



SIGNIFICANCE OF BLOOD PLATELET INDICES DURING THE MENSTRUAL CYCLE IN NORMAL HEALTHY WOMEN

Gynaecology

Dr. Anagha A Modak

Assistant professor, B K L Walawalkar Rural Medical College, Walawalkar Hospital & Research Centre, Derwan, Maharashtra, India.

Dr. Rajesh Butala

Reader, Department of General Pathology, Yogita Dental College & Hospital, Khed, Ratnagiri, Maharashtra, India

ABSTRACT

Menstrual cycle is a physiological process that occurs in women. Changes in the levels of female sex hormones during menstrual cycle are identified to affect the coagulation cascade by producing similar changes in the prothrombotic tendency and the fibrinolytic activity of healthy women. Aim of the study: The estimation of total platelet count (PC), platelet percentage (PCT) and mean platelet volume (MPV), in different phases of menstrual cycle. Materials and Methods: The study was conducted on 30 female subjects in the age group of 13 to 45 years. Three venous samples were taken during single menstrual cycle in menstrual, proliferative, and secretory phases in each subject and were followed up. Results: Comparison of mean PC (Table 1), PCT (Table 2) and MPV (Table 3) between three phases of menstrual cycle showed statistically significant difference ($p < 0.0001$). Platelet count was significantly lower in menstrual phase compared to proliferative phase which shows higher level relative to secretory phase.

KEYWORDS

Introduction

Menstruation is a physiological process consisting of the disintegration of the surface layer of the endometrium which is associated with the rupture of the blood vessels which irrigate the superficial layer of the endometrium¹. The menstrual cycle is characterized by cyclical fluctuations in the levels of FSH, LH, estrogen and progesterone². Platelets constitute the first hemostatic component to mobilize in order to stop the bleeding.

It is proved that during menstruation fibrinogen level; coagulation factors II, VII, and X; and platelet retention are lower in menstrual phase than in luteal phase and fibrinolytic activity is higher in menstrual phase³. Platelet function is periodically altered during the ovarian cycle due to the influence of progestin and estrogen on von Willebrand factor (vWF) concentrations⁴. which means that estrogen not only increases coagulation factors but also stimulates formation and activation of platelets.

Females have higher age-standardized rates of acute conditions, chronic conditions, and disability due to acute conditions, compared to males according to National Health Interview Survey for 1957-725. Available data from developing countries on the frequency of menstrual disorders and their impact on women's health status, quality of life and social integration suggest that evaluation and treatment of menstrual complaints should be given a higher priority in primary care programs⁶.

Platelet function is every so often altered during the ovarian cycle due to the influence of progesterone and estrogen on Von Willibrand factor concentrations. Obvious fall in the platelet count at the time of menstruation and the simultaneous lowering of capillary resistance have given rise to the assumption that menstruation is to be regarded as a physiological thrombopenia with a general problem to bleeding as a latent haemorrhagic diathesis. The correlation of mid-cycle peak elevation of platelet count with the basal temperature shift from lower to higher phase, led to the belief that the former may be more accurate indication of ovulation than the latter⁷.

Numerous scientific studies have been undertaken on hematological, biochemical parameters during menstrual cycle but the results are often contradictory & variable hence the present study was carried out to determine if there was any regular variation in the number of blood platelets during the menstrual cycle in normal healthy women.

Material & methods

The present study was carried out on 30 healthy female healthy subjects in the age group 13-45 years with normal menstrual cycle of 30±3 days. Cases of irregular periods, chronic disease and with history of drug affecting the menstrual cycle were not included. The

estimation of total platelet count(PC), platelet percentage(PCT) and mean platelet volume(MPV), were done under the following phases of menstrual cycle i) Menstrual phase(2nd day), ii) Proliferative phase(between 9th to 13th day) & iii) Secretory phase(between 21st to 24th day).

Blood samples of 2 ml in each individual were drawn from antecubital vein in a plastic vial containing EDTA as anticoagulant and investigations for total platelet count (PC), platelet percentage (PCT) and mean platelet volume (MPV) were performed using Hematology analyser ERMA PCE210.

Results

Comparison of mean PC (Table 1), PCT (Table 2) and MPV (Table 3) between three phases of menstrual cycle, using ANOVA with Tukeys' post hoc Test showed statistically significant difference among three Phases $p < 0.001$.

Table 1: Comparison of mean Platelet count (Lakhs / μ l) between three phases of menstrual cycle

	Menstrual phase (MP)	Proliferative phase (PP)	Secretory phase (SP)	ANOVA (p value)
MEAN	1.74000	2.83667	2.54667	<0.001*
($\pm$) SD	.209433	.391710	.356935	
Range	2.3- 1.2	3.8-2.1	3.1-1.8	

*Statistically Significant

Table 2: Comparison of Mean platelet volume between three phases of menstrual cycle.

