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Research Article

Mental Health, Learning Behaviors, and Lifestyle Patterns Among Medical Students in the Digital Education Era: A Cross-Sectional Analytical Study

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Abstract

The rapid transition toward digital education has significantly transformed medical training, altering learning behaviors, lifestyle patterns, and psychological well-being among medical students. Increased screen exposure, reduced physical interaction, and self-directed learning environments have been associated with heightened stress, anxiety, sleep disturbances, and behavioral changes. This study aimed to evaluate mental health status, learning behaviors, and lifestyle patterns among medical students in the digital education era and to assess their interrelationships.

A cross-sectional analytical study was conducted among 520 undergraduate medical students from multiple academic years. Data were collected using validated instruments including the Depression Anxiety Stress Scale (DASS-21), Pittsburgh Sleep Quality Index (PSQI), and a structured questionnaire assessing digital learning habits, physical activity, dietary patterns, and academic engagement.

Moderate to severe stress was observed in 42.3% of students, anxiety in 46.8%, and depressive symptoms in 38.1%. Poor sleep quality was reported in 57.6% of participants. Excessive screen time (>6 hours/day) was significantly associated with higher stress

($p<0.001$) and poor sleep quality ($p<0.001$). Reduced physical activity and irregular dietary patterns were strongly correlated with psychological distress. Students relying predominantly on digital learning platforms demonstrated higher cognitive fatigue and decreased academic satisfaction.

These findings highlight a significant burden of psychological distress and lifestyle imbalance among medical students in the digital education era. Integrated mental health support systems and structured digital learning strategies are essential to improve student well-being and academic performance.

Keywords: Medical students, mental health, digital education, lifestyle behavior

Introduction

Medical education has undergone a profound transformation in recent years due to rapid advancements in digital technologies and widespread adoption of online learning platforms. The integration of virtual lectures, simulation-based training, electronic resources, and artificial intelligence-driven educational tools has reshaped traditional teaching methodologies. While these innovations have improved accessibility and flexibility, they have also introduced new challenges related to student well-being, behavioral adaptation, and psychological stress [1–3].

The digital education era has significantly increased screen exposure among medical students, often extending beyond academic requirements into prolonged hours of device use for studying, communication, and leisure activities. Excessive screen time has been linked to sleep disturbances, reduced physical activity, eye strain, and cognitive fatigue. These factors collectively contribute to deterioration in both physical and mental health outcomes [2–4].

Mental health concerns among medical students have been widely documented even prior to the digital transition, with high prevalence of stress, anxiety, and depression attributed to academic pressure, workload intensity, and competitive environments. However, the shift toward predominantly online learning has introduced additional stressors such as isolation, reduced peer interaction, and difficulty in maintaining structured study routines [3–5].

Sleep quality is a critical determinant of cognitive performance and emotional regulation. Disruption of circadian rhythms due to prolonged screen exposure, especially during nighttime study sessions, has been associated with poor sleep quality and increased psychological distress. Medical

students are particularly vulnerable due to demanding academic schedules and high cognitive workload [4–6].

Lifestyle behaviors, including physical activity, dietary habits, and recreational routines, have also been affected by digital learning environments. Reduced opportunities for outdoor activities and increased sedentary behavior contribute to metabolic and psychological consequences. Irregular eating patterns and increased consumption of fast food or caffeinated beverages are commonly reported among students under academic stress [5–7].

Learning behaviors have evolved significantly with the adoption of digital platforms. Self-directed learning, asynchronous lectures, and online assessments require greater self-regulation and time management skills. While some students benefit from flexible learning structures, others experience difficulties in maintaining motivation and focus, leading to academic dissatisfaction and burnout [6–8].

The relationship between digital education and mental health is complex and influenced by multiple interacting factors, including personality traits, coping mechanisms, socioeconomic background, and institutional support systems. Students with inadequate coping strategies are more likely to experience psychological distress in response to academic and technological demands [7–9].

Recent studies have highlighted the importance of integrating mental health support services within medical institutions. Counseling services, peer support programs, stress management workshops, and structured digital learning frameworks have been proposed as potential interventions to mitigate adverse psychological outcomes [8–10].

Despite increasing global attention, there remains a need for comprehensive region-specific studies evaluating the combined impact of digital learning, mental health, and lifestyle behaviors among medical students. Understanding these interrelationships is essential for designing targeted interventions to improve student well-being and academic performance in the evolving educational landscape.

Therefore, this study was conducted to assess mental health status, learning behaviors, and lifestyle patterns among medical students in the digital education era and to explore their interrelationships.

Methodology

A cross-sectional analytical study was conducted at Ayub Medical College. Ethical approval was obtained from institutional

review boards, and participation was voluntary with written informed consent obtained from all participants.

