge post-intervention.

**Table (4):** shows the total level of practice toward the administration of anticoagulant agents through injection method pre and post-intervention, it represents that, there was a statistically significant improvement in women's practices regarding self-injection of anticoagulants through injection method at  $p \leq 0.05^*$  as evidenced by only 24.1%, 39.7% & 36.2% respectively of them had satisfactorily reported practices regarding steps that should be done before, during and after injection pre-intervention and improved to 79.3 %, 81.0% & 82.8% of respectively them had satisfactorily reported practices post-intervention.

**Table (5):** shows their total level of practice parts toward the administration of anticoagulant agents through oral method pre and post-intervention, it represents that, there was a statistically significant improvement in women's practices regarding oral anticoagulants through oral method at  $p \leq 0.05^*$  as evidenced by only 33.3%, 41.7% & 33.3% of them had satisfactorily reported practices regarding steps that should be done before and during oral anticoagulant intake pre-intervention and improved to 75.0%, 83.3% & 66.7% respectively of them had satisfactorily reported practices post- intervention.

**Figure (2)** represents the total level of practices toward the administration of anticoagulants through injection or oral methods, agent pre- and post-intervention. It illustrates that there was a highly statistically



significant improvement in women's reported practices post-intervention, as evidenced by 64.3% had unsatisfactory practices pre-intervention and an increase to 81.4% had satisfactory reported practices post-intervention at  $p=0.001^*$ .

**Table (6)** illustrates that there was a highly statistically significant positive correlation between total women's knowledge and reported practices regarding anti-coagulant use pre-& post-intervention.

**Table (1)** Distribution of the studied pregnant women according to their socio-demographic characteristics (n=70).

Socio-demographic characteristic	No.	%
<b>Age/ years</b>		
20-25	8	11.4
26-30	46	<b>65.7</b>
31-35	12	17.1
36-40	4	5.7
<b>Mean <math>\pm</math>SD</b>	<b>27.99<math>\pm</math>2.936</b>	
<b>Educational level</b>		
Read and write	8	11.4
Basic education	24	34.3
Secondary education	26	<b>37.1</b>
University education	12	17.1
<b>Occupation</b>		
Working	38	<b>54.3</b>
Not working	32	45.7
<b>Residence</b>		
Rural	34	48.6
Urban	36	<b>51.4</b>
<b>Family income</b>		
Enough	52	<b>74.3</b>
Not enough	18	25.7

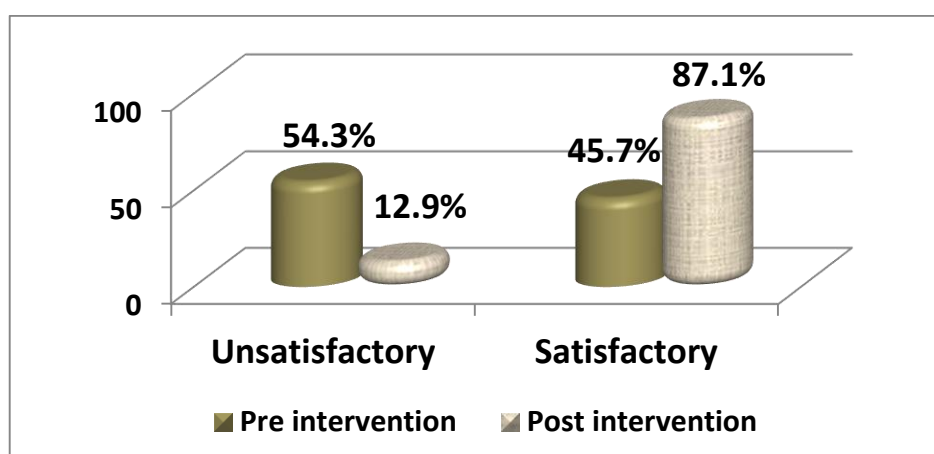
**Table (2)** Distribution of the studied pregnant women according to their past obstetric history (n=70).