	Menstrual phase (MP)	Proliferative phase (PP)	Secretory phase (SP)	ANOVA (p value)
MEAN	15.34333	14.21000	13.20333	<0.001*
($\pm$) SD	.551914	.539060	.561085	
Range	16.200-14.600	14.900-13.600	13.900-12.200	

*Statistically Significant

Table 3 Comparison of Platelet Percentage (%) between three phases of menstrual cycle

	Menstrual phase (MP)	Proliferative phase (PP)	Secretory phase (SP)	ANOVA (p value)
MEAN	0.68433	0.45400	0.24933	<0.001*
($\pm$) SD	0.074077	0.111312	0.032688	
Range	0.520 - 0.880	0.300-0.680	0.180 - 0.290	

*Statistically Significant

Discussion: In our study, we estimated total platelet count, platelet percentage and mean platelet volume in different phases of menstrual cycle. The total platelet count was found to be least during the menstrual phase, subsequently there was rise during the proliferative & secretory phase.

The values in the secretory phase is higher than that in the menstrual phase but the rise is lower as compared to the proliferative phase. The fall in the levels of platelets at the onset of menstruation may be related to the fall in level of corpus luteum hormones and parallelism may be said to exist between the oestrin curve and platelet curve during the menstrual period. The decrease in the platelet levels at the onset of menstruation may be due to menotoxin or due to an endocrine reaction via the spleen or haemopoietic system⁷.

These results are similar to some of the earlier studies. Study conducted by Pepper H and Lindsay⁸ is comparable with the present study. They reported low platelet count during the menstrual phase. Work done by Saxena SC⁷, & Aara S⁹ is consistent with results of present study

A mid-cycle peak raise in platelet count, followed by a steady drop may be due to luteal hormone inhibiting the spleen from releasing platelets^{10, 11}. Genell S et al, believed that absorption of necrotic endometrium caused a systemic reaction with a postmenstrual increase of platelets¹². Several found that the platelet count was elevated significantly during the mid-cycle. The cause of this peak lies in the physiological stress mechanism occurring in the wake of ovulation with an alarm reaction and discharge of corticosteroids, as injections of corticotrophin is followed by an increase in platelet count¹³.

Thus, the variations in the levels of platelet during different phases of menstrual cycle may be explained by variations in the levels of ovarian hormones, menotoxin and toxic resorption of necrotic material from raw endometrial surface or due to an endocrine reaction via the spleen on haemopoietic system or due to corticosteroids. However, in conflicting to above findings some studies have reported mild changes in platelet count, but no statistically significant changes to be observed during different phases of menstrual cycle⁸.

Conclusion

This study revealed that the total platelet count was significantly lower in menstrual phase compared to proliferative phase which shows higher level relative to secretory phase. This observation may be made by phasic changes in female sex hormones.

References

1. Sant'Ana LM, Mendonca AP, Guerra GF, Carvalho GL, Smith AL, Lauro MV. Influence of the menstrual period on the peripheral platelets number. *J Bras Patol Med Lab* 2002; 38(4): 297-299.
2. Malipali B.S, Patil S. Hematological modulation in different phases of menstrual cycle. *IJBR* 2013; 4(2): 88-93.
3. Hahn L, Rybo G. Fibrinogen-fibrin degradation products in menstrual blood from women with normal and excessive menstrual losses. *Acta Obstet Gynecol Scand*. 1975;54(2):119-27.
4. Feuring M, Christ M, Roell A, Schueller P, Losel R, Dempfle CE, et al. Alterations in platelet function during the ovarian cycle. *Blood Coagul Fibrinolysis*. 2002;13(5):443-7.
5. Verbrugge LM. Females and illness: recent trends in sex differences in the United States. *J Health Soc Behav*. 1976 Dec; 17(4):387-403.
6. Sioba'n D Harlow, Oona MR Campbell. Epidemiology of menstrual disorders in developing countries: a systematic review. *BJOG: an International Journal of Obstetrics and Gynaecology*. January 2004; Vol. 111, pp. 6-16
7. Saxena SC, Mishra S. A study of total platelet count, adhesive platelet count and platelet adhesiveness in various phases of normal menstrual cycles. *J ObstetGynaecol India* 1975; 25(6): 797-800.
8. Pepper H, Lindsay S. Levels of platelets, eosinophils, totalleucocytes and polymorphonuclear leucocytes during thenormal menstrual cycle. *J Am CollObstetGynaecol* 1959;14:657.
9. Aara S, Gupta M, Rafiq N et al. Evaluation of haematological factors in various phases of menstrual cycle. *Int J Health Sci Res*. 2016; 6(5):101-106.
10. Gupta R, Mehrotra HN, Negi VK, Pant MC, Mishra. Studies on total platelets, leucocytes and eosinophils during and around ovulatory period in Indian girls. *Indian Med Gazette* 1977;17(5):159.
11. Gupta R, Negi VK, Pant MC, Mehrotra HN. A study of mid-cyclic variations in platelets, eosinophils, leucocytes and serum Ca and P with a view to anticipate ovulation. *Ind J PhysiolPharmacol* 1980;24(5):440.
12. Genell S. Study of variation in numbers of blood platelets during menstrual cycle. *J ObstetGynaecol Br Emp* 1936;43:1124-34.
13. Balasubramaniam P, Parulkar VG, Bhatt JV. Somehaematological observation during menstrual cycle. *Indian J Med Sci* 1980;3418:193-4.