

## RESEARCH ARTICLE

### Effect of moderate aerobic exercise on perceived stress during luteal phase of menstrual cycle in students pursuing professional course

Anuradha Rajiv Joshi, Tanvi Nitin Pendse, Savita M Vaidya

Department of Physiology, Bharati Vidyapeeth (Deemed-to-be-University) Medical College, Pune, Maharashtra, India

Correspondence to: Anuradha Rajiv Joshi, E-mail: anuradhajoshi30@gmail.com

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#### ABSTRACT

**Background:** Students pursuing professional course are always under stress and do not exercise due to time constraint. Regular menstrual periods indicate good reproductive health of female students. Various problems during menstrual period are more common during the age group of 20–24 years. These problems can affect the physical and psychological well-being of female students. Well planned aerobic exercise improves reproductive system functioning in terms of regular menstrual cycle and reduces different symptoms. **Aims and Objectives:** The study was planned to evaluate the effect of aerobic exercise on perceived stress and on various symptoms during the luteal phase of menstrual cycle. **Materials and Methods:** This was an observational cross-sectional study. After ethical committee approval, 60 volunteers were divided into study group ( $n = 30$ , doing aerobic exercise) and control group ( $n = 30$ , non-exercising). They were asked to complete a validated questionnaire about the menstrual cycle. Basal body temperature was recorded to determine the luteal phase. Bleeding patterns were assessed by using questionnaires and pictograms. Cohen's perceived stress scale (PSS) was used to assess PSS score. Results were analyzed by Paired  $t$ -test. **Results:** PSS score showed the statistically significant difference in control and study group subjects. Intermenstrual bleeding was significantly reduced, and incidence of pain and absenteeism was also decreased during the menstrual period in exercising students. **Conclusion:** The study showed that aerobic exercise reduced stress levels in young female students during the luteal phase and a positive effect on premenstrual symptoms was observed.

**KEY WORDS:** Premenstrual Symptoms; Perceived Stress Scale; Absenteeism; Intermenstrual Bleeding

#### INTRODUCTION

Students pursuing professional course are under stress. Due to the vast syllabus and being busy in studies they do not have time to do exercise. Along with normal day-to-day stressors of life, they have to cope up with specific patient-related

workload, interpersonal relations, family matters, and cutthroat competition with colleagues.

Stress and physical inactivity can lead to hormonal imbalance and can affect the menstrual pattern and cause symptoms during the luteal phase. It has been observed that during luteal phase there is evidence of increased physiologic response to stress as measured by increased heart rate, blood pressure, and adrenocortical activity.<sup>[1]</sup>

Menstruation is a normal phenomenon which is an important indicator of women's health. The average menstrual cycle ranges between 21 and 35 days. It is broadly divided into follicular phase (menstrual and proliferative phase), and luteal phase in terms of the ovarian cycle. Follicular phase starts at

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the 1<sup>st</sup> day of menstruation and ends at ovulation while luteal phase begins at ovulation and ends at menstruation.<sup>[2]</sup>

Emotional, physical and behavioral symptoms that occur cyclically during the luteal phase and resolve within few days of the onset of the follicular phase are referred as premenstrual syndrome (PMS). Studies have proved that approximately 40 million women in the world suffer from symptoms of PMS and around 5 million take treatment for the same.<sup>[3]</sup>

During stress, levels of cortisol increase. Luteinizing hormone (LH) is responsible for ovulation and development of the follicle into the corpus luteum. Cortisol interferes with the surge of LH. Hence, ovulation is affected.<sup>[4,5]</sup>

The adrenal glands cannot make cortisol without progesterone often referred to as the “progesterone steal.” Inadequate levels of progesterone lead to symptoms such as hot flashes, night sweats, irritability, and depression.<sup>[6]</sup> Various studies have proved that increased physical activity has a beneficial effect in reducing stress and common symptoms occurring during the luteal phase of menstrual cycle.<sup>[7,8]</sup>

Studies have observed one or more premenstrual symptoms in college students. They were having menstrual problems such as dysmenorrhea or menorrhagia abdominal pain, breast tenderness, increased irritability, and depression. Many studies have been carried out among professional college students either on stress or on premenstrual symptoms, but very few studies have studied the effect of aerobic exercise on stress in the luteal phase of menstrual cycle.

