



## Comparison of hematological parameters and inflammatory marker between Normal and PMS affected women in luteal phase of the menstrual cycle.

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### Article Info

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### Abstract

**Background:** Premenstrual Syndrome (PMS) is a condition affecting 62 percent of women of reproductive age in India and it's most prevalent in low socioeconomically background individual. It is characterized by a range of emotional, physical, and behavioral symptoms occurring in the Luteal phase of the menstrual cycle. Symptoms include mood swings, bloating, fatigue, irritability, and depression, significantly impacting daily life. Despite its prevalence, the etiology and pathophysiology of PMS remain poorly understood.

**Aim:** This study aims to investigate the variations in WBC, Platelet and CRP between normal and PMS-affected women in Luteal phases of the menstrual cycle, thereby shedding light on the physiological underpinnings of PMS.

**Objective:** To compare normal and PMS affected Women in Luteal Phase of the menstrual cycle.

#### Materials and methods:

**Study Design:** Comparative Crosssectional study

**Participants:** Women of age between 18-40 years.

**Inclusion Criteria:** Women having Regular menstrual cycles (21-40 days), not using hormonal contraceptives, no chronic medical condition e.g. bleeding disorder and renal failure.

**Observation & Result:** From this study we calculated the mean value and standard deviation of WBC in normal control is  $6047.5 \pm 671.38$  and  $6955.56 \pm 1507.067$ , Mean Platelet count in control group is  $1.99 \pm 0.24$  and in PMS group  $2.81 \pm 0.534$ . Mean and SD of CRP in control group is  $2.76 \pm 1.2$  and in PMS group is  $7.14 \pm 1.0$ . So, there is significantly increase in WBC, Platelet and CRP level in PMS affected group is seen.

**Conclusion:** in this study we have concluded that there is significant increase in WBC, Platelet and CRP in PMS affected women.

**Keywords:** Menstrual cycle, luteal phase, hematological parameters, inflammatory marker, CRP, pre-menstrual syndrome (PMS)

## 1. Introduction

Premenstrual syndrome (PMS) is a group of Physical, cognitive, emotional and behavioral symptoms that occurs during luteal phase of menstrual cycle [1]. PMS often results in myriad distress to social work and interpersonal relationships which are no less painful than major depressive disorder [2]. The suffering is largely on account of abnormal emotional regulation [3]. Studies have found that women with PMS were more sensitive to anxiety, endured more negative emotions and stressful events and experienced persistent abnormal emotional states [4]. Their attention to negative events are positively correlated with the risk of PMS [5], and the impaired emotional regulation enhanced negative experience, thus exacerbating symptoms [6]. Ding et al. discovered that the most prominent emotion in the PMS group was anger. Saglam et al. found that PMS group showed higher level of anger and lower level of control [7]. Another survey from Sri Lanka pointed out that feeling sad or hopeless was the most frequent reported emotional problem among adolescent females with PMS [8] The menstrual period is natural and specific to female humans and a few species [9]. During their reproductive age, a complex interaction between the hypothalamus, anterior pituitary gland, ovaries, and uterus results in periodic and cyclic shedding of uterine endometrium, which is accompanied by blood loss [10]. In women suffering from severe dysmenorrhea, leukocyte count estimation can assist detect underlying reproductive morbidities [11]. Prolonged and heavy bleeding leads to increased blood loss (>80 ml), [12] which may develop anemia, making it necessary to estimate red blood cells (RBC) [13]. Chronic inflammation may contribute to depression and other mental and somatic illnesses, including PMS (Brennan) [5]. In healthy women with normal menstrual cycle function, levels of plasma and endometrial inflammatory markers, including CRP and the cytokines interleukin (IL)-6, IL-1b, and tumor necrosis factor (TNF)- $\alpha$ , appear to change during the menstrual cycle [14]. This study aims to find the association of hematological parameters between normal and PMS affected women.

## Methodology

This study was conducted over a period of 2 years from Dec. 2022 to May 2024 to evaluate the variation in Hematological parameters in luteal phase of the menstrual cycle. A total of 80 female in age group of 18 to 40 age, were recruited from Indore City who were visited Gynecology department of index medical college hospital. Out of which 40 female was taken as study group who were have PMS related problem on the basis Questionnaire of PMS (on the basis of DSM criteria-5), 40 women were taken as control who had no PMS- related problem. The study was approved by the Institutional Review Board of Index Medical College Hospital and Research Centre, Indore; a comparative crosssectional study was done in the city of Indore during Dec 2022– May 2024.

