International Blood Research & Reviews

11(2): 23-33, 2020; Article no.IBRR.59201
ISSN: 2321–7219

Coagulation Parameters among Women with Obstetric Complications in Specialist Hospital Sokoto, Nigeria

Onuigwe Festus Uchechukwu[1*], Khadija Bello Tudu[1], Erhabor Osaro[1], Buhari Hauwa Ali[1], Bagudo Aliyu Ibrahim[1], Amilo Grace Ifechukwudebelu[2] and Ibeh Nancy Chitogu[3]

[1]Department of Haematology, School of Medical Laboratory Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria.
[2]Department of Haematology, Faculty of Medicine, College of Health Science, Nnamdi Azikiwe University, Nnewi Campus, Nigeria.
[3]Department of Medical Laboratory Sciences, Faculty of Health Science and Technology, Nnamdi Azikiwe University, Nnewi Campus, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Authors OFU, KBT and EO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BHA and BAI managed the analyses of the study. Authors AGI and INC managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IBRR/2020/v11i230127
Editor(s):
(1) Prof. Mehmet Sonmez, Karadeniz Technical University, Turkey.
Reviewers:
(1) A. Hareendran, Sree Chitra Tirunal Institute for Medical Sciences & Technology, India.
(2) V. S. Kalai Selvi, Bharath Institute of Higher Education and Research, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/59201

Original Research Article

Received 18 May 2020
Accepted 23 July 2020
Published 06 August 2020

ABSTRACT

Background and Aim: Obstetric complications are part of the leading causes of maternal mortality worldwide. This study was carried out to investigate the effect of complications on the Prothrombin time (PT), activated partial thromboplastin time (APTT), and platelet count (PLC). Women with obstetric complications were recruited as subjects). Pregnant women without complications were included as controls.
Study Design: This is a case-control study.
Place and Duration of Study: The study took place in Obstetrics and Gynaecology Department of Specialist Hospital Sokoto and the duration was six months.

**Corresponding author: E-mail: uchemls@yahoo.com;*

Methodology: Pregnant women aged 18–41 years (mean age 29.5 years) were recruited for the study. The determination of PT and APTT was done by manual methods using commercially prepared Agappe reagent kits, whereas PLC was done by manual methods using a haemocytometer (Improved Neubauer counting chamber). Data were analyzed using SPSS version 23.

Results: The results of PT and APTT were significantly higher among women with obstetric complications (14.26±0.23 seconds and 31.32±0.70 second) compared to normal pregnant women (13.00 ± 0.13 seconds and 29.66±0.33) (P<0.05). The PLC was significantly lower among women with obstetric complications compared to women without obstetric complications (P< 0.05).Obstetric complications in subject show a significant association when compared with PT and APTT (P< 0.05). The age group of subjects shows a significant association when compared with APTT (P< 0.05).

Conclusion: Findings from this study have shown that obstetric complications causes decrease in platelet count and prolongation in PT and APTT. There is need to assess the PT, APTT and Platelet count routinely for pregnant women to improve the ante-natal care in Specialist Hospital Sokoto.

Keywords: Coagulation parameters; women; obstetric complications; Sokoto; Nigeria.

1. INTRODUCTION

Obstetric complications is defined as an acute condition arising from a direct cause of maternal death, such as antepartum or postpartum haemorrhage, obstructed labor, postpartum sepsis, complications of abortion, pre-eclampsia, gestational diabetes, ectopic pregnancy, intra uterine foetal death and ruptured uterus or indirect causes such as anaemia, malaria, infection and tuberculosis [1]. Pregnancy and birth related complications constitute major drivers to the increasing burden of death and disability, especially in low-income countries [2]. The 2015 global reviews of progress toward achieving Millennium Development Goal 5a (MDG 5a) indicated a steady decline in the maternal mortality ratio (MMR) with Sub-Saharan Africa recording a 49% decrease in comparison with 1990 values [3]. However, this was still far below the global target of 75% reduction. The global assessment of country level progress revealed that Nigeria was one of the 26 countries categorized as having made no progress toward achieving MDG-5 [4]. The point estimates suggested that of the 26 countries, Nigeria was one of the four countries likely to have experienced an increase in MMR [5]. India and Nigeria accounted for over one third of all maternal deaths worldwide in 2015, with an estimated 58,000 (19%) and 45,000 (15%) maternal deaths in the countries respectively [6]. The estimated MMR for Nigeria was 814/100,000 in 2015 [6].

