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Prevalence of Deep Vein Thrombosis and Associated Risk Factors During Pregnancy and Puerperium in Omdurman Maternity Hospital from March 2021-August 2021

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Abstract:

- ***Introduction:***

Women during pregnancy and postpartum period represent one of the highest risk groups for DVT. The treatment and supportive measures are of paramount importance to reduce the risk and complications of this disease. Moreover complications which can occur to the fetus and maternal health during pregnancy should be taken into account in treatment.

- ***Methodology:***

This study is a cross sectional hospital-based study. It was conducted during the period March 2021-August2021, in Omdurman maternity hospital, included women during pregnancy or puerperium. Patient interviewed through a detailed questionnaire and some information obtained from patients file. For event of deep vein thrombosis, associated factors and feto-maternal outcome. Data was processed using the SPSS (vs. 26).

- ***Results:***

Among 13828 deliveries, 50 patients had deep vein thrombosis the prevalence was 0.36%. The mean patient's age was 31.74±6.5 years (range was 18-45 years). The majority of DVT 34 (68%) occur during puerperium, and 16(32%) occur during pregnancy, 8(16%) had history of similar condition, and 20(40%) had family history of similar condition. Chronic illnesses mostly hypertension 9(56.3%), and anemia was in 19(38%). The mode of delivery was vaginal delivery in 26(52%). The mean duration of hospital stay was 6.7±6.0 (range from 1- 30 days). DVT was managed in majority using heparin 33(66 %), LMWH + warfarin in 9(18%), of patients pulmonary embolism was in 3(6%), and the death rate was 1(2%). 5(10%) of fetuses admitted to NICU.

- ***Conclusion:***

Deep vein thrombosis prevalence was 0.36% and it is more frequent during puerperium.

Keywords: *Prevalence, Deep Vein Thrombosis, Risk Factors, Pregnancy, Puerperium.*

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I. INTRODUCTION

Venous thromboembolism (VTE), deep vein thrombosis (DVT) of the leg or pelvis and its consequence, pulmonary embolism (PE), and arterial thromboembolism are among the thromboembolic conditions that can become life-threatening. VTE occurs four to five times more frequently in pregnant women than in non-pregnant women [1], it is logical to assume that it is one of the main causes of maternal morbidity and mortality. In the United States, VTE deaths account for 9.2 percent of all maternal deaths [2]. Hypercoagulability, venous stasis, and vascular damage—trinity Virchow's of risk factors for venous thrombosis—occur both during pregnancy and after delivery [3].

In addition VTE can result in chronic morbidity. Post thrombotic syndrome, a long-term morbidity that causes varying degrees of edema, discomfort, and eczema, lowers quality of life, and is connected with high medical expenses [4]. Preeclampsia, intrauterine growth retardation, fetal mortality, and recurrent miscarriage are just a few of the poor pregnancy outcomes that have been linked to thrombotic risk factors, in addition to the negative effects these outcomes have on health [5]. The morbidity and mortality of pregnancy-related thromboembolism are anticipated to rise in tandem with the proportion of high-risk pregnancies as advanced maternal age and obesity levels rise.

According to reports, there are between 0.08 and 1.76 cases per 1000 deliveries of pregnancy-related VTE [6-9]. Differences in research design and the techniques used to validate the diagnosis are two potential causes for the large range. Following the erosion or rupture of atherosclerotic plaque, platelet-mediated thrombosis is typically what causes arterial thromboembolism [10]. Stroke and cardiac ischemia are the two clinical symptoms that are the most severe. The risk of stroke and heart ischemia has been reported to be 3- to 4-fold higher in pregnant women than in the non-pregnant population, despite the fact that studies of pregnancy-related arterial thromboembolism are quite scarce [7,11].

Guidelines for prescribing thromboprophylaxis when a specific number of risk factors for thromboembolism are present have recently been given [12, 13]. However, due to the low absolute incidence of pregnancy-related thromboembolism, a sizable population-based investigation with the capacity to pinpoint its frequency and risk factors is required. Additionally, population-based studies are insufficient to pinpoint the precise risks and predictors of pregnancy-related thromboembolism, particularly in Sudanese populations.

The aim of this study was to estimate the prevalence of and risk factors for thromboembolism during pregnancy and puerperium among Sudanese women from March 2021-August 2021.

II. MATERIALS AND METHODS

A. *Study Design:*

This is a descriptive observational cross sectional hospital based study.

