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Original Article

Exploring the Link of Screen Time with Emotional Well-Being, Quality of Sleep and Menstrual Symptoms Among Undergraduate University Students

S Hareem Zahra Rizvi[1], Sunniya Kamran[1], Saira Ilyas[1], Fizza Massod[2], Sidra Ali[2], Azka Maryam[1], Fizza Razzaq[1]

[1] Student, University of Management and Technology, Lahore, Pakistan
[2] Lecturer, University of Management and Technology, Lahore, Pakistan

***Corresponding author: Sidra Ali, sidraali@umt.edu.pk**

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ABSTRACT

Background: Excessive screen time is increasingly common among undergraduate students and may be associated with emotional distress, disturbed sleep, and menstrual symptoms. Female university students are particularly vulnerable because academic demands, digital-device dependence, irregular routines, and menstrual discomfort may collectively affect psychological and reproductive well-being. **Objective:** This study aimed to examine the association of screen time with emotional well-being, sleep quality, and menstrual distress among undergraduate female university students. **Methods:** A cross-sectional observational study was conducted among 252 undergraduate female students aged 18–25 years who were currently menstruating, had regular menstrual cycles, and used digital screens for at least two hours per day. Screen time was assessed using device-based Digital Wellbeing or Screen Time records. Emotional well-being was measured using the Depression, Anxiety and Stress Scale-21, sleep quality using the short Pittsburgh Sleep Quality Index, and menstrual symptoms using the Menstrual Distress Questionnaire. Data were analyzed using IBM SPSS Statistics version 26, and Pearson correlation was applied to assess associations. **Results:** Screen time showed a statistically significant weak positive correlation with emotional distress ($r = 0.130$, $p = 0.039$), but no significant correlation with menstrual distress ($r = -0.082$, $p = 0.200$) or sleep quality ($r = 0.060$, $p = 0.346$). Emotional distress was moderately correlated with menstrual distress ($r = 0.593$, $p < 0.001$) and weakly correlated with poorer sleep quality ($r = 0.126$, $p = 0.046$). **Conclusion:** Screen time was weakly associated with emotional distress but was not significantly associated with menstrual distress or sleep quality. Emotional well-being appeared to be the central factor linking psychological, menstrual, and sleep-related health domains. **Keywords:** Screen Time; Emotional Distress; Sleep Quality; Menstrual Distress; Undergraduate Students.

INTRODUCTION

Digital screen exposure has become an integral part of academic, social, and recreational life among university students, with undergraduate students increasingly relying on smartphones, laptops, and other digital devices for learning, communication, entertainment, and daily organization. Although digital access has academic and social benefits, prolonged screen time has been associated with perceived stress, sedentary behavior, unhealthy lifestyle patterns, and adverse psychological outcomes in university populations (1). Female undergraduate students may be particularly vulnerable because excessive screen exposure often coexists with irregular sleep habits, reduced physical activity, academic stress, and altered daily routines, all of which can influence emotional and reproductive health (2). Experimental and observational evidence further suggests that strategies modifying screen exposure can influence screen-

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use behavior and psychological responses, indicating that screen time is not merely a passive habit but a modifiable lifestyle factor relevant to student well-being (3).

Sleep quality is one of the most frequently reported health domains affected by excessive screen exposure. University students commonly use screens during the evening and bedtime hours for social media, video streaming, gaming, academic reading, and communication, which may delay sleep onset, shorten sleep duration, and reduce perceived sleep quality (4). The mechanisms proposed include cognitive and emotional arousal, displacement of sleep time, and exposure to light from screens, particularly during late-night use. In addition, students may develop psychological attachment to smartphones and other digital devices, experiencing anxiety, irritability, or emotional discomfort when access to these devices is restricted, which may further contribute to emotional dysregulation and sleep disruption (5). Sleep quality reflects an individual's satisfaction with sleep duration, sleep continuity, sleep latency, and restoration after sleep, making it a clinically meaningful indicator of both physical and psychological health in student populations (6). Bedtime mobile phone use has also been linked with impaired cognitive functioning, poorer academic performance, and reduced sleep quality among undergraduate students, emphasizing the broader health and educational implications of excessive digital engagement (7).

