RESEARCH PAPER

EXPLORING THE EFFECTS OF POLYCYSTIC OVARY SYNDROME ON SLEEP QUALITY USING THE PITTSBURGH SLEEP QUALITY INDEX AMONG YOUNG WOMEN ATTENDING A TERTIARY CARE CENTER IN SOUTH KERALA

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Abstract
Polycystic Ovary Syndrome (PCOS) is a mutual endocrine disorder between women of reproductive age and is frequently related with metabolic, reproductive, and psychological complications. Emerging evidence suggests that sleep instabilities are more predominant between women with PCOS and may adversely affect their general health and life quality. To assess sleep quality between women with PCOS and age-matched healthy controls using the Pittsburgh Sleep Quality Index (PSQI) and to measure the suggestion between body mass index (BMI), sleep quality and menstrual irregularities. A hospital-based case-control investigation was directed between 56 women attending a tertiary care centre in South Kerala. The research included 28 women diagnosed with PCOS and 28 age-matched healthy controls. Sleep quality was restrained using the Pittsburgh Sleep Quality Index. Anthropometric measurements and menstrual history were recorded. Information were examined using correlation analysis, t-test, and chi-square test. Women with PCOS demonstrated suggestively advanced BMI and poorer sleep quality linked to controls. The mean global PSQI score was suggestively higher among women with PCOS. Poor sleep quality was more predominant in the PCOS group. Menstrual irregularities were observed exclusively among women with PCOS. A weak positive correlation was detected among BMI or PSQI scores; however, the association was not statistically significant. Women with PCOS exhibited suggestively inferior sleep quality than healthy controls. Routine assessment of sleep quality should be combined into the comprehensive management of PCOS to recover total health outcomes and life quality.

Keywords: Polycystic Ovary Syndrome, Sleep Quality, Pittsburgh Sleep Quality Index, Body Mass Index, Menstrual Irregularities.

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Introduction

Polycystic Ovary Syndrome (PCOS), which is linked to ovulatory failure among the most common endocrine disorders in women of reproductive age are hyperandrogenism and polycystic ovarian morphology. The condition can lead to various reproductive, metabolic and psychological complications, which have a substantial impact on quality of life (Bulsara et al., 2021). PCOS is a complex disorder that is heterogeneous and has a spectrum of effects throughout life including reproductive, metabolic and cardiovascular health (Louwers & Laven, 2020). The mechanism of action of PCOS is a complicated one with the interaction of genes, hormones, insulin resistance and environment. Women with PCOS often have irregular periods, are infertile, obese and suffer from metabolic dysfunction and are more likely to develop type 2 diabetes mellitus especially when obese and with central adiposity (Forslund et al., 2020; Escobar-Morreale, 2018). Moreover, offspring of women with PCOS can also experience these cardiometabolic effects and risk future health issues such as cardiovascular disease (Gunning et al., 2020; Geraci et al., 2025).

Sleep is a critical physiological function essential for metabolic homeostasis, cognition and emotional function. Bad sleep has been linked to negative physical and psychological effects. Sleep disturbances seem to be very common in women with PCOS and could significantly increase the burden of this disorder (Fernandez et al., 2018). Sleep disturbances have been related with hormonal imbalance, obesity, inflammation, insulin resistance and circadian rhythm. It has been demonstrated that women with PCOS are more likely to experience obstructive sleep apnoea (OSA) and other sleep-related disorders than healthy women (Kumarendran et al., 2019). Systematic review, and meta-analysis, have shown that women with PCOS are

significantly associated with OSA, with metabolic abnormalities (Kahal et al., 2018) and that poor sleep quality is associated with decreased QoL in women with PCOS (Kahal et al., 2020). In recent studies, it has been reported that women with PCOS have lower melatonin levels, disturbed sleep patterns and impaired circadian rhythms (Li, B et al., 2022). Overweight and obese women with PCOS (Oberg et al., 2023) have been observed to have abnormalities in sleep patterns, and chronotype disturbances have been linked to sleep quality in this population (GÖKMEN KARASU et al., 2021).

