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Original research article

AN UPDATE ON DIAGNOSIS AND MANAGEMENT OF THROMBOEMBOLISM IN PREGNANCY

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Abstract: *Thromboembolism during pregnancy poses a significant challenge in maternal healthcare, substantially contributing to maternal morbidity and mortality worldwide. Understanding its diagnosis and management is crucial for improving maternal and fetal outcomes.* ***Objective:*** *To evaluate the diagnosis and management of thromboembolism in pregnant women.* ***Methods:*** *A retrospective cohort study was conducted at Lady Reading Hospital, Peshawar, from July 2022 to July 2024. The study included 175 pregnant females diagnosed with venous thromboembolism (VTE) during their pregnancy. Data were collected on patient demographics, trimester of diagnosis, type of thromboembolism (deep vein thrombosis [DVT] or pulmonary embolism [PE]), treatment modalities, and outcomes. Patients were treated with either low molecular weight heparin (LMWH) or unfractionated heparin (UFH). Descriptive statistics were used to analyze the data, with results presented as percentages and means with standard deviations.* ***Results:*** *The mean age of the participants was 32.01 ± 2.35 years. Thromboembolism was most commonly diagnosed in the third trimester (65%), followed by the second trimester (25%) and the first trimester (10%). DVT was observed in 74% of patients, while PE occurred in 26%. Among the 160 patients treated with LMWH, 3% (5 patients) experienced a recurrence of VTE. Of the 15 patients who received UFH, 5% (8 patients) had significant bleeding complications. Overall maternal outcomes included a 3% recurrence rate of VTE and a 5% rate of significant bleeding complications. No maternal mortality was reported.* ***Conclusion:*** *Early diagnosis and timely management of thromboembolism in pregnancy, mainly through the use of low molecular weight heparin and a multidisciplinary care approach, significantly improve maternal and fetal outcomes. LMWH was associated with fewer complications compared to UFH, highlighting its effectiveness and safety in treating pregnant women with VTE*

Keywords: Anticoagulation, Pregnancy Complications, Pulmonary Embolism, Thromboembolism, Venous Thrombosis.

Introduction

Thromboembolism in pregnancy represents a complex and multifaceted challenge in maternal health care, significantly contributing to both maternal morbidity and mortality worldwide. Pregnancy in itself is considered to be a risk factor for VTE due to a hypercoagulable state that pregnant women are prone to due to factors including venous stasis, increased blood volume, hormonal changes, and others (1). This condition occurs commonly as deep vein thrombosis (DVT) and pulmonary embolism (PE) and may worsen if not well diagnosed and managed. Thromboembolism in pregnancy is non-specific in its clinical manifestation and, therefore, difficult to diagnose early because symptoms are similar to other typical pregnancy symptoms like swelling of the legs, shortness of breath, and fatigue (2).

For example, diagnostic imaging and laboratory investigations are essential. However, their application should be rational in order to avoid any harm to the fetus, including exposure to ionizing radiation (3). The management of thromboembolism in pregnancy is not less complex: such cases need an individual approach, taking into consideration the condition of both the mother and the fetus. Warfarin sodium is still the mainstay of management, but heparin derivatives are preferable because of the risk of embryopathies associated with warfarin. Nevertheless, the initiation of therapy, the dose, and the duration must be closely controlled to avoid unfavorable outcomes, mainly where there is labor and delivery (4).

Clinical diagnosis of pulmonary thromboembolism in pregnancy still represents a challenge due to the overlapping of physiological changes in pregnancy with those of VTE. Investigations, in particular with pulmonary embolism, entail ionizing radiation to both the mother and the unborn child (5). Excessive concern with light skin exposure to radiation can lead to failure of the objective diagnosis. Today's regulations claim that if there is clinical suspicion of VTE, treatment should be started as soon as possible and before the diagnosis is confirmed. LMWH has been used in preference to UFH because of concerns over safety profiles and the low incidence of bleeding complications in pregnancy. However, most evidence comes from trials conducted on non-pregnant patients and systematic reviews of LMWH and pregnancy (4). Clinicians' presumptions about VTE are paramount to hastening diagnosis and management. Symptoms and signs that are associated with DVT are, rather often, vague and mimic typical pregnancy signs, such as leg swelling and cramps. DVT is more often observed in the symptomatic pregnant women in the left leg than in the right leg (6). This may be due to compression of the left iliac vein by the gravid uterus across the right iliac artery, which is said to have a very significant contribution to iliofemoral DVT in the later period of pregnancy. Most of the thrombi are proximate to the iliac or femoral veins or

both in most patients. In patients who are not pregnant, the thrombi are more common in the distal vessels of the calf (7, 8).

Objective

The study's main objective is to find the diagnosis and management of thromboembolism in pregnancy.

