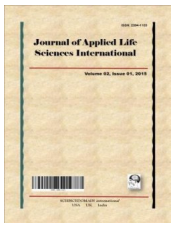

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Comparative Study of Selected Haemostatic Parameters in Different Trimesters among Pregnant Women in Ilesa Metropolis South Western Nigeria

Stephen Olajide Awofadeju[1*]

[1]Department of Chemical Pathology, Obafemi Awolowo University Teaching Hospitals Complex, Wesley Guild Hospital Unit, Ilesa, Osun State, Nigeria.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Aim: The aim of this study was to see the effect of pregnancy on some selected haemostatic parameters based on trimesters.
Place and Duration of Study: Department of Chemical Pathology, Obafemi Awolowo University Teaching Hospitals Complex, Wesley Guild Hospital Unit, Ilesa, Osun State, Nigeria, between September 2015 and March 2016.
Methods: The study design of this work was one-factor, one control - three test group quasi - experimental design. A total of eighty (80) subjects were recruited for the study, and were grouped into 1st trimester pregnant women (n=20), 2nd trimester pregnant women (n=20), 3rd trimester pregnant women (n=20), and non-pregnant women (n=20). Blood samples (6 mL venous blood) were collected, and distributed into sodium citrate bottle (3 mL) and Ethylene Diamine Tetra-acetic Acid bottle (3 mL) respectively. The blood samples were centrifuged and stored at 4°C before being investigated for haematological analysis using standard approved methods. Statistical difference was determined by one-way analysis of variance (ANOVA) followed by a post hoc test (Student Newman-Keuls Test (SNK)).
Results: In first trimester, the mean of packed cell volume (PCV), fibrinogen concentration (FIBC), prothrombin time (PT), activated partial thrombin time (PTTK) and platelets (PLT) were 33.20%,

**Corresponding author: E-mail: awofadejustephen@gmail.com;*

4.34 g/L, 20.38 sec, 43.60 sec and 208,800.00/mm^3 respectively. In the second trimester, the mean of PCV was 32.25%, mean of FIBC was 4.86 g/L, mean of PT was 19.44 sec, mean of PTTK was 51.26 sec and mean of PLT was 194,200.00/mm^3. For the third trimester, the means were as follow: PCV: 29.40%, FIBC: 5.04 g/L, PT: 19.62 sec, and PTTK: 50.63 sec while PLT was 133,400.00/mm^3.

Conclusion: Human pregnancy is found to exerts changes of positive influence on haemostatic parameters, which when done in addition with other haemorrheological investigations may prevent thromboembolic episodes and clotting complications as well as reducing blood loss during and after delivery of pregnancy.

Keywords: Haemostatic parameters; trimesters; pregnancy; ilesa metropolis.

1. INTRODUCTION

Pregnancy is a unique state where the physiology of a woman is greatly altered to accommodate the newly developing 'organ' the foetus [1]. This unique state of pregnancy occurs during ovulation, which is approximately 14th day of regular menstrual cycle and if conception occurs, the ovum is fertilised in the fallopian tube and becomes zygote, which is then carried into the uterus. The zygote divides and become morulla which develops a cavity known as primitive yolk sac and becomes a blastocyst that implants into the uterine wall at about 5 days after fertilisation [2]. Normal pregnancy in human being lasts for about 280 days (40 weeks), and has a large impact on the well being of a woman without any underlying medical disorder and at the same time makes the foetus vulnerable to the changes in the mother's internal and external physiological status. Both mother and the foetus are major consideration in the management of pregnancy [3]. During pregnancy, great changes occur in physiology of the mother which is designed to supply the foetus needed nutrients required for growth, and the mother additional energy that she requires for labour (before the foetal needs arises). These changes begin in the first trimester (up to 13 weeks after conception) where the foetus weighs approximately 13 g and is up to 8 Cm long. During the second trimester (13 to 26 weeks), rapid foetal growth occurs and by the end of the second trimester, the foetus weighs approximately 70 g and is 30 Cm long within which the foetal organs would have begun to mature. During the third trimester (26–40 weeks), the foetal organs complete maturation [4]. Among several other causes of maternal mortality, haemorrhage has been reported to be the major cause in the West Africa sub-regions [5-6]. In the two separate studies in the West African sub-region, haemorrhage accounts for 34.6% in the North Central Nigeria and 32.2% in Benin Republic [6]. The influence of pregnancy on haemostatic parameters is not well known, therefore a study like this is necessary to assess the influence of normal human pregnancy on haemostatic parameters (packed cell volume, fibrinogen concentration, prothrombin time, activated partial thrombin time, and platelets).

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Reagents and chemicals

The reagents and chemicals used for this work were of analytical grade from sigma, and they include platelet reagent [ammonium oxalate (1 ml), Nacl (8.5 g)] to mention a few.