Past obstetric history	No.	%
<b>Frequency of previous pregnancy</b>		
Primigravida	30	<b>42.9</b>
Gravida one	4	5.7
Gravida two	16	22.9
Gravida three	12	17.1
>Three	8	11.4
<b>Number of abortions (n=40)</b>		
One	22	<b>55.0</b>
Two	10	25.0
Three	8	20.0
<b>Previous pregnancy complication (n=40)</b>		
Yes	21	<b>52.5</b>
No	19	47.5
<b>Complication of previous pregnancy (n=21)</b>		
Preeclampsia	3	14.3
Anemia	8	<b>38.1</b>
Bleeding	10	47.6
<b>Type of labor (n=40)</b>		
Normal	9	22.5
Caesarian	31	<b>77.5</b>
<b>Receiving anticoagulant agents during previous pregnancy (n=40)</b>		

Yes	32	80.0
No	8	20.0
<b>Type of anticoagulant agents (n=32)</b>		
Injection (Clexane)	23	71.9
Oral (Asbosid)	9	28.1

**Table (3):** Distribution of the studied pregnant women according to their current obstetric history (n=70).

Current obstetric history	No.	%
<b>Trimester pregnancy</b>		
First trimester	12	17.1
Second trimester	50	71.4
Third trimester	8	11.4
<b>Number of follow-up visits</b>		
Once/ month	8	11.4
Twice /month	58	82.9
Three times/month	4	5.7
<b>Problems during the current pregnancy</b>		
Yes	50	71.4
No	20	28.6
<b>Types of problems (n=50)</b>		
Hypertension	13	26.0
Anemia	34	68.0
Gestational diabetes	3	6.0
<b>Type of anticoagulants</b>		
Injection (Clexane)	58	82.9
Oral (Asbosid)	12	17.1
<b>Frequency of anticoagulant agents</b>		
Once daily	58	82.9
Twice daily	12	17.1
<b>Route of anticoagulants</b>		
Subcutaneous	58	82.9
Oral (by mouth)	12	17.1



$\chi^2$  = Relation between pre& post-intervention (8.697), p= 0.003\*

**Figure (1):** Distribution of the studied pregnant women regarding their total level of knowledge about anticoagulant agents during pregnancy pre- and post-intervention.

**Table (4):** Distribution of the studied pregnant women regarding their total level of practice toward the administration of anticoagulant agents through the injection method pre and post-intervention (n=58).

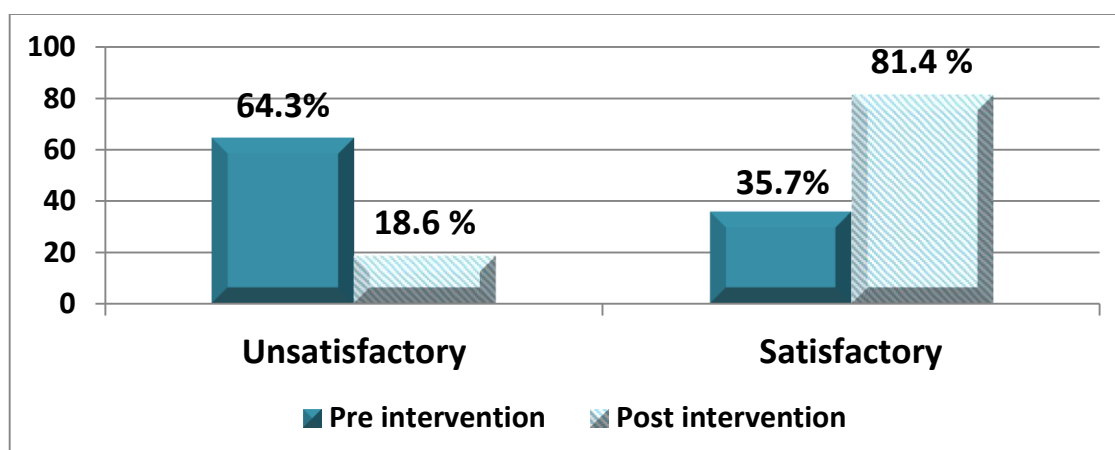
Items	Pre				Post				Chi-square	
	Unsatisfactory		Satisfactory		Satisfactory		Unsatisfactory		X2	p-value
	No.	%	No.	%	No.	%	No.	%		
Before	44	75.9	14	24.1	46	79.3	12	20.7	4.814	0.024*
During	35	60.3	23	39.7	47	81.0	11	19.0	8.920	0.002*
After	37	63.8	21	36.2	48	82.8	10	17.2	6.858	0.007*
Total injection	36	62.1	22	37.9	47	81.0	11	19.0	8.296	0.003*