**Inclusion Criteria:** for subject as follows

1. Age: 18- 40 years
2. Regular Menstrual Cycle

## Exclusion Criteria

1. Subject using contraceptive pills
2. Irregular menstruation (menorrhagia)
3. Under medication
4. Diabetes mellitus
5. Psychiatric illness.

## Collection of sample

The subjects were asked to report to Phlebotomy department on 20<sup>th</sup> to 22<sup>nd</sup> day of onset of period (menses). From each subject 5 ml whole blood was drawn from vein puncture under all aseptic precaution with disposable syringe. The needle was detached from syringe and 1 ml blood was transferred to the gel tube container and blood was left for 5 min and then it was centrifuged at 2000 RPM for 5 minute. Then serum sample was sent to Biochemistry Lab for CRP valuation and 4 ml blood was transferred to DETA tube and mixed it well to avoid coagulation and sent to hematology lab for estimation of WBC and Platelet.

## Statistical analysis

The data were collected on the basis of reading given by sample fed in fully automated Hormonal analyzer and data as arranged on MS excel. Statistically significant differences among quantitative variables were evaluated ANNOVA with the Help of SPSS software (version27). A  $p$  – value less than 0.005 were considered as statistically significant.

## Result

In this study we have calculated mean and standard deviation of WBC, Platelet and CRP and found the association of all these parameters in normal and PMS respectively.

**TABLE 1: BASIC CHARACTERISTIC OF PARTICIPANTS**

| Variables   | Normal (n=40) |      | PMS(n= 40) |      | P     |
|---|---------------|------|------------|------|-------|
|   | Mean          | SD   | Mean       | SD   |       |
| Age (yr)  | 28.6          | 11.4 | 27.6       | 12.3 | 0.347 |
| Weight (kg)   | 54.7          | 6.8  | 56.3       | 7.2  | 0.434 |
| Height (cm)   | 153.5         | 4.8  | 153.8      | 4.3  | 0.856 |
| BMI( kg/m <sup>2</sup> )  | 23.37         |      | 24         |      | 0.313 |
| * t- test was applied . Abbreviations : BMI ( Body Mass Index; PMS Premenstrual |               |      |            |      |       |

The above table showing the Mean age of the control group female is 28.6 and SD is 11.4 and in PMS group mean age of female 27.6 and SD is 12.3. The average weight of control group female is 54.7 and SD is 6.8. The BMI of control group is 23.37 and BMI of PMS affected group is 24. So, in this study association of BMI with PMS is not statically significant.

**TABLE 2: SHOWING COMPARISON OF BLOOD PARAMETERS AND INFLAMMATORY MARKER IN NORMAL AND PMS AFFECTED GROUP.**

| Parameters               | Normal              | PMS                    | p-vale |
|--------------------------|---------------------|------------------------|--------|
|                          | Mean $\pm$ SD       | Mean $\pm$ SD          |        |
| WBC(cells/ $\mu$ L)      | 6047.5 $\pm$ 671.38 | 6955.56 $\pm$ 1507.067 | 0.0008 |
| Platelet (Lakh/ $\mu$ L) | 1.99 $\pm$ 0.24     | 2.81 $\pm$ 0.534       | <0.001 |
| CRP(mg/dL)               | 2.76 $\pm$ 1.2      | 7.14 $\pm$ 1.30        | <0.001 |

From this above table it is observed that mean and standard deviation of WBC count is 6047.5 $\pm$ 671.38 in normal women in contrast to that mean and standard deviation in PMS group is 6955.56 $\pm$ 1507.067 so, it reveals that there is significant increase in WBC count in Luteal phase of the menstrual cycle and increase in WBC count is significant in PMS. Mean and standard deviation of Platelet count is 1.99 $\pm$ 0.24 in control group female unlike mean and standard deviation in PMS group is 2.81 $\pm$ 0.534. So increase in Platelet count is seen PMS affected female. The mean and standard deviation of C- reactive protein in normal control female is 2.76 $\pm$ 1.2 with comparison mean and standard deviation of CRP in PMS affected group is 7.14 $\pm$ 1.30, so there is significant increase in C-reactive protein in PMS affected female.

