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ORIGINAL RESEARCH

Correlation of habitual physical activity and body mass index on premenstrual syndrome among medical students

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ABSTRACT

Background and objectives: Premenstrual syndrome (PMS) symptoms encompass a range of physical, emotional and behavioural symptoms that can significantly impact daily functioning and quality of life in women. Studies have shown variable findings between association of physical activity and Body mass index (BMI) on PMS, although the evidence remains inconclusive. This study aims to assess the correlation between habitual physical activity and Body mass index (BMI) on PMS among medical students. **Material and methods**- A cross-sectional study was conducted including 83 female medical students in the age group of 18- 25yrs. BMI was calculated based on standard anthropometric measurements, PMS severity was assessed using Premenstrual syndrome scale (PMSS) and Habitual Physical Activity by International physical activity questionnaire (IPAQ)short form. Scoring of PMS and IPAQ was done and results were analysed using SPSS 26, Pearsons's correlation coefficient was used to examine the association. **Results-**.The analysis revealed a statistically significant negative correlation between habitual physical activity and PMS (p=0.03) and no significant negative correlation between BMI and PMS (p=0.28)**Conclusion**- PMS symptoms is less in subjects with higher habitual physical activity.

Key points-Premenstrual Syndrome, Habitual Physical Activity, Body mass index, International Physical Activity Questionnaire

INTRODUCTION

Most well-adjusted women experience minor psychological and somatic changes for a few days preceding menstruation. These symptoms usually subside once menstruation is established. In some women these manifestations become exaggerated to constitute a Premenstrual syndrome (PMS). This is common at all ages especially in women aged 30 – 45 yrs. [(1)] The global prevalenceis 47.8% in worldwide [(2)] and in India it ranges from 14.3% - 74.4%.[(3)]

There are many factors implicated in the aetiology of PMS. Body's abnormal responses to normal fluctuations in estrogen and progesterone during the menstrual cycle particularly in luteal phase. Neurotransmitter imbalances is also implicated in PMS. The luteal phase levels of beta endorphins and serotonin have been found to be lower in women with PMS and can lead to anxiety, food craving and physical discomfort.[(1)] Genetic factors also contribute to PMS susceptibility. Variations in genes related to hormone receptors, such as estrogen receptor alpha have been associated with increased risk.[(4)] Psychosocial factors like stress, trauma are known to alter brain neurochemistry and hormonal activity influencing the severity of PMS.[(5)] Deficiencies in nutrients like calcium, magnesium, Vitamin B6 and vitamin D and lifestyle factors like poor sleep, caffeine, alcohol consumption and smoking have also been linked to PMS.[(6)]

Exercise is known to increase endorphin levels, to help regulate progesterone and estrogen synthesis and to encourage production of endogenous anti-inflammatory chemicals. [(7)]while some studies report a negative correlation between physical activity and PMS[(8,9)], others show no association [(10)].

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Studies also shown the association between higher body mass index (BMI) and severity of PMS. Obese women (BMI >=30) have nearly 3-fold increased risk for PMS than non-obese women. [11] There are also studies which shows no association between higher BMI and severity of PMS [12] and a study which showed PMS was more frequent in patients with normal BMI and less frequent in patients with higher fat mass. [13]

Though there are many studies examining the relationship between physical activityand BMIon premenstrual syndrome there are no consistent findings showing their association. As the aetiology of PMS still remains unclear, this study is aimed to study the association between habitual physical activity and BMI on PMS in medical students.

OBJECTIVES OF STUDY

1. To determine the correlation between habitual physical activity and premenstrual syndrome in medical students.
2. To determine the correlation between BMI andpremenstrual syndrome in medical students.

MATERIALS AND METHODS

Study design and participants

A cross-sectional study conducted using a convenience sampling method October 2024 to February 2025. Data was collected from 83 medical students at Akash Institute of Medical Sciences and Research centre.

Subjects were selected according to inclusion and exclusion criteria.

Inclusion criteria

- Female medical students aged between 18 to 25 yrs.
- Regular menstrual cycle of normal duration.
- Willingness to participate in the study.

Exclusion criteria

- History of ovarian cysts.
- Acute or chronic illness
- Endocrine disorder or psychiatric disorders.
- Acute academic or family stress.
- Chronic use of any medications including oral contraceptive pills (OCPs).
- Habitual alcohol consumption or smoking.
- Family history of severe PMS in mother or sisters.

