Assessment of some haemostatic parameters at different stages of pregnancy

Abstract

This study evaluated the effect of pregnancy on some haemostatic parameters. Blood samples were collected from sixty eight (68) pregnant women; comprising of 26, 21 and 21 subjects at 1st, 2nd and 3rd trimesters of pregnancy respectively within the age of 18–45 years. Another 40 age–matched non–pregnant adult females served as controls. Standard methods were adopted for the analysis of prothrombin time (PT), activated partial thromboplastin time (APTT) and platelets counts (PLT). Overall results showed that PT, APTT and PLT counts were 11.50 seconds, 30.16 seconds and 190.26 x 10^9/L, respectively for the test groups, and 12.99 seconds, 33.68 seconds and 256.73 x 10^9/L, respectively for the control groups. There was significant (P<0.005) decline in the test group for each of the haemostatic parameters under study. The results also showed a decline in the haemostatic parameters at increased pregnancy duration. Although decline occurs among the various stage of pregnancy but it’s not enough to cause hypercoagulability with regard to PT and APTT, and thrombocytopenia or thrombocytosis based on the platelets count results.

Keywords: activated partial thromboplastin time, Platelets, Pregnancy, prothrombin time

Introduction

In women within the reproductive age, several hormones such as estradiol, progesterone, luteinizing and follicle–stimulating hormone play essential role. At different phase (viz: ovulation, pregnancy, breast feeding etc), different hormones are at work. Specifically, during pregnancy a woman’s body goes through several physiological changes.

Anaemia has been recognized as one of the adverse health conditions during pregnancy. According to American Pregnancy Association, anaemia is a health situation that results from insufficient healthy red blood cells that could transport oxygen to body tissues and system. Authors have indicated that anaemia during pregnancy is a contributing factor to low birth weight, maternal mortality and premature birth. Anaemia symptom at pregnancy are mainly fatigue, low concentration, breath shortness, irregular heartbeat, chest pain, dizziness, pale skin, lips, and nails, cold hands and feet, weakness, tiredness, anorexia, swollen legs, trembling and palpitation.

Secondly, micro tears occur at the endothelium lining which could lead to blood vessel enlargement particularly at the uterus during pregnancy. Hence, pregnancy leads to adjustment in life pattern. Papadopol et al. opined that pre–pregnancy diet of the woman; fetal size and lifestyle are the main determinant factors of variation in physiological characteristics of the woman.

During pregnancy the changes in the body leads to adaptation in the metabolic processes. Furthermore, pregnancy could alter some blood parameters such as haemoglobin level. Several other blood parameters are altered during pregnancy. Papadopol et al. reported that decline in blood parameters during pregnancy is associated to hemodilution.

Typically, blood plays a vital function in humans. Blood provides a pathological retractor for certain conditions. Blood characteristics are influenced by health status/physiological condition, gender, age, etc. Numerous haematological indices/parameters are used to evaluate the health condition of a patient. Blood is used in assessing several parameters that provide useful information about the health condition of an individual. Some of this parameters include liver function indices/parameters (viz: alkaline phosphatase, total protein, conjugated bilirubin, alanine transaminase, albumin, aspartate transaminase, total bilirubin), triglyceride, creatinine, cholesterol, chloride, sodium, potassium, calcium, bicarbonate, phosphate, blood sugar, red blood cells, mean corpuscular volume, haemoglobin, haematocrit, mean corpuscular haemoglobin concentration, mean corpuscular haemoglobin, white blood cells, erythrocyte sedimentation rate, platelets, blood differentials (neutrophil, lymphocyte, monocyte, eosinophil, basophil counts), retroviral screening, activated partial thromboplastin time and prothrombin time, among others.

Blood platelets are crucial in preventing excess bleeding and red blood cell leakage. Prothrombin time and activated partial thromboplastin time help to determine the integrity of the coagulation system. These parameters are therefore essential to the body. Hence, this study aimed at assessing the effects of various stages of pregnancy on some haemostatic parameters.