Since students take medications to relieve symptoms the study aimed to find whether doing moderate exercise can reduce the symptoms and stress in these students. Thus, the study was planned to analyze whether moderate aerobic exercise has a potential benefit on the pattern of the menstrual cycle and Perceived Stress during the luteal phase in students pursuing a professional course in the age group of 18–25 years.

## MATERIALS AND METHODS

The present study was a cross-sectional observational study and was conducted from August 2016 to December 2016. After ethical committee approval, it was conducted in female student volunteers studying professional course in the city. The experimental protocol was explained to all volunteers, and written consent was taken from them. They were evaluated as per standard pro forma which included a questionnaire regarding aerobic exercise. Detailed history of menstrual cycle pattern was collected from study group and control group.

The study included 60 volunteers aged between 18 and 25 years. The volunteers were divided into two groups, namely, the study group (30 females doing exercise) and control group (30 females not doing exercise).

Volunteers having BMI 18.5–23.99 kg/m<sup>2</sup> and doing aerobic exercise for 30 min/day, 5 days a week for at least 6 months were included in the study group. They had self-reported cycle length between 21 and 35 days for each menstrual cycle in the past 6 months.

Subjects suffering from any acute or chronic gynecological illness, having diseases such as cardiovascular diseases, renal diseases, endocrine disorders, neurological disorders, with history of asthma or those taking steroid treatment, and taking any kind of medication such as androgens or oral contraceptives or suffering from any psychiatric disorders, anxiety, depression, or chronic illness like tuberculosis were excluded from the study. Control group consisted of age-matched non-exercising females, not suffering from any illness and without any physical deformity.

Assessment of menstrual pattern was done using questionnaires and pictograms. The diagnosis of menorrhagia was done by the history of prolonged duration more than 7 days/cycle or excessive bleeding by noting number of sanitary napkins used per day and passage of clots during the menstrual cycle.

Basal body temperature (BBT) recording was done to detect ovulation. The period after ovulation is considered as a luteal period. Volunteers in both the groups were asked to record body temperature with a digital thermometer on the body temperature chart. They recorded body temperature daily before starting any physical activity for previous 2 menstrual cycles to determine the luteal phase. Before ovulation, a woman's BBT is usually about 97.0–97.5° Fahrenheit. During ovulation, the body releases the hormone progesterone, which results in a slightly raised temperature on the day of ovulation. There is a rise of 0.5°.<sup>[9]</sup>

The perceived stress scale (PSS) was developed to measure the degree to which situations in one's life are appraised as stressful. The PSS predicts both objective biological markers of stress and increased risk for disease among persons with higher perceived stress levels. PSS questioner has 10 questions (six negatively stated and four positively stated items). The response set ranges from 0 (never) to 4 (very often), and positively stated items are reverse coded before items are summed with higher scores indicating more perceived stress. Scores for 10-item range from 0 to 40, it is considered that higher the score more is the stress (Score 0–13 is normal, 13–26 is stressful, and >27 highly stressful condition). All of the above parameters were measured in the study group (exercising females) and control group (non-exercising females) under the same conditions.<sup>[10]</sup>

## Statistical analysis

The data were represented as mean ± standard deviation. PSS score was analyzed using paired *t*-test and percentage

analysis of various symptoms during the menstrual period was done.

**RESULTS**

The age of the volunteers was  $17 \pm 3.4$  years and height was  $158 \pm 6.2$  cm. As shown in Table 1, the statistically significant difference was not observed in menstrual pattern and blood flow while comparison of PSS score was statically significant in control and study group volunteers [Table 2].

Symptoms such as pain and intermenstrual bleeding were significantly reduced in exercising group than in non-exercising group [Table 3].

**DISCUSSION**

The study showed that there was no statistically significant difference in age of menarche, cycle length, duration of blood flow and blood flow per day in control and study group subjects [Table 1]. In the present study, incidence of pain, intermenstrual bleeding, and frequency of absenteeism was more in control group than in study group [Table 3]. The study also showed the positive impact of regular aerobic exercise on decreasing perceived stress in the luteal phase of menstrual cycle. It was found that study group (exercising) students showed a statistically significant decrease in PSS score than the control group (non-exercising) female students.

