

Association between gender, digital device usage patterns, and sleep schedule with perceived stress level among students in public health institutions of Pakistan

Sheza Khan,¹ Khansa Ayyub.²

Abstract:

Background: University students face rising stress due to social, academic, and technological pressures. In Pakistan, limited access to mental health services worsens the issue. While screen time and irregular sleep are linked to stress, their combined impact on public health students remains underexplored.

Objectives: This study sought to determine important behavioral determinants of stress and evaluate the relationship between perceived stress levels, gender, sleep patterns, and digital device use among students in public health institutes throughout Pakistan.

Methods: A structured online questionnaire was used to perform a cross-sectional study with 317 students. Data comprised the Perceived Stress Scale (PSS-10), screen time, sleep length, and demographics. ANOVA, multivariate linear regression, chi-square tests, t-tests, and Pearson correlation were among the statistical analyses, with significance set at $p < 0.05$.

Results: Moderate stress was reported by 87.4% of students, with a mean PSS score of 19.25 ± 4.64 . There was a significant correlation between stress levels and screen time ($\chi^2 = 34.58$, $p < 0.00001$), gender ($\chi^2 = 9.99$, $p = 0.0068$), and sleep duration ($\chi^2 = 31.31$, $p = 0.00012$). Regression analysis revealed that sleep length adversely predicted stress ($\beta = -0.69$, $p = 0.046$), accounting for 8.4% of the variance ($R^2 = 0.084$), whereas screen time positively predicted stress ($\beta = 1.01$, $p = 0.001$).

Conclusions: Long periods of screen time and insufficient sleep are major factors in public health students' elevated stress levels. It is advised that interventions that support sleep hygiene and digital wellness be implemented to enhance students' mental health.

Keywords: Perceived Stress, Screen Time, Sleep Quality, PSS-10, Public Health Students, Mental Health

^{1,2} University of the Punjab

depression (33.7%) reported to be significantly high.³ In Pakistan and nearby regions, student mental health is particularly concerning. A systematic review

Introduction:

Mental health and stress management are crucial highlighted that up to 90% of Pakistani medical students concerns for students, as they often face academic experience psychological distress, largely due to pressure, social challenges, and personal struggles that academic workload and financial challenges.⁴ Another can lead to anxiety, depression, and decreased study found that 42.66% of university students in academic performance.¹ Maintaining mental well- Pakistan showed symptoms of depression.⁵

being is vital for students' overall success, with As smartphones and laptops become more integrated emotional and social stability playing a central role.² into daily life, there has been a noticeable shift toward Stress remains a major public health issue, impacting mobile device use.⁶ The type of device used also affects both mental and physical health. The COVID-19 academic engagement students who relied on computers pandemic further intensified this problem, with global or laptops for online learning tended to report better rates of stress (29.6%), anxiety (31.9%), and knowledge retention and participation compared to

those using smartphones.⁷ However, excessive use of **Material and Method**

digital devices, particularly smartphones, has been linked to several adverse physical and psychological effects. Research indicates that problematic smartphone use is associated with higher levels of depression, anxiety, and stress, with more frequent use worsening these effects.⁸

Late-night screen exposure is another concern, as it disrupts melatonin production and natural sleep-wake cycles, contributing to poor sleep quality.⁹ Studies suggest that adolescents who use screens at night are more likely to experience poor sleep and symptoms of insomnia, highlighting the negative consequences of pre-bedtime screen time on mental and sleep health.¹⁰ Likewise, disrupted circadian rhythms and reduced melatonin release from late-night screen use lead to poor sleep quality in various age groups.⁹ A comprehensive view of sleep health which includes aspects like sleep satisfaction, alertness, timing, efficiency, and duration has been associated with better mental health in adults.¹¹ Younger individuals, particularly females, tend to report more pronounced negative effects of digital media use on sleep and fatigue.¹²

This study aims to examine the relationship between gender, patterns of digital device use, and sleep habits with perceived stress levels among public health students. Using the PSS-10 scale to measure stress, the research explores how these factors vary and interact. The goal is to identify which elements most significantly affect student stress, providing insights that could contribute to improving mental well-being among students.