The WHO has identified the major causes of maternal deaths among which hemorrhage accounted for 27.1%, hypertensive disorders 14.0%, and sepsis 10.7% of maternal deaths, with the remainder due to abortion (7.9%), embolism (3.2%), and all other direct causes of death (9.6%) [7]. Majority of causes of the maternal deaths are preventable and avoidable. To prevent women from dying during pregnancy and childbirth, all women must receive basic preventive and primary reproductive healthcare services, including preconception and interconception care, comprehensive sexuality education, family planning and contraception, as well as adequate skilled care during pregnancy, childbirth, and the postpartum period [6]. Preeclampsia, often asymptomatic [8] that may often exhibit hypertension and proteinuria, with or without pathologic edema [9], whereas, preeclampsia / eclampsia altogether involve a fatality rate of 6. 4 per 10,000 delivery cases as reported by US Centers for Disease Control and Prevention (CDC) [10]. Most pregnancy-related medical complications appear to resolve at delivery or shortly thereafter. Common examples are preterm labor, placental abruption, preeclampsia, and gestational diabetes.

Women who developed such complications are known to be at increased risk of developing similar complications in future pregnancies. Women who delivered prematurely are at increased risk of recurrent preterm labor, those who had preeclampsia have an increased risk of preeclampsia in subsequent pregnancies and women who developed gestational diabetes (GDM) are likely to develop it again, as are women who experienced placental abruption, fetal growth impairment and so on. Recently,

research has shown that these pregnancy-specific complications continue to affect maternal health long after the index pregnancy. It has become apparent that women with a history of adverse pregnancy outcome are at increased risk of cardiovascular and metabolic diseases later in life. Data increasingly links maternal vascular, metabolic, and inflammatory complications of pregnancy with an increased risk of vascular disease in later life. For example, it has been reported that women who gave birth to very low birth weight babies or experienced combined complications had a several-fold increased risk of mortality from cardiovascular causes [11,12].

Pregnancy is associated with changes in haemostasis, including an increase in the majority of clotting factors, a decrease in the quantity of natural anticoagulants, and a reduction in fibrinolytic activity [13]. The platelet count decreases in normal pregnancy possibly due to increased destruction and haemodilution with a maximal decrease in the third trimester [14].

Prothrombin time (PT) and Activated partial thromboplastin time (APTT) are the most commonly used tests in coagulation therapy monitoring and for the detection of coagulation defects today. They are both considered as being functional tests as they measure enzymatic activities that lead to clot formation [15]. Prothrombin time is a laboratory screening test used to detect disorders involving the activity of the factors I, II, V, VII, and X of the extrinsic and common pathways [16]. Activated partial thromboplastin time is used to screen for abnormalities of the intrinsic and common clotting systems and to monitor the anticoagulant effect of circulating heparin. It measures the activities of factors I, II, V, VIII, IX–XI, and XII of the intrinsic and common pathways [17]. Changes in these proteins favor the development of hyper-coagulable and pro-thrombotic state, which may in turn enhance cardiovascular risk by increasing the likely hood of developing an occlusive thrombus within a coronary/cerebral artery contributing to the development of atherosclerotic lesion [18].

Maternal morbidity and mortality are major public health concerns in most developing countries and in under-resourced settings [19]. According to WHO 2014 report, globally, an estimated number of 289,000 women died during and following pregnancy and childbirth related problem in 2013 alone, showing a decline of 45% from 1990 report. Developing countries like sub-Saharan (62%) and South Asia (24%) together contribute 86% of the problem [20].

Nigeria contributes approximately 10% of the global burden of maternal and child deaths and thus has one of the worst maternal health outcomes [21]. The World Health Organization ranked Nigeria as having the second highest number of maternal deaths in the world, with an estimated 37,000 maternal deaths [22]. Nigeria is one of few countries where the maternal mortality ratio (MMR) has almost doubled in the 1990-2008 figures [23]. In the rural areas, the MMR is very high as the majority of births take place at home unassisted and or assisted by unskilled persons, thus women who develop complications rarely receive emergency services [24].

Maternal mortality remains a public health challenge worldwide, and the global maternal mortality ratio of 525 per 100,000 live births annually is still unacceptably high [23]. A disproportionately high burden of these maternal deaths is borne by developing countries including Nigeria, with a maternal mortality ratio of 500–1,000 per 100,000 live births [25]. These deaths arise from pregnancy, childbirth or postpartum complications. According to WHO [26], maternal deaths are thought to occur in developing countries due to delay in deciding to seek appropriate care, delay in reaching an appropriate health facility, and delay in receiving adequate emergency care once at a facility.