The present study has demonstrated a strong association of stress with symptoms in the luteal phase. Various studies correlating stress with menstrual abnormalities showed conflicting results. Clarvit and Sood *et al.* did not found any association of stress with a menstrual function,<sup>[11,12]</sup> while Sharma *et al.* noticed increased incidence of PMS and dysmenorrhea.<sup>[13]</sup>

Subjects suffering from a symptom of abdominal pain during luteal phase were more in control group (65%) as compared to study group (43.3%). In a study done by Singh *et al.*,<sup>[14]</sup> it has been reported that 50% of the students had irritability and incidence of pain was more as compared to the present study. It has been observed that 44% of the students had painful periods and 60% were taking medications for the same.

Regular menstrual cycles predict the good reproductive health of female students. Studies have proved that beta-endorphin levels are reduced in late luteal phase due to changes in the levels of sex hormones. Aerobic activity causes  $\beta$ -endorphin surge which results in mood elevation and gives analgesic relief from pain.<sup>[15]</sup> It has been documented that exercise eliminates negative thoughts and facilitates positive thoughts which also helps in coping up with stress. Exercise reduces adrenal cortisol level and decreases stress.

Exercise may also increase body temperature, blood circulation in the brain and impact on hypothalamic-pituitary-adrenal axis, and physiological reactivity to stress. The possible psychological mechanisms include improvement of self-efficacy, distraction, and cognitive dissonance.<sup>[8]</sup>

**Table 1: Menstrual pattern in control and study group volunteers**

Criteria	(mean±SD)		P
	Controlgroup (non-exercising)	Studygroup (exercising)	
Age of menarche (years)	12.88±0.86	12.96±0.72	>0.05
Cycle length (days)	29.23±3.06	28.5±3.19	>0.05
Duration of blood flow (days)	4.80±0.56	4.72±0.64	>0.05
Blood flow/day (ml)	25.27±10.64	22.15±6.84	>0.05

P>0.05 statistically not significant. SD: Standard deviation

**Table 2: Comparison of PSS score in control and study group volunteers**

Criteria	(mean±SD)		P
	Control group subjects (non-exercising)	Study group subjects (exercising)	
PSS score	19.94±4.63	17.12±4.91	<0.05*

P<0.05\* statistically significant. SD: Standard deviation, PSS: Perceived stress scale

**Table 3: Effect of moderate exercise on symptoms in control and study group volunteers**

Symptoms	Control group subjects n=30 number of students (%)	Study group subjects n=30 number of students (%)	P
Pain	20 (65)	13 (43.3)	<0.05*
Intermenstrual bleeding	25 (83.3)	3 (10)	<0.05*
Absenteeism	20 (66.66)	3 (10)	<0.05*

P<0.05\* statistically significant

The feelings such as depression, anxiety, and mood swings can be linked to low serotonin levels during the premenstrual period. Serotonin also known as the “happy hormone” shows a decline before the commencement of menstruation and thus produces symptoms of irritability and mood disorders.<sup>[16]</sup>

The monoamine hypothesis says that exercise increases the availability of monoamines such as serotonin, epinephrine, and dopamine.<sup>[17]</sup> Exercise thus results in overall good health and psychological well-being.

Moreover,  $\beta$ -endorphin secreted by exercise may also influence the release of dopamine and therefore activate pleasure and satisfaction areas in the brain reducing pain sensation.<sup>[18]</sup>

The pain was related to increased incidence of absenteeism, and it was found that 66% belonged to the non-exercising group and 10% from the exercising group remained absent for regular classes. Intermenstrual bleeding was found to be less in exercising group than in the non-exercising group. This reflects the positive impact of exercise on the menstrual cycle.

Leptin, a proinflammatory hormone has its receptors in hypothalamus, ovaries as well as the uterus. Increased levels of plasma leptin during late follicular and luteal phases could be due to increased production of leptin from adipocytes and from mature ovarian follicles.

Studies have reported that increased levels of leptin might lead to psychological symptoms through its receptors in the hypothalamus. It has also been observed that reduced serotonin activity in late luteal phase might be responsible for the depressive mood and serotonin levels are reduced due to increased brain serotonin metabolism through the L-arginine-nitric oxide pathway which is induced by leptin. It has been observed that exercise reduces the amount of leptin in blood, thus reducing psychological symptoms.<sup>[19]</sup>

The study showed the positive impact of moderate exercise on menstrual problems in the luteal phase. This study was based on a self-administered questionnaire, and hormone assessment was not done. Longitudinal study will be useful to determine the relationship between stress and different symptoms.

## CONCLUSION

The results of the present study suggested that performing moderate aerobic exercise reduced PSS and symptoms such as pain and intermenstrual bleeding and thus causing a decrease in the incidence of absenteeism.

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