B. *Study Duration:*

The study was carried out during the period from March 2021-August 2021.

C. *Study Area:*

The study conducted at Omdurman maternity hospital which is situated in Khartoum locality.

- **Study population:** Women experienced DVT at OMH during the study period.
- **Inclusion criteria:** All mothers that experienced DVT at OMH during pregnancy or during 42 days postpartum {puerpereum} admitted and managed.
- **Exclusion criteria**: Women refused to participate and those out of study period.
- **Data collection tools:** The data was collected by comprehensive structured close ended questionnaire that covering the relevant aspects and variables in the study.

D. *Sampling:*

In order to determine the prevalence of DVT we assessed all patients file (N=13828) presented during study period, then patients with DVT (N=50) were studded further for Sociodemographical information, history, management and outcome.

- **Data Management:** The data exported to SPSS version 26.0 for data analysis.Bi-variable analysis to determine the associations between the main outcome variable and the other associated factors with the Chi-square test (for categorical variables) statistical tests. P value of 0.05 or less is considered significant.

Data was represented after analysis in the form of uni-variable tables, cross-tabulation (bi-variable tables), multivariable tables, figures, and narrative illustration.

E. *Ethical Implications:*

- The study was presented to the ethics review committee of the Sudan Medical Specialization Board.
- Ethical approval was obtained from the ethical committee at the research unit-EDC.
- Permission was obtained from the Omdurman Maternity hospital administrative authorities.
- Written consent was obtained from participants after explaining the nature and purpose of the study.
- Confidentiality of participants' data was considered by coding the questionnaire.

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III. RESULTS

In this study 50 patients out of 13828 found to have DVT during pregnancy or puerperium, the prevalence was 0.36%.

A. Socio Demographical:

In this study 50 patients were included the mean patients age was 31.74±6.5 years (range was 18-45 years) the majority of patients 23(46%) within age group 26-35 years.

Regarding education level, 14(28%) had secondary school level, 10(20%) had basic school level, and 9(18%) had university school level.

The majority 40(80%) of patients were house wife, and 39(78%) were from urban area. 32(46%) had moderate socioeconomical status, and 15(30%) had low socioeconomical status. Table (1)

The mean of patient's weight was 72.7±14.2 kg (range 49-110 kg). BMI was normal in 21(42%), while 19(38%) were overweight, and 9(18%) were obese. Figure (1)

B. Medical History:

Regarding antenatal booking status, 32(64%) was booked and 18(36%) unbooked antenatal care.

Majority of women 12(24%) were parity three, followed by 11(22%) was parity 4, and 10(20%) were parity two.

8(16%) had history of similar condition, and 20940%) had family history of similar condition Table (2)

Among patients, 16(32.0%) had chronic illnesses, mostly hypertension 9(56.3%), followed by diabetes mellitus 4(25.0%). and 3(18.7%) had both DM and HTN. Table (3)

Anemia was 19(38%) of patients. Figure (2)

The majority of DVT 34(68%) occur during puerperium, and 16(32%) occur during pregnancy. Figure (3)

Among patients developed DVT during pregnancy 9(56.3%) within gestational age 28-33+6, and 6(37.5%) in gestational age 34-36+6.Table (4)

Majority of patients presented with Limb swelling 37(74%), followed by limbs pain 36(72%), and limbs redness 4(8%). Table (5)

Majority of DVT was confirmed diagnosis with Dobbler 37(74%), followed by clinical diagnosis in 21(42%) and lab test (D- dimer) in 4(8%). Table (6)

The mean duration of hospital stay was 6.7±6.0 (range from 1- 30 days). The duration of hospital stay was <24 hours in 2(4%), 1-3 days in 14(28%), 3-7 days in 18(36%), and more than 7 days in 16(32%). Table (7)

DVT was managed in majority using heparin 33(66 %), LMWH + warfarin in 9(18%), and Heparin + warfarin in 8(16%). Table (8)

The mode of delivery was vaginal delivery in majority 26(52%), and cesarean section in 24(48%). Figure (4)

Most of pregnancy was single 33(66%), and 17(34%) were multiple fetuses. Figure (5)

Regarding maternal complications, 3(6%) developed pulmonary embolism, and 1(2%) died. Table (9)

The mean birth weight was 3.31 ±0.52 (range 2.2-5 kg). Most of fetus weight 34(68%) was >3-4 kg.

