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ORIGINAL ARTICLE

Psychological distress during COVID-19: The impact of virus related fear on sleep quality and menstrual health in University students

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Abstract

Purpose
To investigate the impact of COVID-19-related fear on menstrual regularity and sleep quality among female university students during the pandemic period.

Method
This cross-sectional study was conducted with 229 female students from both a private and a state university who participated voluntarily. Data were collected using a Descriptive Information Form, the Pittsburgh Sleep Quality Index (PSQI), and the Fear of COVID-19 Scale (FCV-19S). Statistical analysis was performed using IBM SPSS Statistics version 26.0.

Results
Of the participants, 91.3% were single, 51.5% were first-year students, and 88.7% resided with their families. The mean FCV-19S score was 15.63 ± 6.01 (range: 7-35), and the mean PSQI score was 9.61 ± 3.65 (range: 3-20), indicating poor overall sleep quality. Participants reporting menstrual irregularities during the pandemic showed significantly higher PSQI and FCV-19S scores. A statistically significant positive correlation was found between fear of COVID-19 and poor sleep quality.

Conclusion
Fear of COVID-19 was significantly associated with sleep quality and menstrual irregularities; however, the strength of this relationship was weak. These findings highlight the need for psychosocial support and health monitoring for young women during and after public health crises to mitigate potential long-term effects on reproductive health.

Keywords: Fear of COVID-19, Menstrual health, Menstrual irregularity, Sleep quality, Psychological distress.

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Introduction

The COVID-19 pandemic, which emerged in Wuhan, China, in December 2019, triggered a global health crisis with far-reaching consequences. To curb the spread of the virus, mandatory social isolation and quarantine measures were implemented worldwide, significantly increasing the prevalence of mental health disorders [1]. During this period, psychological well-being was severely compromised, with a marked rise in symptoms of anxiety and depression [2].

In Turkey, following the Council of Higher Education's decision, face-to-face education was initially suspended and subsequently transitioned to a distance learning model starting from the 2019-2020 spring semester [3]. University students, a demographic particularly vulnerable to social disruption, were profoundly affected by these restrictive measures. Research conducted during the quarantine period revealed that separation from peer groups and prolonged confinement in enclosed spaces led to intense feelings of anger, helplessness, depression, anxiety, fear of death, and hopelessness [4-5]. Furthermore, Akman et al. (2020) demonstrated that nursing students' knowledge levels regarding COVID-19 were closely associated with their stress, anxiety, depression, and fear scores [6].

It is well established that periods of intense stress and psychological distress negatively affect the female menstrual cycle [7]. The inhibitory effect of stress on the hypothalamic-pituitary-gonadal (HPG) axis suppresses the release of gonadotropin-releasing hormone (GnRH) from the hypothalamus. Additionally, elevated glucocorticoid levels inhibit luteinizing hormone (LH) release and ovarian production of estrogen and progesterone [8]. Recent studies have confirmed that increased psychological stress during the COVID-19 pandemic directly contributed to menstrual irregularities in women [9-11].

Beyond reproductive health, psychological states such as anxiety and stress are also known to deteriorate sleep quality [12-13]. Disrupted sleep patterns and insomnia further exacerbate depression and anxiety, creating a bidirectional cycle of stress [14]. Cellini et al. [15] reported a significant decline in sleep quality during the pandemic, while Zhou et al. [16] found that the incidence of sleep disorders among university students reached 50.1%.

Considering the convergence of these factors, this study aimed to evaluate the impact of COVID-19-related fear on menstrual regularity and sleep quality among university students, providing insight into the broader health implications of the pandemic for young women.

Methods

Study design

This study employed a descriptive, cross-sectional, correlational design. Data collection was conducted between February and August 2021, during the active phase of the COVID-19 pandemic.

Population and sample

The study population consisted of female students enrolled at a private and a state university in Istanbul, Turkey. A convenience sampling method was used. Although 240 students initially agreed to participate, the final sample comprised 229 participants who met the inclusion criteria: being female, volunteering to participate in the study, not using hormonal medications (including hormonal contraceptives), and being hemodynamically stable.

