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Original Article

Study of immune profile during different phases of menstrual cycle

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ABSTRACT

Background and Objectives: Menstrual cycle is the cyclical phenomenon characterized by periodic vaginal bleeding, influencing all the systems of the body. Interaction between the reproductive system & immune cells plays an important immunoregulatory role. The present study was taken up to study the variations in the blood leucocytes during different phases of menstrual cycle. **Materials & Methods:** 40 healthy women in the age group of 18-25 years with regular menstrual cycles of 30 ± 2 days duration participated in the study. Women with irregular cycles, gynecological disorders, history of prolonged drug intake were excluded from the study. Total Leucocyte Count (TLC), Absolute Eosinophil Count (AEC) & Differential Leucocyte Count (DLC) were analyzed during the menstrual phase, proliferative & secretory phase during a single cycle. The data collected was statistically analyzed. **Results:** There was a statistically significant increase in total leucocyte count during secretory phase. In differential leucocyte count, there was a significant increase in the neutrophil percentage during secretory phase. Lymphocyte count increased during proliferative & secretory phase. **Conclusion:** This study attempted to understand the normal variation in the leucocytes during different phases of menstrual cycle which may help in understanding various disorders.

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1. Introduction

Menstrual cycle is a repetitive phenomenon occurring during the reproductive life of a female that involves structural, functional & hormonal changes in the reproductive system. The periodicity of the menstrual cycle ranges from 25 to 35 days with recurrent discharge of blood from female genital tract which occurs for 3-5 days. The active reproductive life of female starts with the onset of this cyclical phenomenon that is menarche and ceases with the onset of menopause. It is related to the secretion of estrogen & progesterone from the ovaries & influenced by the gonadotrophins through the hypothalamo pituitary activity. Ovarian hormones influence almost all the systems of the body. They are known to alter the immune system like depression of the suppressor T cell activity [1]. Human & animal studies suggest that there is a change in the distribution of immune cells during different phases of menstrual cycle [2]. Hence the present study aimed at assessing the

distribution of the leucocytes in the peripheral blood during different phases of menstrual cycle.

2. Materials and Methods

The present study was carried out on 40 healthy female subjects in the age group of 18-25 years with normal regular menstrual cycle. The duration of the cycles were 30 ± 2 days. Subjects with irregular cycles, gynaecological disorders, anemia, history of drug intake affecting menstrual cycle or history of chronic disease were excluded from the study. Study protocol was explained to the subjects & informed consent was obtained from each of the subject. Experimentations were carried out in accordance with ethical standards of the committee according to Helsinki declaration [3].

Venous samples were taken during different phases of menstrual cycle. The first sample on the 2nd day of the onset of menstruation (Menstrual phase), second sample during 6-9th day (Proliferative phase) & the third sample during 22-24th day of menstrual cycle (Secretory phase). All the subjects were followed up during a single cycle. Samples were taken at the same time of the day to avoid diurnal variation. The parameters analyzed were Total Leucocyte Count (TLC), Absolute Eosinophil Count (AEC) &

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Differential Leucocyte Count (DLC) of neutrophils, lymphocytes, monocytes, eosinophils & basophils, using Automated Hematology Analyzer (Sysmex KX-21), as automated analyzers provide reliable & accurate cell counts.

The various parameters were statistically analyzed using SPSS for windows (version-16.00). Students't' test was applied to determine the significance of difference. The 'p' value less than 0.05 was considered statistically significant.

3.Results

There was a statistically significant increase in TLC during the secretory phase of the menstrual cycle as shown in Table 1. No significant difference in AEC during different phases of menstrual cycle.

Table 1. Total Leucocyte Count during different phases of menstrual cycle. All the values are expressed as Mean \pm Standard Deviation (n=40).

