

A STUDY OF VARIATION OF TOTAL LEUCOCYTE COUNT AND PLATELET COUNT WITH DIFFERENT PHASES OF MENSTRUAL CYCLE

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ABSTRACT

BACKGROUND

Menstrual cycle is a physiological state which is associated with numerous changes affecting the hormone levels. The blood counts change especially the leucocyte count and the platelet count, which may give an insight into the immunological status and the haemostatic changes during the different phases of the menstrual cycle.

MATERIALS AND METHODS

100 women in the age group of 18-22 year were selected. Total leucocyte count is done by using Turks fluid and Neubauer's Chamber and a compound microscope. Platelet count is done by using Reese-Ecker method. Counts were done during proliferative, secretory and menstrual phases.

RESULTS

In the present study, the total leucocyte count and platelet count were studied during the menstrual phase, proliferative and secretory phases in 100 subjects in the age group 18-22 years. The results are as follows:

The mean age of the subject \pm SEM is 18.65 ± 0.106 years.

The TLC mean \pm SEM in menstrual phase is 8387 ± 137.51 /cumm, in the proliferative phase, it is 5439.4 ± 78.87 /cumm and in the secretory phase it is 5752.34 ± 83.54 /cumm. There is a mild increase in the TLC from the proliferative to secretory phase, which grossly increases by the onset of menstruation. The p value is <0.05 which shows that the changes are significant. The mean of the platelet count \pm SEM in the proliferative phase is 3.12 ± 0.070 lakhs/cumm, in the secretory phase it is 2.97 ± 0.71 lakhs/cumm and in the menstrual phase it is 2.97 ± 0.72 lakhs/cumm.

CONCLUSION

The leucocyte count is low during proliferative phase and increases to the maximum in the menstrual phase. The platelet count is high in the proliferative phase and gradually decreases to the lowest values in the menstrual phase.

KEYWORDS

Neubauer's Chamber, Reese-Ecker Method, Proliferative Phase, Secretory Phase, Menstrual Phase, Turk's Fluid.

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BACKGROUND

The human body consists of about 5 litres of blood. The RBC, WBC and platelet in the blood comprise formed elements of the blood. In health, the cell counts are maintained at specific levels with minor variations. Menstruation is a repetitive phenomenon which is confined to the Female primates. It is observed that systemic and haematological changes accompany different phases of menstrual cycle which are controlled by the cyclical changes in the female reproductive hormones.

TLC & Platelet count were found to fluctuate with the fluctuating hormone levels in the proliferative, secretory and the menstrual phases of the menstrual cycle. The availability

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of the immune cells in peripheral blood in woman plays an important role in their response to infections play an important role in haemostasis.¹

Objectives of The Study

1. To study the variations in total leukocyte count and platelet count in different phases of menstruation.
2. To study the effects of the hormonal variations during the menstrual cycle on the total leukocyte & platelet counts.

MATERIALS AND METHODS

The present study is conducted in the dept. of physiology, RMC, Kakinada, Andhra Pradesh after the approval of the study protocol by the ethical committee of the institute.

Selection of Subjects

100 healthy young women in the age group of 18-22 years having regular menstrual cycles were selected. Presence of anaemia, endocrinal disorders, gynaecological disorders and infections at the time of sampling was excluded.

Method of Data Collection

The protocol in explained to the subjects. Informal consent is obtained from the patients. 3 samples of blood taken, one within 48 hours of onset of menses, second during 8-10th day of the period and 3rd during 22-24th day of the cycle. The samples were taken between 2 pm – 4 pm to avoid diurnal variations. The samples are analysed within 1 hour of collection.

The TLC is studied by manual counting with the help of haemocytometer Neubauer’s chamber and Turks fluid. Platelet count is studied similarly using Rees – ether solution. In statistical analysis, t-test is applied to study the significance of the values. P value of less than or equal to 0.05 was considered to be statistically significant in the t-test.