Approximately 15% of pregnant women develop life-threatening complications hence need for emergency obstetric care. These complications are unpredictable and may progress rapidly to a fatal outcome [27].

Pregnancy related complications are one of the leading causes of maternal mortality worldwide and a greater risk factor for venous thromboembolism and disseminated intravascular coagulation. There is paucity of data on coagulation parameters (PT, APTT and Platelet count) among women with obstetric complications in Sokoto. This study is thus an attempt to generate the evidenced-based data on the haemostatic profile of women with obstetric complications to facilitate the Obstetric and haematology-related care offered to pregnant women in the state. There is need to evaluate the effect of pregnancy on haemostatic parameters (PT, APTT and Platelet count) in

order to reduce the risk of development of thromboembolism and improve the antenatal care given to pregnant women in Sokoto, Nigeria. The study is aimed at determining the coagulation parameter among women with obstetric complication in Sokoto State.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out on pregnant women with obstetric complication attending antenatal clinic of specialist hospital Sokoto, North-Western Nigeria. Specialist Hospital Sokoto is a tertiary institution located within the Sokoto metropolis. Sokoto is the capital city of Sokoto State of Nigeria. Sokoto state is located in the extreme north-west of Nigeria, near Nagarta science, college. The state is bounded in the north by Niger Republic, Kebbi state to the south west and to east by Zamfara state. The state is within the Sahel savannah region of sub-Saharan Africa, with an annual average temperature of 28.3°C (82.9°F). Report from the 2007 National Population Commission indicated that the state had a population of 3.6 million people [28].

2.2 Study Population

A total of 100 subjects were recruited in this study, 50 of these subjects serve as case group (pregnant women with obstetric complication) while 50 will serve as control group (pregnant women without obstetric complications). The entire subject and controls where recruited from Specialist Hospital, Sokoto.

2.3 Inclusion Criteria

Pregnant women with obstetrics complications who are willing to give informed consent will be included in this study. Consenting apparently healthy pregnant women will be included in the study as control.

2.4 Exclusion Criteria

Pregnant women with history of blood transfusion within the last three months will be excluded from the study. Pregnant women who refused to give informed consent will be excluded from this study.

2.5 Study Design

The research is a case-control study to assess the effect of obstetric complications on some coagulation parameters of pregnant women in Specialist Hospital, Sokoto.

2.6 Sample Size Determination

Sample size for this study was calculated using this formula:

n =minimum sample size
z =standard normal deviation and probability.
p=prevalence or proportion of value to be estimated from previous studies.
q=Proportion of failure (= 1 - P)
d=precision, tolerance limit, the minimum is 0.05.
Therefore, $n=z^2\ pq/d^2$

Where,

z= 95% (1.96)
p= 6.2% (0.062) [29].
q = 1 - 0.062 (=0.938)
d = 5% (0.05)

Therefore,

$n = (1.96)^2\ (0.062)\ (0.938) / (0.05)^2$
n =88
Addition of 10% due to loss and attrition, calculated and added to the sample size

10÷100×88=8.8
88+8.8=96.8

Approximately the total sample size = 100.

Questionnaire

A semi-structured interviewer-administered questionnaire was administered to all consenting participants in order to obtain information on their socio-demographic and medical history.

2.7 Sample Collection

Whole blood was collected via venipuncture, using BD vacutainer into Tri-sodium citrate tubes and Ethylene diamine tetra acetic acid (EDTA) under strict aseptic techniques. The tri-sodium citrate tube was centrifuged at 3000 rpm for ten minutes on a bench-top centrifuge in order to get Platelet Poor Plasma (PPP). The PPP obtained was transferred into sterile tube and analyzed. The EDTA sample was used for Platelet count. These samples were analyzed in the Haematology Laboratory of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria.

2.8 Analytical Method

2.8.1 Estimation of prothrombin time test (Agappe diagnostic reagent Switzerland, 2016) principle

Tissue thromboplastin in the presence of calcium ions (Ca^{2+}) activates extrinsic pathway of human blood coagulation cascade. Activation time is proportional to the concentration of individual clotting factors taking part in the coagulation cascade. This assists in estimating cause and extent of haemorrhagic disorder. When thromboplastin reagent is added to citrated plasma, clotting cascade is initiated forming gel clot. The time required for clot formation would be prolonged if there is deficiency of factor (s) activity in the extrinsic pathway of coagulation cycle.

Procedure

1. The reagent vial was gently swirled before use.
2. Enough reconstituted PT reagent was dispensed into a thoroughly clean dry test tubes
3. PT reagent was pre-warmed at 37°C for 10 minutes.
4. Then, 100 µl of plasma was pipetted into test tube at 37°C and incubated for 3 minutes
5. Then, 200 µl of pre-warmed PT reagent was added forcibly into the test cuvettes.
6. Timer was started simultaneously and the clotting time was recorded in seconds.

