

# Sports Participation to Combat Premenstrual Syndrome and Night Eating Syndrome and Its Correlations among Undergraduate Female Varsity Students

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## ABSTRACT

**Aim of the Study:** The study investigated the impact of sports participation on PMS and NES and the relationship between these two variables in female varsity students.

**Methodology:** Using a sample of 400 female university students, 200 were female athletes (age Mean=21.49, SD=1.84) and 200 were female non-athletes (age Mean=20.96, SD=1.81). Data was collected using the cross-sectional research design from four universities. PSST was used to measure PMS, and NEQ was used to measure NES.

**Findings:** According to the independent sample t-test, female non-athletes showed noticeably greater levels of PMS and NES as compared to their female counterparts. In addition, Pearson correlation analysis found that NES was more common among female athletes and non-athletes who had higher levels of PMS symptoms.

**Conclusion:** These findings demonstrated the value of encouraging sports participation as a therapeutic and preventative strategy for treating eating disorders and PMS among early adult female university students.

**Keywords:** Night Eating Syndrome, Premenstrual Syndrome, Sports Participation, Female Students, Athlete, Non-athlete.

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## 1. INTRODUCTION

In the recent era, PMS and NES have emerged as the most common health related disorders among early adult female students studying in the universities (Deo et al., 2024). PMS is characterized by changes in appetite, depression, anxiety, sleep problems, emotional sensitivity, mood changes and gastrointestinal issues that appeared during the last stage of the menstrual cycle and reduce with the start of menstruation (Kumari & Sharma, 2024). Some researchers found that up to 70% of female students experience PMS

symptoms in their lives at some time (Ayyub et al., 2025; Ahmad et al., 2024). Lifestyle and behavioral factors including nutritional habits, lack of exercise, and chronic stress can be considered significant contributors to its manifestations (Singh et al., 2025).

On the other hand, NES is characterized by a delayed daily plan of food intake, at a minimum 25% of daily energy eat at night or at least two times of late-night eating per week after sleep onset (Tzischinsky & Latzer, 2025). To identify an individual with NES under this description, a minimum of three out of the following five criteria must be met: (a) ignoring breakfast four or longer times in a week; (b) having cravings to eat between evening and time before bed; (c) troubling with sleep; (d) thinking that you need to eat to sleep, and (e) bad feeling in the evening (Lavery & Frum-Vassallo, 2022).

Research has found significant level of prevalence of these two health conditions. For example, studies found that PMS prevalence varied between 32.6% to 69.9% among young adults female university students (Direkvand-Moghadam et al., 2014). Studies found the prevalence of PMS 52.2% in Turkey (Erbil & Yücesoy, 2023), 70.8% in Iran (Ranjbaran et al., 2017), 53% in Ethiopia (Geta et al., 2020) and 43% in Indian female university students, respectively (Dutta & Sharma, 2021). In contrast, prevalence of NES was 6.8%, (Öztürk, 2025), 21.6% (Sayed Ahmed et al., 2024) and 1.6% among young females (Striegel-Moore et al., 2005).

Participation in varsity sport appeared to be related with wide range of health related and behavioral related outcomes. Sports participation can raise mood, lessen stress, improved lifestyle, healthy eating habits and keep hormonal stability by managing the release of neurotransmitters, like serotonin and endorphins (Cabral, 2025; Durani et al., 2024; Perveen et al., 2023). It enhanced fitness levels, body composition, and general health of female students whilst reducing the risks of obesity and metabolic syndrome (Aljehani et al., 2022). Female students who engaged in regular sports reported less stress and depression, greater self-esteem, and greater emotional balance than their inactive counterparts (Song et al., 2025). Keeping in view all these physiological and psychological benefits of sports participation, there's possibility that sports engagement may impact on PMS and NES.