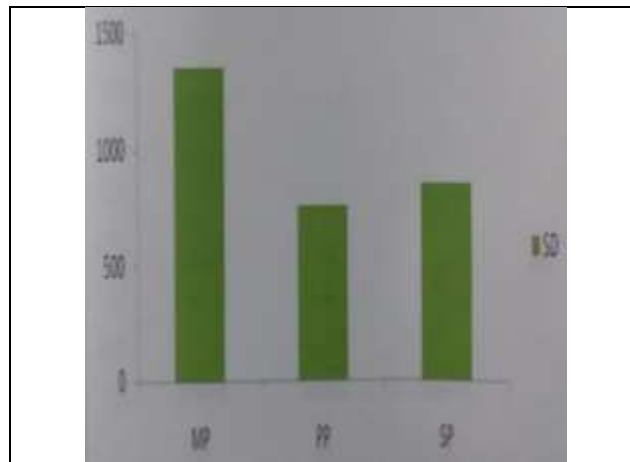
RESULTS

In the present study the total leucocyte count and platelet count were studied during the menstrual phase, proliferative and secretory phases in 100 subjects in the age group 18-22 years. The results are as follows:

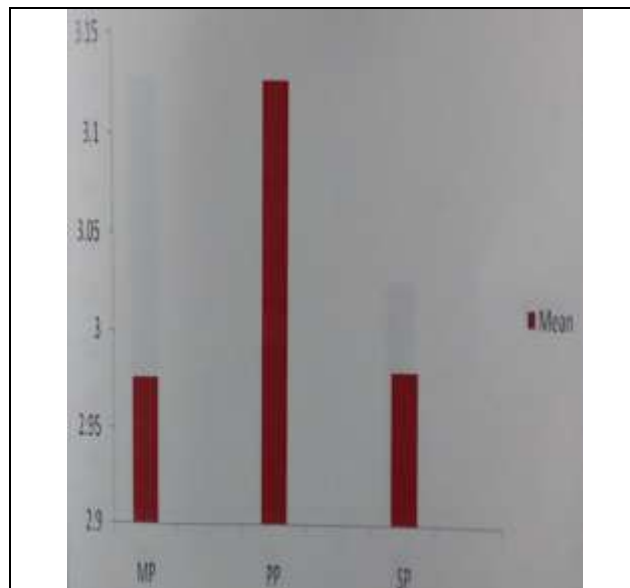
The mean age of the subject’s ± SEM is 18.65 ± 0.106 years.

The TLC mean + SEM in menstrual phase is 8387 ± 137.51 / cumm, in the proliferative phase, it is 5439.4 ± 78.87 / cumm and in the secretory phase it is 5752.34 ± 83.54 / cumm. There is a mild increase in the TLC from the proliferative to secretory phase, which grossly increases by the onset of menstruation. The P value is < 0.05 which shows that the changes are significant. The mean of the platelet count ± SEM in the proliferative phase is 3.12 ± 0.070 lakhs / cumm, in the secretory phase it is 2.97 ± 0.71 lakhs/cumm and in the menstrual phase it is 2.97±0.72 lakhs/cu mm.

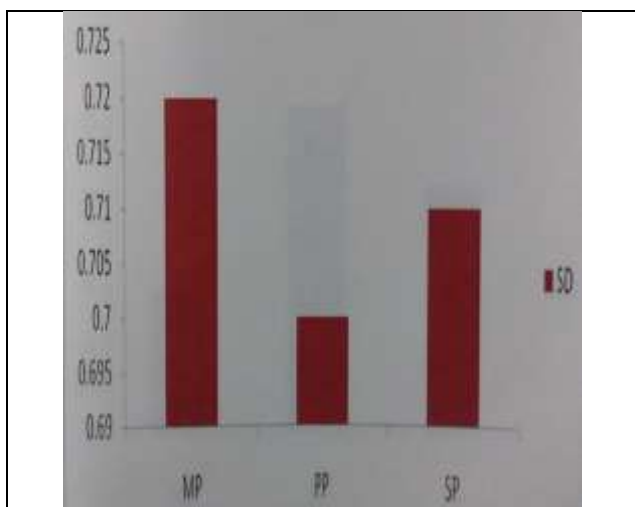
There is a gradual and significant fall of the platelet count from the proliferative phase to the secretory phase and significantly low at the onset of the menstruation. The p value is < 0.05 which implies the significant changes.