Apgar score was <7 in 18(46%) at 1 mints, and <7 in 13(26%) at 5 mints.

5(10%) of fetuses admitted to NICU. Table (10)

Table 1: Age Groups and Education Level of Patients with Deep Vein Thrombosis during Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Sociodemographic	Frequency	Percent
Age groups		
16-25years	12	24.0
26-35years	23	46.0
36-45years	15	30.0
Total	**50**	**100.0**
Education level		
Illiterate	9	18.0
Basic school	10	20.0
Secondary school	14	28.0
University	9	18.0
Postgraduate	8	16.0
Total	**50**	**100.0**

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Table 2: Occupation, Residence, Socioeconomically of Patients with Deep Vein Thrombosis during Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Occupation	Frequency	Percent
Housewife	40	80.0
Employee	10	20.0
Total	50	100.0
Residence		
Urban	39	78.0
Rural	11	22.0
Total	50	100.0
Socioeconomically status		
Low	15	30.0
Moderate	32	64.0
High	3	6.0
Total	50	100.0

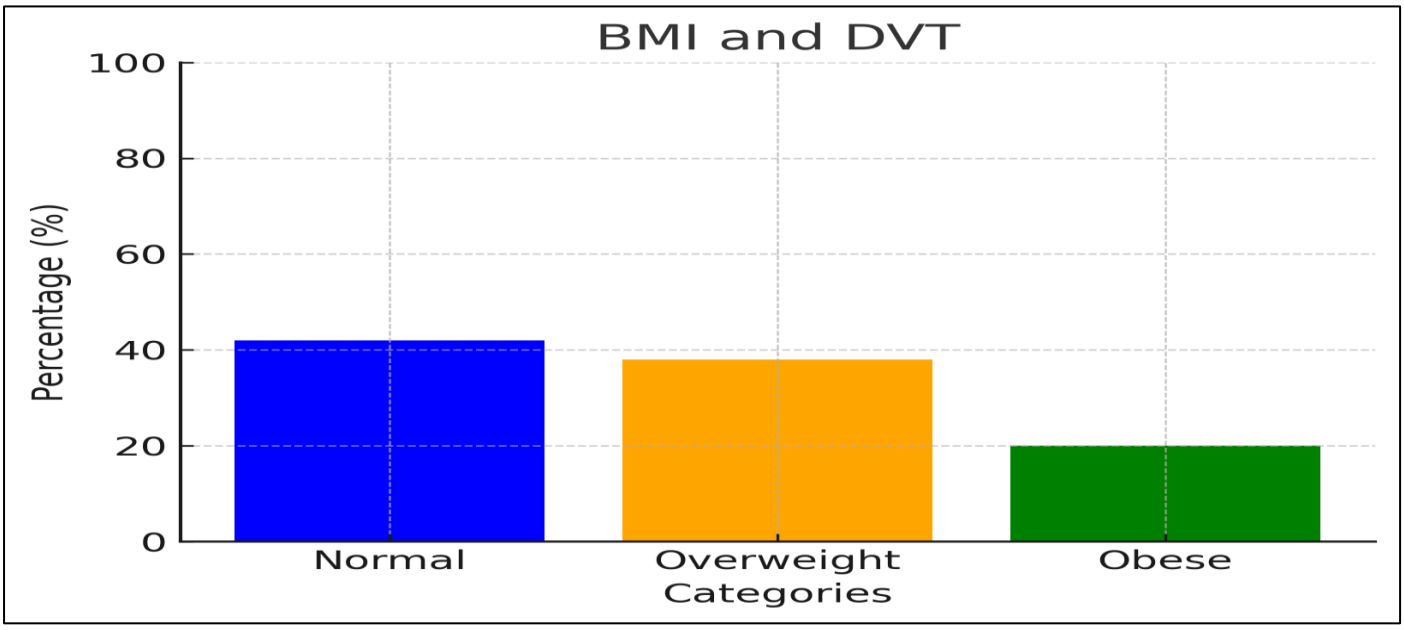

Fig 1: Body Mass Index of Patients with Deep Vein Thrombosis during Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Table 3: Medical History of Patients with Deep Vein Thrombosis during Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Clinical Data	Frequency	Percent
ANC Booking status		
Booked	32	64.0
Un-booked	18	36.0
Total	**50**	**100.0**
Parity		
Primigravida	7	14.0
Multigravida	39	78.0
Grandmultipara	4	8.0
Total	**50**	**100.0**
History of similar condition		
Yes	8	16.0
No	42	84.0
Total	**50**	**100.0**
Family history of similar condition		
Yes	20	40.0
No	30	60.0
Total	**50**	**100.0**

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Table 4: Chronic Illness among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021.