Menstrual health is another important but often under-recognized component of well-being among female university students. Premenstrual symptoms, menstrual pain, and menstrual distress can affect mood, concentration, class attendance, daily functioning, and quality of life (8). A global review of university students' menstrual experiences showed that menstrual symptoms can interfere with educational participation, academic performance, and routine activities, highlighting the importance of studying menstrual health within academic settings (9). Dysmenorrhea and related menstrual symptoms commonly involve lower abdominal and lumbar pain and are influenced by hormonal and inflammatory mechanisms, including changes in estrogen levels and prostaglandin-mediated uterine contractions (10). Despite the high burden of menstrual discomfort, many young women do not seek care because of embarrassment, normalization of pain, limited menstrual education, or uncertainty about available treatment options (11).

The relationship between screen time, emotional well-being, sleep quality, and menstrual symptoms is biologically and behaviorally plausible. Excessive screen time may contribute to emotional distress through prolonged digital engagement, social comparison, academic overload, reduced physical activity, and disrupted rest patterns. Poor sleep may, in turn, heighten pain sensitivity, worsen mood regulation, and increase vulnerability to menstrual discomfort. Menstrual distress may also intensify emotional symptoms such as anxiety, irritability, and low mood, while emotional distress can amplify the perception of pain and sleep disturbance. Therefore, these factors may not operate independently; rather, they may interact as part of a broader student-health pattern in which digital behavior, psychological well-being, sleep, and menstrual symptoms are interrelated.

Although previous research has examined screen time, sleep quality, emotional health, and menstrual symptoms separately, fewer studies have evaluated these variables together among undergraduate female students. This represents an important knowledge gap because university students are exposed to high academic demands, frequent digital-device use, irregular routines, and reproductive-health challenges during a critical developmental period. Understanding whether screen time is associated with emotional well-being, sleep quality, and menstrual distress may help identify modifiable behavioral targets for student-health promotion. Therefore, the present study aimed to examine the association of screen time with emotional well-being, sleep quality, and menstrual distress among undergraduate female university students. The study hypothesized that higher screen time would be associated with poorer emotional well-being, poorer sleep quality, and greater menstrual distress.

MATERIALS AND METHODS

The study was conducted as a cross-sectional observational study to examine the association of screen time with emotional well-being, sleep quality, and menstrual distress among undergraduate female university students. This design was selected because the objective was to assess exposure and outcome variables at a single point in time and determine whether higher screen time was statistically associated with psychological, sleep-related, and menstrual-health indicators in the target population. The study population comprised undergraduate female students aged 18–25 years who were currently menstruating, had regular menstrual cycles ranging from 26 to 45 days, used digital screens for at least two hours per day, and had access to the internet and a personal digital device with either Digital Wellbeing on Android or Screen Time on iOS for objective or app-based screen-use assessment (12–15).

Participants were selected using a convenience sampling technique from undergraduate university students who met the eligibility criteria. Eligible students were approached, informed about the purpose and procedures of the study, and invited to participate voluntarily. Written informed consent was obtained before data collection. Participation was anonymous and voluntary, and students were informed of their right to withdraw at any stage without penalty. Female students were excluded if they had diagnosed reproductive-system diseases, previous pelvic surgery, known chronic illness, current use of contraceptive pills, current or previous diagnosed psychiatric disorders including severe depression, bipolar disorder, suicidal thoughts, or substance abuse, visual or neurological impairments, or a diagnosis of insomnia. These exclusion criteria were applied to reduce the influence of pre-existing reproductive, psychiatric, neurological, and sleep-related conditions that could independently affect menstrual symptoms, emotional well-being, or sleep quality.

Data were collected through a structured questionnaire and mobile-device screen-time records. The first section of the questionnaire recorded demographic and clinical characteristics, including age, height, weight, body mass index category, current day of menstrual cycle, and screen-time duration. Screen time was treated as the independent exposure variable and was assessed using participants' device-based screen-time information obtained from Digital Wellbeing for Android users and Screen Time for iOS users. Emotional well-being, sleep quality, and menstrual distress were treated as dependent outcome variables. Emotional well-being was assessed using the Depression, Anxiety, and Stress Scale-21, a 21-item self-report instrument that evaluates symptoms of depression, anxiety, and stress and provides a total score reflecting overall emotional distress (16). Sleep quality was measured using the short Pittsburgh Sleep Quality Index, which assesses key components of sleep quality and generates a total score representing sleep-related difficulties (17). Menstrual symptoms were assessed using the Menstrual Distress Questionnaire, which captures menstruation-related physical, emotional, and behavioral symptoms and provides a total menstrual distress score (18).