Data collection tools

Descriptive Information Form

A semi-structured form developed by the researchers was used to collect data on age, academic year, marital status, and residence. It also included specific questions regarding menstrual health, such as regularity, duration of menstrual flow, and daily pad use. Participants with chronic diseases were not excluded; instead, chronic disease status was recorded and included as a variable in the analysis. Participants receiving non-hormonal medical treatments were also not excluded, as these were not expected to directly affect menstrual cycle regulation. Information regarding the presence and type of chronic diseases was collected through this form.

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Pittsburgh Sleep Quality Index (PSQI)

The PSQI evaluates sleep quality over the previous month across seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score ranges from 0 to 21, where a score ≤5 indicates good sleep quality and a score >5 indicates poor sleep quality. The Turkish validity and reliability study was conducted by Ağargün et al. (1996), who reported a Cronbach's alpha of 0.80 [17]. In the present study, Cronbach's alpha was 0.88.

Fear of COVID-19 Scale (FCV-19S)

Developed by Ahorsu et al. (2020), this 7-item unidimensional scale measures fear related to COVID-19 using a 5-point Likert-type scale [18]. Total scores range from 7 to 35, with higher scores indicating greater fear. The original study reported a Cronbach's alpha of 0.82. In this study, Cronbach's alpha was 0.91.

Data collection procedure

Data were collected digitally using Google Forms due to pandemic-related social distancing measures. The survey link was distributed through mobile communication platforms, including WhatsApp, BiP, and Telegram. Participants completed the survey in approximately 3-4 minutes.

Statistical analysis

Data analysis was performed using SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. Continuous variables were summarized using means and standard deviations, as well as medians and minimum-maximum values. Categorical variables were expressed as frequencies and percentages (%). The Mann-Whitney U test was used to compare two independent groups, and Spearman's correlation analysis was used to examine relationships between scale scores. Statistical significance was set at $p < 0.05$.

Results

Demographic and descriptive characteristics

The demographic profile of the participants showed that the vast majority were single (91.3%), and nearly half were first-year students (51.5%). Regarding living conditions during the pandemic, 41.9% resided in metropolitan areas, and 88.7% lived with their families. Detailed demographic characteristics are presented in Table 1.

Table 1. Demographic characteristics of participants (n=229)

Features	n	%
Marital status		
Married	20	8.7
Single	209	91.3
Year of study		
1st year	118	51.5
2nd year	46	20.1
3rd year	37	16.2
4th year	28	12.2
Place of residence		
Big city	96	41.9
Province	49	21.4
District	61	26.6
Village	23	10.1

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Features	n	%
Living place		
With family	203	88.7
With relative	6	2.6
At my own home with my partner	20	8.7
Chronic disease status		
Yes	18	7.9
No	211	92.1
Total	229	100

Among the participants reporting chronic diseases (n = 18), the most commonly reported conditions included asthma, thyroid disorders, anemia, and migraine. None of these conditions were considered to directly interfere with menstrual cycle regulation or sleep quality.

COVID-19 related experiences and menstrual health

In terms of COVID-19 exposure, 66.8% of the students had not undergone testing, and 65.1% reported no positive or suspected COVID-19 status. Notably, 87.3% of the participants reported experiencing anxiety related to the pandemic, and 42.8% experienced menstrual irregularities during this period (Table 2).

