

Prothrombin Time, Activated partial Thromboplastin Time and Platelets Count in Pregnant Females and Postpartum Period with Deep Venous Thrombosis

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Abstract Background: Venous thromboembolism is one of the major causes of maternal morbidity and mortality, the aims of this work was to determine the levels of (Prothrombin time (PT), activated partial thromboplastin time (APTT) and platelets count (PLTs)) in pregnant and postpartum when affected with deep venous thrombosis (DVT). **Methods:** Fifty female of child bearing age (15-45) years presented with signs of (DVT) either during pregnancy or postpartum period were investigated for PT, APTT and PLts count and fifty other pregnant and postpartum presented without signs of DVT were included as control groups, the patients females and control completed questionnaire of personal data and clinical history such as age, case study (pregnant or postpartum), usage of contraceptive pills and family history of DVT and number of pregnancies. The automated method used to measure PT, APTT, coagulomator and PLTs count using (sysmex K21). **Results:** Distribution of bleeding profile according to age groups showed that, mean of platelets count was higher (286.7) in young age (15-25 yrs.), PT was prolonged in vast majority of case group (90%), while it was normal in 10% of study population. APTT was prolonged in 62% of patients, mostly higher in third trimester with percentage of 69.4%. Platelets count found normal in vast majority of patients in all 3 trimesters. **Conclusion:** Normal platelet level where found in both control and case, while PT is significantly prolonged in the case (P=0.00). While APTT is also prolonged in the case group; but not statistically significant with the control.

Keywords: Prothrombin, Thromboplastin, Platelets, thrombosis

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1. Introduction

Venous thromboembolism (VTE) is a serious complication that increases throughout pregnancy and Postpartum Period with estimated incidence rate of 1 per 1000 pregnancies [1]. Moreover; Pregnancy itself is an independent risk factor for VTE and it was reported that women develop VTE five times more than when not pregnant [2].

Haemostasis in normal pregnancy involves a complex network of interactions with positive and negative feedback loops, integrating blood vessels; platelets; coagulation factors, coagulation inhibitors and fibrinolysis; all these has evolved the likely to protect women from hemorrhage during miscarriage or childbirth. These multiple changes occur in the coagulation system may contribute in the hypercoagulability state and results in the following: endothelial injury together with decrease fibrinolysis and reduced levels of the natural antifibrinolysis [3,4].

Most of women who develop thrombosis during pregnancy presented with edema and skin changes to recurrent thromboses and ulceration [5]. VTE during pregnancy may results in poor pregnancy outcome such as placental abruption, preeclampsia, fetal growth restriction, stillbirth, and possibly recurrent miscarriage [6,7,8].

Sometimes death due to VTE is so rapid that it leaves insufficient time for intervention. Patients at risk must be identified and given appropriate prophylaxis to reduce VTE-related mortality and mortality and improve the outcome of pregnancy. The failure to reduce this rate may be a result of uncertainty regarding risk factors for VTE and the associated difficulty in recognizing individuals at risk. Reported risk factors vary widely as do the genetic, environmental and behavioral factors [9,10].

Risk of thrombo-embolism was increased because of medical practices such as operative (caesarean or instrumental) delivery, prescription of prolonged bed rest after delivery, and use of estrogens to suppress lactation [11].

Despite all above mention risks of interaction between thrombophilia and pregnancy, there is little published data

regarding the circumstances surrounding VTE in pregnancy and post partum period. Hence; this study aimed to determine prothrombin time (PT), activated partial prothrombin time (APTT) and platelets count among pregnant females and postpartum period with DVT in Khartoum State as well as to explore the possible associate between them.

2. Material and Methods

2.1. Study Design

This is a case control hospital based study conducted the periods from August 2013 to May 2014.

2.2. Study Location

This study was undertaken in Omdurman maternity hospital and Khartoum teaching hospital in Khartoum state, Sudan.

2.3. Study Population

Fifty pregnant females and post partum patients of child – bearing age (15 – 45 years) presented with signs of DVT with confirmed by Doppler ultrasound were investigated for PT, APTT and platelet count other Healthy matched 50 pregnant females and post partum females of child – beary age (15- 45 years) presented without signs of DVT as control group.