Chi-square test, \* \* highly statistically significance  $p \leq 0.001$ , \* statistically significance  $p \leq 0.05$

**Table (5):** Distribution of the studied pregnant women regarding their total level of practices' parts toward the administration of anticoagulant agent through oral method pre and post-intervention (n=12).

Items	Pre				Post				Chi-square	
	Unsatisfactory		Satisfactory		Satisfactory		Unsatisfactory		X2	p-value
	No.	%	No.	%	No.	%	No.	%		
Before	8	66.7	4	33.3	9	75.0	3	25.0	3.317	0.007*
During	7	58.3	5	41.7	10	83.3	2	16.7	2.803	0.017*
After	8	66.7	4	33.3	8	66.7	4	33.3	2.345	0.039*
Total oral	8	66.7	4	33.3	10	83.3	2	16.7	3.317	0.007*

Chi-square test, \* \* highly statistically significance  $p \leq 0.001$ , \* statistically significance  $p \leq 0.05$



$\chi^2 = \text{Relation between pre\& post-intervention}(8.869), (0.002*)$

**Figure (2):** Percentage distribution of the studied pregnant women regarding their total level of practices toward the administration of anticoagulants through injection or oral methods agent pre- and post-intervention

**Table 6:** Correlation between total knowledge and total practices among the studied pregnant women pre- and post-intervention.

Scale	Total practices		
		pre	post
	R	0.812	0.804
Total knowledge	p-value	0.000**	0.000**

Pearson Correlation Coefficient\* \* highly statistically significance  $p \leq 0.001$



## Discussion:

### Part I: Socio-demographic characteristics of the studied pregnant women.

Regarding the socio-demographic characteristics of the studied pregnant women. The present study findings revealed that the mean age of the studied pregnant women was  $27.99 \pm 2.936$  years. This result isn't similar to a study conducted by **Hwang et al. (2023)**, who conducted a study in Korea about "Incidence of pregnancy-associated venous thromboembolism: a second nationwide study". They found that the mean age of the studied samples was  $34.67 \pm 1.255$ . Also, this result is similar to a study conducted by **AL-Mugheed & Bayraktar (2018)**, who conducted a study in Egypt about "Knowledge and practices of nurses on deep vein thrombosis risks and prophylaxis". They found that the mean age of the studied samples was  $27.67 \pm 1.255$ . This may be related to the different samples.

Concerning educational level, the current study revealed that more than one-third of the studied pregnant women had secondary education. This result agrees with **Demelo-Rodríguez et al. (2024)**, who carried out a study conducted in China about the "Direct oral anticoagulants versus vitamin K antagonists in patients with thrombotic antiphospholipid syndrome: A prospective observational analysis"; they found that more than one-third of the studied samples had secondary education. **From the researcher's point of view**, access to education varies significantly across different regions and communities, often influenced by socioeconomic status, cultural norms, and governmental policies. In some areas, secondary education may be the highest level of education attainable due to financial constraints or limited educational facilities.

Regarding occupation, the current study revealed that more than half of the studied pregnant women worked. This result is in the same line with **Ahmed et al. (2020)**, who carried out a study conducted in Egypt about "Obstetric venous thromboembolism: a one-year prospective study in a tertiary hospital in Egypt"; they showed that more than half of the studied samples were working. **From the researcher's point of view**, the need for financial independence or to support their families, or where dual incomes are necessary to meet living expenses. Additionally, many women seek fulfillment and a sense of purpose through their careers, valuing the opportunity for personal and professional growth.

