LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

Postoperative Hemorrhagic Complication after Elective Cesarean Section under Spinal Anesthesia in Patients receiving Long-Term Anticoagulant Therapy: Retrospective Study

Haifa Mohamed Nwerat[a], Atiga Othman Albakoush[b]

[a] Libyan Academy for Graduate Studies, Alkhoms, Libya

[b] Elmergib University. Faculty of Medicine, Alkhoms, Libya

* Corresponding author email: 2310242@academy.edu.ly

A B S T R A C T

Background: This study was conducted on pregnant women which admitted to obstetrics section of Alkhoms Medical Center between July15; and October15, 2021. Amis: The study aimed to assess the severity of bleeding and identify the specific factors that contribute to the varying rates of hemorrhage reported in clinical cases.

Methods:

The study conducted on 60 pregnant women, information was obtained from registration book and files of patients including; medical problems that occurred after caesarean section particularly, bleeding, coagulation and coagulopathy and also anticoagulant used.

Results:

The majority of cases (96.7%) had bleeding during caesarean delivery, while 3% had not. The commonest medication used was Low Molecular weight heparin LMWH (35%), the commonest coagulation problem was deep vein thrombosis (50%), and the most anticoagulation used was during the antepartum period (66.7%).

Conclusion:

Research findings indicated that postpartum bleeding was prevalent among the patients, all of whom were using anticoagulants—primarily to treat DVT. However, most patients suffered obstetric hemorrhages linked to these drugs. The study concludes that because long-term anticoagulation can be fatal for pregnant women, strict medical supervision is vital to ensure patient safety.

Keywords: *Hemorrhagic disorder, Anticoagulation, Cesarean Section, spinal anesthesia, complication*

1. Introduction

Anesthesia refers to a medically induced, controlled, and temporary loss of sensation or consciousness. It can involve one or more of the following: analgesia (pain relief or prevention), muscle relaxation (paralysis), memory loss (amnesia), and unconsciousness [1]. For patients undergoing elective cesarean section, spinal anesthesia is generally the preferred technique because it carries fewer risks for both mother and fetus compared to general anesthesia [2]. Spinal anesthesia continues to be a cornerstone of modern anesthetic practice due to its reliability,

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

high patient satisfaction, and low incidence of complications. Advances in spinal needle design, particularly in diameter and tip configuration, have contributed to reducing complications such as post-dural puncture headaches (PDPHs) [3]. The first spinal analgesia was performed in 1885 by James Leonard Corning (1855–1923), a neurologist in New York, who accidentally pierced the dura mater while experimenting with cocaine on a dog's spinal nerves [4].

Most side effects of spinal anesthesia are mild, self-limiting, or easily managed, while severe complications—though rare—can result in permanent neurological damage or even death. These adverse events may occur immediately after administration or within 48 hours postoperatively. Common minor complications include mild hypotension, bradycardia, nausea and vomiting, transient neurological symptoms (such as lower back pain radiating to the legs), and PDPH [5]. Cesarean section is the most frequent surgical procedure in obstetrics and gynecology, accounting for about 30% of births worldwide. With rising cesarean delivery rates globally, the number of surgical interventions continues to increase. The choice of anesthesia depends on patient preference, obstetric indications, and the anesthesiologist's expertise [6]. Introduced in the late nineteenth century, cesarean section became a life-saving intervention for mothers and newborns facing serious pregnancy or childbirth complications [7]. Spinal anesthesia is traditionally considered the first choice for uncomplicated elective cesarean sections because it avoids airway manipulation, reduces aspiration risk, and is technically straightforward [5].

A growing number of surgical patients are on anticoagulant therapy preoperatively, which increases the risk of epidural hematoma during spinal anesthesia. It is therefore essential for anesthesiologists to anticipate this risk and adjust anesthetic plans accordingly [7]. Guidelines for managing patients on anticoagulation during spinal or epidural anesthesia emphasize avoiding concurrent medications that affect coagulation, considering technical challenges with regional blocks, and carefully timing block administration relative to thromboprophylaxis. If traumatic needle or catheter placement occurs, anticoagulation should be delayed for 24 hours postoperatively to reduce hematoma risk. For patients on high-dose anticoagulation, spinal anesthesia should be performed 10–12 hours after the last dose, while needle insertion should be postponed for at least 24 hours. If prophylactic anticoagulation is given two hours before surgery, spinal anesthesia should be avoided due to peak anticoagulant activity. The most feared complication in these patients is symptomatic spinal hematoma, which can cause severe neurological outcomes such as paralysis. Early diagnosis and preoperative neurological status are critical for prognosis after surgical decompression [8]. Managing pregnant patients on anticoagulation is particularly complex because of the added risk of spinal hematoma and the unpredictable timing of labor [10].