Anthropometric information was recorded using self-reported or measured height and weight, and participants were categorized into body mass index groups as underweight, healthy weight, overweight, or obese. Menstrual-cycle information was collected according to the participant's current menstrual day, with eligible participants contributing data during menstruation. The data collection process was standardized by using the same questionnaire format and the same outcome instruments for all participants. Participants were guided to report their responses accurately, and device-based screen-time information was used to reduce recall error where available. Completed questionnaires were reviewed for completeness before analysis, and available valid responses were included in the statistical dataset.

Potential sources of bias were addressed through predefined inclusion and exclusion criteria, use of standardized instruments, and app-based screen-time assessment. Restricting the sample to currently menstruating undergraduate females with regular menstrual cycles helped reduce heterogeneity related to menstrual status. Excluding students with diagnosed insomnia, psychiatric disorders, reproductive-system disease, chronic illness, contraceptive-pill use, and neurological or visual

impairments reduced the likelihood that the measured associations were driven by major pre-existing conditions. However, because the design was observational and cross-sectional, the analysis was limited to identifying associations rather than causal relationships. The final sample size was 252 participants. Data were entered and analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize participant characteristics, including age, body mass index category, menstrual-cycle day, and screen-time distribution. Frequencies and percentages were calculated for categorical variables, while continuous or score-based variables were summarized using appropriate measures of central tendency and dispersion. Pearson correlation analysis was used to examine the relationship between screen time and the three outcome variables: total DASS-21 score, total Menstrual Distress Questionnaire score, and total short Pittsburgh Sleep Quality Index score. Correlation coefficients were interpreted according to both direction and magnitude, and statistical significance was assessed using two-tailed p-values, with $p < 0.05$ considered statistically significant. The number of valid observations was reported for each analysis to account for item-level missingness across outcome measures.

Ethical principles of autonomy, voluntary participation, informed consent, confidentiality, and the right to withdraw were followed throughout the study. Participants were informed about the study objective, the nature of the questionnaire, and the use of their responses for research purposes. Identifying information was kept confidential, and the data were handled in a manner that protected participant privacy. Data integrity was supported by standardized data collection procedures, consistent use of validated instruments, review of completed forms, and analysis using a defined statistical plan.

RESULTS

A total of 252 undergraduate female students were included in the analysis. The mean age was 21.23 years. Most participants were in the healthy BMI category (n = 142, 56.35%), followed by underweight (n = 60, 23.81%), overweight (n = 31, 12.30%), and obese (n = 19, 7.54%). The age distribution showed that the largest proportion of participants were aged 21 years (n = 115, 45.63%), followed by 22 years (n = 40, 15.87%) and 20 years (n = 39, 15.48%). Most participants were assessed during the first two days of menstruation, with 56 participants on day 1 and 63 participants on day 2, together accounting for 47.22% of the sample.

Table 1. Demographic and menstrual-cycle characteristics of participants

Variable	Category	Frequency (n)	Percentage (%)
Total sample	—	252	100.00
Age, years	18	23	9.13
	19	20	7.94
	20	39	15.48
	21	115	45.63
	22	40	15.87
	23	11	4.37
	24	3	1.19
	25	1	0.40
Mean age		21.23 years	
Body mass index category	Underweight	60	23.81
	Healthy weight	142	56.35
	Overweight	31	12.30
	Obese	19	7.54
Day of menstrual cycle	Day 1	56	22.22
	Day 2	63	25.00
	Day 3	37	14.68
	Day 4	32	12.70
	Day 5	36	14.29
	Day 6	15	5.95
	Day 7	13	5.16

Screen-time exposure was distributed across a wide range of daily use values. The visual distribution showed that the largest frequencies were concentrated between approximately 6 and 10 hours of screen time, with the highest observed frequency around 7 hours. Lower frequencies were seen at the upper end of the distribution, including screen-time values of approximately 14–17 hours, indicating that very

high screen use was present but less common. This pattern suggests that moderate-to-high daily screen exposure was common in the sample rather than restricted to a small subgroup.