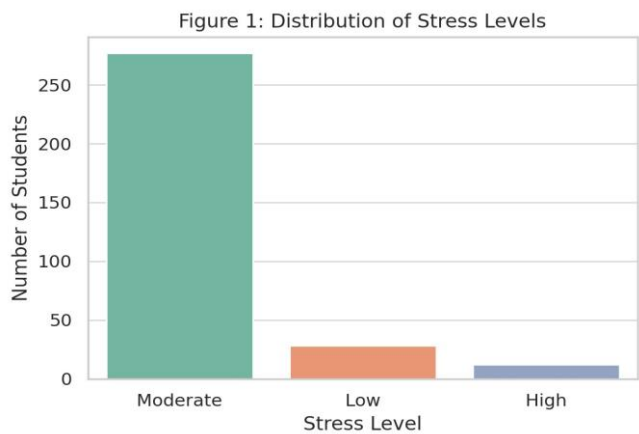
This cross-sectional analytical study employed a quantitative approach to examine the association between perceived stress levels, sleep cycles, gender, and digital device usage among students in public health programs across Pakistan. A non-probability convenience sampling technique was used. Eligible participants were students aged 18 or older enrolled in BS, MPH, MPhil, or PhD public health programs at various universities nationwide. Students with a diagnosed mental health condition or on extended academic leave were excluded. Only those who consented were included.

Data was collected using a structured, self-administered online questionnaire via Google Forms. The tool included four sections: the Perceived Stress Scale (PSS-10), sleep patterns, digital device usage, and demographic data. The PSS-10 consists of 10 items scored on a 5-point Likert scale (0 = never to 4 = very often), producing total scores from 0 to 40.¹⁴ Stress levels were categorized as low (0–13), moderate (14–26), and high (27–40). A pilot test with 10 students was conducted to assess the questionnaire's internal consistency, validity, and clarity. No identifiable personal data was collected to maintain confidentiality. Responses were exported into an Excel-compatible format and analyzed using IBM SPSS Statistics. Descriptive statistics (means, standard deviations, frequencies, percentages) summarized the data. Independent t-tests and one-way ANOVA compared group means; chi-square tests assessed associations between categorical variables. Pearson correlation evaluated continuous variable relationships (e.g., screen time and stress). Multivariate linear regression identified

significant predictors of stress. A p-value < 0.05 was considered statistically significant. Sample size was calculated using the standard formula for a single population proportion, assuming Z = 1.96, P = 0.5, and d = 0.055, yielding an estimate of 317 participants.¹⁵ A total of 317 complete responses were obtained via the online survey..

Result

A total of 317 students participated in this study. The average Perceived Stress Scale (PSS) score among respondents was 19.25 ± 4.64, with scores ranging from 0 to 31. Based on PSS categorization, most students (87.4%) experienced moderate levels of stress, while 8.8% reported low stress, and only 3.8% fell within the high-stress category (Figure 1).



Chi-square analysis revealed a statistically significant association between gender and stress level ($\chi^2 = 9.99$, $df = 2$, $p = 0.0068$), suggesting that stress levels differed between male and female participants. Additionally, screen time ($\chi^2 = 34.58$, $df = 6$, $p < 0.00001$) and sleep duration ($\chi^2 = 31.31$, $df = 8$, $p = 0.00012$) were both significantly associated with stress level, indicating a strong relationship between behavioral patterns and perceived stress (Table 1).

Table 1: Chi-square Test Results				
Variables	Chi-square (χ^2)	df	p-value	Significance
Gender × Stress Level	9.99	2	0.0068	Significant
Screen Time × Stress Level	34.58	6	<0.00001	Highly Significant
Sleep Duration × Stress Level	31.31	8	0.00012	Highly Significant

Further comparison of group means using independent t-tests and ANOVA showed that mean PSS scores did not significantly differ between males and females ($t = 0.96$, $p = 0.336$). However, there were statistically significant differences in mean stress scores across different screen time categories ($F = 6.76$, $p = 0.0002$) and sleep duration categories ($F = 8.91$, $p < 0.00001$), confirming that both variables meaningfully influenced the degree of perceived stress (Table 2).

Table 2: Group Mean Comparison (t-test / ANOVA)				
Comparison	Test Type	Statistic	p-value	Significance
Gender × PSS Score	t-test	$t = 0.96$	0.336	Not Significant

Screen Time × PSS Score	ANOVA	F = 6.76	0.0002	Significant
Sleep Duration × PSS Score	ANOVA	F = 8.91	<0.0001	Significant

Pearson correlation analysis supported these findings. A moderate positive correlation was observed between screen time and PSS score ($r = 0.254$, $p = 0.0004$), indicating that higher screen time was associated with increased stress. Conversely, a negative correlation was observed between sleep duration and stress ($r = -0.180$, $p = 0.012$), suggesting that students who reported longer sleep durations tended to have lower stress scores (Table 3).