Concerning residence, the current study revealed that more than half of the studied pregnant women resided in urban areas. This result is in the same line with **Nabil et al., (2022)** who carried out a study conducted in Egypt about the "Efficacy of Training Program on Nurses Performance regarding Preventive Measures of Venous Thromboembolism among Critical Pregnant Women", they showed that more than half of the studied samples had a resident in an urban area. **From the researcher's point of view**, employment opportunities, cities typically offer a wider range of jobs across various industries, attracting individuals seeking career advancement and higher wages. Urban areas also provide better access to education and healthcare services, with numerous schools, universities, and medical facilities available.

Regarding family income, the current study revealed that more than two-thirds of the studied pregnant women had enough family income. This result wasn't the same as line of **Mohamed et al. (2022)**, who carried out a study conducted in Egypt about the "Effect of Education Program about Deep Venous Thrombosis among Pregnant Women in Antenatal Clinic"; they found that less than a quarter of the studied samples had enough family income. **From the researcher's point of view**, a stable income contributes to financial security, reducing stress and allowing families to plan for the future.

### Part II: Health history of the studied pregnant women.

Concerning the frequency of previous pregnancy, the current study revealed that less than half of the studied pregnant women were primigravida. This result agrees with **Nasr et al. (2022)**, who carried out a study conducted in Egypt about the "Assessment of Women's Perception of Pregnancy Risk". They illustrated that less than half of the studied samples were primigravida.

Regarding the number of abortions, the current study revealed that more than a quarter of the studied pregnant women had one abortion. This result disagrees with **Sarkar et al. (2022)**, who carried out a study conducted in India about the "Narrative Review on Prevalence of Venous Thromboembolism and Public Awareness in India".

They illustrated that less than half of the studied samples had one abortion. **From the researcher's point of view**, conditions affecting blood vessel health, such as antiphospholipid syndrome, can lead to recurrent pregnancy loss. Anticoagulants may be used to improve uteroplacental circulation and reduce the risk of miscarriage.

Concerning the type of labor, the current study revealed that less than half of the studied pregnant women had a cesarean section. This result disagrees with **Semary et al. (2021)**, who carried out a study conducted in Egypt about " Predicting Health Facility Delivery Among Women in Egypt Based on Antenatal Care ". They showed that more than two-thirds of the studied samples had a cesarean section.

Regarding the period of pregnancy, the current study revealed that more two two-thirds of the studied pregnant women were in the second trimester. This result agrees with **Abdelsamei et al. (2024)**, who carried out a study conducted in Egypt about " Assessment of the clinical and laboratory risk factors for thrombosis in neonates admitted to neonatal intensive care unit (two Egyptian tertiary centers experience)". They showed that more than two-thirds of the studied samples were in the second trimester. **From the researcher's point of view**, women experiencing issues like fetal growth restriction or recurrent pregnancy loss may be prescribed anticoagulants to improve uteroplacental circulation and reduce the risk of miscarriage.

Concerning the number of follow-up visits, the current study revealed that the majority of the studied pregnant women had visits twice per month. This result agrees with **Campello et al. (2024)**, who carried out a study conducted in Egypt about " Anticoagulant Therapy in Pregnant Women with Mechanical Heart Valves ". They showed that the majority of the studied samples had twice-per-month visits. **From the researcher's point of view**, regular visits allow healthcare providers to monitor the effectiveness of the anticoagulant therapy, adjust dosages as needed, and ensure that the medication is adequately managing the risk of thromboembolism.