Obstetric hemorrhage remains a leading cause of maternal mortality. From an anesthesiologist's perspective, it is vital to assess coagulation changes during pregnancy and evaluate the risk of coagulation disorders [9]. Pregnancy often leads to physiological anemia and alterations in coagulation factors, shifting the balance toward hypercoagulability to prepare for delivery. Anesthesiologists must understand both normal physiological changes and pathological alterations caused by disease or medication to ensure safe regional anesthesia during labor and cesarean section [10]. Spinal hematoma after regional anesthesia has been linked to coagulation abnormalities in 68% of cases. Obstetric bleeding also contributes significantly to maternal mortality, necessitating careful evaluation of coagulation disorders, transfusion needs in postpartum hemorrhage, and pharmacological management in special circumstances such as intrauterine fetal death [9]. Normal pregnancy induces a hypercoagulable state that persists for up to eight weeks postpartum, increasing thrombotic risk three- to five-fold compared to

Corresponding author email: 2310242@academy.edu.ly

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

non-pregnant women. Anticoagulant therapy is often required for prevention and treatment of coagulation disorders during pregnancy [9]. Common agents include unfractionated heparin, low molecular weight heparin, and aspirin, while warfarin is contraindicated in pregnancy. Adjustments in anticoagulation regimens aim to balance maternal safety with minimizing fetal risk [10]. Oral anticoagulants include warfarin and aspirin (the latter being an antiplatelet agent considered safe at low doses), while parenteral options include UFH, LMWH, and newer heparinoids, which are reserved for cases where UFH or LMWH are unsuitable [11]. The most significant adverse effect of anticoagulants is bleeding, with risk influenced by drug class, patient age, and comorbidities. Hemorrhage following cesarean section under spinal anesthesia is particularly dangerous [12].

Aims: This study aims to evaluate postoperative hemorrhagic complications after elective cesarean section under spinal anesthesia in pregnant women receiving long-term anticoagulant therapy.

2. Methods

This study was designed as a retrospective observational study based on review of hospital medical records. The study was conducted at Alkhoms Medical Center, Libya. It was carried out over a three-month period from July15to October15 2021. This study included 60 participants who met the inclusion criteria. Sample size was determined based on all eligible and available cases during the specified study period. Additionally, this number was considered statistically acceptable for retrospective observational studies of similar scope, particularly given the limited number of pregnant women receiving long-term anticoagulant therapy during pregnancy at the study center.

2.1 Participants

Data were collected through a comprehensive review of medical records of participants who underwent elective cesarean section under spinal anesthesia and received anticoagulant therapy during pregnancy, whether for prophylactic or therapeutic purposes.

The collected data included:

- Type and duration of anticoagulant therapy.
- Indications for anticoagulation.
- Postoperative hemorrhagic complications, including bleeding events, coagulopathy, and related adverse outcomes.

2.2 Data Collection Procedure

A structured data collection form was used as the primary tool for extracting relevant information from hospital records. The form included demographic characteristics, obstetric history, details of anticoagulant therapy, type of anesthesia, and postoperative clinical outcomes.

2.3 Inclusion Criteria

- Pregnant women undergoing elective cesarean section under spinal anesthesia.
- Receiving anticoagulant therapy during pregnancy.
- Availability of complete medical records including bleeding and coagulation data.

2.4 Exclusion Criteria

- Medical records of women not receiving anticoagulant therapy Known primary bleeding disorders.
- Emergency caesarean sections or procedures performed under general anesthesia.

2.5 Statistical Analysis

Statistical analysis was conducted using SPSS version 22. Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were presented as means and standard deviations, while categorical variables were expressed as

Corresponding author email: 2310242@academy.edu.ly

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

frequencies and percentages. The incidence of hemorrhage was described according to its timing, whether occurring intraoperative or postoperative. Given the high overall prevalence of hemorrhagic events and the limited number of non-hemorrhagic cases, the analysis primarily focused on descriptive reporting of outcomes.

2.6 Ethical Considerations

Official approval was obtained from the administration of Alkhoms Medical Center prior to data collection.

In addition, A strict confidentiality of personal and medical information was maintained. All data were used solely for research purposes and handled in accordance with established ethical principles for medical research.

3. Results

The present study included 60 participants who attended Alkhoms Medical Center between 15 July 2021 and 15 October 2021. The analysis focused on identifying the main indications for anticoagulant therapy during pregnancy and evaluating associated hemorrhagic complications during cesarean delivery.