The correlation analysis examined screen time as the independent variable and total scores for emotional well-being, menstrual distress, and sleep quality as dependent outcome measures. Screen time showed a statistically significant positive correlation with total DASS score ($r = 0.130$, $p = 0.039$, $n = 252$), indicating a weak positive association between higher screen time and greater emotional distress. Screen time was not significantly correlated with total MDQ score ($r = -0.082$, $p = 0.200$, $n = 246$) or total PSQI score ($r = 0.060$, $p = 0.346$, $n = 252$).

Table 2. Pearson correlations between screen time and study outcome measures

Exposure Variable	Outcome Variable	Valid N	Pearson Correlation (r)	Direction of Association	p-value
Screen time	Total DASS score	252	0.130	Positive	0.039
Screen time	Total MDQ score	246	−0.082	Negative	0.200
Screen time	Total PSQI score	252	0.060	Positive	0.346

Additional correlation testing showed that emotional well-being was significantly associated with menstrual distress and sleep quality. Total DASS score had a moderate positive correlation with total MDQ score ($r = 0.593$, $p < 0.001$, $n = 246$), indicating that participants with higher emotional distress also tended to report greater menstrual distress. Total DASS score also showed a weak positive correlation with total PSQI score ($r = 0.126$, $p = 0.046$, $n = 252$), suggesting that higher emotional distress was weakly associated with poorer sleep quality. Total MDQ score was not significantly correlated with total PSQI score ($r = 0.008$, $p = 0.897$, $n = 246$).

Table 3. Correlations among emotional well-being, menstrual distress, and sleep quality

Variable 1	Variable 2	Valid N	Pearson Correlation (r)	Direction of Association	p-value
Total DASS score	Total MDQ score	246	0.593	Positive	<0.001
Total DASS score	Total PSQI score	252	0.126	Positive	0.046
Total MDQ score	Total PSQI score	246	0.008	Positive	0.897

Overall, the strongest observed association was between emotional distress and menstrual distress ($r = 0.593$, $p < 0.001$). The association between screen time and emotional distress was statistically significant but weak ($r = 0.130$, $p = 0.039$). In contrast, screen time did not show statistically significant relationships with either menstrual distress or sleep quality. The valid sample size varied from 246 to 252 across analyses because the MDQ-based correlations included 246 valid observations, while DASS and PSQI correlations included 252 valid observations.

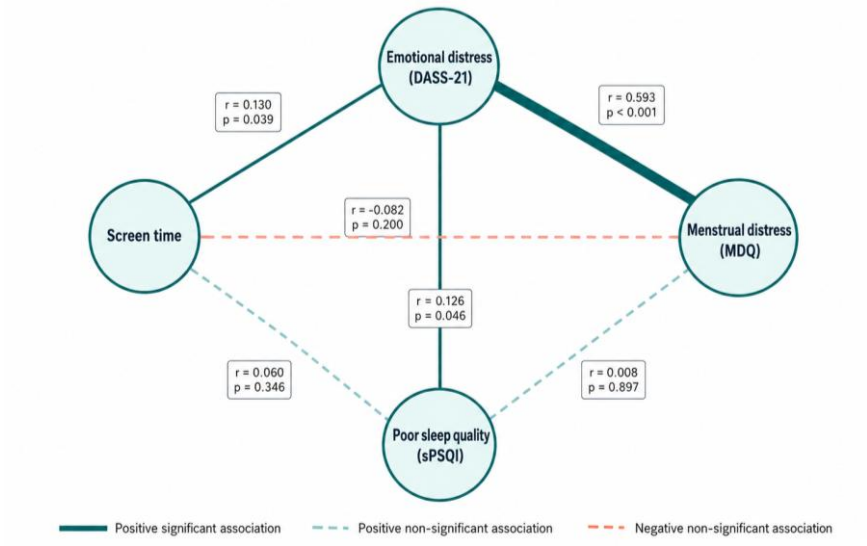


Figure 1. Correlation Network of Screen Time, Emotional Distress, Menstrual Distress, and Sleep Quality Among Undergraduate Female Students