Regarding the type of anticoagulants, the current study revealed that more than two-thirds of the studied pregnant women had used Clexane. This result is in the same line with **Irshaid et al. (2023)**, who carried out a study conducted in Jordan about " Evaluation of Clotting Parameters in Pregnant Women with Placental Blood Clots: Impact of Patient Characteristics and Assessment of Clexane Efficacy ". They found that more than two-thirds of the studied samples had used Clexane. **From the researcher's point of view**, Clexane is commonly prescribed to prevent venous thromboembolism (VTE), particularly in women with a history of blood clots or those with conditions that increase the risk of clotting.

Concerning the frequency of anticoagulant agents, the current study revealed that the majority of the studied pregnant women had used them once daily. This result is in the same line with **Zakaria et al. (2024)**, who carried out a study conducted in Egypt under the title of " Comparative Study Between Effect of Sildenafil Citrate and Acetylsalicylic Acid and Clexane on Uteroplacental Perfusion in Intrauterine Growth Restriction ". They found that the majority of the studied samples had used Clexane once daily. **From the researcher's point of view**, once-daily administration simplifies the medication regimen, making it easier for women to adhere to their treatment plan. This convenience is especially important during pregnancy when routine can be disrupted.

Regarding the source of knowledge, the current study revealed that more than half of the studied pregnant women had received their knowledge from the Internet. This result is in the same line with **Ouda et al. (2023)**, who carried out a study conducted in Egypt about the " Effect of Implementing Evidence-Based Nursing Practices Guidelines on Prevention of Deep Venous Thrombosis among Postpartum Women ". They found that more than half of the studied samples had received their knowledge from the Internet. **From the researcher's point of view**, the internet provides a wealth of resources that allow women to quickly access information about their medications, including how they work, potential side effects, and their relevance during pregnancy.

**Part (III): Knowledge of the studied pregnant women regarding anticoagulant agents during pregnancy. The results of this part answered the research hypothesis.**

Regarding the effectiveness of the study on total knowledge of the studied pregnant women, the present study revealed that less than half of the studied pregnant women had unsatisfactory knowledge pre-intervention which improved, and the majority of them had satisfactory knowledge post-intervention this finding disagree with **Friedman et al., (2025)** whose conducted published study in England under the title of " Effect of Nursing

Intervention on time for a large trial to evaluate aspirin for obstetric venous thromboembolism prophylaxis" who reported that more one-third of the studied sample had unsatisfactory knowledge pre-intervention and fewer two-thirds of them had satisfactory knowledge post-intervention. **From the researcher's point of view**, this might be due to the educational intervention was effective in enhancing the overall knowledge of the participants.

**Part (IV): Reported Practices of the studied pregnant women regarding administration of anticoagulant agents. Answered the research hypothesis.**

Regarding their total level of practice toward the administration of anticoagulant agents through the injection method pre and post-intervention, there was a statistically significant improvement in women's practices regarding the self-injection of anticoagulants using the injection method at  $p \leq 0.05^*$ . Pre-intervention, fewer than one-quarter (approximately one in four) of the women satisfactorily reported practices for steps to be done before injection, slightly fewer than two-fifths reported satisfactory practices during injection, and a little over one-third reported satisfactory practices for steps after injection. Post-intervention, these figures improved dramatically, with nearly four-fifths of women reporting satisfactory practices for steps before injection, just over four-fifths reporting satisfactory practices during injection, and more than four-fifths adhering to the recommended practices after injection.

These findings are in line with those reported by **Kho et al. (2024)** in their study titled "Postpartum thromboprophylaxis with enoxaparin: a prospective cohort study on patients' adherence, injection experience, and information retention after counselling by pharmacists" The study demonstrated that educational interventions significantly improved patients' practices related to self-injection of anticoagulants. Pre-intervention, patients showed inadequate knowledge and incorrect techniques during injection. Post-intervention, there was a marked improvement in their adherence to proper steps before, during, and after the injection process, with significant gains in hygiene practices, dose verification, and reporting side effects.