Chronic Illness	Frequency	Percent
Yes	18	32.0
No	32	68.0
Total	50	100.0
If yes		
HTN	9	50.0
DM	4	22.2
HTN+DM	3	16.7
APS	2	11.1
Total	18	100.0

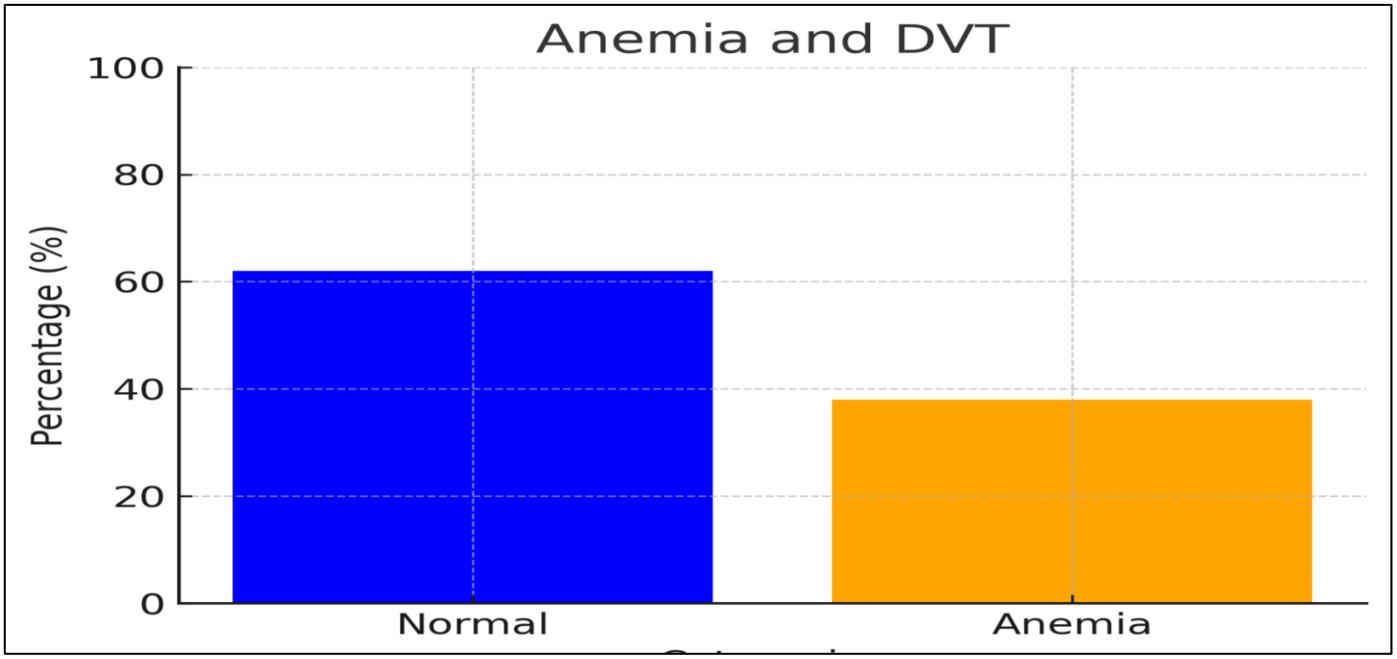

Fig 2: Anemia among Patients with Deep Vein Thrombosis during Pregnancy and Puerperium in Omdurman Maternity Hospital January 2021-june 2021