Result

The time taken for the formation of a clot was recorded as PT.

Calculation of Results

International normalized ratio (INR) = {PT of test/PT of control}^{ISI}

Where ISI (International Sensitivity Index) = 1.28

Reference Range: 10-15Seconds

2.8.2 Estimation of activated partial thromboplastin time (Agappe diagnostic reagent Switzerland, 2016)

Principle

In presence of Ca^{2+}, cephaloplastin activates the coagulation factors of intrinsic pathway in plasma leading to clot formation. Clotting time is proportional to the concentration of factors VIII, IX, XI and XII as well as common pathway factors II, V and X.

Procedure

1. The reagent vial was gently swirled before used.
2. Enough volume of reagent 1 (C_aCl_2) was pre-warmed for immediate use in a clean and dry test tube at 37°C.
3. Then 100 µl of test plasma was pipetted into test cuvettes at 37°C.
4. Then, 100 µl of pre-warmed Reagent 2 (APTT Reagent) was pipetted into the test cuvette.
5. It was mixed well and incubated at 37°C for 3 minutes.
6. 100 µl of the pre-warmed Reagent 1 (C_aCl_2) was forcibly pipetted into the test cuvette.
7. Timer was simultaneously started and the clotting time was recorded in seconds.

Reference Range: 21-38 Seconds.

2.8.3 Platelet counts (manual method) [30]

Principle

Blood is diluted 1 in 20 in a filtered solution of ammonium oxalate reagent which lyses the red cells. Platelets are counted microscopically using an Improved Neubauer ruled counting chamber and the number of platelets per liter of blood calculated.

Procedure

1. Perform a platelet count within 2 hours of collecting the blood.
2. Measure 0.38 ml of filtered 1% ammonium oxalate diluting fluid and dispense it into a small container or tube.
3. Add 20 µl (0.02 ml) of well-mixed anticoagulated venous blood and mix.
4. Assemble the counting chamber and fill it with well-mixed sample.
5. Leave the chamber undisturbed for 20 minutes. To prevent drying of the fluid, place the chamber in a Petri dish or plastic container on dampened tissue or blotting paper and cover with a lid.
6. Dry the underside of the chamber and place it on the microscope stage. Using the 10 objective, focus the rulings of the grid and bring the central square of the chamber into view. Change to the 40

objective and focus the small platelets. They will be seen as small bright fragments (refractile).
7. Count the platelets in the small squares marked P
8. Report the number of platelets in 1 liter of blood.

Calculation

Platelet count (per liter) = (no of platelets counted X 20 x 10^6 / 0.2 mm^2 x 0.1 mm

Where 20 = 1 in 20 dilution of blood, 0.2 mm^2= area counted, 0.1 mm = depth of counting chamber

Reference range: 150-400 x 10^9 platelets / liter of blood.

2.9 Statistical Analysis

Data obtained was entered into Spread sheet and analyzed by descriptive statistics using statistical package for social sciences (SPSS) Version 23, comparison between the test and controls was calculated using students t-test and analysis of variance (ANOVA). Probability (P<0.05) will be used to determine the level of significant for all statistical analysis. Data are presented in tables (mean± SEM).

3. RESULTS

A total of one hundred pregnant women were recruited for the study. Fifty pregnant women confirmed with obstetric complications where used as the subjects and fifty pregnant women without obstetric complications where used as the study control. The results were presented as mean± standard error of mean.

Table 2 shows the differences in PT, APTT, INR and Platelet count of the study subjects and controls. There was a statistically significant increase in PT, INR, APTT and Platelet count among the subjects as compared to control P-value (< 0.05). There was statistically significant difference in between the subjects and controls.

Table 2 represents the mean comparison of study subjects based on coagulation parameters. This shows a statistically significance increase in Prothrombin time and activated partial thromboplastin time in study subjects.