Table 2. COVID-19 characteristics of participants

Features	n	%
COVID-19 test status		
Yes	76	33.2
No	153	66.8
COVID-19 positive/suspect status		
Yes	80	34.9
No	149	65.1
Presence of a family member at risk for COVID-19		
Yes	89	38.9
No	140	61.1
Anxiety due to COVID-19		
Yes	200	87.3
No	29	12.7
In the COVID-19 pandemic menstrual irregularity		
Yes	98	42.8
No	131	57.2
In the COVID-19 pandemic number of menstrual days		
1-3 days	18	7.9
4-5 days	90	39.3
6-7 days	100	43.7
8-10 days	21	9.2
In the COVID-19 pandemic Number of pads used per day on menstrual days		
1-2 pads	72	31.4

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Features	n	%
3-4 pads	101	44.1
5-6 pads	33	14.4
7-8 pads	23	10.1
Total	229	100

Scale scores and sleep quality components

The mean score for the FCV-19S was 15.63 ± 6.01 (range: 7-35). The mean PSQI total score was 9.61 ± 3.65 (range: 3-20), indicating overall poor sleep quality (PSQI > 5).

A component-level analysis of the PSQI provided a more detailed understanding of the specific nature of sleep disturbances among the participants. The highest mean component scores, reflecting the greatest impairment, were observed in sleep disturbance (1.76 ± 0.46), followed by sleep latency (1.66 ± 0.98) and daytime dysfunction (1.64 ± 0.92). Participants also reported reduced subjective sleep quality (1.52 ± 0.73) and sleep duration (1.48 ± 0.75). Although habitual sleep efficiency (1.25 ± 0.89) was also affected, use of sleep medication (0.29 ± 0.64) remained the lowest scoring component, suggesting that students largely experienced poor sleep quality without pharmacological intervention. The cumulative mean scores and corresponding ranges for both the PSQI and FCV-19S are presented in Table 3.

Table 3. Descriptive statistics of PSQI and FCV-19S scores (n = 229)

Scales	Min - Max	Mean ± SD	Median
Pittsburgh Sleep Quality Index	3-20	9.61 ± 3.65	10
Fear of COVID-19 Scale	7-35	15.63 ± 6.01	15

Comparative analysis of scale scores

Analyses of scale scores according to participant characteristics revealed significant differences. Married participants and those with pre-existing chronic diseases had significantly higher FCV-19S and PSQI scores. Furthermore, students who had family members in high-risk groups for COVID-19, as well as those reporting pandemic-related anxiety, exhibited higher levels of both fear and sleep disturbance. A key finding was that participants experiencing menstrual irregularities during the pandemic had significantly higher FCV-19S and PSQI total scores compared with those with regular menstrual cycles (Table 4).

Table 4. Comparison of Pittsburgh Sleep Quality Index and Fear of COVID-19 Scale (FCV-19S) scores according to some characteristics of the participants (n=229)

		Pittsburgh Sleep Quality Index	Coronavirus Fear Scale
Features		N	N
Marital status			
Married		110.13	132.95
Single		114.92	112.73
Statistical Test	Z	-0.31	-1.31
	p	p=0.756	p=0.190
Chronic Disease Status			
Yes		163.11	124.94
No		110.90	114.15
Statistical Test	Z	-3.21	-0.66
	p	p=0.001	p=0.506
COVID-19 test status			
Yes		134.26	113.86
No		105.43	115.57