Mental health may suffer as a result of sleep issues as well as physical effects. In a cohort of women with PCOS who did not get a good night's sleep they were shown to have high levels of depression, anxiety and stress (Kite et al., 2021). The biological mechanisms underlying this link involve emerging evidence suggesting that sex hormones and sex hormone-binding globulin (SHBG) can impact sleep-related issues, potentially affecting their development (Jafar et al., 2025). The PSQI was a commonly-used and authenticated amount of sleep quality and sleep disturbance in a 1-month period. It assesses various elements of sleep, including latency, duration of sleep, effectiveness, interruptions, use of sleep aids, and daytime functioning. De Moraes et al., (2024) showed the consistency and validity of PSQI in different populations. Another pilot study using PSQI found that women with PCOS had significantly poorer sleep quality than their healthy controls (Chouhan et al., 2021). In addition, recent Mendelian randomization evidence suggests that there may be some causal relationships between sleep and PCOS, suggesting that sleep disturbances may be both a cause and a consequence of PCOS (Chen et al., 2026).

Although there are increasing global evidence, limited data on sleep quality among women with PCOS exist in South India particularly in Kerala. Besides, there was a lack of studies in the regional context which explored the correlation between menstrual irregularities or sleep quality in women with PCOS, giving rise to the need for the present investigation. Hence, the current investigation was directed to measure sleep quality using PSQI in PCOS-affected women compared to age-matched healthy controls and to look into the correlation between sleep quality, BMI and menstrual irregularity in women attending a tertiary care centre in South Kerala.

Research Questions

Is the quality of sleep is low for women with PCOS?

Which component of sleep are most affected in PCOS?

Is there any substantial correlation among BMI and sleep quality among women in PCOS?

Is there any substantial correlation among menstrual irregularities and sleep quality among women in PCOS?

Hypothesis

Alternative Hypothesis (H1)

The quality of sleep is noticeably lower in women with PCOS compared to age matched healthy control.

Null Hypothesis (H0)

There is no significant difference in sleep quality among PCOS women and healthy control women of the same age.

Aim of the Study

To evaluate the women with PCOS and age-matched healthy controls' sleep quality using the PSQI.

Objectives of the Study

Primary Objective

To evaluate the sleep quality in PCOS-affected women and age-matched healthy controls using the PSQI.

Secondary Objectives

To analyze which component of sleep are most affected in PCOS.

To correlate PSQI scores with body mass index and menstrual irregularity in PCOS patients.

2. Methodology

2.1 Study Design

To find the effect of PCOS on sleep quality, a hospital-based case-control investigation was conducted in the young women attending a tertiary care centre in South Kerala. Using the PSQI, sleep quality was compared between the women with PCOS and age-matched healthy women without PCOS. The case-control design allowed for the assessment of the differences in sleep quality and its related characteristics between the two groups.

2.2 Study Setting

The study was directed in the Department of Obstetrics and Gynaecology, in a tertiary care centre of South Kerala. All the eligible outpatients who visited the outpatient department during the study period were approached for participation. The data collection was performed with informed consent of the subjects. The hospital environment helped to recruit women identified with PCOS and healthy controls from the same people.

2.3 Study Population

Women in the reproductive age range made up the study population (18-40 years) attending the tertiary care centre. The respondents were divided into two groups. Case group encompassed of women analyzed with PCOS based on Rotterdam criteria (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004), and control group encompassed of age-matched healthy women with even menstrual cycles with no known endocrine disorders. To make the groups comparable, both groups were selected from the same clinical setting.

2.4 Sample Size

Sample size was resolute to comparation the PCOS-affected women's sleep quality and healthy controls (HC) PSQI. Based on a 95% confidence level and 80% study power, the sample size calculated was 28 in each group. Thus 28 women with PCOS and 28 women without PCOS (healthy controls) were recruited, for a total sample size of 56 women.

2.5 Inclusion Criteria

The research comprised women of reproductive age (18-40 years) eager to contribute and provide informed written consent. Cases were women with a analysis of PCOS based on Rotterdam criteria. Controls were healthy, age-matched women with regular menstrual periods and no known endocrine disorders. Participants had to have the ability to read and understand English and/or the local language for the purpose of filling out the study questionnaire.

2.6 Exclusion Criteria

Pregnant women were excluded from the study. Those with diagnosed sleep disorders, any other endocrine disorders (except PCOS), previous psychiatric diagnosis or sleep-inducing medication use were also excepted. The exclusion criteria were used to reduce possible confounding features that may impact sleep quality on their own and affect the association between PCOS and sleep disturbances. Women who were treated with the medication metformin, oral contraceptive pills, hormonal treatment or any other drug that might impact the quality of their sleep were excluded from the study.