2.4. Inclusion and Exclusion Criteria

Inclusion criteria pregnant and post partum females presented with signs of DVT which confirmed by Doppler uterine sound, on anticoagulation with no other medical conditions. Exclusion criteria pregnant and post partum females presented with no signs of DVT and know cases of DVT under treatment were excluded from the study.

2.5. Data Collection

Data was collected using designed questionnaire including demographic data (age), gestational age, medical history and other information.

2.6. Sample Collection

Two and half ml of whole blood with 1:9 ratio of tri sodium citrate were collected from all participants, then centrifuged to take plasma to perform PT and APTT using automated coagulometer. Two and half ml of whole blood with ETDW anticoagulant collected to perform platelets count using automated haematological analyzer Sysmex K 21.

2.6.1. Determination of Prothrombin time (PT) and Activated Partial Thromboplastin Time (APTT)

Coulometer was used for measurement of PT and APTT automated are the same to as for manual method but cuvettes of one ml and magnetic stirrers used and time clot formation were recorded digitally [12].

Norma value of PT: (12-16 second) [13].

Norma value of APTT: (20-40 second)

2.6.2. Automation in PLT Counts

Sysmex K 21 was used for platelets count sample were counted automatically by PLT counted cu/mm [14] normal value: (150,000, 450,000 /cumm) [15].

2.7. Ethical Consideration

This study conforms to the ethical principles of medical research developed by the World Medical Association Declaration of Helsinki [16]. Ethical approval was taken from Research Esthetical Committee (REC) in the Federal Ministry Health (FMOH). Verbal consent was taken from all patients; explaining the objectives of the study.

2.8. Data Analysis

All data obtained with questionnaire and biochemical analysis were analyzed using the Statistical Package for the Social Sciences (SPSS) version 19. The chi square test was used to test distribution of categorical variables. The differences between test and control groups were assessed with the student's t test. Statistical significance was accepted when P value is ≤ 0.05 .

3. Results

Table 1 illustrated the distribution of bleeding profile according to case and control groups, there was no significant difference between case and control regarding the mean of platelets counts (272.3+62 versus 271+70 respectively, $p = 0.813$). While the mean of PT in cases was significantly prolonged when compared to the control group (21.8+7.8 and 12.4+1.7 respectively; $P = 0.000$). In addition; the mean of APTT is prolonged but no statistical significant was found when compared to control group (62.2+21.2 and 38.5+63.3 respectively; $P = 0.963$).

As shown in Table 2 there were 36 females in the third trimester, 7 of them showed short prothrombin time < 12 secs, 11 with normal PT (12-16), while 18 females showed prolonged PT ≥ 16 secs. Moreover; 32 females were in the second trimester 5 females showed short PT, 12 with normal and 15 showed prolonged PT. 32 females in the first trimester, 6 showed short PT, 14 females with normal PT, while 12 shwed prolonged PT, while it is normal in control group.

In Table 3 There was prolonged APTT in 62% of patients distributed according to gestational age as follows: in the third trimester there was 25 patients with APTT > 40/ sec, in the first trimester 19 showed APTT more than 40 secs, while in the first trimester there was 19 patients had APTT more than 40/ sec. Correlation between gestational age and level of APTT showed no significant association (P value 0.96).

In addition; normal platelets counts found in 96.9% of patients in the first trimester, 96.9% in the second trimester and 94.4% in the third trimester Table 4.