Table 1. Mean comparison of coagulation parameters for the subjects and controls

Parameter	Test (N=50)	Control (N=50)	P-value
PT (Secs)	14.26±0.23	13.00±0.13	0.01*
INR	1.03±0.023	0.90±0.013	0.01*
APTT (Secs)	31.32±0.70	29.66±0.33	0.04*
PLT (×10^9L)	148.90±4.60	170.50±5.89	0.01*

Data are presented as mean± SEM. Key: PT=Prothrombin time, APTT= Activated partial thromboplastin time, PLT= Platelet count

Table 2. Mean comparison between obstetric complications and coagulation parameters between study subjects

Obstetric complications	PT (Secs)	APTT (Secs)	PLT (×10^9L) c
Pre-eclampsia	13.52±0.26	28.24±0.80	161.14±7.03
Malaria in pregnancy	14.38±0.43	35.69±0.85	152.00±9.51
IUFD	13.50±0.50	25.50±1.50	137.00±8.00
GDM	14.25±0.63	31.00±1.35	134.75±9.70
Eclampsia	16.50±0.76	35.83±0.91	114.50±5.23
Ectopic pregnancy	13.00	25.00	156.00
Obstetric haemorrahage	16.00	38.00	130.00
Infection	16.00	24.00	111.00
Anemia in pregnancy	14.00	32.00	188.00
Total	14.26±0.23	31.32±0.70	148.9±4.60
P-value	0.006*	0.000*	0.063

Data are presented as mean± SEM. Key: PT=Prothrombin time, APTT= Activated partial thromboplastin time, PLT= Platelet count

Table 3. Mean comparison between socio-demographic data and coagulation parameter between test subjects

Characteristic	N=50	PT (secs)	APTT (Secs)	PLT (×10^9/ L)
Age group				
18-23	15	14.31± 0.31	30.40±1.21	144.13±5.73
24-29	19	14.16±0.34	29.21±0.92	156.21±8.33
30-35	10	14.20±0.59	29.30±1.89	150.20±10.40
36-41	6	15.00±1.10	36.17±1.56	135.50±17.24
TOTAL	50	14.26±0.23	30.42±0.71	148.90±4.60
P-Value		0.713	0.019*	0.521
Tribe				
Hausa/Fulani	43	14.33±0.26	30.74±0.81	148.67±5.3
Yoruba	2	13.50±0.50	30.00±0.00	145.00±10.0
Igbo	3	14.00±1.20	26.67±1.20	162.33±1.5
Others	2	14.00±0.00	29.50±0.50	137.50±8.5
Total	50	14.26±0.23	30.42±0.71	148.90±4.6
P-Value		0.895	0.598	0.860
Educational status				
Non-formal	31	14.35±0.27	31.19±1.02	142.52±4.83
Primary	2	14.00±0.00	29.50±0.50	138.50±3.50
Secondary	14	13.71±0.46	29.07±0.97	166.07±10.85
Tertiary	3	16.00±1.16	29.33±2.60	141.67±21.85
Total	50	14.26±0.23	30.42±0.71	148.90±4.60
P-Value		0.159	0.594	0.139
Place of residence				
Urban	38	14.34±0.29	30.34±0.85	147.61±5.8
Rural	12	14.00±0.25	30.67±1.31	153.00±5.45
Total	50	14.26±0.23	30.42±0.71	148.90±4.60
P-Value		0.531	0.847	0.621

Data are presented as mean± SEM

Table 3 shows the differences between coagulation parameters when compared with socio-demographic data, it shows no statistically significant difference in the Prothrombin time and platelet count of the subjects when compared against the age group, but there is statistical significance between the age group when compared with the Activated partial thromboplastin time with a p-value (< 0.005).

Table 4. Mean comparison between obstetric variables and coagulation parameter in test subjects

Characteristics	N=50	PT(secs)	APTT (secs)	PLT(×10^9/ L)
Parity				
Single	8	14.00±0.57	30.63±1.61	139.13±10.2
Twice	11	13.73±0.384	29.09±1.39	153.00±4.4
Multipara	15	14.27±0.32	30.60±0.99	150.67±6.8
Multiparous	16	14.75±0.53	31.06±1.64	149.31±11.8
Total	50	14.26±0.23	30.42±0.71	148.90±4.6
P-Value		0.428	0.795	0.824
Trimester				
First trimester	6	13.67±0.56	30.00±1.97	161.33±23.41
Second trimester	12	14.25±0.37	30.50±0.89	145.25±6.28
Third trimester	32	14.38±0.32	30.47±1.01	147.94±5.41
Total	50	14.26±0.23	30.42±0.71	148.90±4.60
P-Value		0.628	0.977	0.599

Data are presented as mean± SEM

Table 4 reveals the obstetric variables of the study subjects when compared with the coagulation parameters, this shows no statistically significant differences of Prothrombin time, Activated partial thromboplastin time and platelet count of study subjects when compared with the obstetric variables.