Due to the high prevalence of PMS among female university students, it has become a crucial public health issue that needs significant investigations. PMS not only impact females physical and emotional health but also hinder their academic performance, focus, and social connections (Abu Alwafa et al., 2021). Its management through awareness, knowledge, and healthy lifestyle interventions has become crucial to help the psychological and physical well-being of female students.

Among female students, both syndromes share familiar psychological and physiological factors like hormonal imbalances, depression, emotional imbalances, and irregular sleep patterns (Miraj et al., 2022). During the premenstrual stage, female often experience interchanges in appetite and hunger, which may lead to raise night eating or uneven eating behaviors (Shiota et al., 2021; Bibi et al., 2023). Late-night eating and insomnia have been linked with mental disturbances and bad emotional regulation, which can heighten menstrual health issues (Celik et al., 2019). Consequently, understanding NES as a potential correlate of PMS is crucial for planning integrated interventions that focus both eating habits and psychological health among female university students. NES may be a factor that can impact PMS.

### ***1.1 Problem Statement***

Unnatural eating habits can have notable negative consequences on menstrual health among female university students. Uneven eating patterns, extreme intake of manufactured foods, coffee, and sweets, along with low use of fruits, vegetables, and key micronutrients, can reduce hormonal stability and heighten premenstrual and menstrual signs (Barati et al., 2021). Bad dietary behaviors lead to deficit in iron, magnesium, and vitamin B6, which are important for managing the menstrual cycle and decrease signs like fatigue, anger, and abdominal cramps (Raval et al., 2022).

## ***1.2 Significance of the Study***

Furthermore, anxiety related eating that can irritate hormonal imbalances and lead to uneven menstrual cycles among young females (Karout et al., 2021). Therefore, keeping balanced dietary habits rich in whole grains, lean proteins, and micronutrients is important for aiding physiological and psychological health in young females.

## ***1.3 Research Objectives***

The primary goal of this research was to investigate the impact of sports participation to combat PMS and NES. Another aim was to investigate the relationship between PMS and NES among female varsity athletes and non-athletes.

## ***1.4 Research Hypotheses***

It was expected that sports participation may have some impact on PMS and NES. It was also assumed that there may be some connection between premenstrual syndrome and night eating syndrome.

## **2. LITERATURE REVIEW**

NES is a well-defined type of eating disorder pronounced by uncontrolled utilizing of food in the evening or late-night, led by sleep problems and anorexia in the morning (Allison et al., 2008). Previous studies indicated that NES is consistently linked with psychological suffering, stress, and mood changes (Colles et al., 2007).

PMS is a cyclical state distinguished by emotional, behavioral, and physical symptoms that exhibit during the luteal phase of the menstrual cycle and lessened after the beginning of menstruation (Steiner et al., 2003). Changes in the levels of hormones like estrogen and progesterone, together with variations in serotonin, are accepted to impact emotional and appetite management. These physiological variations are thought to increase emotional eating and cravings during the premenstrual phase, potentially linking PMS with NES behaviors (Yoshinari et al., 2024).

(Finch et al., 2023) indicated that females reported higher eating behaviors, like binge eating or emotional eating, also undergo more severe PMS symptoms. Similarly, Burnatowska et al. (2023) found that females with higher scores in emotional eating reported more marked premenstrual cravings and mood changes.

Female athletes consistently endure higher physical and psychological stress resulting from hard training regimens, energy deficiencies, and performance pressures, which can disturb menstrual cycles and eating behaviors (Bratland-Sanda & Sundgot-Borgen, 2013). Gimunova et al. (2022) suggested that PMS and amenorrhea were normal to find among female athletes compared to non-athletes, particularly in endurance and sports. Although, some previous researches also indicating that regular sports participation and organized timetables may shield emotional imbalances and decreases PMS severity (Brown et al., 2024).

## **3. RESEARCH METHODOLOGY**

### ***3.1 Research Design***

This research used a cross-sectional design to investigate the impact of sports participation on PMS and NES and its link among female varsity student's athletes and non-athletes.