3.1. Indications for Anticoagulant Therapy:

The most common indication for anticoagulation was deep vein thrombosis (DVT), accounting for 50% of cases. Placental related coagulation disorders represented 13.3%, while other medical indications collectively accounted for 36.7% of participants. For more details see Figure 1.

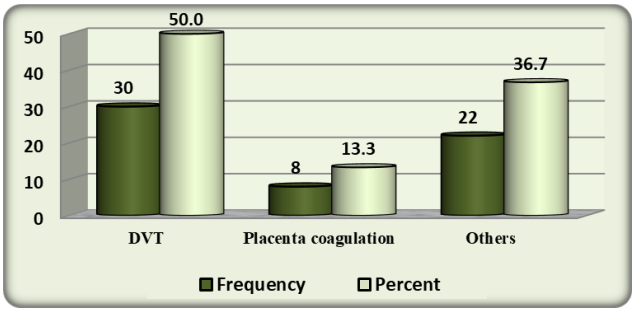

Figure 1: Repetitive Distribution and percentage for the indication of use anticoagulation

3.2. Types and Distribution of Anticoagulant Therapy:

The most commonly used anticoagulant was low molecular weight heparin **(LMWH)**, including enoxaparin and related preparations (35%). This was followed by unfractionated heparin (31.7%). Aspirin was used in 30% of cases. Fraxiparine and warfarin were the least frequently prescribed, each accounting for 1.7%. For more details see Figure 2.

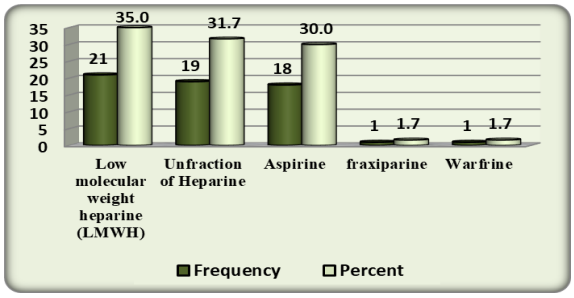

Figure 2: Repetitive Distribution and percentage for the anticoagulation.

Corresponding author email: 2310242@academy.edu.ly

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

3.3. Timing of Anticoagulant Use:

Regarding the timing of anticoagulation therapy, the majority of patients (66.7%) received treatment during the antepartum period only. This was followed by a combined antepartum and postpartum regimen in 30% of cases, while postpartum-only administration was the least frequent, accounting for only 3.3% of the study population. For more details see Figure 3.

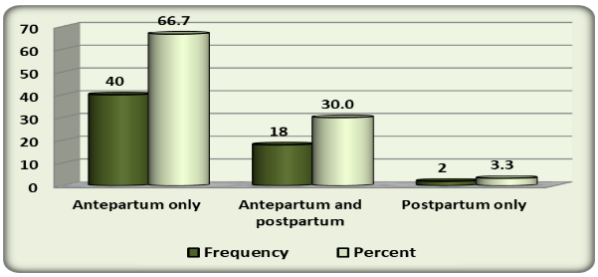

Figure 3: Repetitive Distribution and percentage for the Anticoagulation used.

3-4. Types of treatment and duration use anticoagulation:

Table (1): The Statistical description of the anticoagulants, the type of treatment and how often it is used:

Name of anticoagulation			For how many taken medication			
	Therapeutic dose	Prophylactic dose	days	months	years	Total
Unfractionated Heparin	**8**	**10**	**0**	**16**	**2**	**18**
Low molecular weight heparin (LMWH)	**15**	**7**	**0**	**21**	**1**	**22**
Aspirin	**5**	**14**	**1**	**18**	**0**	**19**
Fraxiparine	**0**	**1**	**1**	**0**	**0**	**1**

From the data presented in Table 1, LMWH was the most frequently used anticoagulant, predominantly in therapeutic doses. Unfractionated heparin was also common, while aspirin was mainly prescribed prophylactically. Fraxiparine and warfarin were rarely used.

3-5. Hemorrhagic complication:

Among the study sample, 96.7% experienced significant hemorrhage during cesarean delivery, while the remaining 3.3% did not encounter bleeding complications. The high rate of hemorrhage was mainly related to the high-risk profile of the participants, particularly the use of long-term anticoagulant therapy, in addition to obstetric and surgical factors that may have contributed to increased blood loss. For more details see Figure 4.