Materials and methods

Study area

Yenagoa metropolis is within Yenagoa local government area of Bayelsa State. Yenagoa metropolis is also the capital of Bayelsa state. The state surrounded with Rivers, Delta states and Atlantic Ocean. The region is a sedimentary basin and fishing is one of the main occupations of natives of the area. However, due to industrialization, urbanization and developmental projects the area is characterized...
by few businesses and civil service jobs. The climatic condition of the area is peculiar to other Niger Delta regions that have been widely reported in literatures$^{15-28}$ with regard to relative humidity and atmospheric temperature.$^{29-33}$

**Selection criteria for participants**

**Inclusion criteria:** The participants of this study were individuals attending antenatal clinic at the Federal Medical Centre Yenagoa; a tertiary health institution. A total of sixty eight (68) pregnant women with age range of 18–45 years were recruited in this study. Control group was also established using non–pregnant women within the age of 18–45 years. Pregnancy test was done using Kit supplied by Citus Diagnostics Inc. Canada; Lot number:HCG17090031.

**Exclusion criteria:** Pregnant women with hepatitis, tuberculosis, diabetes, vascular diseases incidence were exempted for the study. Also, those who declined consent were exempted.

**Blood collection**

The blood samples were collected using standard venipuncture technique previously described by Eledo et al.$^{9,13}$ Approximately 5mls of blood was collected from each subject; some portion of the blood was dispensed into dipotassium EDTA bottles containing 1.5mg/ml of blood of the anhydrous salt for platelets count determination, while, samples meant for prothrombin and activated partial thromboplastin time analysis were dispensed into a plastic tube containing 0.25ml of trisodium citrate.

**Laboratory assessment**

Prothrombin time and activated partial thromboplastin time analysis were carried out following the methods previously described by Eledo et al.$^{9,13}$ Kits supplied by Agappe Diagnostics Switzerland with Lot number: 52601003 were used for prothrombin time and Lot number: 52602001 for activated partial thromboplastin time. The platelets counts were analysed using Cronkit’s ammonium oxalate method.

**Statistical analysis**

Statistical analysis was carried out using SPSS software. Descriptive statistics mean ± standard error. Student “t” test was used to test for significance variation at $P=0.05$.

**Results and discussion**

The effects of 1$^{st}$, 2$^{nd}$, 3$^{rd}$ trimesters of pregnancy on haemostatic parameters among pregnant women attending the antenatal clinic of the Federal Medical Centre, Yenagoa, Bayelsa state, Nigeria is presented in Table 1–3. While the overall effects of pregnancy on haemostatic parameters is presented in Table 4. In the 1$^{st}$, 2$^{nd}$, 3$^{rd}$ trimesters and overall effect of pregnancy, prothrombin time was 12.14seconds, 11.37seconds, 10.84seconds and 11.50seconds, respectively. These values were significantly ($P<0.001$) lower than the control value of 12.99seconds. Apart from 3$^{rd}$ trimester value that was slightly below 11second, the prothrombin time is within normal range. These suggest no risk of hypercoagulability tendency that could result from alteration of thrombo–haemorrhagic stability in support of thrombosis.

### Table 1 Effects of pregnancy on some haemostatic parameters during the 1$^{st}$ trimester

| Parameters                          | Mean± standard error | t-value | P-value |
|-------------------------------------|---------------------|---------|---------|
| Subjects (n=26)                     | Control (n=40)      |         |         |
| Prothrombin time (PT), secs         | 12.14±0.12          | -5.644  | 0       |
| Activated partial thromboplastin time (APTT), secs | 31.92±0.41          | -2.971  | 0.004   |
| Platelets counts (PLT)(x10$^9$/L)   | 205.85±2.62         | -20.246 | 0       |