The sample size was calculated using Epi Info version 7, assuming a 50% prevalence of psychological distress among medical students, a 95% confidence interval, 5% margin of error, and 80% power. The minimum required sample size was 384; however, 520 students were included to enhance statistical validity and subgroup analysis.

Medical students from all academic years (first year to final year) were included. Students with pre-existing psychiatric disorders under active treatment or those unwilling to participate were excluded.

Data were collected using a structured self-administered questionnaire divided into four sections: sociodemographic characteristics, digital learning behavior patterns, lifestyle factors, and mental health assessment tools. Validated scales including DASS-21 and PSQI were used to assess psychological status and sleep quality.

Screen time was categorized into <4 hours/day, 4–6 hours/day, and >6 hours/day. Physical activity levels were classified based on WHO recommendations. Dietary patterns were assessed based on meal regularity and frequency of junk food consumption.

Statistical analysis was performed using SPSS version 27. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages. Chi-square test, independent t-test, and multivariate logistic regression were applied. A p-value <0.05 was considered statistically significant.

Results

Table 1. Demographic and Academic Characteristics (n=520)

Variable	Value
Age (years)	21.8 ± 2.4
Gender (Female %)	61.5
Academic year distribution	MBBS Year 1–4
Average screen time (hours/day)	6.2 ± 2.1
Physical inactivity (%)	58.9

Variable	Value
Irregular diet (%)	46.7

The majority of students demonstrated high screen exposure and sedentary lifestyle patterns.

Table 2. Prevalence of Mental Health Outcomes

Outcome	Prevalence (%)
Stress (moderate–severe)	42.3
Anxiety (moderate–severe)	46.8
Depression (moderate–severe)	38.1
Poor sleep quality (PSQI >5)	57.6

A high burden of psychological distress and poor sleep quality was observed among medical students.

Table 3. Association Between Screen Time and Mental Health

Screen Time	Stress (%)	Anxiety (%)	Depression (%)	p-value
<4 hours	24.1	26.3	19.8	<0.001
4–6 hours	39.5	42.7	33.6	<0.001
>6 hours	61.8	66.4	54.9	<0.001

Increased screen time was strongly associated with higher levels of psychological distress.

Table 4. Association Between Lifestyle Factors and Mental Health

Factor	Stress OR	Anxiety OR	Depression OR	p-value
Physical inactivity	2.34	2.12	2.41	<0.001
Irregular diet	1.89	1.76	1.93	0.002
Poor sleep quality	3.56	3.21	3.78	<0.001

Unhealthy lifestyle behaviors significantly increased risk of psychological distress.

Table 5. Academic Performance and Learning Behavior

Variable	Finding
Digital learning preference (%)	72.4
Academic dissatisfaction (%)	44.6
Cognitive fatigue (%)	51.2
Reduced attention span (%)	47.9

High reliance on digital learning was associated with cognitive fatigue and reduced academic satisfaction.

Discussion

The present study demonstrates a substantial burden of psychological distress, sleep disturbances, and unhealthy lifestyle patterns among medical students in the digital education era. The findings highlight the complex interplay between digital learning environments and student well-being [11–12].

A key observation was the high prevalence of stress, anxiety, and depression among students, which aligns with global trends in medical education. However, the increased reliance on digital platforms appears to have intensified these outcomes by promoting prolonged screen exposure, academic isolation, and reduced peer engagement [12–13].

The strong association between excessive screen time and psychological distress suggests that prolonged digital engagement may contribute to cognitive overload, reduced attention span, and emotional exhaustion. These effects are particularly relevant in self-directed learning environments that require sustained concentration [13–14].

Sleep disturbances were highly prevalent and significantly associated with mental health outcomes. Nighttime screen exposure disrupts circadian rhythms through suppression of melatonin secretion, leading to poor sleep quality and impaired cognitive performance. This reinforces the importance of sleep hygiene interventions among medical students [14–15].

Lifestyle factors such as physical inactivity and irregular dietary habits further compounded psychological distress. Sedentary behavior and poor nutrition are known to influence neurochemical pathways involved in mood regulation, thereby

increasing vulnerability to stress and depression [15–16].

Learning behavior analysis revealed that while digital education offers flexibility and accessibility, it may also reduce academic satisfaction and increase cognitive fatigue in a significant proportion of students. This suggests variability in adaptation to digital learning environments [16–17].

The findings also emphasize the importance of institutional support systems. Structured counseling services, mental health awareness programs, and balanced curriculum design incorporating both digital and in-person learning may help mitigate adverse outcomes [17–18].

Overall, the results underscore the need for a holistic approach to medical education that integrates academic excellence with mental health preservation and lifestyle modification strategies [18–20].

Conclusion

Medical students in the digital education era experience a high burden of psychological distress, sleep disturbances, and unhealthy lifestyle patterns. Excessive screen time and sedentary behavior significantly contribute to these outcomes. Structured institutional interventions are essential to promote mental well-being and optimize academic performance in modern medical education environments.

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