4. DISCUSSION

Obstetric complications is defined as an acute condition arising from a direct cause of maternal death, such as antepartum or postpartum haemorrhage, obstructed labor, postpartum sepsis, complications of abortion, pre-eclampsia, gestational diabetes, ectopic pregnancy, intra uterine foetal death and ruptured uterus or indirect causes such as anemia, malaria, infection and tuberculosis [1]. Annually, approximately 9.5 million women around the world suffer from pregnancy-related complications, and over 300,000 die [23]. This study was aimed at determining the effect of obstetric complications on the Coagulation parameters in pregnant women in Specialist Hospital, Sokoto. A total of 100 pregnant women were recruited in this study. This study has shown that the Prothrombin time was higher in women with obstetric complications as compared to the pregnant women without obstetric complications. The PT of the subjects shows a statistically significance increase when compared with the controls (P< 0.05). This is in consonance with the findings by Onuigwe and colleagues [28]. The prolongation of PT could be associated with the decrease in the extrinsic factors due to obstetric complications in the subjects. It was observed that the Activated partial thromboplastin time was statistically higher in women with obstetric complications as compared to pregnant women without obstetric complications (P< 0.05). This finding is in Contrast with research carried out by Abass and colleagues [31]. The prolongation of the APTT may be associated with decreased intrinsic factors due to pregnancy and obstetric complications.

The study has also shown that platelet count in pregnant women with obstetric complications is significantly lower when compared with those without obstetric complications (P< 0.05). This is in accordance with the research carried out by Reese and colleagues [32]. Low platelet count in obstetric complications may be due to volume dilution from increased plasma, accumulation of platelets within the spleen, which increase in size by about 50% during pregnancy.

It was observed that women with pre-eclampsia have prolonged PT and APTT (P< 0.05). The finding is in agreement with the previous study [33]. And this is due to the fact that pre-eclampsia is associated with decreased in most of the intrinsic and extrinsic factors of coagulation. The platelet count in women with pre-eclampsia is reduced. This finding is in consistent with findings from previous study [28] which observed a low platelet count in women with pre-eclampsia.

This study has shown that pregnant women infected with malaria have prolonged PT and APTT (P< 0.05). This is in agreement with previous study [34]. This is because malaria stimulates the coagulation system; the stimulation of the coagulation system is caused by various procoagulants present during malarial infection. It was also observed that pregnant women infected with malaria have reduced platelet count. This is in consonant with the previous research [34]. Possible causes of platelet reduction in malaria infected pregnancy include reduced platelet survival from peripheral destruction (by immune, consumptive or other mechanisms), enhance splenic uptake or sequestration and decreased platelet production.

This study shows that the PT and APTT are prolonged in women with Gestational diabetes mellitus (P< 0.05). This is in agreement with previous study carried out [35]. This may be due to the Hypercoagulable state which may ensue changes in the level of haemostatic factors. Platelet count was observed to be reduced in pregnant women with gestational diabetes mellitus. This is in agreement with the research conducted [36].

In this study we observed that pregnant women with obstetric haemorrhage have prolonged PT and APTT (P< 0.05). This is in accordance with previous study carried out in Sokoto [37]. This prolongation of PT and APTT may be associated with massive bleeding which is associated with decreased in the extrinsic and extrinsic factors. It was also observed that the platelet count of pregnant women with obstetric haemorrhage is reduced. This finding is in consistent with findings in previous study [37]. The decrease in platelet count may be associated with obstetric bleeding and may progress to severe haemorrhage [38].

It was observed that the PT and APTT of pregnant women with eclampsia were prolonged (P< 0.05). This is in agreement with the findings

[33]. This may be because of the increase with worsening thrombocytopenia. The platelet count in eclamptic pregnant women is observed to be reduced. This is in agreement with research [33]. The variation in platelet count may be due to an increased consumption with reduced life span and increased aggregation by increased levels of thromboxane A_2 at Placental circulation.

This study has shown that the APTT of the subjects have significant association with the age of the pregnant women with obstetric complications ($P<0.05$). This may be due to the fact that women of child bearing potential are at increased risk of developing complications in pregnancy and it can lead to alteration in the intrinsic factors of coagulation system. It was observed that the ethnicity, educational level and place of residence have no significant association between PT, APTT and Platelet count with obstetric complications ($P> 0.05$). This is in line with the findings from previous study [39]. This study has also shown that obstetric variables have no significant association with the coagulation parameters in the study subjects ($P> 0.05$). This may be due to the fact pregnancy is associated with alteration in coagulation factors and platelet count.