METHODOLOGY

A cross-sectional study was conducted using convenient sampling method. Prior to data collection, ethical approval was obtained from the Institutional Ethics Committee. Eligible participants were informed about the study and written informed consent was obtained. Anthropometric measurements, including height, weight was recorded and BMI was calculated using the formula weight(kg) / Height (m^2).

Participants completed two questionnaires:

1. Premenstrual Syndrome Scale (PMSS):

The validated tool includes 40 items covering physiological, psychological and behavioral symptoms. Responses were scored using 5- point Likert scale ranging from 1 (“Never”) to 5 (“Always”). The total score was used to categorize PMS severity as follows:No symptoms – 1-40

Mild- 41-80

Moderate- 81-120

Severe – 121-160

Very severe-161-200.

Validity and reliability were established by Padmavathi et al[14].

2. International Physical Activity Questionnaire-short form (IPAQ-SF)[15]:

This tool evaluates physical activity over the last 7 days, categorizing activity as walking, moderate or vigorous. Physical activity was assessed both categorically (low, moderate, high) and continuously (in MET-mim/week). MET values assigned were:

Walking: 3.3 METs

Moderate activity: 4 METS

Vigorous activity: 8 METs

MET-min/week Calculation

MET-min/week = MET value × minutes/day × days/week

Total MET-min/week = (Walking + Moderate + Vigorous)

Physical Activity Level Classification

Level	Criteria
Low	Does not meet Moderate or High criteria
Moderate	Any of the following: • ≥ 3 days of vigorous activity for ≥ 20 min/day • ≥ 5 days of moderate/walking for ≥ 30 min/day • ≥ 600 MET-min/week from any combination
High	Any of the following: • Vigorous activity on ≥ 3 days accumulating ≥ 1500 MET-min/week • ≥ 7 days of any combination accumulating ≥ 3000 MET-min/week

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STATISTICAL ANALYSIS

The Collected data were entered into a Microsoft excel and analysed using SPSS version 26. Continuous variables were presented as mean ± standard deviations, while Categorical variables were presented as frequencies and percentages. An Independent t-test was used to find out the mean difference between the 2 groups. Pearson's Correlation coefficient was employed to assess the relationship between BMI and PMS scores. A p- value of <0.05 was considered as statistically significant.

RESULTS AND ANALYSIS

Table 1: Demographic and anthropometric parameters of subjects.

	mean	Standard deviation (SD)
Age in yrs	21	0.92
BMI -Kg/m^2	22	4.38
Age of menarche in yrs	13	1.17

Table 1 shows demographic and anthropometric parameters of the subjects.The subjects belonged to the age group of 21yrs ± 0.92, BMI of the subjects was22 ±4.38 and age of menarche was 13yrs ± 1.17.

Table 2: PMS distribution in the subjects.

PMS category	Count (n)	Percentage (%)
Mild (41- 80)	36	43.3
Moderate (81-120)	22	26.5
Severe (121- 160)	22	26.5
very severe (161-200)	3	3.6

Table 2 shows the severity of PMS symptoms in the subjects. As shown in the table and graph, 43% of the subjects had mild symptoms, 26.5% had moderate symptoms, 26.6% had severe symptoms and 3.6% had very severe symptoms of PMS.

Table 3: BMI distribution in the subjects.

BMI wt kg/Ht m^2.	Count (n)	Percentage (%)
Normal (18.5-22.9)	29	34.9
Obese(>=25)	23	27.7
Overweight (23-24.9)	16	19.2
Underweight (<18.5)	15	18

Table 3 shows BMI distribution in the subjects. As shown in the table and graph 34.9% had normal BMI, 27.7% were obese, 19.2% were overweight and 18% were underweight.

Table 4: Physical activity distribution in the subjects.

IPAQ score	Count (n)	Percentage (%)
High activity	3	3.6
Low activity	21	25.3
Moderate activity	59	71

Table 4 shows the physical activity distribution in the subjects. The habitual physical activity as measured by IPAQ score reported in category shows that 25% had low activity, 59% moderate activity and 3% had high activity.

Table 5: Correlation of Physical activity with PMS score.