**From the researcher's point of view**, educational interventions significantly improve pregnant women's practices regarding self-injection of anticoagulants, particularly in understanding and managing their medication routines. The study by **Goyal et al. (2022)** supported this point of view that educational interventions significantly improve pregnant women's practices regarding self-injection of anticoagulants. Their research demonstrated that structured education, including clear instructions on medication management, enhanced adherence to prescribed doses and proper administration techniques, leading to better patient outcomes.

**Regarding their total level of practices'** parts toward the administration of anticoagulant agents through oral method pre and post-intervention, there was a statistically significant improvement in women's practices regarding oral anticoagulants through the oral method at  $p \leq 0.05^*$ , as evidenced by only about one-third, slightly over two-fifths, and one-third of participants reporting satisfactory practices for steps to be followed before and during oral anticoagulant intake pre-intervention. However, post-intervention, approximately three-quarters, just over four-fifths, and two-thirds of women reported satisfactory practices for the same steps, demonstrating a significant improvement in their adherence to recommended practices.

These findings agree with the study conducted by **Al-Salman et al. (2023)** titled "The Impact of Educational Interventions on Anticoagulant Knowledge and Adherence in Pregnant Women" in Egypt found that educational interventions significantly improved the knowledge and practices of pregnant women using anticoagulants, particularly regarding their medication routines and the importance of consistent monitoring. This study's results demonstrate the effectiveness of tailored educational strategies in improving patient adherence to anticoagulant therapy, consistent with findings of improved practices in the present study after educational interventions.

**From the researcher's point of view**, educational interventions are crucial in improving pregnant women's practices related to self-administration of anticoagulants. Several studies support this view, demonstrating that structured education leads to increased adherence to medication schedules, better understanding of potential side effects, and overall improved patient outcomes.

**Part (V): Relation and correlation between study variables.**

Regarding the correlation between total knowledge and total practices among the studied pregnant women pre- and post-intervention, the present study illustrates that there was a highly statistically significant positive correlation between total women's knowledge and reported practices regarding anti-coagulant use pre- & post-intervention.

This finding was supported by **Mohammad et al., (2022)** titled "Knowledge, Attitude, and Practices Regarding Anticoagulant Therapy Among Pregnant Women: A Pre- and Post-Education Study" conducted in Jordan found that after the implementation of an educational program, pregnant women's knowledge about anticoagulant use significantly increased, leading to improved practices regarding the medication. This aligns with the current study, which reports a significant correlation between women's knowledge and their practices pre- and post-intervention.

**From the researcher's point of view**, the findings of this study align with the growing body of evidence supporting the significant correlation between knowledge and practices regarding anticoagulant use. Studies have shown that increasing patients' knowledge about anticoagulants, particularly through education, leads to improved adherence to prescribed practices, thus reducing the risk of complications. For example, **Mohammad et al. (2022)** in Jordan found that after an educational intervention, pregnant women's knowledge about anticoagulants increased significantly, and their practices improved accordingly, echoing the current study's results.

**Conclusion:**

The present study concluded that there was significant improvement in women's knowledge and practices regarding the use of anticoagulant agents for improving uteroplacental circulation after providing an educational booklet. Pregnant women demonstrated high levels of knowledge and reported better practices post-intervention compared to their level before. Additionally, the results strongly support the research hypothesis that the awareness of pregnant women who rely on anticoagulant agents during pregnancy will improve after receiving the educational booklet.

**Recommendations:**

In light of the findings of the current study, the following recommendations can be suggested:

- Provide training for healthcare providers, especially nurses regarding prevention of risks of anticoagulant agents during pregnancy.
- Distribution of similar educational booklets to a wider audience of pregnant women using anticoagulants.
- Practical demonstrations include hands-on demonstrations or role-playing activities during patient education sessions to bridge the gap between knowledge and real-life practices.

**Future recommendation**

- Re-study women with similar circumstances.
- Design an educational interactive application to raise awareness about anticoagulant agents during pregnancy.
- Establish regular follow-up sessions for women on anticoagulant therapy to reinforce knowledge and ensure sustained improvements in practices.
- Facilitate support groups where women can share experiences and strategies for adhering to safe practices while using anticoagulants.

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