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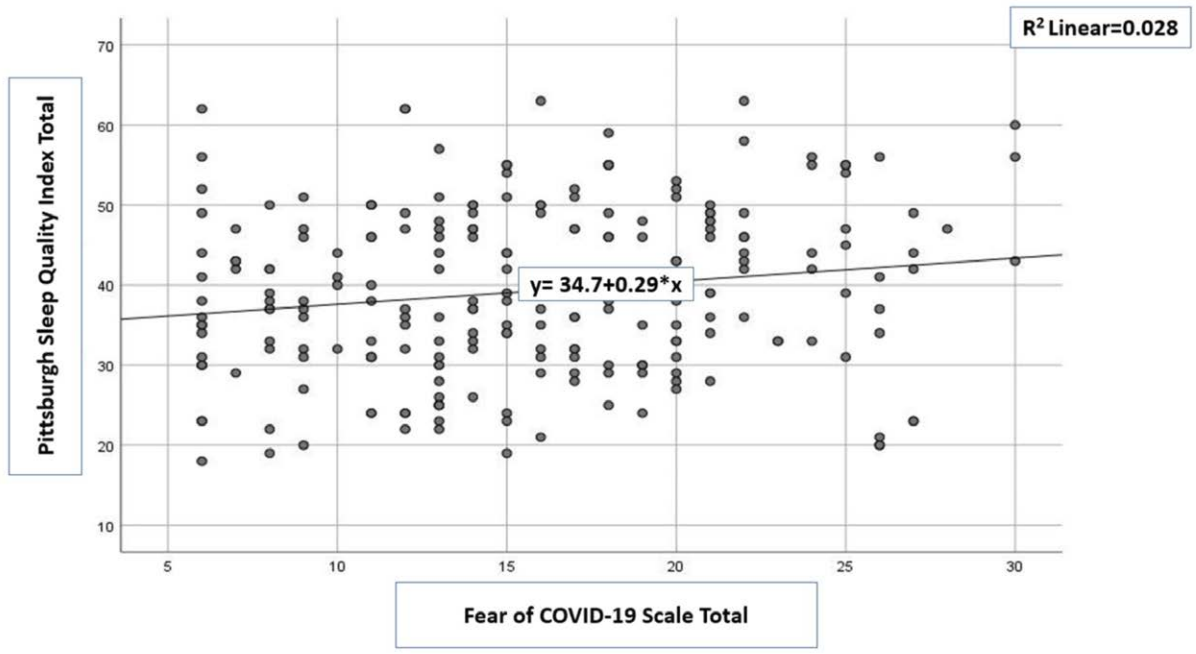
		Pittsburgh Sleep Quality Index	Coronavirus Fear Scale
Statistical Test	Z	-3.10	-0.18
	p	p=0.854	p=0.002
Presence of a family member at risk for COVID-19			
Yes		135.39	129.31
No		102.04	105.90
Statistical Test	Z	-3.71	-2.61
	p	p=0.000	p=0.009
Anxiety due to COVID-19			
Yes		120.51	121.20
No		77.03	72.28
Statistical Test	Z	-3.30	-3.72
	p	p=0.001	p=0.000
In the COVID-19 pandemic menstrual irregularity			
Yes		142.51	130.63
No		94.42	103.31
Statistical Test	Z	-5.43	-3.09
	p	p=0.000	p=0.002

Correlation analysis

Correlation analysis revealed a statistically significant association between the FCV-19S and the PSQI ($r = 0.168$, $p < 0.05$); however, the strength of the association was negligible.

Figure 1. Relationship between Pittsburgh Sleep Quality Index (PSQI) total scores and Fear of COVID-19 Scale (FCV-19S) mean scores (n = 229)



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Discussion

The COVID-19 pandemic has functioned as a global stressor, profoundly impacting individuals across physical, social, and psychological domains. Negative emotional states, particularly fear and anxiety, became hallmark psychological responses to the prolonged uncertainty of the pandemic. In the present study, 87.3% of the participants reported significant worry regarding COVID-19, a finding that aligns with Ceyhan et al. (70.1%) [19] and Kuşoğlu et al. (83.6%) [20], who similarly reported high anxiety levels in their respective cohorts. These collective results underscore that the pandemic triggered widespread psychological distress among university students, consistent with broader international literature.

A major finding of this study was that 42.8% of participants experienced menstrual irregularities during the pandemic. Despite the significant prevalence observed here, the existing literature on the direct impact of COVID-19 fear on menstrual regularity remains sparse. For instance, a comprehensive review by Öztürk and Can (2021), which examined the impact of historical epidemics (HIV/AIDS, Zika, Ebola, SARS, MERS, and COVID-19) on women's health, focused primarily on obstetric outcomes and pregnant populations, leaving a critical gap regarding general menstrual health [21].