2.7 Sampling Procedure

Recruitment of participants was done using convenient sampling. Women fulfilling the inclusion or exclusion criteria were enrolled after gaining informed written consent. Twenty-eight women with PCOS were casually allocated to the case group and twenty-eight age-matched healthy women with regular menstruations were selected as control group. To minimize confounding effects of age on sleep quality and better compare the two groups, age matching was conducted.

2.8 Data Collection Procedure

Using a structured proforma and Pittsburgh Sleep Quality Index questionnaire, data was collected. Each participant was asked about her sociodemographic characteristics, anthropometric measurements, menstrual history, and the PCOS-related details. BMI was computed, and weight and height were assessed using standard equipment. Afterwards, everyone had the Pittsburgh Sleep Quality Index questionnaire filled out to determine how well they slept in the month before.

2.9 Data Collection Tools

A structured sociodemographic data proforma was used to obtain data on age, height, weight, marital status, dietary habits, and BMI. Menstrual history was documented such as age at menarche, last menstrual period, menstrual abnormality, menstrual frequency, menstrual duration and secondary amenorrhea. PCOS diagnosis was done using Rotterdam criteria. The PSQI was used to measure sleep quality. All respondents were given an informed written consent before data collection.

2.10 Assessment of Sleep Quality

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) which is a 19 item, self-administered, standardized questionnaire (Buysse et al., 1989). Seven components of the instrument were: Subjective sleep quality, length, latency, average efficiency, disturbances, use of sleep aids, and dysfunction during the day. The PSQI is a reliable and valid instrument that has been widely used in clinical and research settings to assess sleep quality (Carpenter & Andrykowski, 1998). The scores were calculated from 0-3 for each component and then added to provide a global PSQI score from 0-21. Global PSQI scores > 5 were considered to reflect poor sleep quality and scores ≤ 5 were considered to reflect good sleep quality. This instrument has previously been successfully applied in studies that evaluated sleep quality in women with PCOS.

2.11 Anthropometric Assessment

Anthropometric measurements were conducted among which measurements of height and weight with the help of a stadiometer and a calibrated weighing machine. The investigation measured height (cm) and weight (kg). BM was designed as weight (kg)/height (m)2. BMI values were compared for PCOS-affected women and controls as well as to determine the association among BMI or sleep quality.

2.12 Outcome Measures

Sleep quality (measured by the global PSQI score) was the primary outcome measure. Poor sleep quality, PSQI component scores, menstrual pattern characteristics and BMI were secondary outcome measures. Sleep quality was classified according to PSQI as good sleep quality (PSQI ≤5) and poor sleep quality (PSQI >5). Association of BMI and sleep quality among women with PCOS was also assessed.

2.13 Statistical Analysis

The data was recorded in MS Excel and analyzed. Mean and SD were used for continuous data, and percentages and frequencies for categorical variables. t-tests were executed to comparison the mean BMI and PSQI scores between the women with PCOS and controls. To evaluate the association among categorical variables, chi-square tests were employed such as the sleep quality categories. Correlation investigation was used to evaluate the association of BMI and PSQI scores in women with PCOS. $p<0.05$ was measured as statistically substantial.

2.14 Ethical Considerations

Before the investigation began, the research protocol was approved by the Institutional Ethics Committee. All the participants were made aware of the determination and procedure of the research, and written informed consent was found from all of them. It was voluntary and participants could opt out at any time without penalty. The anonymity and confidentiality of the study subjects were kept.

3. Results

3.1 Distribution of Study Respondents

The research comprised a total of 56 women, of whom 28 were analyzed with PCOS and 28 as age-matched controls. There was an equal contribution from both the groups so as to maintain the representation of the study

population and also to make the comparison and interpretation between the cases and controls. The equal allocation of participants enhanced the reliability of the comparative analyses performed in the current investigation (Table 1)

Table 1. Distribution of Study Respondents

Group	Frequency (n)	Percentage (%)
PCOS Cases	28	50.0
Controls	28	50.0
Total	56	100.0