2.2 Methods

2.2.1 Experimental design and grouping of subjects

Quasi-experimental design method was utilized in this study and subjects were divided into eight (4) groups:

i. Group 1 was 1st Trimester Pregnant Women;
ii. Group 2 was 2nd Trimester Pregnant Women;
iii. Group 3 was 3rd Trimester Pregnant Women;
iv. Group 4 was Non-pregnant Women.

2.2.2 Sampling areas

The hospital selected for the purpose of this research in ilesa metropolis was Obafemi Awolowo University Teaching Hospitals Complex, Wesley Guild Hospital Unit, Ilesa, Osun State, Nigeria. This hospital is recognised as referral centre for best antenatal care in ilesa metropolis.

2.2.3 Recruitment of subjects

A total of eighty (80) subjects were recruited for the study, and were grouped into 1st trimester pregnant women (n=20), 2nd trimester pregnant women (n=20), 3rd trimester pregnant women (n=20), and non-pregnant women (n=20). Their blood samples were processed for analysis within 72 hours of collection employing standard approved methods.

2.2.4 Selection of subjects

The subjects for this project were selected according to the following criteria:

i. Visiting antenatal clinic to seek consent of the pregnant women and obtaining brief clinical history from them using questionnaire to take care of personal data, gestational age and other health informations;
ii. Visiting out-patient clinic to seek consent of the non-pregnant women and obtaining brief clinical history from them using questionnaire to take care of personal data, and other health informations;
iii. Ensuring that the pregnant subjects were free from all pregnancy associated complications while the non-pregnant subjects were healthy.

2.2.5 Collection of blood samples

2.2.5.1 Blood sample

About 6mL of venous blood was collected from each subject and distributed into sodium citrate bottle (3 mL) and Ethylene Diamine Tetra-acetic Acid bottle (3 mL) respectively.

2.2.5.2 Preparation of blood plasma

The blood samples were spunned in a centrifuge at 4,000 rpm for 20 min. The blood samples were then investigated for haematological analysis after being stored at 4℃ using standard approved methods.

2.2.6 Determination of prothrombin time and activated partial thrombin time (prothrombin test time with kaolin)

Prothrombin time and Prothrombin Time Test with Kaolin was determined according to the procedure reported by Quick [7].

2.2.7 Determination of plasma fibrinogen concentration

Plasma levels of fibrinogen in all the samples collected were carried out according to clotweight method [8].

2.2.8 Estimation of platelets

Platelets were counted according to ammonium oxalate reagent method [9].

2.2.9 Determination of packed cell volume

This was done according to microhaematocrit method [9].

2.3 Statistical Analysis

Results are expressed as mean ± SEM. Statistical difference was determined by one-way analysis of variance (ANOVA) followed by a post hoc test (Student Newman-Keuls Test (SNK)). Difference was considered statistically significant with $p < 0.05$. Computer software Graph pad PRISM® version 3.00 was used for the analysis.

3. RESULTS

The results of this study showed for each trimester together with non-pregnant women (control) are summarized in Tables 1-3. Tables 4-6 show the results of comparison of the three trimesters.

Table 1. Haemostatic parameter in 1st trimester pregnant and non-pregnant (control) women

Parameters	1st Trimester (n=20)	Control (n=20)	P
PCV (%)	33.20±0.52	38.55±0.38	P<0.05
FIBC (g/L)	4.34±0.09	2.64±0.16	P<0.05
PT (Sec)	20.38±0.31	17.41±0.40	P<0.05
APTT(Sec)	43.60±0.74	39.13±0.74	P<0.05
PLT(/mm^3)	208,800.00±8,567.12	232,200.00±17,776.26	p>0.05

Table 2. Haemostatic parameter in 2nd trimester pregnant and non-pregnant (control) women

Parameters	2nd trimester (n=20)	Control (n=20)	P
PCV (%)	32.25±0.47	38.55±0.38	P<0.05
FIBC (g/L)	4.86±0.11	2.64±0.16	P<0.05
PT (Sec)	19.44±0.31	17.41±0.40	P<0.05
APTT(Sec)	51.26±0.78	39.13±0.74	P<0.05
PLT(/mm^3)	194,200.00±7,948.16	232,200.00±17,776.26	p>0.05

Table 3. Haemostatic parameter in 3rd trimester pregnant and non-pregnant (control) women

Parameters	3rd trimester (n=20)	Control (n=20)	P
PCV (%)	29.40±0.60	38.55±0.38	P<0.05
FIBC (g/L)	5.04±0.11	2.64±0.16	P<0.05
PT (Sec)	19.62±0.31	17.41±0.40	P<0.05
APTT(Sec)	50.63±1.05	39.13±0.74	P<0.05
PLT(/mm^3)	133,400.00±6,482.80	232200.00±17776.26	P<0.001