5. CONCLUSION

Findings from this study have shown that the PT and APTT shows a statistically significance increase between pregnant women with obstetric complications and those without obstetric complications. There was statistical significance decrease between platelet counts of the subjects when compared with controls. The PT and APTT show a significant association with obstetric complications in pregnant women. At the end of this research work it was found that age group of subjects shows a statistical significance when compared with the PT, APTT and platelet count.

6. RECOMMENDATIONS

- The PT, APTT and Platelet count should be assayed routinely for pregnant women attending Specialist Hospital Sokoto to improve the antenatal care given to pregnant women.
- More effort should be invested to ensure the implementation of prevention of maternal mortality due to pregnancy related complications and control strategies among high risk pregnant women. Self-checking of BP either with a Mercury free sphygmomanometer or an automated BP Apparatus with a suitable cuff may help an early warning of eclampsia.
- There should be an increase in enrolment of females in school, so as to improve access to formal education.
- More studies should be carried out to describe the trend in the coagulation system of obstetric complications in pregnant women. Etiology of intracranial aneurysms in pregnant women may be subjugated by a protocol of early review and mandatory autopsy.

CONSENT

Written informed consent was obtained from each of the participants with explanation of the aim and objectives of this research.

ETHICAL APPROVAL

Ethical approval of the study was obtained from research and ethical committee of Specialist Hospital Sokoto. (SHS/SUB/133/VOL.1).

ACKNOWLEDGEMENTS

The authors appreciate the management and staffs of Haematology Department, School of Medical Laboratory Sciences, Usmanu Danfodiyo University, Sokoto for approving the study and making their laboratory available for the study. Also, we appreciate the management of Specialist Hospital, Sokoto for granting ethical approval for the study. Furthermore, we thank the staffs of Obstetrics and Gynaecology Department of Specialist Hospital, Sokoto for their supports and encouragements during sample collections.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. United Nations Fund For Population Activities (UNFPA). Guidelines for monitoring the availability and use of obstetric services. UNFPA New York; 2003.
2. World Health Organization. Health Statistic and Health Information System: Maternal Mortality Ratio. Geneva: World Health Organization Press; 2013.

3. Millennium Development Goals (MDG) Report. New York: United Nations; 2015. Available:http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20 (July%201)
4. Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: An analysis of 172 countries. The Lancet. 2012; 380:11125.
5. Alkema L, Zhang S, Chou D, Gemmill A, Moller A, Ma Fat D, et al. Bayesian Approach to the Global Estimation of Maternal Mortality. 2015; 1511: 03330. Available:http://www.arxiv.org/abs
6. World Health Organization (WHO). Trends in Maternal Mortality: 1990 to 2015: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Geneva: World Health Organization; 2015.
7. Say L, Chou D, Gemmill A, Tunçalp O, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic Analysis. The Lancet Global Health. 2014; 2:e323-333.
8. Available:https://emedicine.medscape.com/article/1476919-overview
9. Available:https://www.medicinenet.com/pregnancy_preeclampsia_and_eclampsia/article.htm,
10. Available:https://www.medscape.com/answers/253960-78077/what-is-the-mortality-rate-associated-with-eclampsia#:~:text=A%20study%20from%20the%20US,20%2D28%20weeks'%20gestation.
11. Smith GCS, Pell JP, Walsh D. Pregnancy complications and maternal risk of ischemic heart disease: A retrospective cohort study of 129,290 births. The Lancet. 2001l357:2002–2006.
12. Davey Smith G, Harding S, Rosato M. Relation between infants' birth weight and mothers' mortality: Prospective observational study. The British Medical Journal. 2000;320:839–840.
13. Bremme KA. Haemostatic changes in pregnancy. Best Practice Research Clinical Haematology. 2003;16(2):153–168.
14. O'Riordan MN, Higgins JR. Haemostasis in normal and abnormal pregnancy. Best Practice Research Clinical Obstetrics Gynaecology. 2003;17(3):385–396.
15. Sylvester AJ. The development of a novel native Prothrombin assay for the more efficient management of oral anticoagulation therapy; 2004.
16. Hinchcliff KW, Kaneps AJ, George RJ. Equine sports medicine and surgery. In: Basic and clinical science of the equine athlete. WB Saunders, Philadelphia, PA. 2014;1295–1302.
17. Iazbik C, Couto G, Gray TL, Kociba G. Effect of storage conditions on hemostatic parameters of canine plasma obtained for transfusion. American Journal of Veterinary Research. 2001;62:734–735.
18. Dunn EJ. Grant PJ. Type 2 diabetes: An atherothrombotic syndrome. Current Molecular Medicine. 2005;5(3):323-322.
19. WHO. Packages of intervention for family planning, safe abortion care, maternal, new born and child health: Sexual and reproductive health. Geneva: WHO; 2010. Available:http://whqlibdoc.who.int/hq/2010/WHO_FCH_10.06
20. Roudi F, Monem A, Ashford L, El-Adawy M, Rawe K, Moreland S. The Millennium Development Goals Report 2014, United Nations; 2014.
21. United Nations International Children's Fund (UNICEF). The state of the world's children 2009. New York: United Nations Children's Fund; 2008.
22. World Health Organization (WHO). maternal mortality in 2000: Estimates developed by WHO, UNICEF and UNFPA. Geneva:World Health Organization; 2004.
23. Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela, SM, et al. Maternal mortality for 181 countries, 1980- 2008: A systematic analysis of progress towards Millennium Development Goal 5. The Lancet. 2010;375(9726):1609—1623.
24. Osubor KM, Fatusi AO, Chiwuzie JC. Maternal health-seeking behavior an associated factors in a rural Nigerian community. Maternal and Child Health Journal. 2006;10(2):159-169.
25. World Bank. Trends in Maternal Mortality Ratio; 2013.
26. World Health Organization (WHO). WHO guidelines for the management of postpartum haemorrhage and retained placenta [Internet]. World Health Organization; 2009. Available:http://whqlibdoc.who.int/publications/2009/9789241598514_eng.pdf
27. Rogo K, Aloo O. Maternal mortality in Kenya: The state of health facilities in a rural district. East African Medical Journal. 2001;78:468-472.