	Pearson's correlation		p value
IPAQ vs PMS	-0.23		0.03*

*Statistically significant

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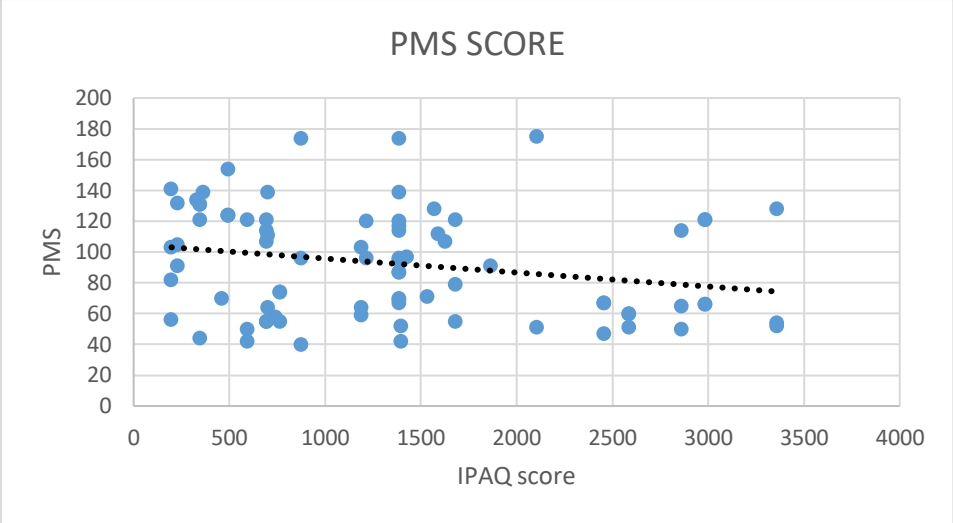

Graph 1: Correlation of physical activity with PMS score

Table 5 and Graph 1 shows the Pearson's correlation between physical activity and PMS score.

As shown in the table and graph the Pearson's correlation of IPAQ score and PMS, r value is-0.23 which indicates an inverse relationship between habitual physical activity and PMS and p value is 0.03 which is statistically significant.

Table 5: Correlation of BMI with Premenstrual Syndrome

	Pearson's correlation (r)	p value
BMI VS PMS	0.12	0.28

Table 5 shows the correlation of BMI with PMS. As shown in the table and graph,Pearson's correlation, r value is 0.12 which indicates a very weak positive correlation between BMI and PMS. P value is 0.28 which is not statistically significant.

DISCUSSION

A cross sectional study was done to see the correlation of habitual physical activity and BMI with premenstrual syndrome among medical students.In our study we have assessed the habitual physical activity using IPAQ which assess time spent being physically active as part of their everyday lives. The study showed a significant negative correlation between habitual physical activity and premenstrual syndrome. This is in correlation with studies done by Sabei Y et al and Haghighi ES et al who showed negative correlation between Physical activity and PMS syndrome.[9,10]

There are several mechanisms by which exercise can possibly reduce the symptoms of PMS. The luteal phase levels of beta endorphins and serotonin have shown to be below in women with PMS and can lead to anxiety, food craving and physical discomfort. [1] Exercise is known to increase endorphin levels which can improve the mood and less emotional symptoms of PMS. Exercise also helps to regulate progesterone and estrogen synthesis by acting on pituitary hypothalamic gonadal axis andincreases the production of endogenous anti-inflammatory chemicals there by reducing the PMS symptoms. [7]

The study did not show correlation between BMI and PMS. This was in accordance with cross sectional study done by Mahishe A et alwhich showed no significant correlation between PMS and BMI.[12] There are also studies which shows that increased BMI is associated with higher PMS symptoms.[11,16] Obesity is linked to lower levels of estradiol and progesterone during the menstrual cycle. These hormonal fluctuations can disrupt mood regulation and exacerbate PMS symptoms. There is also association between polycystic ovarian syndrome (PCOS) and obesity both of these conditions may affect hormonal regulation and increases PMS severity. [11] But in our study, we have excluded subjects with PCOS and irregular periods. This may be the reason for not finding association between increased BMI and PMS in our study.

CONCLUSION

This study highlights a statistically significant negative correlation between habitual physical activity and the severity of premenstrual syndrome (PMS) symptoms among medical students, suggesting that regular physical activity may serve as a protective factor in managing PMS. In contrast, no significant association was observed between body mass index (BMI) and PMS, indicating that BMI alone may not be a reliable predictor of PMS severity in this population. These findings underscore the potential of non – pharmacological interventions, such as lifestyle modifications, particularly consistent physical activity, in alleviating PMS symptoms among young women in academic settings.

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LIMITATIONS OF THE STUDY

Sample size of the study is relatively small and all drawn from a single academic setting, which may limit the generalizability of the findings to the broader population. Additionally, self-reported data on physical activity and PMS symptoms may be subject to recall bias or subjective interpretation. Future studies with larger, more diverse population and objective measurement tools are recommended to expand upon these findings.

CONFLICT OF INTEREST- None

ETHICAL CLEARANCE- Obtained from the Institutional Ethical Committee

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