The association network shows that emotional distress had the strongest relationship with menstrual distress ($r = 0.593$, $p < 0.001$), while screen time demonstrated only a weak but statistically significant

positive association with emotional distress ($r = 0.130$, $p = 0.039$). Screen time showed no significant relationship with menstrual distress ($r = -0.082$, $p = 0.200$) or poor sleep quality ($r = 0.060$, $p = 0.346$), and menstrual distress was not meaningfully associated with sleep quality ($r = 0.008$, $p = 0.897$). Overall, the pattern indicates that emotional distress is the central correlate linking the study variables, whereas screen time is only weakly connected to psychological symptoms and not significantly connected to menstrual or sleep outcomes.

DISCUSSION

Screen time showed a statistically significant but weak positive association with emotional distress among undergraduate female students, indicating that students with higher screen exposure tended to report slightly higher levels of depression, anxiety, and stress symptoms. Although the magnitude of this association was small, the finding is clinically relevant because emotional distress in university students is often multifactorial and may be influenced by cumulative lifestyle, academic, behavioral, and digital-use patterns rather than a single dominant exposure. Previous evidence among college students has similarly linked higher screen time and reduced physical activity with perceived stress, supporting the possibility that digital overuse may contribute to psychological strain through sedentary behavior, academic overload, social comparison, and reduced engagement in restorative activities (1). Excessive or poorly regulated screen use may also intensify emotional symptoms through constant notifications, prolonged social media exposure, cognitive arousal, and dependence on digital devices for academic and social interaction, which is consistent with evidence that psychological and contextual factors influence smartphone screen-time behavior and emotional responses to device use (5).

The absence of a statistically significant association between screen time and sleep quality suggests that total screen exposure alone may not fully explain sleep-related difficulties in this population. This finding differs from studies reporting that bedtime mobile phone use and prolonged screen exposure are associated with poorer sleep quality, shorter sleep duration, and impaired cognitive or academic performance among undergraduate students (4,7). One possible explanation is that sleep disruption may depend more strongly on the timing, content, and context of screen use than on total daily screen duration. Evening or bedtime screen exposure, emotionally stimulating content, social media engagement, gaming, academic stress, caffeine intake, and irregular sleep schedules may have stronger effects on sleep than total screen time measured across the day. Therefore, the non-significant screen time–sleep relationship may reflect the limited sensitivity of total screen-time measurement to capture the specific digital behaviors most relevant to sleep physiology and sleep perception.

Screen time was also not significantly associated with menstrual distress. This suggests that, within the measured range of exposure, daily screen duration may not be directly related to the severity of menstrual symptoms. Menstrual distress is influenced by hormonal variation, prostaglandin-mediated uterine contractions, pain sensitivity, lifestyle factors, stress, physical activity, diet, and individual biological differences, and these mechanisms may be more directly relevant than screen exposure alone (10,11). Prior research has emphasized that menstrual symptoms can interfere with education, attendance, concentration, and functional ability among university students, but the determinants of menstrual distress are complex and may not be adequately explained by a single behavioral exposure (9). In this context, screen time may act indirectly through emotional distress, sleep disruption, or sedentary lifestyle rather than showing a strong independent association with menstrual symptoms.

The strongest association observed was between emotional distress and menstrual distress, indicating that students with higher depression, anxiety, and stress scores also tended to report greater menstrual symptom burden. This moderate positive relationship is an important finding because it supports the concept that menstrual health and psychological well-being are closely connected. Emotional distress can heighten pain perception, reduce coping capacity, increase somatic vigilance, and worsen the subjective experience of menstrual symptoms. Conversely, menstrual pain and premenstrual symptoms

may contribute to irritability, anxiety, low mood, reduced academic functioning, and poorer quality of life. This bidirectional relationship is consistent with literature showing that premenstrual syndrome and menstrual symptoms are important contributors to overall well-being and stress among females (19). It also aligns with evidence that menstrual experiences can negatively affect educational participation and daily functioning in university students (20).