## Discussion

Hematological parameters and inflammatory markers indicate the status of women's health and her reproductive ability (15). The menstrual cycle is classical and natural phenomenon of female in their reproductive age (8). Fluctuation of hormonal parameters, hematological parameters and inflammatory markers in female menstrual cycle is natural phenomenon. But this study showed that is significant increase in WBC count in PMS affected female in Luteal phase of the menstrual cycle. (p vale 0.0008). Hanchinal Basavraj et al. (2021) showed: More than half of the subjects demonstrated PMS (57.6%). Leukocyte and Neutrophil counts were found to be elevated during LL phase (7.24 $\pm$ 1.67  $\times$  10<sup>3</sup>/mm<sup>3</sup>; 58.84 $\pm$ 8.89% . Ara Sagufta et al. (2016) The Red blood cell count, hemoglobin concentration, total leukocyte count, Differential leukocyte count, total platelet count showed no significant changes during various phases of menstrual cycle in normal female without PMS. This Present study showed that there is significant increase in WBC count and Platelet count in PMS affected women in luteal phase of the menstrual cycle.

Inflammatory marker C-reactive protein is significantly increase in PMS affected female compared to normal female in luteal phase of menstrual cycle p value is (<0.001). E.R. Bert one- Johnson et al (2014) CRP level in PMS affected female was p<0.05. Recent literature support strong relationship between levels of CRP and depressive disorder.

## References

1. Aara S, Gupta M, Rafiq N, Syed SI, Ahmed R, Resident S. Evaluation of Haematological Factors in Various Phases of

2. Andualem F, Melkam M, Takelle GM, Nakie G, Tinsae T, Fentahun S, et al. Prevalence of premenstrual syndrome and its associated factors in Africa: A systematic review and meta-analysis. *Front Psychiatry.* 2024;15(Jan):1–11.
3. Xing J, Wu H, Wang X, Yi S, Wei Y, Zhao Y, et al. Psychological, physiological, and biochemical correlations after negative emotional videos in college students with and without premenstrual syndrome. *Front Psychiatry.* 2023;14(Aug):1–11.
4. Rabindran P, Bharadwaj B. Short Report. 2019;17–19.
5. Saeedian Kia A, Amani R, Cheraghian B. The Association between the Risk of Premenstrual Syndrome and Vitamin D, Calcium, and Magnesium Status among University Students: A Case Control Study. *Heal Promot Perspect [Internet].* 2015;5(3):225–30. Available from: <http://dx.doi.org/10.15171/hpp.2015.027>
6. Yadav TS, Pandey G, Kumar G. Comparison of Hematological Profile of Athletes in Various Phases of Menstrual Cycle. *Asian Pacific J Heal Sci.* 2022;9(3):218–222.
7. Pak J, Havva Yesildere Saglam et al. 2019;35(2):515–20. Available from: [www.pjms.org.pk](http://www.pjms.org.pk)516
8. Vanteemar S, Sreeraj S, Uvais2 NA, Mohanty3 S, Kumar3 S, Department. Indian nursing students' attitudes toward mental illness and persons with mental illness. *Ind Psychiatry J.* 2019;195–201.
9. RB Kamal K, Mishra A, Chawla K. Anemia in Menstruating Women: Variation in Hematological Parameters in Different Phases of Menstrual Cycle. *Int J Clin Exp Physiol.* 2019;6(2):42–44.
10. Hashemi S, Tehrani FR, Mohammadi N, Dovom MR, Torkestani F, Simbar M, et al. Comparison of metabolic and hormonal profiles of women with and without premenstrual syndrome: A community based cross-sectional study. *Int J Endocrinol Metab.* 2016;14(2).
11. Bertone-Johnson ER, Houghton SC, Whitcomb BW, Sievert LL, Zagarins SE, Ronnenberg AG. Association of Premenstrual Syndrome with Blood Pressure in Young Adult Women. *J Women's Heal.* 2016;25(11):1122–8.
12. Samadi Z, Taghian F, Valiani M. Effects of pilates and aerobic exercise on symptoms of premenstrual syndrome in non-athlete girls. *J Isfahan Med Sch.* 2013;30(213):1880–1891.
13. Hanchinal VB, Sambrani A, Baljoshi V. A study on influence of different phases of menstrual cycle on hematological parameters. *J Exp Clin Med.* 2021;38(3):308–311.
14. Gursoy AY, Caglar GS, Kiseli M, Pabuccu E, Candar T, Demirtas S. CRP at early follicular phase of menstrual cycle can cause misinterpretation for cardiovascular risk assessment. *Interv Med Appl Sci.* 2015;7(4):143–146.
15. Fukushima K, Fukushima N, Sato H, Yokota J, Uchida K. Association between nutritional level, menstrual-related symptoms, and mental health in female medical students. *PLoS One [Internet].* 2020;15(7 Jul):1–11. Available from: <http://dx.doi.org/10.1371/journal.pone.0235909>