28. Onuigwe FU, Udomah FP, Dio A, Abdulrahaman Y, Erhabor O, Uchechukwu NJ. Platelet count in women with pregnancy induced Hypertension in Sokoto, North Western Nigeria. Research in Obstetrics and Gynaecology. 2015;3(1): 1-4.
29. Udomah FP, Isaac IZ, Lukman I, Nwobodo D, Erhabor O, Abdulrahaman Y, John RT. Plasmodium parasitemia among pregnant women attending antenatal clinic in Sokoto, North western Nigeria. Journal of Nursing Sciences. 2015;1(1):9-14.
30. Cheesbrough M. District laboratory practice in tropical countries, Part 2, Cambridge University, Press, Second edition. 2006;273-339.
31. Abass AE, Adam E, Badwi H, Hassan A, Mohamed, R, Izzaldein E, et al. Investigation of some coagulation parameters in pregnant women with pre-eclampsia. Journal of Pharmacy and Biological Sciences. 2016;2(4):88-91.
32. Reese JA, Peck JD, Deschamps DR, Mclntosh JJ, Knueltson EJ, Terrell DR, et al. Platelet counts during pregnancy. New England Journal of Medicine. 2018;379:32-43.
33. Awelola OO, Enaruna NO. Determination of coagulation complicating severe pre-eclampsia and eclampsia with platelet count in a University Hospital, South-South, Nigeria. Tropical Journal of Obstetric and Gynaecology. 2019;23(2): 179-184.
34. Okorie HM, Obeagu EI, Eze EN, Jeremiah ZA. Assessment of coagulation parameters in malaria infected pregnant women in Imo state, Nigeria. International Journal of Current Research in Medical Sciences. 2018;4(9):41-49.
35. Gorar S, Alioglu B, Ademoglu E, Uyar S, Bekdemir H, Canden Z, et al. Tendency for Thrombosis in Gestational Diabetes Mellitus: Journal of Laboratory Physicians. 2018;8(2):101-105.
36. Yilmaz ZV, Yilmaz EA, Icer B, Kucukozkan T. Association of complete blood count parameters with gestational diabetes mellitus. Gynaecology Obstetrics and Reproductive Medicine. 2017;22:5-10.
37. Erhabor O, Isaac IZ, Muhammad AM, Abdurrahman Y, Ezimah AC, Adias TC. Some Haemostatic parameters in women with obstetric haemorrhage in Sokoto, Nigeria. International Journal of Womens Health. 2013;5:285-291.
38. Charbit B, Mandelbort L, Saman E, Baron G, Haddaoui B, Keita H, et al. The decrease of fibrinogen is an easy predicts of the severity of post partum haemorrhage. Journal of Thrombosis and Haemostasis. 2007;5(2):266-273.
39. Fawole AO, Ezeasor C, Bello FA, Roberts A, Awoyinka BS, Tongo O, et al. Effectiveness of a structured checklist of risk factors in identifying pregnant woman at risk of gestational diabetes mellitus: A cross-sectional study. Nigerian Journal of Clinical Practice. 2014;17(4):495-501.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/59201