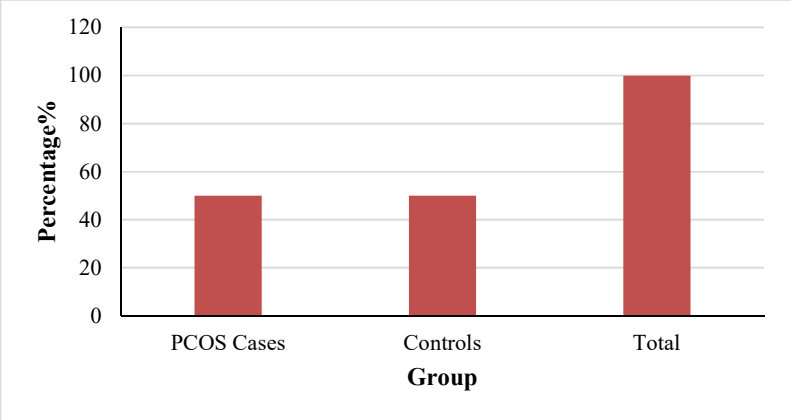

Figure 1. Distribution of Study Participants by Group

The distribution of the participants in the study, with respect to their group classification, is shown in Figure 1. The study respondents was subdivided into two groups, PCOS-affected women and healthy controls. The graph shows that the groups are evenly distributed, allowing for a fair comparison of sleep quality and sleep characteristics.

3.2 Demographic and Anthropometric Features of Study Participants

The age of the women with PCOS was 26.71 ± 7.29 years and controls was 29.14 ± 6.76 years. Among the study participants, majority of both the groups were unmarried (67.9% in PCOS group and 57.1% in control group). Fifty-seven-point one % of subjects with PCOS and 53.6% of controls reported being vegetarian. Table 2 shows the mean BMI to be higher for women with PCOS (27.70 ± 3.90 kg/m²) than controls (24.23 ± 3.68 kg/m²), indicating that overweight and obesity were more prevalent in the PCOS group.

Table 2. Demographic and Anthropometric Features

Variable	PCOS (n=28)	Controls (n=28)
Age (Mean ± SD)	26.71 ± 7.29	29.14 ± 6.76
BMI (Mean ± SD)	27.70 ± 3.90	24.23 ± 3.68
Married	9 (32.1%)	12 (42.9%)
Unmarried	19 (67.9%)	16 (57.1%)
Vegetarian	16 (57.1%)	15 (53.6%)
Non-Vegetarian	12 (42.9%)	13 (46.4%)

3.3 Comparison of BMI, Sleep Quality and Global PSQI Scores Between Study Groups

Women with PCOS presented a substantial difference in BMI or sleep quality score when compared to controls. The mean BMI among women with PCOS was 27.70 ± 3.90 kg/m² compared with 24.23 ± 3.68 kg/m² among controls, and this change was statistically substantial ($t = 3.423$, $p = 0.0012$). Likewise, the mean global PSQI score was meaningfully advanced in the PCOS group (8.75 ± 2.49) than in the control group (4.79 ± 1.75) ($t = 6.894$, $p < 0.001$). PSQI showed that 85.7% of women with PCOS had poor sleep quality while 25.0% of controls had poor sleep quality. Using Chi square statistics, there was a substantial connotation among PCOS and poor sleep quality ($\chi2 = 18.498$, $p < 0.001$) (Table 3).

Table 3. Assessment of BMI, Sleep Quality and Global PSQI Scores

Variable	PCOS (n=28)	Controls (n=28)	Test Statistic	p-value
BMI (Mean ± SD)	27.70 ± 3.90	24.23 ± 3.68	t = 3.423	0.0012*
Global PSQI Score (Mean ± SD)	8.75 ± 2.49	4.79 ± 1.75	t = 6.894	<0.001*
Good Sleep Quality, n (%)	4 (14.3)	21 (75.0)	$\chi^2 = 18.498$	<0.001*
Poor Sleep Quality, n (%)	24 (85.7)	7 (25.0)	$\chi^2 = 18.498$	<0.001*

**Statistically substantial at $p < 0.05$.*

3.4 Menstrual Pattern Among Women with and Without PCOS

The menstrual frequency varied significantly among the study groups. All the women in the control group had normal menstrual periods. Instead, all women with PCOS had menstrual irregularities. In PCOS group, 15 (53.6%) described infrequent menstrual cycle and 13 (46.4%) reported frequent. None of the women with PCOS reported normal menstrual frequency. This result is similar to the typical menstrual irregularities seen associated with PCOS and defines the case group from the healthy controls (Table 4).