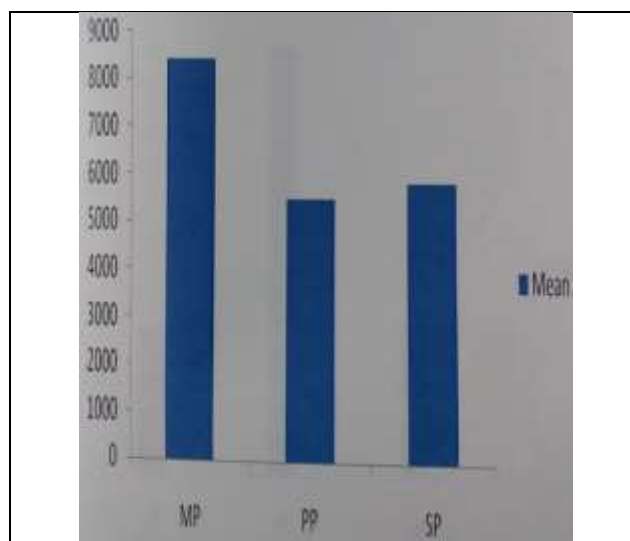
Graph 2. SD of Total Leucocyte Count in Different Phases of Menstrual Cycle in 100 Study Subjects



Graph 3. Platelet Count- Means in 3 Phases of Menstrual Cycle



Graph 1. SD of Platelet Count in The Subjects in Different Phases of Menstrual Cycle



Graph 4. Means of TLC in Phases of Menstrual Cycle

DISCUSSION

Steroid hormones are known to induce immunological events. The fluctuation of the sex hormone levels during menstrual cycle provide a convenient basis for analysing the interaction of sex hormones and immune mechanisms. Haematological changes accompany the different phases of menstrual cycle.²

The human menstrual cycle is under the control of hypothalamic – pituitary--ovarian axis. The endometrium is stimulated by the hormones oestrogen and progesterone which are controlled by FSH and LH. Oestrogen also alters fibrinolysis activity and increases platelet aggregation and thrombosis.

Though there is margin of technical error in platelet counting making it difficult to demonstrate minor variations in single subject, in a group subjected to same experimental conditions, minor variations may be revealed by statistical analysis. Generalised hem dilution & haemoconcentration can also affect the platelet count. In women the platelet count falls before menstruation.

Leucocyte count variations are complex. The TLC is minimum during ovulation and maximum at menstruation. The fluctuations of TLC count could be due to the variations in the levels of hormones oestrogen, progesterone, FSH and LH. Rise in the temperature during post Ovulatory phase of the menstrual cycle may be responsible for the rise in the leucocyte count.

Platelets have critical role in normal haemostasis. Oestrogen & progesterone regulate the platelet functions and activation. The variation in the platelet count in the different phases³ may be explained by:

1. Variations in the ovarian hormone levels.
2. Toxic resorption of necrotic menstrual from raw endometrial surface.
3. Endocrine reaction in haemopoietic system via spleen
4. Due to corticosteroids

In the proliferate phase, there is an elevation of the platelet count due to systemic reaction because of absorption of necrotic endometrium.

During the mid-cycle & prior to ovulation, the platelet count reaches peak to the discharge of corticosteroids which is due to the physiological stress reaction.