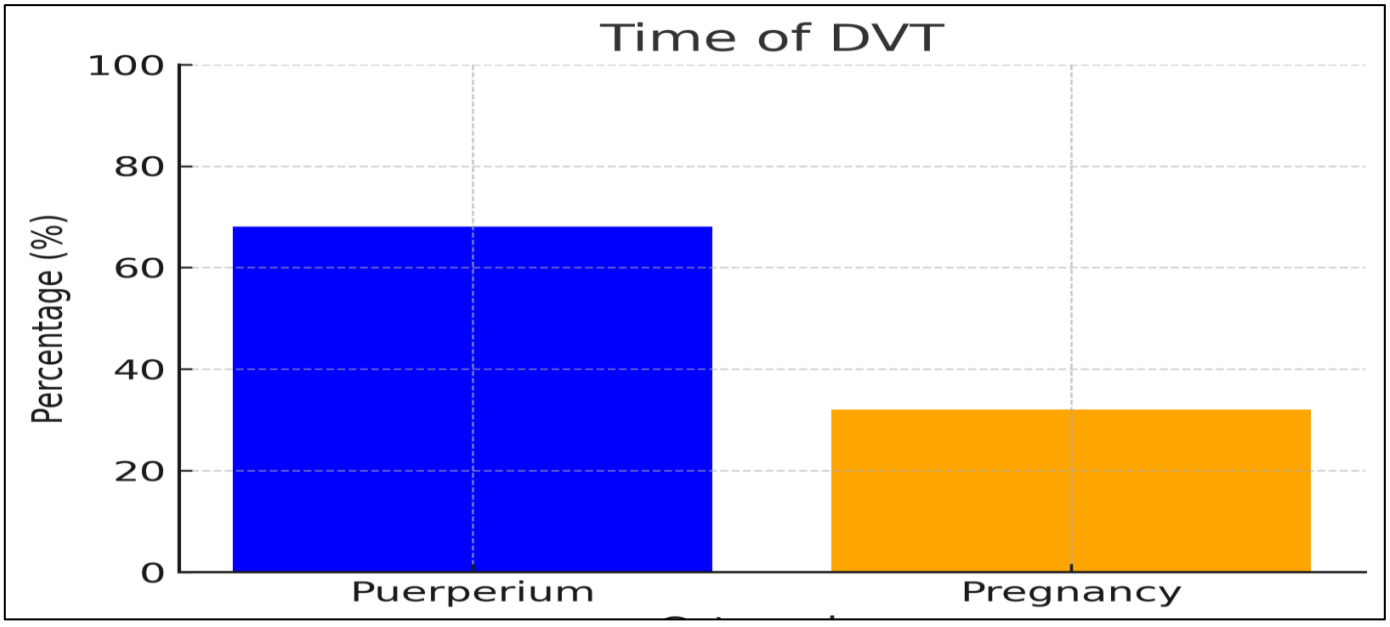

Fig 3: Time of DVT among Patients during Pregnancy and Puerperium in Omdurman Maternity Hospital January 2021-june 2021

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Table 5: Gestational Age when DVT Occur During Pregnancy Among Patients in Omdurman Maternity Hospital January 2021-June 2021.

Gestational Age	Frequency	Percent
24-27+6	1	6.3
28-33+6	9	56.3
34-36+6	6	37.5
Total	16	100.0

Table 6: Presenting Symptoms of Patients with Deep Vein Thrombosis during Pregnancy and Puerperium in Omdurman Maternity Hospital January 2021-june 2021

DVT Site	Frequency	percent
Left	48	96.0
Right	2	4.0
Bilateral	0	0.0
Presenting symptoms		
Limb swelling	37	74.0
Limbs pain	36	72.0
Limbs redness	4	8.0

- Note: Some patients presented with more than one symptom, thus the collection of frequency more than total number of patients.

Table 7: DVT Diagnosis among Patients with Deep Vein Thrombosis during Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Diagnosis	Frequency	Percent
Clinically	21	42.0
Doppler	37	74.0
Lab test (D-dimer)	4	8.0
Total	50	100.0

- *Note:* confirmation of DVT in some patients performed by more than one test, therefore the assumes of frequency exceed the asum of total number of patients.

Table 8: Duration of Hospital Stay Among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Duration of Hospital Stay	Frequency	Percent
< 24 hrs.	2	4.0
1-3 days	14	28.0
3-7 days	18	36.0
>7 days	16	32.0
Total	50	100.0

Table 9: Type of Management among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Management	Frequency	Percent
Heparin	33	60.0
LMWH+Warfarin	9	2.0
Heparin + warfarin	8	18.0
Total	**50**	**100.0**