### ***3.2. Participants***

Data was gathered from four universities. The sample consisted of female university students. The age of participants was between 18 to 25 years, all of them were doing their Bachelor's degrees from various institutions.

### 3.3 Sample

A sample of 400 female university students was chosen, comprising 200 female athletes (M=21.49, SD=1.840) and 200 female non-athletes (M=20.96, SD=1.811). Only female athletes competed at national and the international were chosen. Female who was not between the ages of 18 and 25 were not included. Athletes who played at the national and international levels were chosen. In contrast, females who don't play sports and have never been part of a sports team or competed were hired.

### 3.4 Data Collection

The following questionnaires were employed to gather data from the selected population from four distinct universities.

The Night Eating Questionnaire (Allison et al., 2008) was used to measure night eating disorders. This tool assessed the intensity of night eating habits. 14-item NEQ evaluates a person's attitude and cognitive expressions. The NEQ is a reliable instrument that was intensively used in the past research to diagnose night eating disorder.

Permission was obtained from McMaster University before utilizing this tool. (Steiner et al., 2003) came up with the Premenstrual Symptoms Assessment Tool. PSSST is a reliable instrument utilized globally to assess premenstrual symptoms.

After this, the completed survey was given to the chosen sample by going to the specified universities. Before filling out the questionnaire, participants were told what the study's goals and methods were, and they gave their permission.

### 3.5 Data Analysis

Descriptive statistics and Pearson correlation analysis were conducted.

The study only allowed females to participate if they want to, and they can leave at any moment. Each female student had 15 to 20 minutes to finish each part of the questionnaire. The researcher employed a direct contact strategy for data collecting.

SPSS 2022 (IBM Corp, 2017) was used to analyze the data. Saving the privacy of participants is important, as it guarantee ethical and clear data collecting.

## 4. RESULTS

Table 1: *Demographic characteristics of Female athletes and non-athletes*

Variables	Female Athlete		Female non-athlete	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
University				
1	52	26	74	37
2	54	27	53	26.5
3	39	19.5	6	3
4	55	27.5	67	33.5
Playing level				
National	182	91	N/A	N/A
International	18	9	N/A	N/A
Playing Experience	M= 6.60	SD= 2.433	N/A	N/A
Age	M= 21.49	SD= 1.840	M= 20.96	SD= 1.811

Note: M= Mean, SD= Standard Deviation, N/A= No participation

Table 1 showed the demographic data for both female athletes and female non-athletes. 26% of the female athletes were in 1<sup>st</sup> year, 27% were in 2<sup>nd</sup> year, 19.5% were in 3<sup>rd</sup> year, and 27.5% were in 4<sup>th</sup> year. For female non-athletes, on the other hand, 37% were in 1<sup>st</sup> year, 26.5% were in 2<sup>nd</sup> year, 3% were in 3<sup>rd</sup> year,

and 33.5% were in 4<sup>th</sup> year. The average age of female athletes was  $M = 21.49$  ( $SD = 1.84$ ), and the average age of female non-athletes was  $M = 20.96$  ( $SD = 1.81$ ). As for the level of competition, 91% of female athletes played at the national level, and 9% competed at the international level. The mean playing experience for female players was  $M = 6.60$  years ( $SD = 2.43$ ).

Table 2: Mean comparison between female athletes and non-athletes

Variables	Athlete	Non-Athlete	t	p	Cohen's d
	M (SD)	M (SD)			
Total PMS	29.29 (10.569)	33.12 (10.110)	3.703	.001	10.342
Total NES	22.50 (4.925)	23.81 (6.079)	2.368	.018	5.532