Table 4. Menstrual Frequency Distribution Among Study Participants

Menstrual Frequency	PCOS (n=28)	Controls (n=28)
Normal	0 (0.0%)	28 (100.0%)
Infrequent	15 (53.6%)	0 (0.0%)
Frequent	13 (46.4%)	0 (0.0%)

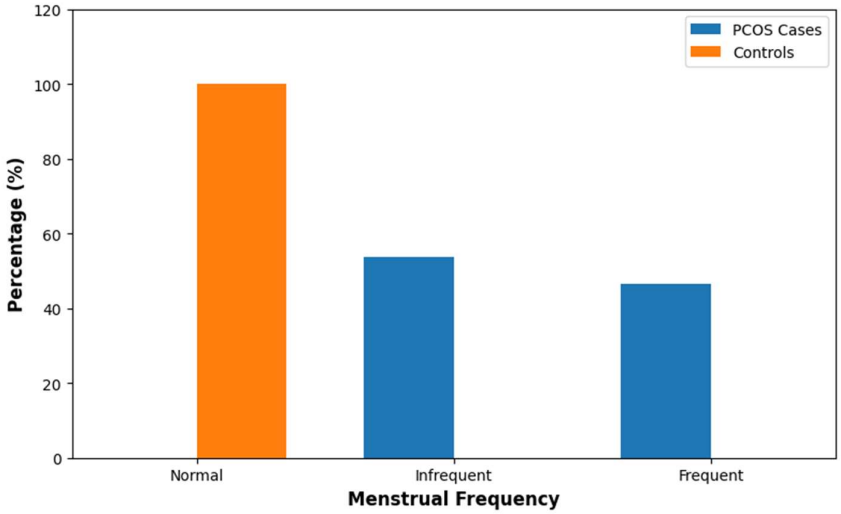

Figure 2. Distribution of Menstrual Frequency Among Study Participants

Menstrual frequency distribution of PCOS-affected women or controls is revealed in Figure 2. Among the PCOS patients most of the abnormalities in the menstrual period were noticed while the controls were mostly regular. The figure shows significant differences in menstrual cycle parameters between the two groups, which are indicative of the reproductive dysfunctions associated with Polycystic Ovary Syndrome (PCOS).

3.5 Correlation Between BMI and Sleep Quality Between Women With PCOS

Correlation was used to measure the correlation among BMI and global PSQI score in PCOS-affected women. A weak positive correlation was seen among BMI and sleep quality score (r = 0.124) (BMI increased with increase in PSQI score). But it was not statistically substantial (p = 0.528). These outcomes designate that in the present research BMI was not independently linked with sleep quality among the females with PCOS (Table 5)

Table 5. Correlation Between BMI and Global PSQI Score

Variables	Correlation Coefficient (r)	p-value

BMI and Global PSQI Score	0.124	0.528

p > 0.05; not statistically substantial.

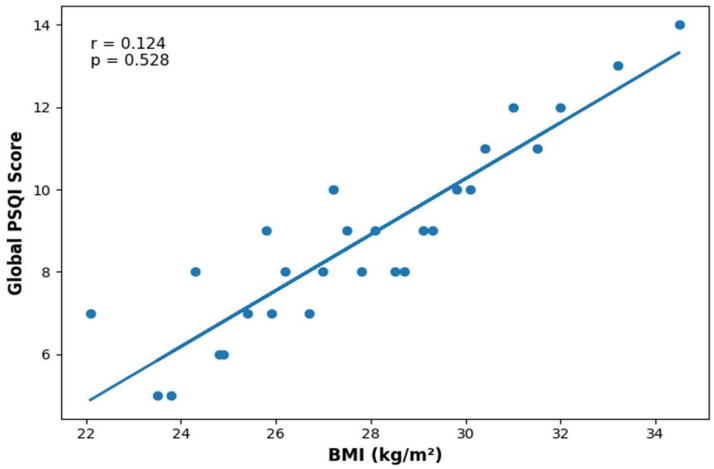

Figure 3. Correlation Between BMI and Sleep Quality

The correlation of BMI with the global PSQI scores in the Polycystic Ovary Syndrome women is shown in Figure 3. The graph is a scatter plot showing a weak positive association between the two variables. An increase in BMI was linked with a reduction in sleep quality, although this was not significant in the study population.