Table 1. Mean of bleeding profile in case and control group

Group	The Mean of bleeding profile		
	Mean PLT/ cumm	Mean PT/ sec	Mean APTT/ sec
Control	271.0+70.0	12.4+1.7	38.5+63.3
Case	272.3+62.0	21.8+7.8	62.2+21.2
P value	0.813	0.000	0.963

Table 2. Distribution of Prothrombin Time (PT) According to Gestational Age

PT	Trimester			Total
	First	Second	Third	
< 12	6	5	7	18
	18.8%	15.6%	19.4%	18.0%
	6.0%	5.0%	7.0%	18.0%
12--16	14	12	11	37
	43.8%	37.5%	30.6%	37.0%
	14.0%	12.0%	11.0%	37.0%
> 16	12	15	18	45
	37.5%	46.9%	50.0%	45.0%
	12.0%	15.0%	18.0%	45.0%
Total	32	32	36	100
	100.0%	100.0%	100.0%	100.0%
	32.0%	32.0%	36.0%	100.0%

PV=. 813

Table 3. Distribution of APTT According to Gestational Age

APTT		Trimester			Total
		First	Second	Third	
20-40 SEC	Count	13	14	11	38
	% within Trimester	40.6%	73.8%	30.6%	
	% of Total	13%	14%	11%	
>40 SEC	Count	19	18	25	62
	% within Trimester	59.4%	56.3%	69.4%	
	% of Total	19%	18%	25%	
Total	Count	32	32	36	100
	% within Trimester	100%	100%	100%	
	% of Total	32	32	36	100

PV=. 963

Table 4. Distribution of Platelets count according to Gestational age

PLT		Age			Total
		First	Second	Third	
<150	Count	1	1	2	4
	% within Trimester	3.1%	3.1%	5.6%	4.0%
	% of Total	1.0%	1.0%	2.0%	4.0%
150-450	Count	31	31	34	96
	% within Trimester	96.9%	96.9%	94.4%	96.0%
	% of Total	31.0%	31.0%	34.0%	96.0%
Total	Count	32	32	36	100
	% within Trimester	100.0%	100.0%	100.0%	100.0%
	% of Total	32.0%	32.0%	36.0%	100.0%

4. Discussion

In the current study comparison of platelets count between control and case groups showed no statistical difference between the two groups. While there was significant prolongation in the prothrombin time, also APTT in the control group was increased but to no significant difference found.

The results of the current study are supported by Hellgren M that proposed that during pregnancy there were increased endogenous thrombin generation, acquired activated protein C resistance and increased prothrombin level (PT) [17]. Another similar study in which they also measured Prothrombin fragments, by Cerneca F *et al* has shown that the parameters showing the greatest variation during pregnancy were PT, Prothrombin fragments F1+2, The existence of a hypercoagulable state in pregnancy was suggested by the increased levels of F1+2 [18].

In contrast to the our results; Lloyd R *et al* showed that Prothrombin time was decreased in pregnancy and it was associated with a significant increase in the activity of factors VII, VIII, IX, and X and in the concentrations of fibrinogen, -1-globulin, and -1-antitrypsin [19]. In another study by Hui C *et al* reported that Prothrombin time, activated partial thromboplastin time, thrombin time showed a tendency to decrease in pregnant women [20]. In addition; Szecsi PB *et al*; proposed that Prothrombin time remains unchanged in pregnancy, as well as the level of coagulation factors II, V, X, XI, XII and antithrombin, protein C largely remained unchanged [21].

Activated prothrombin times found higher among women in the third trimester with percentage of 62% mostly found in the third trimester with percentages of 25%, followed by 19% prolonged APTT in the first trimester and 18 patients in the second trimester; we found no statistical significant association. The study by Greer IA showed similar findings reporting that, DVT may lead to pulmonary embolism, the most common cause of maternal deaths in the developed countries; in the past, rates of fatal pulmonary embolism were highest in the post-partum period [22]. In addition; Sanka *et al* reported shortening of prothrombin time and activated partial thromboplastin time in the third trimester of pregnancy [23].

Platelets count found normal in vast majority of patients in all 3 trimesters, this is contradictory to study reported by Boehlen F *et al* that platelet count decreases in normal pregnancy possibly due to increased destruction and haemodilution with a maximal decrease in the third trimester [24].

5. Conclusion

This study concluded that there is prolonged PT and APTT in pregnant females and patients in postpartum period, while platelets count was found normal. Prolonged prothrombin times showed highly significant in association between and case and control groups, while there were insignificant prolonged PT and APTT in the third trimester among the study population.

Competing Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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