

## Hemostasis Status of Some Female Students Before and After Menstruation

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### Abstract

This study investigated the effect of menstruation on prothrombin time, activated partial thromboplastin time and platelet counts of some female students from a tertiary educational institution in Nigeria. A total of 50 women between 18-27 years of age participated in this study. Blood samples were collected from the participants prior to menstruation and after menstruation. The blood samples were analyzed using standard procedures i.e. Hemostatic Indicators Procedure. Results showed before and after menstruation were in the range of 11-19 sec (mean 14.84 ± 1.63 sec) and 12-17 sec (14.94 ± 1.12 sec) respectively for prothrombin time, 30-49 sec (mean 36.90 ± 4.27 sec) and 32.00-47.00 (mean 36.45 ± 3.64 sec), respectively for activated partial thromboplastin time, and 116-326×10<sup>9</sup>/L (mean 243.36 ± 38.72×10<sup>9</sup>/L) and 249-419×10<sup>9</sup>/L (mean 331.73 ± 36.82×10<sup>9</sup>/L) for platelets. Statistically, there was no significant variations (P>0.05) in pre and post menstruation for prothrombin time and activated partial thromboplastin time, and significant difference (P>0.001) exists for platelets counts during pre and post menstruation. No significant variation suggests no risk of hypercoagulability or coagulopathy; while platelets values before and after menstruation suggest no risk of thrombocytosis among the age grade under study.

**Keywords:** Hemostatic indicators; Hypercoagulability; Menstruation; Thrombocytosis

### Introduction

The immune cells in the peripheral blood stream of women plays essential role in response to disease and therapeutic interventions [1]. The authors further reported that the interaction of the reproductive and immune system is vital for normal immunoregulatory activities. During reproduction there is series of physiological transformation in the body. Specifically, at adolescence (a time of life between puberty and psychophysical maturity when vital endocrinological, metabolic, somatic and psychological changes occur in females) several hormones begin to develop in females [2]. Dambhare et al. [3] reported that adolescence marks an import period in girl's child life because it signifies the transition from girlhood to womanhood usually marked by menarche. Rigon et al. [2] also stated that during adolescence several transformations that occur and it marks the maturation of the complex endocrinological system (involving hypothalamus, pituitary gland, and ovaries). These endocrinological systems play essential role in the production of progesterone and estrogen. These hormones play essential role in reproduction processes in females. Furthermore, Dambhare et al. further stated that menstruation is integral part of maturation processes in women [3].

Prior to menarche (first menstruation occurring between 9-16 years of age) gonadotropic hormones (*viz*: follicle stimulating and luteinizing hormone) begin to secrete at the pituitary gland. Amaza et al. reported that menarche usually occurs at 12 years of age on average [4]. At menarche the oestrogens is produced by the ovaries due to the

activation of the gonadotrophins of the anterior pituitary glands [5-7]. The oestrogens typically act on the endometrium and lead to menstruation which last between 2-7 days but it last 3-5 days in most women. During this period blood is lost. Typically, the duration of menstrual cycle depends on the follicular phase which varies among individuals.

Menstrual cycle is a major determinant factor of a woman's reproductive health. Irregularities in the menstrual cycle are major concerns among female adults and adolescents. The abnormalities in the menstrual cycle are due to psychological stress, strenuous physical exercise, low body weight and alteration in the endocrine system. Amaza et al. is with the opinion that at late adolescence approximately 75% of girls experience some problem associated with menstruation [4].

During menstruation a lot of physiological processes take place in the body. The activities leading to menstruation is solely by activities of some hormones [8]. According to one study, menstruation has some inflammatory process, and the complexity and sequence of events are beginning to unrevealed. Basically, progesterone which has anti-inflammatory potentials decreases along with estrogen during late secretory stage of non-conception cycle. The author further reported that the hormones have the tendency to initiate a sequence of interdependent events of an inflammatory nature involving local inter-cellular interactions within the endometrium. The intracellular response to decline of progesterone causes a decrease in prostaglandin metabolism and loss of protection from reactive oxygen species [9]. Davies et al. reported that the cessation of menstrual bleeding is achieved by endometrial hemostasis (which is mostly by interaction of

endocrine, immunological and hemostatic factors at the molecular level) through platelet aggregation, fibrin deposition and thrombus formation. The coagulation system also plays essential role during the cessation of menstrual flow and also reported that thrombin is necessary for the cessation of menstrual bleed probably because they have then tendency to instigate coagulation factors As such there is the need to study hemostasis during menstruation [8].

Platelet-leukocyte aggregation is essential during coagulation of blood and inflammatory processes [10]. Due to the fact that menstruation could elicit inflammation hence there is the need to study it. Again, due to the fact that cessation of menstrual flow involves the activation of the coagulation cascade, there is need to study some coagulation parameters such as prothrombin time and activated partial prothrombin time. Hence this study aimed at assessing the hemostatic status of some female students in a tertiary educational institution.

## Materials and Methods

### Study setting

This study was conducted at Madonna University, Elele, River state, Nigeria. Only students participated in the study.

### Selection criteria for subjects

**Inclusion criteria:** The individuals that participated in this study were young females within the age of 18-27 years. A total of 50 subjects participated before and after their menstruation.