4. Discussion

The current investigation intended to evaluate the PCOS-affected women's sleep quality and age-matched healthy controls (HMHC) using PSQI. Results showed that women with PCOS had meaningfully lower sleep quality than the control group, suggesting that sleep disturbances are predominant in PCOS. BMI values were suggestively advanced in PCOS women linked to controls, and there is a strong connotation among metabolic dysfunction and PCOS. The higher BMI in women with PCOS, which corroborates the known association among obesity and PCOS, specifies that women with PCOS have greater metabolic burden.

The present study reported significantly lower sleep quality and more poor sleepers in women with PCOS. The results are also consistent with the findings of Wang et al. (2022), who conducted a meta-analysis that revealed a significant increase in the risk of sleep disturbances in women with PCOS compared to healthy controls. In addition, Zhang et al. (2022) found that women with PCOS had lower sleep quality and higher cardiometabolic risk. Yılmaz and Küpçü (2025) also reported that adolescents with PCOS exhibited increased risk for OSA and decreased sleep quality. In the current study, the mean BMI was found to be higher in women with PCOS, which aligns with results reported by Sharma et al. (2025) that obesity and sociodemographic factors are significant characteristics associated with PCOS. The need for regular evaluation and treatment of metabolic disturbances in women with PCOS have been highlighted in the international evidence-based guidelines published by Teede et al. (2018) and then updated by Teede et al. (2023). In addition, evidence of the validity and reliability of the Pittsburgh Sleep Quality Index as a tool for assessing sleep quality among women and other adult populations (Zak et al., 2022) support the use of the Pittsburgh Sleep Quality Index in the present study.

Menstrual irregularity was seen only in women with PCOS and no women with controls had been experienced any menstrual irregularity in their periods. This result corroborates the known reproductive dysfunction of PCOS and helps to discriminate between cases and controls clinically. Between women with PCOS, there was a weak positive correlation among BMI and PSQI but this correlation was not significant. This discovery indicates that sleep disturbances in PCOS may be more of an interplay of various mechanisms (hormonal, metabolic and psychological) rather than a BMI-dependent phenomenon.

The outcomes of the present research emphasize the need for sleep quality assessment as a part of clinical practice for PCOS women. Identifying sleep disturbances early could help provide timely interventions and enhance the reproductive, metabolic, and psychological health outcomes. Evaluation of sleep quality might also help provide a broader picture of patient health and disease burden. There were some restrictions of the research. The comparatively small sample size or single-centre plan may have a bearing on the generalizability of the findings. Furthermore, statistical correlation between menstrual irregularity and sleep quality could not be done in detail since all women in the PCOS group had menstrual irregularity thus reducing the variability among the study population. Sleep quality was measured using a self-reported questionnaire and not objective

sleep assessment methods. Further, the study was cross-sectional, which did not allow evaluation of causal association between sleep disturbances and PCOS.

Larger multicentre populations and objective sleep assessment methods like polysomnography or actigraphy should be used in future studies. Additional studies with larger, more diverse populations should also look into the link between sleep quality and each individual aspect of menstrual irregularity. Future studies including longitudinal evaluation of lifestyle changes, weight management and therapeutic interventions on sleep outcomes could help address the association among PCOS and sleep disturbances, and guide the creation of a holistic approach to the management of PCOS.

5. Conclusion

The current research intended to understand the influence of PCOS on sleep quality using the PSQI in women who attend a tertiary care centre in South Kerala. Results showed that PCOS women showed significantly poorer sleep quality than age matched healthy women. There was a substantial alteration among the occurrence of women with PCOS who were poor sleepers and those who were not, suggesting that sleep disturbances are a frequent and clinically relevant aspect of PCOS. Additionally, the BMI values of the PCOS-affected women were greater, which indicates the metabolic burden this disorder places on women. However, the women with PCOS were the only ones who had menstrual irregularities, underscoring the reproductive dysfunction that is a hallmark of PCOS. A weak positive connotation was initiate among BMI and PSQI scores, but this association was not statistically significant, indicating that other factors apart from body weight might be responsible for the poor PCOS-affected women's sleep quality. Overall, the investigation highlights the need for regular assessments of sleep quality in PCOS-affected women. The early detection and management of sleep disorders could help achieve better reproductive, metabolic and psychological health outcomes. Including sleep assessment as part of routine PCOS treatment could help to recover the general organization of the disorder and recover the life PCOS-affected women's quality.

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