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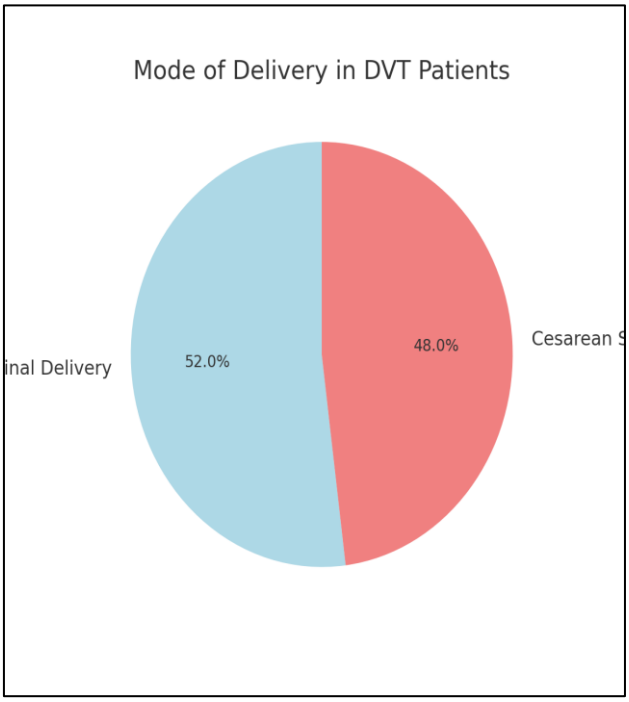

Fig 4: Mode of Delivery among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

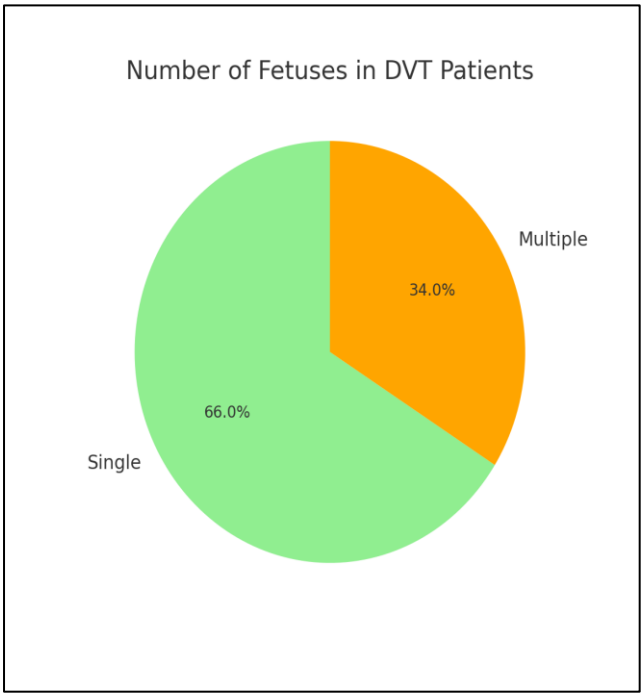

Fig 5: Number of Fetus among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Table 10: Complication among Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Complications	**Frequency**	**Percent**
Pulmonary embolism	3	6.0
Death	1	2.0
Venous surgery	0	0.0
Non	46	92.0
Total	**50**	**100.0**
ICU admission		
Yes	4	8.0
No	46	92.0
Total	**50**	**100**

Table 11: Fetal Outcome of Patients with Deep Vein Thrombosis During Pregnancy and Puerperium Omdurman Maternity Hospital January 2021-June 2021

Fetal outcome	**Frequency**	**Percent**
Birth weight /kg		
2-3	14	28.0
>3-4	34	68.0
>4-5	2	4.0
Total	**50**	**100.0**
Apgar score		
Apgar score < 7 at 1 minute	18	36.0
Apgar score < 7 at 5 minute	13	26.0
NICU admission		
Yes	5	10.0
No	45	90.0
Total	**50**	**100.0**

IV. DISCUSSION

DVT during pregnancy and postnatal are increasing in prevalence and are associated with significant long-term psychological and physical maternal morbidity. It has significant problems that require skill and knowledge to limit potential adverse events.

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This study showed that the prevalence of DVT during pregnancy or puerperium was 0.36%. Much higher prevalence reported by two previous studies in Sudan *Handady S. O.et al;* [14] in Shendi Teaching and Elmec-Nimir University Hospitals -Sudan that DVT was (0.622%), during one year period, and *Gader AA, et al* reported nearly the rate was (0.44%) Khartoum and Khartoum North Teaching hospitals, Sudan. Moreover *Galambosi PJ, et al;* [15] in Finland stated among the 634 292 delivered women, 0.18% had venous thromboembolic events 0-180 days postpartum, majority within the first week after delivery. Also *Park JE, et al;* [16] in Korea reported the prevalence of thromboembolism was 0.028%. However previously published studies of the prevalence of pregnancy-related VTE have reported a wide variation in incidence (0.08–3.6 per 1000 deliveries), [17, 18, 19] the variation possibly due to the differences in the study populations investigated, study design, study size and validity of the data.