Methodology

This retrospective cohort study was conducted at Lady Reading Hospital, Peshawar, from July 2022 to July 2024. Data were collected from 175 pregnant females who were diagnosed with venous thromboembolism (VTE) during their pregnancy.

Inclusion Criteria

- Pregnant women of any age and gestational stage who had a confirmed diagnosis of VTE, either deep vein thrombosis (DVT) or pulmonary embolism (PE).
- Patients who received diagnostic imaging such as Doppler ultrasound, computed tomography pulmonary angiography (CTPA), or magnetic resonance imaging (MRI) to confirm the presence of thromboembolism.
- Women who were treated with anticoagulation therapies during pregnancy, including low molecular weight heparin (LMWH) or unfractionated heparin (UFH).

Exclusion Criteria

- Women with pre-existing coagulopathies or other hematological disorders that could affect clottings, such as antiphospholipid syndrome or inherited thrombophilias.
- Patients receiving anticoagulation therapy prior to pregnancy for conditions unrelated to pregnancy, such as atrial fibrillation or mechanical heart valves.

Data Collection

A thorough review of medical records from the hospital's database was conducted to collect the data. It included patient demographics, age, parity, gestational age, clinical presentation, symptoms and signs of DVT or PE, and the diagnostic modalities used. Information on the type of anticoagulant used, the dose given, the duration of treatment, and any dose adjustments in accordance with patient-specific factors such as proximity to labor and delivery was also collected in the study. Data also contain maternal and fetal outcomes, including the rates of recurrence of VTE, bleeding complications, and delivery outcomes. Specific management interventions evaluated were anticoagulation therapies LMWH and UFH and their effects on both maternal and fetal status, reoccurrence of VTE, and any complications that may be related to the treatment.

Data analysis

Data were analyzed using SPSS v23. Statistical methods were used to identify correlations between patient characteristics, diagnostic approaches, and treatment outcomes, providing valuable insights into the optimal management of VTE in pregnant women.

Results

Data were collected from 175 pregnant females with an average age of 32.01 years (±2.35). Thromboembolism was most commonly diagnosed in the third trimester, accounting for 65% of cases, followed by the second trimester at 25% and the first trimester at 10%. Deep vein thrombosis (DVT) was more prevalent, observed in 74% of patients, while pulmonary embolism (PE) occurred in 26%. The most frequent symptoms included leg swelling and pain in 70% of DVT cases and shortness of breath or chest pain in 80% of PE cases. (Table 1)

Table 1: Patient Demographics and Clinical Presentation

Characteristic	Value
Number of Patients	175
Average Age (years)	32.01±2.35
Gestational Age at Diagnosis	
- First Trimester	10% (18 patients)
- Second Trimester	25% (44 patients)
- Third Trimester	65% (113 patients)
Type of Thromboembolism	
- Deep Vein Thrombosis (DVT)	74% (130 patients)
- Pulmonary Embolism (PE)	26% (45 patients)
Common Symptoms	
- Leg Swelling and Pain	70% of DVT cases (91 patients)
- Shortness of Breath/Chest Pain	80% of PE cases (36 patients)

Doppler ultrasound was used in 120 deep vein thrombosis (DVT) cases and successfully confirmed the diagnosis in 96% of cases (115/120). CT pulmonary angiography (CTPA) was employed in 45 cases of pulmonary embolism (PE), with a 95% success rate (43/45). MRI was utilized in 7 cases where other methods were inconclusive, achieving a 100% success rate (7/7). (Table 2)

Table 2: Diagnostic Methods Used

Diagnostic Method	Number of Cases	Success Rate
Doppler Ultrasound (for DVT)	120	96% (115/120)
CT Pulmonary Angiography (CTPA)	45	95% (43/45)

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MRI (used when other methods are inconclusive)	7	100% (7/7)
D-dimer Testing	150	93% Elevated (140/150)

Among the 160 patients treated with low molecular weight heparin (LMWH), 3% experienced a recurrence of VTE (5 patients). Unfractionated heparin (UFH) was used in 15 patients, with significant bleeding complications occurring in 5% (8 patients). Overall maternal outcomes included a 3% recurrence of VTE and a 5% rate of major bleeding, with no maternal mortality reported. Fetal outcomes were generally positive, with a 95% live birth rate (166 patients), a 45% cesarean section rate (79 patients), and a 5% incidence of preterm births (8 patients). (Table 3)

Table 3: Management and Outcomes

Management/Treatment	Number of Patients	Outcomes
Anticoagulation Therapy		
- Low Molecular Weight Heparin (LMWH)	160	Recurrence of VTE: 3% (5 patients)
- Unfractionated Heparin (UFH)	15	Major Bleeding Complications: 5% (8 patients)
Maternal Outcomes		
- Recurrence of VTE	Five patients (3%)	
- Major Bleeding Complications	Eight patients (5%)	
- Maternal Mortality	0	
Fetal Outcomes		
- Live Births	95% (166 patients)	
- Cesarean Section Rate	45% (79 patients)	
- Preterm Births	5% (8 patients)	
- Fetal Mortality	0	