Note: PMS: Premenstrual syndrome, NES: Night eating syndrome

An independent samples t-test was utilized to compare the total PMS and NES scores of athletes and non-athletes. The findings indicated a notable disparity in total PMS results between athletes ( $M = 29.29$ ,  $SD = 10.57$ ) and non-athletes ( $M = 33.12$ ,  $SD = 10.11$ );  $t = 3.70$ ,  $p = .001$ , Cohen's  $d = 10.34$ . This signified that female non-athletes exhibited elevated premenstrual syndrome scores in comparison to female athletes. There was also a big difference in total night eating syndrome scores between athletes ( $M = 22.50$ ,  $SD = 4.93$ ) and non-athletes ( $M = 23.81$ ,  $SD = 6.08$ );  $t = 2.37$ ,  $p = .018$ , Cohen's  $d = 5.53$ . Female non-athletes exhibited elevated night eating syndrome scores compared to their female athlete counterparts.

Table 3: Prevalence of Premenstrual syndrome among female athletes and non-athletes

PMS	Female Athletes (N=200)		Female non-athletes (N=200)	
	F	%	f	%
Mild	42	21.0	18	9.0
Moderate	119	59.5	118	59.0
High	39	19.5	64	32.0

Note: PS= Premenstrual Syndrome, N= number of participants, f= frequency, %= percentage

Table 3 showed how common premenstrual syndrome (PMS) was among female athletes and women who didn't play sports. Out of 200 female athletes, 21.0% said they had mild PMS, 59.5% said they had moderate PMS, and 19.5% said they had extreme PMS. Conversely, among female non-athletes ( $N = 200$ ), 9.0% expressed mild PMS, 59.0% suffered from moderate PMS, and 32.0% reported severe PMS. The results showed that both groups had the most moderate PMS symptoms overall. However, non-athletes (32.0%) were far more likely to have severe PMS symptoms than athletes (19.5%). On the other hand, athletes (21.0%) were more likely to have mild PMS symptoms than non-athletes (9.0%).

Table 4: Prevalence of Night Eating Syndrome among female athletes and non-athletes

NES	Female Athletes (N=200)		Female non-athletes (N=200)	
	F	%	f	%
Mild	29	14.5	27	13.5
Moderate	169	84.5	161	80.5
High	2	1.0	12	6.0

Note: NES= Night Eating Syndrome, N= number of participants, f= frequency, %= percentage

Table 4 showed the prevalence of NES is among female athletes and non-athletes. Of the 200 female athletes, 14.5% reported that they had mild NES symptoms, 84.5% reported that they had moderate NES, and just 1.0% said they had high levels of NES. Conversely, among female non-athletes ( $N = 200$ ), 13.5% reported mild NES, 80.5% had moderate NES, and 6.0% reported high NES symptoms. In general, the

results showed that both groups had the most modest levels of Night Eating Syndrome. Non-athletes (6.0%) were more likely than athletes (1.0%) to have significant NES symptoms.

Table 5: *Pearson Correlation Analysis on university female student athletes*

<b>Variables</b>	<b>Total PMS</b>	<b>Total NES</b>
Total PMS	1	.354**
Total NES	.354**	1

Note:  $p < .001$  (\*\*)

The Pearson correlation study showed a strong positive relationship between PMS and NES among female student athletes at universities ( $r = .354$ ,  $p < .01$ ). This indicated that athletes with higher symptoms of PMS are more prone to engage in night eating behavior.

Table 6: *Pearson Correlation Analysis on university female student non-athletes*

<b>Variables</b>	<b>Total PMS</b>	<b>Total NES</b>
Total PMS	1	.509**
Total NES	.509**	1

Note:  $p < .001$  (\*\*)

The Pearson correlation analysis demonstrated a strong positive link between PMS and NES among female university non-athletes ( $r = .509$ ,  $p < .01$ ). This indicated that female non-athletes who show more PMS signs are more prone to involve in NES.

## 5. DISCUSSION AND FINDINGS

The objectives of this research were to investigate the impact of sports participation to combat PMS and NES, and to investigate the relationship between PMS and NES among female varsity students.

The finding of this research revealed that among female varsity students, participation in sports substantially decreases both PMS and NES. According to independent sample t-test, female non-athletes had higher PMS and NES signs than female athletes.