### Table 2 Effect of pregnancy on some haemostatic parameters during the 2$^{nd}$ trimester

| Parameters                          | Mean± standard error | t-value | P-value |
|-------------------------------------|---------------------|---------|---------|
| Subjects (n=21)                     | Control (n=40)      |         |         |
| Prothrombin time (PT), secs         | 11.37±0.14          | -10.002 | 0       |
| Activated partial thromboplastin time (APTT), secs | 30.14±0.45          | 5.514   | 0       |
| Platelets counts (PLT)(x10$^9$/L)   | 186.86±9.97         | 38.695  | 0       |

### Table 3 Effect of pregnancy on some haemostatic parameters during the 3$^{rd}$ trimester

| Parameters                          | Mean± standard error | t-value | P-value |
|-------------------------------------|---------------------|---------|---------|
| Subjects (n=21)                     | Control (n=40)      |         |         |
| Prothrombin time (PT), secs         | 10.84±0.18          | 11.968  | 0       |
| Activated partial thromboplastin time (APTT), secs | 28.00±0.50          | 8.712   | 0       |
| Platelets counts (PLT)(x10$^9$/L)   | 174.38±2.2          | 37.441  | 0       |

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Activated partial thromboplastin time of 1\textsuperscript{st}, 2\textsuperscript{nd}, and 3\textsuperscript{rd} trimesters and overall effect of pregnancy was 31.92 seconds, 30.14 seconds, 28.00 seconds and 30.16 seconds, respectively, showing significant variation (P<0.005) between test and control groups. Low activated partial thromboplastin time is a measure of hyper‒coagulable conditions that could predispose patients to thrombotic events.\textsuperscript{9,34,35} Despite the decline in the test group, the values are not low to cause major cardiovascular and thrombotic events among the various stages of pregnancy. According to Elhassade & Balha,\textsuperscript{39} Eledo et al.,\textsuperscript{4} activated partial thromboplastin time is one of the major coagulant indices used to determine aberrations in the integrity of the coagulation system.

The platelets counts of 1\textsuperscript{st}, 2\textsuperscript{nd}, and 3\textsuperscript{rd} trimesters and overall effect of pregnancy was 205.85 x10\textsuperscript{9}/L, 186.86 x10\textsuperscript{9}/L, 174.38 x10\textsuperscript{9}/L and 190.26 x10\textsuperscript{9}/L, respectively. Basically, significant variation (P<0.001) exists between test and control groups. There was a decline in platelets counts, but the values are within normal reference range. This suggests no alteration in metabolic body chemistry due to platelets counts.

Furthermore, the values of activated partial thromboplastin time, platelets counts and prothrombin time decreased with increased pregnancy duration. Usually, prothrombin time, activated partial thromboplastin time is among the main coagulation indices.\textsuperscript{9,36} While platelets is essential in the initiation and propagation of thrombosis.\textsuperscript{9}

### Conclusion

Prothrombin time and activated partial thromboplastin time provide useful information about the integrity of the intrinsic and extrinsic coagulation system, while blood platelet count is essential parameter used in assessing function which may predispose one to conditions that could predispose patients to thrombotic events. Prothrombin time and activated partial thromboplastin time due to physiological changes associated with pregnancy. Also the study showed that as pregnancy duration increased the platelets counts, prothrombin time and activated partial thromboplastin time declined. However the overall values of the haemostatic indices assessed in this study revealed no major change that could predispose the women to vascular complications.

### Acknowledgement

None.

### Authors contribution

Author BOE conceived the idea, involved in sample collection and laboratory analysis. Author SCI managed literature search, carried out the statistical analysis and wrote the initial draft. Authors OOC and ECO proof read the manuscript. All authors approved the manuscript.

### Ethical consideration

Permission was obtained from the ethics committees of the Medical Laboratory Science Department of Madonna University, Elele, Nigeria and Federal Medical Centre Yenagoa, Nigeria. Informed consent was obtained from the patients prior to sample collections.

### Conflict of interest

The authors declare that there is no conflict of interest.

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