This study showed that the mean patient's age was 32.74±6.5 years (range was 18-45 years) the majority of patients 46% within age group 26-35 years, and 30% within age group 36-45 years, this in line with *Huang D, et al;* [20] study which stated that the mean age at pregnancy was 35.8±3.7 years, also *Handady S. O. et al;* [14] found the mean age was 36.31±2.88 among the case group. Moreover *QIN C, et al* [21] meta-analysis revealed that most studies showed that advanced age was related to an increased risk of VTE. This may indicated that the rate of pregnancy-related venous thromboembolism in our population appeared to increase with increasing maternal age. [22]

Present study results showed that the majority of DVT 68% occur during puerperium, and 32% occur during pregnancy. This was in agreement with previous reports as there were approximately twice and five times as many postpartum as antepartum DVT events.[1, 53,64] in line *Park JE, et al;* [16] study find that incidence of antepartum thromboembolism was 0.1 per 1,000 deliveries (418 cases), and the incidence of postpartum thromboembolism was 0.18 per 1,000 deliveries (770 cases). In contrast, *James* and colleagues reported more pregnant women suffer DVT in early pregnancy than in the puerperium. [7]

Deep vein thrombosis was found in women delivered by vaginal delivery 52%, compared with 48% that delivered by cesarean section. which is comparable to *Handady S. O.et al;* [14] study which revealed that deep vein thrombosis was found in women delivered by VD 67.9 % and 32.1% that delivered by CS also *Jacobsen AF* et al; [17] who revealed that, incidence of venous thromboembolism is probably two to four times higher after cesarean sections when compared to normal and forceps deliveries [17]. On the same point of view, our finding was supported by *Gader AA, et al;* who reported that cesarean delivery was a predictor for DVT (OR = 2.21; 95% CI = 1-4.40, P = 0.02. Cesarean section is a known risk factor for DVT [23].

In this study BMI was normal in 21(42%), while 19(38%) were overweight, and 9(18%) were obese. in contrast *Handady S. O.et al;* [14] showed that most of patients had high BMI obese was 52% and BMI is significant risk factor associated with DVT. Similar observations were showed in previous studies by *Simpson EL, et al.* and *Ohira T, et al.* [24, 25]. Several studies have found an association between BMI in early pregnancy and venous thromboembolism during pregnancy and the puerperal period [37,64,66] One of these found obesity to be associated with a higher risk of pulmonary embolism than of deep venous thrombosis [26]. The small association between BMI and venous thromboembolism during pregnancy that we found could reflect a more aggressive prophylactic awareness for this category of pregnant women in Denmark. Similar findings were found in the study based on the British general practitioners registry [27].

This study showed that majority of women were booking 64%, and majority were parity three, followed by was parity 4, in contrary *Handady S. O.et al;* found that one-half were of women were primigravidae which showed statistically significant association with the disease and majority of women 157 (67.1%) were booking.[14]

In this study high frequency of multiple fetus pregnancy 34%was reported, in line *Virkus RA; et al;* [28] study stated that the association between multiple pregnancies and venous thromboembolism in pregnancy was very strong, but not in the puerperal period was also found in other studies [7, 17,29] , but not in the recent study by *Sultan et al.* [27]. The possible reason for these results is that multiple births are more related to gestational hypertension, antenatal hemorrhage and cesarean delivery than singleton pregnancy.

The most important individual risk factor for VTE in pregnancy and puerperium is a history of thrombosis. This study reported high frequency of women who are had positive family history of DVT was 40%, and who had past history of DVT been 16%. Previous study found that 15% to 25% of thromboembolic events in pregnancy are recurrent events. The risk of recurrent VTE in pregnancy is also increased 3-to 4-fold (relative risk 3.5 [95% confidence interval 1.6, 7.8]). [30] In recent studies, the rate of recurrent VTE in women who did not receive anticoagulation has been reported to range from 2.4% to 12.2%.[31,32] In women who did receive anticoagulation, the rate of recurrent VTE has been reported to range from 0% to 2.4%.[32,33].