Another finding revealed that there was a positive link found between PMS and NES among female athletes, indicating that females who exhibited extreme PMS signs were more prone to involve in night eating habits. The link between PMS and NES was stronger among female non-athletes, indicating that females with more PMS signs were more prone to involve in night eating behaviors.

According to the research, female athletes revealed considerably decreased NES and PMS than non-athletes. This finding supported with studies by Ayyub et al. (2025), which revealed that exercise substantially lessened PMS signs like exhaustion, impatience, and pain during enhancing emotional balance. Another study by Yang et al. (2024) investigated connection between enhanced physical activity and lowered PMS. This demonstrated how structured exercise is solving hormone imbalances and emotional issue. Regular exercise has been linked with more extent of endorphins and serotonin, which lessened PMS (Ayyub et al., 2025).

According to Khan et al. (2024), female non-athletes had more characteristics of having NES, generally as outcome of their helplessness to eat or sleep constantly. In contrast, exercise aids in controlling starvation, which decrease the possibility of NES. Ekici et al. (2025) also found that NES is related with cognitive health issues, which indicated that regulating athletic based anxiety may be a shielding act.

However, there are contradictory findings as well. According to a study by Bodur et al. (2025), mild physical activity did not considerably impact PMS, which indicated that benefits of exercise may vary on its volume. According to Mighani et al. (2025), despite the fact that exercise improved the overall well-being, dietary order and emotional pressure had higher impact on the severity of PMS than sports.

According to Ayyub et al. (2025), physical activity has been exhibited to better feeling and lowers worry related eating disorders. This indicated that despite the fact that there is a link, it may not be as extreme for females who encourages stabilize training intensity. This indicated that female athletes who engaged in regular physical exercise may be unlikely to eat more than those who are exhausted or encounter energy distress.

The crucial finding of this research was that among female non-athletes, there was a substantial link found between NES and PMS. This demonstrated that when females don't do any physical exercise regularly, they are more inclined to NES due to more PMS signs. According to Mighani et al. (2025), NES was demanding for female with severe PMS, particularly when they hadn't been doing any physical activity. According to Bargagna and Casu (2024), NES is increased in female non-athletes and is due to a mixture of hormonal imbalances, psychological pain, and inadequate circadian management.

Bodur et al. (2025) revealed that PMS was linked with ketogenic diet and more starvation for sugary items, especially in females who are not engaged in any physical activity. Not exercising may make it harder to keep your metabolism stable and control your emotions, which could lead to eating at night as a way to make up for it. Khan et al. (2024) found that university non-athletes who didn't sleep well and ate at odd times were more likely to have NES.

However, there are contradictory results. Riccobono et al. (2025) proposed that symptoms of sadness and evening chronotype partially moderate the relationship between PMS and NES, indicating that psychological variables, rather than physical inactivity, may enhance the correlation. Similarly, Ekici et al. (2025) discovered that mental health and perceptions of stress were more significant predictors of night eating than menstruation symptoms alone. Thus, whereas non-athletic status exacerbates the PMS–NES link, mood and sleep disruptions are likely to function as fundamental mediators.

## **6. CONCLUSION**

In general, the results showed that sports participation makes PMS and NES less severe and makes the link between them less. Sports participation helps female athletes regulate their bodies and minds, while non-athletes are more likely to develop both syndromes. The enduring link between PMS and NES, especially in athletes, indicated a same hormonal and mental foundation.

### **6.1 Recommendations**

According to the study's findings, universities needed to encourage female students to do sports frequently in order to reduce their likelihood of having NES and PMS. Awareness campaigns should educate female students on the benefits of exercise for their health as well as appropriate coping mechanisms for eating disorders and PMS. Regular testing, counseling, and dietary advice should be provided by health centers, particularly for those who do not participate in sports but have symptoms of NES and PMS.

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## Conflict of Interest

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