	Menstrual phase (2nd day)	Proliferative phase (6-9th day)	Secretory phase (22nd-24th day)	Significance* 'p' value < 0.05
Total Leucocyte Count (cells/mm ³)	5893.6 \pm 1.37	6025.2 \pm 1.13	6675.4 \pm 1.12*	Significant
Absolute Eosinophil Count (cells/mm ³)	156.53 \pm 60.26	154.42 \pm 53.69	159.2 \pm 61.30	Not Significant

2. Table 2 shows that in the DLC,

- There was a significant rise in the neutrophil percentage during secretory phase when compared to proliferative phase.
- Lymphocyte count increased during proliferative & secretory phase when compared to menstrual phase.
- No significant changes were observed in eosinophils, monocytes & basophils.

Table 2. Differential Leucocyte Count during different phases of menstrual cycle. All the values are expressed as Mean \pm Standard Deviation (n=40).

	Menstrual phase (2nd day)	Proliferative phase (6-9th day)	Secretory phase (22nd-24th day)	Significance* 'p' value < 0.05
Neutrophils (%)	59.63 \pm 6.37	57.92 \pm 7.62	62.75 \pm 7.89*	Significant
Lymphocytes (%)	27.8 \pm 5.97	32.92 \pm 6.04*	30.725 \pm 5.94*	Significant
Monocytes (%)	8.12 \pm 2.9	8.54 \pm 3.27	9.07 \pm 3.23	Not Significant
Eosinophils (%)	2.53 \pm 0.97	2.42 \pm 0.91	2.3 \pm 1.01	Not Significant
Basophils (%)	0.32 \pm 0.43	0.34 \pm 0.39	0.27 \pm 0.37	Not Significant

n= Number of subjects in the study

4.Discussion

Menstrual cycle involves complex & regular changes occurring under the control of hypothalamopituitary ovarian axis. Increase in the TLC in the present study during secretory phase is due to increase in all the subpopulations of leucocytes. This finding is similar to that observed in the previous studies by Mathur et.al & Tikare et.al [4, 5, and 6]. Another study conducted by Rajnee et.al reveals that TLC raised from menstrual phase to proliferative phase & maximum level occurred around mid cycle [7].

Statistically significant increase in neutrophil percentage during secretory phase is probably due to the hormonal changes that are occurring in the ovaries. Estrogen & progesterone that is secreted by the ovaries regulate the neutrophil count. Invitro studies have suggested that estrogen enhances granulocyte

proliferation [8]. An increase in 17 beta estradiol concentration during secretory phase probably causes the increase in the granulocyte number [9].

There is no significant change observed in the eosinophil percentage as well as the AEC.

This result is contrary to the observations in other studies, where there was a significant drop in eosinophil count during midcycle followed by a rise in the secretory phase [7, 10], which occurred as a response to physiological stress wherein the levels of steroids increase causing eosinopenia.

Increase in differential lymphocyte count during proliferative & secretory phase in comparison to menstrual phase is due to increase in number of Helper T cells, cytotoxic T cells & Natural killer cells [11], that occurs under the influence of steroids which are present during the proliferative & the secretory phase.

Observations documented show that in the luteal phase of the menstrual cycle, diseases like Systemic Lupus Erythematosus (SLE) tend to flare [12]. Similar picture is seen in pregnancy, suggesting that their humoral mechanisms (antibody production) are geared up [13]. This indicates that the immune response is shifting towards humoral, that is away from cell mediated response. This is further explained by the observation that patients with rheumatoid arthritis, a cell mediated autoimmune disorder, often observe improvement of their symptoms during the luteal phase. The concentration of steroid hormones estrogen & progesterone secreted from the ovary rise during the luteal phase with progesterone rising to its peak concentration. This could be the reason for the shift in the immune mechanisms, with progesterone having a major role.

5. Conclusion

This preliminary study gives a brief idea over a small population. This can further be studied over a larger population as well as in women suffering from autoimmune disorders. Study of distribution of cells during different phases of menstrual cycle gives the picture of availability of immune cells in the peripheral blood. Optimal availability of these cells plays an important role in the disease process, body's response to disease process. This may help researcher's in better understanding of mechanisms of various disorders, natural history of disorders. It may explain & answer the question of why few disorders are commonly suffered by women population & also help in therapeutic interventions.

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