**Exclusion criteria:** Individuals with their age above 30 years; menstruating women, pregnant women, lactating mothers, and individuals with known cases of HIV/AIDs, hepatitis, B and C, tuberculosis, diabetics and vascular diseases.

### Blood collection

The blood samples were collected from each of the participants following venipuncture technique. About 5 mL of blood was collected from each subjects through the dorsal vein, and about 2.25 mL was dispensed into plastic tube containing 0.25 mL of trisodium citrate for prothrombin time and activated partial thromboplastin analysis,

while the remain blood sample was dispensed into dipotassium EDTA bottles containing 1.5 mg/mL of anhydrous salt for platelets analysis [11-16].

### Laboratory analysis

The prothrombin time and activated partial thromboplastin time was described following the methods explain by the manufacturer (Agappe Diagnostics Switzerland). The kit used for the analyses has Lot number: 52601003 for prothrombin time and Lot number: 52602001 for activated partial thromboplastin time. Furthermore, blood platelets determined using Cronkit's ammonium oxalate method.

### Statistical analysis

SPSS version 20 was used for the statistical analysis. Data were presented as mean  $\pm$  standard deviation, and range of the data was presented parenthesis. Significance variations between pre and post menstruation for each of the hemostatic parameters under study was carried out at  $P < 0.05$  using t-test.

## Results and Discussion

The hemostatic indicators of females or a tertiary educational institution in Nigeria before and during menstruation is presented in Table 1. The pre and post values of prothrombin time was 11-19 sec (mean  $14.84 \pm 1.63$  sec) and 12-17 sec ( $14.94 \pm 1.12$  sec) respectively; and the activated partial thromboplastin time were in the range of 30-49 sec (mean  $36.90 \pm 4.27$  sec) and 32.00-47.00 (mean  $36.45 \pm 3.64$  sec), respectively. Statistically, there were significant variations ( $P < 0.005$ ) between pre and post menstruation for the coagulation system parameters under study (*viz*: activated partial thromboplastin time and prothrombin time). Furthermore blood platelets were in the range of  $116-326 \times 10^9/L$  (mean  $243.36 \pm 38.72 \times 10^9/L$ ) and  $249-419 \times 10^9/L$  (mean  $331.73 \pm 36.82 \times 10^9/L$ ) during pre and post menstruation. Blood platelets showed that there were significant variation ( $P < 0.05$ ) during pre and post menstruation. Basically, blood platelet function varies during particular phases of the normal menstrual cycle [10].

Parameters	Mean $\pm$ standard deviation		t-value	P-value
	Pre (n=50)	post (n=50)		
Prothrombin Time (PT), seconds	$14.84 \pm 1.63$ (11-19)	$14.94 \pm 1.12$ (12-17)	-0.806	0.422
Activated Partial Thromboplastic Time (APTT), seconds	$36.90 \pm 4.27$ (30-49)	$36.45 \pm 3.64$ (32-47)	0.509	0.612
Platelets Counts (PLT)( $\times 10^9/L$ )	$243.36 \pm 38.72$ (116-326)	$331.73 \pm 36.82$ (249-419)	-10.373	0

**Table 1:** Effect of hemostasis on menstruation among young females student of a tertiary educational institution in Nigeria.

Hemostatic agents improve systemic and endometrial hemostasis, they play essential role in blood loss during menstruation with or without bleeding disorders [8]. Obeagu et al. [17] and Okoroiwu et al. [18] pinioned that hemostasis is the process of arresting bleeding due to damage of the blood vessel. Typically all the values of the hemostasis parameters under study are within the normal range. However, the absence of significant variation in activated partial thromboplastin time and prothrombin time suggests no risk of hypercoagulability. As

such the integrity of the coagulation system is not altered before and after menstruation [17,18]. This suggests that there is no abnormal of uterine bleeding. According to Davies et al. [8] imbalance due to hemostasis could lead to abnormality of bleeding is heavy menstrual bleeding. In addition, Okoroiwu et al. [18] and Obeagu et al. [17] reported that injuring in the endothelia cells lead to inhibition of the coagulation system and aggregation of inhibitors and thereby leading

to the secretion of Von Willbrand factors which initiate the maintenance of hemostasis after injury.

The blood platelets were significantly higher after menstruation. Though, the values are within normal range. The decline prior to menstruation suggests that changes in body physiology (Ovulation) could result to changes in platelets count. The increase after menstruation may suggest the fresh release of platelets in the body (especially the spleen and bone marrow) after menstruation. Either case (pre or post menstruation) there is no risk of thrombocytopenia (which could have occurred due to low platelets).

## Conclusion

This study assessed hemostasis in menstruation using prothrombin time, activated partial thromboplastin time and platelets count as an indicator in young females of a Nigeria tertiary educational institution. The results revealed that prothrombin time and activated partial thromboplastin time showed no significant variation suggesting no risk of coagulation disorders. Furthermore, platelets count showed a significant increase after menstruation. Though, significant but the values were within the normal range hence there is no risk of thrombocytopenia (which occurs due to low platelets counts).

## Ethical Consideration

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

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