In the secretory phase, the platelet count declines due to the inhibition of the inhibition of the spleen to release platelets into the blood stream by the elevated levels of the luteal hormone.

A study done by Rajnee, Vinod Kumar et al., at department f physiology, Sardar Patel Medical College, Bikaner and Dr. Sampurnanand Medical College, total leukocyte count and platelet count increased around the mid cycle (p<0.001) during the cycle.⁴

In a study in patients with cyclic thrombocytopenia done by Aaron Tomer, et al., platelet half-life was done in different phases of menstrual cycle. Platelet count reached a radius of 5-20×100,00,00,000/l at the onset of menstrual cycle. At the time of ovulation, the platelet count increased to around

900×100,00,00,000/l. The platelet half-life was prolonged to 32 days.⁵

An article by Sadiqua begum, Ashwini, published in Indian journal of biological medical research 2012 3(1): 1407-1409 'Study of immune profile during different phases of menstrual cycle 'recorded that there is increase in total leukocyte count during secretory phase. It also recorded that the lymphocyte count increased during proliferative and secretory phases of the menstrual cycle.⁶

In my present study, bleeding time and clotting time variations were also studied in association with the total leukocyte count and platelet count variations.

The bleeding time mean ± SEM during the menstrual phase is 175±3.78 sec, during proliferative phase it is 150.4±4.02 sec and in secretory phase it is 156.3±3.9 sec. This indicates that there is a mild increase in bleeding time during secretory phase and significant increase during menstrual phase.

The clotting time during menstrual phase mean ± SEM is 232.2 ± 4.2 sec, in proliferative phase it is 233.2 ± 4.2 sec and during secretory phase, it is 202.6 ± 4.2 sec. This shows that there is an increase of clotting time in proliferative phase and a decrease in secretory phase.

These findings of bleeding time and clotting time variations correlate with the variations of the platelet count during the respective phases of the menstrual cycle.

A study that was done in dept. Of physiology, MKCG medical college, Orissa, India and published in American journal of infectious diseases in April, 2009 compares the variations in bleeding time and clotting time in people with different blood groups. It shows that bleeding time is more in people with AB blood group than in people with O blood group and clotting time is prolonged in people with B blood group than in people with a blood group.⁷

A study by Ali Maleki, Hamidreza Roohafza, Negin Rashid, et al., done at Lorestan university of medical sciences shows relation between bleeding time variations with age and sex. It shows that in men bleeding time decreases with increase in age but in women there is no variation of bleeding time with increase in age.⁸

TLC	Menstrual	PP	SP
Mean	8350	5450	5250
SD	1350	750.5	850
SEM	135	75.05	85

Table 1

P <0.05 – Significant.

Platelet Count	MP	PP	SP
Mean	2.97	3.12	2.97
SD	0.72	0.7	0.71
SFM	0.072	0.07	0.071

Table 2

P <0.05 – Significant.

T & p values of paired t test of TLC & platelet count during different phase of menstrual cycle in 100 subjects.

TLC	t	p	S/NS
MP vs. PP	1.40	0.02	S
PP vs. SP	2.81	0.01	S
MP vs. SP	0.24	0.02	S

Table 3

Platelet Count	T	p	S/NS
MP vs. PP	2.22	0.03	S
PP vs. SP	0.12	0.02	S
MP vs. SP	0.12	0.02	S

Table 4

CONCLUSION

The fluctuating levels of the steroid hormones, oestrogen & progesterone during the three phases of the menstrual cycle has effect on different system of the body including the blood cell counts, because blood cells possess receptors for the hormones.

The leucocytes count variations during the menstrual cycle were within normal limits. The count is maximum during the menstrual phase and minimum during the proliferative phase. This rise is due to the phagocytic activity at the site of the breached endometrium.

The platelet count variations during the different phases of menstruation are within normal limits. The count is high in proliferation phase and least during menstrual phase. The

count is increased in secretory phase also though it is less than in the proliferative phase.

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