Corresponding author email: 2310242@academy.edu.ly

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

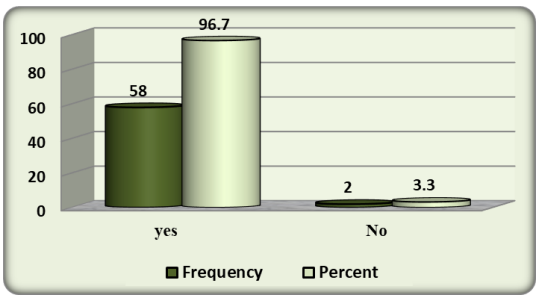

Figure 4: Repetitive distribution and percentage of bleeding complications among patients undergoing cesarean section.

4. Discussion

Anticoagulation therapy during pregnancy, particularly in women undergoing cesarean section under spinal anesthesia, represents a clinical challenge due to the need to balance the prevention of thromboembolic events against the risk of postoperative hemorrhage. Limited evidence exists regarding surgical bleeding risks in anticoagulated pregnant women, and previous studies have reported increased rates of perioperative bleeding complications among patients receiving long-term anticoagulant therapy.

In the present study, 60 pregnant women who received anticoagulation therapy and underwent cesarean delivery under spinal anesthesia were evaluated. Postoperative bleeding was observed in 58 participants (96.7%), whereas only 2 participants (3.3%) did not experience bleeding. This high frequency of hemorrhagic events highlights the significant association between anticoagulant exposure and bleeding risk during delivery. These findings are consistent with Kearsley et al., [13]. who reported that patients receiving long-term oral anticoagulants experienced higher rates of moderate to severe postoperative bleeding compared with controls. This supports the concept that prolonged anticoagulation increases the likelihood of hemorrhagic complications during surgical delivery.

Regarding the indication for anticoagulation, DVT was the most common indication in the current study (50%). This differs slightly from other reports where VTE was reported as the most frequent indication for anticoagulation during pregnancy (approximately 21% in some studies) [15]. The variation may be attributed to differences in study populations and diagnostic criteria.

In terms of medication patterns, LMWH was the most commonly used anticoagulant (35%), followed by unfractionated heparin (31.67%). These findings are partially consistent with previous studies reporting that LMWH is the most frequently prescribed anticoagulant during the antepartum period [14]. However, in contrast to other reports where unfractionated heparin was more commonly used postpartum [16]. the current study showed a higher overall use of LMWH. This may reflect institutional prescribing preferences and clinical protocols.

Most anticoagulation therapy in the present study was administered during the antepartum period (66.7%), while combined antepartum and postpartum use accounted for 30%, and postpartum-only use was minimal (3.3%). These results align with established clinical practice, where anticoagulation is primarily required during pregnancy to prevent thromboembolic complications [17].

The findings indicate a high frequency of postoperative bleeding among pregnant women receiving anticoagulation therapy, particularly low

Corresponding author email: 2310242@academy.edu.ly

LEBDA MEDICAL JOURNAL, VOL. 11, NO. 1 (30 APRIL 2026), PP. 01–08.

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

molecular weight heparin and unfractionated heparin. The observed pattern is consistent with previously published studies reporting an increased risk of hemorrhagic complications in anticoagulated obstetric patients. These results underscore the importance of individualized risk assessment, appropriate dose adjustment, and careful perioperative monitoring to balance bleeding risk and thromboembolic prevention.

Strengths and Limitations

Strengths:

This study addresses a clinically relevant and underexplored population—pregnant women receiving long-term anticoagulant therapy—providing valuable real-world data. Inclusion of all eligible cases during the specified period minimized selection bias and reflects routine clinical practice.

Limitations:

The relatively small sample size (n = 60) may limit statistical power and generalizability. The retrospective single-center design increases the risk of information bias, incomplete records, and residual confounding. Additionally, the limited number of pregnant women receiving long-term anticoagulant therapy restricted the ability to perform detailed subgroup analyses.

5. Conclusion

The study demonstrates that anticoagulation therapy in high-risk pregnant women undergoing cesarean delivery under spinal anesthesia is accompanied by a substantial frequency of postoperative bleeding. Rather than establishing causality, the findings reflect an observed pattern of hemorrhagic events in a population characterized by thrombotic risk and exposure to anticoagulant treatment. These results emphasize the clinical importance of individualized risk assessment, appropriate dose adjustment, and vigilant perioperative monitoring to minimize bleeding complications while maintaining effective thromboembolic prophylaxis.

Interpretation of these findings should consider the limitations of the study, including its retrospective design, single-center setting, and relatively small sample size. Further prospective, larger-scale studies are required to better define risk determinants and optimize management strategies in this population.