Table 3: Pearson Correlation Results				
Variables	Correlation (r)	p-value	Direction	Remark
Screen Time × PSS Score	0.254	0.0004	Positive	Significant
Sleep Duration × PSS Score	-0.180	0.012	Negative	Significant

Lastly, multivariate linear regression was conducted to assess the predictive power of screen time and sleep duration on perceived stress. The model was statistically significant ($F(2,190) = 8.70$, $p < 0.001$) and explained approximately 8.4% of the variance in stress scores ($R^2 = 0.084$). The results indicated that

screen time was a significant positive predictor of stress ($\beta = 1.01$, $p = 0.001$), while sleep duration was a significant negative predictor ($\beta = -0.69$, $p = 0.046$). This suggests that increased screen exposure and inadequate sleep independently contribute to higher levels of stress among public health students (Table 4).

Table 4: Multiple Linear Regression Analysis					
Predictor	β (Co-eff.)	SE	t-value	p-value	Remarks
Screen Time	1.01	0.31	3.26	0.001	Significant Predictor
Sleep Duration	-0.69	0.34	-2.01	0.046	Significant Predictor
Constant (Intercept)	18.14	1.42	12.75	<0.001	—

Discussion:

This study investigated how students participating in public health initiatives throughout Pakistan related to gender, screen time, sleep patterns, and felt stress. The results add to the expanding corpus of research highlighting the mental health issues that college students encounter, especially considering rising digital participation and changing lifestyle choices.

According to the findings, most students (87.4%) reported feeling moderately stressed. This aligns with earlier studies conducted in South Asia and Pakistan, where psychological distress is known to be exacerbated by financial worries, career uncertainty, and academic pressures. ⁴

Screen time was found to be a major factor linked to communication of stress account for this pattern. stress. Greater screen time was found to predict greater stress. Despite significance, the regression model explained stress scores using both categorical analysis and linear only 8.4% of stress level variance, suggesting other regression. These results are in line with global unmeasured factors like personality, academic load, research showing that extended use of digital devices, social support, and exercise also influence perceived particularly for nonacademic purposes, is linked to stress. Future research using longitudinal and mixed worse mental health outcomes. Digital methods could explore these factors further. This overstimulation, sleep disturbances, social comparison relatively low explanatory power indicates that other on social media, and decreased physical activity, all of psychosocial or lifestyle variables-such as personality which led to psychological stress could account for the traits, academic workload, physical activity, and social association.⁹ support-likely play substantial roles in determining

Similarly, there was a negative correlation between perceived stress.

stress levels and sleep length. Reiterating the preventive function of enough sleep for mental health, students who reported shorter sleep duration were more likely to report higher levels of stress. This confirms earlier findings that sleep problems, frequently made worse by late-night screen time, can impair emotional control and make people more susceptible to stress and anxiety.¹¹

The t-test revealed no significant difference in the mean PSS scores between male and female students, even though gender was substantially associated with stress level categories in the chisquare analysis. This may reflect differences in stress communication or classification. However, the pattern aligns with research showing female students using digital media heavily often report increased subjective stress and worse sleep quality.¹³ This apparent inconsistency between categorical and continuous analyses suggests that while stress classification may differ between genders, the overall mean stress intensity remains similar. Future studies could explore whether qualitative factors such as coping style or

Conclusion

The results of this study demonstrate how behavioral lifestyle characteristics, specifically screen usage and sleep duration, are significantly correlated with reported stress in Pakistani public health students. The high frequency of moderate stress highlights how urgent institutional initiatives to support students' mental health are needed. Effective interventions could include introducing stress management courses, encouraging digital health, and advocating for improved sleep hygiene. Although the title refers to broader patterns such as digital device usage and sleep schedule, this study operationalized these as screen time and sleep length to ensure quantitative consistency and reliability of responses. Institutions should also consider awareness campaigns promoting balanced device use, mindfulness training, and regular physical activity, as these practices have been shown to improve psychological resilience among university students. Furthermore, although there are gender differences in how stress is presented, they may be subtle and impacted

by societal factors. To lessen the strain on students' mental health, universities and public health organizations should take a comprehensive approach to student support services, including counseling, instruction in digital literacy, and flexible academic schedules.

This study concludes by highlighting how changing modifiable behaviors, including cutting back on needless screen time and promoting better sleep habits, can be a major step in improving the academic performance and general well-being of aspiring public health professionals.

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