Table 4. Comparison of haemostatic parameter in 1st trimester pregnant and 2nd trimester pregnant women

Parameters	1st trimester (n=20)	2nd trimester (n=20)	P
PCV (%)	33.20±0.52	32.25±0.47	P>0.05
FIBC (g/L)	4.34±0.09	4.86±0.11	P<0.05
PT (Sec)	20.38±0.31	19.44±0.31	P<0.05
APTT(Sec)	43.60±0.74	51.26±0.78	P<0.05
PLT(/mm^3)	208,800.00±8,567.12	194,200.00±7,948.16	p>0.05

Table 5. Comparison of haemostatic parameter in 1st trimester pregnant and 3rd trimester pregnant women

Parameters	1st trimester (n=20)	3rd trimester (n=20)	P
PCV (%)	33.20±0.52	29.40±0.60	P<0.05
FIBC (g/L)	4.34±0.09	5.04±0.11	P<0.05
PT (Sec)	20.38±0.31	19.62±0.31	P>0.05
APTT(Sec)	43.60±0.74	50.63±1.05	P<0.05
PLT(/mm^3)	208,800.00±8,567.12	133,400.00±6,482.80	P<0.001

Table 6. Comparison of haemostatic parameter in 2nd trimester pregnant and 3rd trimester pregnant women

Parameters	2nd trimester (n=20)	3rd trimester (n=20)	P
PCV (%)	32.25±0.47	29.40±0.60	P<0.05
FIBC (g/L)	4.86±0.11	5.04±0.11	P>0.05
PT (Sec)	19.44±0.31	19.62±0.31	P>0.05
APTT(Sec)	51.26±0.78	50.63±1.05	P>0.05
PLT(/mm^3)	194,200.00±7,948.16	133,400.00±6,482.80	P<0.001

Table showed Means ± Standard error of mean (SEM), Differences between means and the Levels of significance (P<0.001 and P<0.05). PCV= Packed cell volume, FIBC = Fibrinogen concentration, PT= Prothrombin time, APTT= Activated partial thrombin time, PLT= Platelets

4. DISCUSSION

Results obtained from this study showed significant reduction in PCV in pregnancy in the three trimesters. This is in line with previous studies [10,11,12]. The anaemia in pregnancy is sometimes referred to as physiological anaemia. This occurs as a result of increased plasma volume associated with normal pregnancy causing dilution of the whole blood without resultant effect of increase on cellular component of blood especially the red cells. The reduced

PCV values in pregnancy as compared to non-pregnant subject could be due to this factor [11,12,13].

However, fibrinogen concentration increased gradually from first to third trimester when compared to control, and was significant. When all trimesters were compared to each other, statistically significant increase was also observed in fibrinogen concentration. The highest value was associated with the third trimester. This is in line with the previous work [13] where elevated plasma fibrinogen concentration was observed in normal human pregnancy. The elevated fibrinogen concentration observed during pregnancy might be due to increased protein synthesis by liver hepatocytes to cope with increase protein needed for the mother and foetus development during pregnancy which could have made liver to produce more fibrinogen. The increase might also be due to depressed fibrinolytic system during pregnancy, and this confirms the previous work reported [13].

The result of this study showed that pregnant women had prolonged prothrombin time and activated partial thrombin time from first to third trimester when compared to control groups. The prolong with statistically significant difference might be due to hormonal changes in pregnancy. It is known that in pregnancy, various hormones are secreted and could be on the increase e.g oestrogen. This hormonal stimulation causes decrease activity of the coagulation factors to bring about prolonged coagulation, as this was reported in previous work [14].

Results obtained for platelets showed reduction that was not significant in first and second trimester but significant in third trimester. This is in line with previous studies [15,16]. The thrombocytopenia in pregnancy is sometimes referred to as gestational thrombocytopenia This occurs as a result of platelet dilution with increased plasma volume and accelerated clearance (increased consumption) of platelets in the uteroplacental circulation with gestation, so that irrespective of increased platelet aggregation, platelet lifespan will be made to decline to result in decrease in number of circulating platelet in pregnancy.

Pregnancy is often associated with changes in haemostatic system, this is considered to be in preparation for the haemostatic challenges during delivery. Therefore, this work shows that pregnancy as it progresses with trimester exerts changes of positive influence on haemostatic parameters.

5. CONCLUSION

Human pregnancy is found to exerts changes of positive influence on haemostatic parameters, which when done in addition with other haemorrheological investigations may prevent thromboembolic episodes and clotting complications as well as reducing blood loss during and after delivery of pregnancy.

CONSENT

Author declares that written informed consent was obtained from all the subjects studied in this work.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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