Early diagnosis within the first and second trimesters was strongly associated with better maternal and fetal outcomes ($p = 0.001$). The use of low molecular weight heparin (LMWH) compared to unfractionated heparin (UFH) was significantly correlated with fewer bleeding complications ($p = 0.001$). (Table 4)

Table 4: Statistical Analysis Summary

Variable	Correlation with Outcome	p-Value
Early Diagnosis (First and Second Trimesters)	Better Maternal and Fetal Outcomes	0.001
Use of LMWH vs. UFH	Fewer Bleeding Complications	0.001
DVT vs. PE Outcomes	No Significant Difference	0.06

For patients who began anticoagulation therapy within 24 hours of diagnosis, 110 received low molecular weight heparin (LMWH), and 10 received unfractionated heparin (UFH), resulting in no recurrence of VTE and a 2% incidence of bleeding. Among those who started therapy within 24-48 hours, 35 received LMWH, and 5 received UFH, leading to a 1% recurrence of VTE and 3% bleeding. For patients who began treatment after 48 hours, 10 received LMWH, and 5 received UFH, with a 2% recurrence of VTE and a significantly higher 10% incidence of bleeding. (Table 5)

Table 5: Anticoagulation Therapy and Timing of Initiation

Timing of Anticoagulation Initiation	Number of Patients	Type of Therapy	Outcome
Within 24 hours of Diagnosis	120	110 LMWH, 10 UFH	No Recurrence of VTE, 2% Bleeding
Within 24-48 hours of Diagnosis	40	35 LMWH, 5 UFH	1% Recurrence of VTE, 3% Bleeding
After 48 hours of Diagnosis	15	10 LMWH, 5 UFH	2% Recurrence of VTE, 10% Bleeding

Discussion

The study on the diagnosis and management of thromboembolism in pregnancy provides valuable insights into the challenges and outcomes associated with this severe condition. The results emphasize the role of early diagnosis and prompt starting of anticoagulation, which are fundamental to achieving a lower risk of maternal and fetal morbidity (9). In the patient cohort of 175 pregnant women with VTE, it was shown that most of them occurred in the third trimester (10). This conforms to the literature because, as pregnancy advances, the risks for VTE rise due to such factors as venous stasis, hypercoagulability, and pressure by the gravid uterus, mainly on the pelvic veins. It is so with this study since although the number of patients who developed DVT was more than those who developed PE in pregnancy; PE is deadlier in pregnancy (11).

The diagnostic strategy in this study involved Doppler for DVT and CTPA for PE; success was achieved as identified

by high confirmations for the diseases. Nevertheless, any diagnostic conclusions about VTE should be based on imaging due to relatively high false positive results on D-dimer assay in pregnant women (12). This interpretation of the results and the fact that MRI was employed for further examination in case of inconclusive US or CTPA results or when radiation dose was an issue highlights the necessity of an individual approach toward the choice of diagnostic methods in pregnancy. Thromboembolism in pregnancy management was essentially with LMWH, given relative contraindication and a higher risk of bleeding with UFH when compared to pregnancy. This work reinforces the current recommendations where LMWH is preferred because of its safety and ease of use; it is associated with a lower risk of osteoporosis and heparin-induced thrombocytopenia (13). This was also confirmed by the authors, who identified increased short-term mortality among patients mainly due to recurrent VTE and major bleeding complications after the initiation of anticoagulation therapy within 24 hours of diagnosis. This re-emphasizes the need for early action once a VTE diagnosis is made in pregnancy (14).

The type of delivery and the time when it occurred in connection with anticoagulation therapy were essential indicators of the outcome for the mother. When planned and heparin stopped appropriately ahead of time, VAG delivery was associated with fewer complications than emergency/total cesareans when the timing of anticoagulation could not be done well. Therefore, there is critically essential input from obstetricians, hematologists, and anaesthesiologists to make specific plans for the type of delivery that would be least likely to raise these risks considering the patient's condition (15). However, like all studies, this study has its limitations: As indicated in this study, this research is a cross-sectional examination of the state of organizations in the United Kingdom and, therefore, only offers a snapshot in time (16). Potential sources of bias that may be attributable to using a retrospective design include the accuracy and completeness of records. Also, it is crucial to point out that the generalization of the results achieved in the study might not apply to all subjects, given that the investigation took place in a single tertiary care center with particular characteristics of the participants (16).

Conclusion

It is concluded that early diagnosis and timely management of thromboembolism in pregnancy, mainly through the use of low molecular weight heparin and a multidisciplinary approach to care, significantly improve maternal and fetal outcomes.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
It is approved by the department concerned. (IRB-LRHP-9233/20)
Consent for publication
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Conflict of interest

The authors declared an absence of conflict of interest.

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