Recommendations:

Based on the findings, anticoagulation therapy in pregnant women should be prescribed according to individualized thrombotic and bleeding risk assessment, with appropriate dose adjustment and close perioperative monitoring to minimize hemorrhagic complications. Careful planning of temporary interruption and timely resumption around surgical procedures is essential to balance thrombosis prevention with bleeding risk. In cases of significant bleeding, rapid recognition and prompt hemostatic management are necessary to reduce maternal morbidity and related complications.

ETHICAL APPROVAL

The study was approved by the institutional ethics committee and conducted in accordance with institutional ethical regulations. Patient confidentiality was strictly maintained.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

AUTHORS CONTRIBUTIONS

All authors contributed to study design, data collection, analysis, and manuscript preparation.

Corresponding author email: 2310242@academy.edu.ly

Lebda Medical Journal; |LMJ|; {Online ISSN:2520-095X}

Lebda Medical Journal Homepage: https://lebmedj.elmergib.edu.ly/index.php/LMJ/en

Received:02.02.2026; Revised:20.02.2026; Accepted:17.04.2026; Published:30.04.2026.

6. References

1. Martin EA, editor. Concise colour medical dictionary. Oxford: Oxford University Press; 2015.
2. Alhowary AA, Alsawalmeh M, Abokmael A, Odat H, Sindiani A. Effect of spinal anesthesia versus general anesthesia on blood glucose concentration in patients undergoing elective cesarean section surgery: a prospective comparative study. Anesth Res Pract. 2019; 2019:7585043.
3. Liu SS. Current issues in spinal anesthesia. Anesthesiology. 2001;94(5):888-906.
4. Cwik J. Postoperative considerations of neuraxial anesthesia. Anesthesiol Clin. 2012;30(3):433-43.
5. Maranhao B, Liu M, Palanisamy A, Monks DT, Singh PM. The association between post-dural puncture headache and needle type during spinal anaesthesia: a systematic review and network meta-analysis. Anaesthesia. 2021;76(8):1098-110.
6. Daleffe ACM, Moura PFT, da Silva GAN, de Oliveira Casadei JC, Brites CS, Zanin P, et al. Abordagens anestésicas na cesariana: implicações neurológicas e considerações clínicas. Braz J Implantol Health Sci. 2024;6(10):3539-52.
7. Begum T, Rahman A, Nababan H, Hoque DME, Khan AF, Ali T, et al. Indications and determinants of caesarean section delivery: Evidence from a population-based study in Matlab, Bangladesh. PLoS One. 2017;12(11):e0188074.
8. Claerhout AJ, Johnson M, Radtke JD, Zaglaniczny KL. Anticoagulation and spinal and epidural anesthesia. AANA J. 2004;72(3):181-7.
9. Atukunda EC, Mugyenyi GR, Obua C, Atuhumuza EB, Musinguzi N, Tornes YF, et al. Measuring post-partum haemorrhage in low-resource settings: the diagnostic validity of weighed blood loss versus quantitative changes in hemoglobin. PLoS One. 2016;11(4):e0152408.
10. Butwick AJ, Carvalho B. Anticoagulant and antithrombotic drugs in pregnancy: what are the anesthetic implications for labor and cesarean delivery? Can J Anaesth. 2011;58(5):491–498.
11. Kokki H. Spinal blocks. Paediatr Anaesth. 2012;22(1):56–64.
12. Levine MN, Raskob G, Beyth RJ, Kearon C, Schulman S. Hemorrhagic complications of anticoagulant treatment: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest. 2004;126(3 Suppl):287S–310S.
13. Kearsley R, Stocks G. Venous thromboembolism in pregnancy: diagnosis and management. BJA Education. 2021;21(3):117-123.
14. DeLoughery E, Bannow BS. Anticoagulant therapy for women: implications for menstruation, pregnancy, and lactation. Hematology Am Soc Hematol Educ Program. 2022;2022(1):467–473.
15. Wang EH, Marnoch CA, Khurana R, Sia W, Yuksel N. Haemorrhagic complications of peripartum anticoagulation: a retrospective chart review. Obstet Med. 2014;7(2):77-83.
16. Romualdi E, Dentali F, Rancan E, Squizzato A, Steidl L, Middeldorp S, et al. Anticoagulant therapy for venous thromboembolism during pregnancy: a systematic review and a meta-analysis of the literature. J Thromb Haemost. 2013;11(2):270-281
17. Zachariah KA, Yuan S, DeSancho MT, Landres IV, Singh HS. Role of antiplatelets and anticoagulation therapies in pregnancy. J Clin Med. 2024;13(24):7757.

Corresponding author email: 2310242@academy.edu.ly