A weak but statistically significant positive association was also observed between emotional distress and poorer sleep quality. This finding is consistent with the established relationship between psychological symptoms and sleep disturbance, in which anxiety, stress, and depressive symptoms may delay sleep onset, reduce sleep continuity, and impair perceived sleep restoration. Poor sleep may also worsen emotional regulation, increase irritability, reduce cognitive control, and intensify stress responses, creating a reinforcing cycle between sleep difficulty and emotional distress. Evidence from undergraduate populations has shown that mobile phone use at bedtime is related to sleep quality and cognitive functioning, but the present findings suggest that emotional distress may be more closely linked with sleep quality than screen time itself (21). This pattern highlights the need to interpret sleep quality within a broader psychosocial framework rather than attributing sleep problems only to digital exposure.

The lack of a meaningful relationship between menstrual distress and sleep quality was notable. Previous research has reported that sleep disturbance may be associated with menstrual irregularities, menstrual pain, heavy bleeding, and premenstrual symptoms in female university students (22). However, the present finding may indicate that menstrual distress and sleep quality were not directly linked in this sample, or that the relationship was influenced by factors not captured in the analysis, such as menstrual phase variation, pain intensity, analgesic use, physical activity, academic stress, caffeine intake, bedtime screen exposure, and individual sleep routines. Because participants were assessed during menstruation, symptom timing may also have influenced the distribution of menstrual distress scores and reduced the ability to detect broader cycle-related associations.

Taken together, the results suggest that emotional distress is the central variable connecting the health domains assessed in this study. Screen time was weakly associated with emotional distress but not significantly associated with sleep quality or menstrual distress, whereas emotional distress showed significant relationships with both menstrual distress and sleep quality. This pattern indicates that the psychological dimension may be more strongly related to menstrual and sleep-related experiences than screen time alone. It also suggests that interventions focused only on reducing total screen exposure may be insufficient unless they also address emotional regulation, academic stress, sleep hygiene, and menstrual-health education.

The study has several limitations that should be considered when interpreting the findings. The cross-sectional design limits causal interpretation, as it cannot determine whether higher screen time contributes to emotional distress or whether emotionally distressed students spend more time using screens. Convenience sampling may limit generalizability beyond undergraduate female students with similar demographic and academic characteristics. Screen time was measured through device-based records, but the analysis did not differentiate academic use from recreational use, daytime use from bedtime use, or passive use from emotionally engaging digital activity. These distinctions are important because different types of screen exposure may have different psychological and physiological effects (23). The analysis was based primarily on correlations and did not adjust for potential confounders such as academic workload, physical activity, caffeine intake, socioeconomic status, baseline mental health, menstrual pain medication, or sleep routines. In addition, menstrual distress was assessed during the menstrual period, and changes across different phases of the menstrual cycle were not evaluated.

Despite these limitations, the study contributes useful preliminary evidence by examining screen time, emotional well-being, sleep quality, and menstrual distress together in undergraduate female students. The findings indicate that higher screen time is weakly associated with emotional distress, while

emotional distress is more strongly associated with menstrual distress and modestly associated with poorer sleep quality. These results support a student-health model in which digital behavior, psychological well-being, menstrual symptoms, and sleep quality should be understood as interconnected but not equally related domains. Future research using longitudinal designs, phase-specific menstrual tracking, detailed screen-use categories, and adjusted multivariable models would help clarify whether screen exposure has direct or indirect effects on emotional, sleep, and menstrual outcomes.

CONCLUSION

The study concluded that screen time had a statistically significant but weak positive association with emotional distress among undergraduate female students, indicating that higher screen exposure was related to slightly higher depression, anxiety, and stress scores. However, screen time was not significantly associated with menstrual distress or sleep quality, suggesting that total screen duration alone may not be a major direct correlate of these outcomes in this sample. Emotional distress showed a moderate positive association with menstrual distress and a weak positive association with poorer sleep quality, highlighting emotional well-being as the central factor connecting psychological, menstrual, and sleep-related health domains. These findings suggest that student-health interventions should not focus solely on reducing screen time but should also address emotional regulation, stress management, sleep hygiene, menstrual-health education, and healthy digital-use behaviors. Because the study was cross-sectional, the findings indicate associations rather than causal relationships, and further longitudinal research is needed to clarify the direction and mechanisms of these relationships across different phases of the menstrual cycle.

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