Our study addresses this gap by highlighting how pandemic-related stress may disrupt the reproductive axis. The mean FCV-19S score in our study was 15.63 ± 6.01, suggesting a fear level slightly below the moderate threshold. This is remarkably consistent with findings from university students in Spain (16.79 ± 6.04) [18] and Karadem's study (16.0 ± 5.47) [22]. While some studies, such as Bakioğlu (2020), reported slightly higher scores (19.44 ± 6.07) [23], and research on specific populations such as pregnant women (19.50 ± 6.64) [24], menopausal women (19.7 ± 5.1) [25], and medical students (18.71 ± 4.91) [26] also showed elevated fear levels, the overall trend remains similar. Variations in fear scores across studies, including those in Russia and Belarus (18.0 ± 4.50) [27], likely stem from differences in population demographics, timing of data collection relative to the pandemic peak, and the prevailing level of public knowledge regarding the virus at the time of the research.

Sleep quality emerged as another significantly affected domain, with a mean PSQI score of 9.61 ± 3.65, indicating poor sleep quality among the participants. This trend of deteriorated sleep during the pandemic is well documented. For example, one study found that 69.5% of participants particularly women and young adults had poor sleep quality, with a mean PSQI of 6.89 ± 3.71 [17]. Similarly, Şahin et al. (2020) reported a mean score of 7.44 ± 3.65, with 63.6% of participants experiencing poor sleep [28]. Other studies have consistently shown PSQI scores above the 5.0 threshold during this period [29-32].

The significant relationship between PSQI scores and anxiety symptoms reported by Shen et al. (2020) [30] supports our finding of a positive correlation between COVID-19 fear and sleep disruption. Despite statistical significance, the observed correlation was extremely weak, indicating limited practical or clinical relevance. This finding should be interpreted cautiously, particularly given the use of convenience sampling, which limits the generalizability and inferential strength of the results. The fact that our participants' sleep quality scores were higher (worse) than several pre-pandemic or early-pandemic studies suggests a cumulative psychological burden.

In conclusion, the convergence of health-related anxiety, the stressors of quarantine, and the abrupt transition to online education created a challenging environment for university students [33]. The "digital alert" state and constant fear appear to disrupt physiological rhythms, manifesting as both impaired sleep and menstrual irregularities, necessitating targeted psychosocial interventions for this vulnerable group. These findings should be interpreted within the context of methodological limitations and should not be generalized beyond similar populations.

Limitations of the study

Several limitations should be acknowledged in the interpretation of these findings. First, the data were collected through digital platforms (WhatsApp, BiP, and Telegram) due to pandemic-related restrictions, which may have introduced self-selection bias. Second, the study relied on self-reported data, which may be subject to recall bias, particularly regarding menstrual cycle patterns and sleep quality. Finally, since

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the sample consisted of a specific group of healthy, hemodynamically stable university students, including some participants with chronic conditions or ongoing medical treatments, the findings may not be fully generalizable to the broader population of young women with underlying health conditions. The use of convenience sampling and the very low correlation coefficient further limit the practical significance of the findings.

Conclusions

In conclusion, this study demonstrates that university students experienced significant psychological distress during the COVID-19 pandemic, manifested through heightened fear, poor sleep quality, and menstrual irregularities. A significant positive correlation was identified between fear of COVID-19 and sleep disruption, suggesting that pandemic-related anxiety served as a major stressor affecting physiological rhythms.

The findings indicate that the “triple burden” of fear, anxiety, and stress not only deteriorated sleep quality which is essential for learning processes and overall health but also disrupted the hormonal balance governing the menstrual cycle.

Given these results, it is imperative to:

Identify and mitigate stressors: Academic institutions should implement psychological support programs to help students manage health-related anxieties.

Promote sleep hygiene: Targeted educational interventions are needed to raise awareness about the importance of regular sleep habits for both mental and reproductive health.

Future research: Future studies should employ more objective measurement tools (such as actigraphy for sleep or hormonal assays for menstrual health) and include longitudinal designs to evaluate the long-term recovery of these physiological functions in the post-pandemic period.

Declarations

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Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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