In the current series almost all patients treated with heparin, in majority using heparin 33(66 %), LMWH + warfarin in 9 (18%), and Heparin + warfarin in 8(16%). *Jain P,et al;* [34] study finding stated that all patients were treated with LMWH as it has longer plasma halflife, more predictable dose response, lower risk of heparin-induced thrombocytopenia and probably a lower risk of osteoporosis [35] . The treatment is offered for a minimum of 3–6 months as per the American college of chest physician (ACCP) guidelines. Currently, there is no data available on use of novel oral anticoagulants (NOAC's) in postpartum patients. They have been treated with Class II compression stockings as per ACCP guidelines, but recent edition recommendations and Royal College of Obstetricians and Gynecologists guidelines are against their routine use.[36, 37]

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Regarding maternal complications, this study found 3(6%) developed pulmonary embolism, and 1(2%) died. too much higher frequency of DVT reported by *Park JE, et al;* [16] study that pulmonary embolism accounted for the largest portion of total thromboembolism (31%) while *Jain P, et al* [34] stated that none of the patients had in-hospital PE or any other complication.

Determining which patients should receive thromboprophylaxis remains a challenge. Despite recommendations for thromboprophylaxis for women undergoing cesarean delivery,[17] a 2-fold increased risk may not be sufficient to justify thromboprophylaxis unless other risk factors are present. All published guidelines, including American, British, Australian, and French are in favor of thromboprophylaxis, usually for 6 weeks postpartum in case of previous VTE, regardless of the mode of delivery. [38]

In this study the mean birth weight was 3.31 ±0.52 (range 2.2-5 kg). Most of fetus weight 34(68%) was >3-4 kg .In contrast previous research reported that low birth weight of <2500 g at term is a strong and independent risk factor for postpartum VTE.[39] also *Zhou ZH,et al;* [40] study suggested that birth weight of <2500 g was a risk factor for postpartum VTE but not an independent variable. Furthermore, histological placental examinations of women with growth restriction provide evidence of both maternal and fetal vascular obstruction.[41] variation in finding possibly due to variation in patients characteristics since these study involved women patients with postpartum DVT , while ours included that occurs during pregnancy and postpartum .

The limitation of this study was that it wasn't controlled study, thus significance of risk factors was unable to determine.

V. CONCLUSION

- The prevalence of DVT was 0.36%.
- The majority of DVT two thirty occur during puerperium, and one thirty occur during pregnancy.
- The commonest presenting symptoms was Limb swelling followed by limbs pain, and limbs redness 4(8%).
- The mean patient's age was 31.74±6.5 years (range was 18-45 years).
- Most of patients were booking for antenatal care, and were parity three.
- History of similar condition was reported in 16%, and family history of similar condition was found in 40%.
- DVT was managed in majority using heparin, LMWH + warfarin.
- High frequency of multiple fetus's pregnancy reported among patients.
- Pulmonary embolism rate was 6%, and death rate was 2%.
- Most of fetus's birth weight was normal. And 10% of fetuses admitted to NICU.
- DVT is more prevalent in vaginal delivery (52%)

RECOMMENDATIONS

- There is need for prophylaxis measures against DVT for pregnant women who had history of similar condition.
- There must more researches to study the need of post vaginal delivery DVT prophylaxis.
- Larger studies with a randomized design, and control groups are required to confirm the current findings.
- Encourage early mobilization for patients after both vaginal and C/S
- Provide Health education for patients to detect early symptoms of DVT.

ABBREVIATIONS

	Term
APLA	antiphospholipid antibody
ASHP	American Society Of Health System Pharmacists
CTED	chronic thromboembolic disease
CTEPH	constant thromboembolic pulmonary hypertension
CTPA	computed tomography pulmonary angiography
CUS	Compression ultrasonography
DM	Diabetes Mellitus
DOACs	direct oral anticoagulants
DVT	deep vein thrombosis
ESC	European Society of Cardiology
FVL	factor V Leiden
HIT	heparin induced thrombocytopenia
ISTH	International Society on Thrombosis and Haemostasis
JIVAS	Jain Institute of Vascular Sciences
LMWH	low molecular weight heparin
LSCS	lower segment cesarean section
HTN	Hypertension
OMH	Omdurman Maternity Hospital
PA-VTE	pregnancy-associated Vein thromboembolism
PE	pulmonary embolism
PTS	post-thrombotic syndrome
RCOG	Royal College of Obstetricians and Gynecologists
SPSS	Statistical Package For Social Science
UFH	unfractionated heparin
VTE	Vein thromboembolism

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