

**Association between Internet Addiction and Sleep Quality among Medical Students**Sneha Mudgal<sup>1</sup>, Raghuveer Choudhary<sup>2</sup>, Omprakash Dudi<sup>3</sup><sup>1</sup>MBBS, MD Physiology, Senior Resident, Physiology, Dr SNMC, Jodhpur, Rajasthan, India<sup>2</sup>MBBS, MD physiology, Senior Professor, Physiology, Dr SNMC, Jodhpur, Rajasthan, India<sup>3</sup>MBBS, MD Psychiatry, Junior Specialist, DH, Barmer, Rajasthan, India

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**Abstract:**

**Background:** Internet addiction has emerged as a significant behavioral health concern among medical students due to increasing dependence on digital technology for academic and social activities. Excessive internet use may adversely affect sleep quality and psychological well-being. This study aimed to assess the association between internet addiction and sleep quality among medical students.

**Methods:** A cross-sectional observational study was conducted among 150 MBBS students at Dr. S.N. Medical College. Participants aged 18–24 years who had been using mobile internet for more than one year were included. Data were collected using a pre-structured questionnaire along with standardized assessment tools: Young's Internet Addiction Test (IAT), Pittsburgh Sleep Quality Index (PSQI), and Depression Anxiety Stress Scale-21 (DASS-21). Statistical analysis was performed using appropriate tests, and a p-value <0.05 was considered statistically significant.

**Results:** The mean age of participants was 20.30 years. The prevalence of internet addiction was 13.33%, while 31.33% were classified as internet over-users. Poor sleep quality was observed in 50.7% of participants. A significant positive correlation was found between internet addiction and depression ( $r=0.565$ ), anxiety ( $r=0.509$ ), stress ( $r=0.549$ ), and poor sleep quality measured by PSQI ( $r=0.484$ ), with all p-values <0.0001. Male students demonstrated significantly higher IAT and PSQI scores compared to females. Night-time internet use and prolonged internet exposure (>6 hours/day) were highly prevalent.

**Conclusion:** Internet addiction is significantly associated with poor sleep quality and psychological distress among medical students. Early identification, sleep hygiene education, and promotion of healthy internet usage practices are essential to improve mental well-being and academic performance.

**Keywords:** Internet addiction; Sleep quality; Medical students; PSQI; Psychological distress.

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**Introduction**

The internet has revolutionized modern life by transforming communication, education, healthcare, and social interaction into a globally interconnected system. Initially developed for research and information exchange, the internet has now become an indispensable component of daily life [1]. In the field of education, especially medical education, the internet plays a critical role in academic learning, research activities, communication, and access to scientific resources. The rapid advancement of digital technology and widespread availability of smartphones, laptops, and wireless internet have substantially increased internet usage among students worldwide.

Medical students constitute one of the major groups dependent on internet-based resources because of their demanding academic curriculum and

continuous need for updated medical information. The internet offers several educational advantages such as access to e-books, online journals, virtual lectures, educational videos, and communication with peers and faculty members. However, excessive and uncontrolled use of the internet may result in problematic internet use or internet addiction. Internet addiction (IA) is defined as the inability to control excessive internet use, accompanied by preoccupation with online activities, withdrawal symptoms when offline, mood changes, irritability, and impairment in social, academic, and psychological functioning.

Globally, internet use has increased dramatically over the past two decades. India has emerged as one of the largest internet-using countries in the world due to increasing smartphone penetration and

affordable internet services. Young adults and college students are among the most active internet users. Studies have reported a growing prevalence of internet addiction among university and medical students, making it an important public health concern. Excessive internet use has been associated with poor academic performance, social isolation, reduced physical activity, anxiety, depression, stress, fatigue, and sleep disturbances [2].

Sleep is a fundamental biological necessity essential for physical health, emotional well-being, cognitive functioning, memory consolidation, and learning. Good sleep quality is necessary for optimal academic performance and mental health among medical students, who often experience demanding schedules, examinations, and psychological stress. Sleep quality includes various dimensions such as sleep duration, sleep latency, sleep efficiency, sleep disturbances, daytime dysfunction, and subjective satisfaction with sleep. Poor sleep quality may adversely affect concentration, mood, learning ability, immunity, and overall quality of life [3].

Recent evidence suggests a strong association between excessive internet use and poor sleep quality. Prolonged screen exposure, particularly during nighttime, may suppress melatonin secretion, disturb circadian rhythms, delay sleep onset, and reduce total sleep duration. Students with internet addiction often spend prolonged hours on social networking sites, online gaming, streaming platforms, and other digital activities, resulting in late-night internet use and inadequate sleep [4]. Additionally, excessive internet use may increase psychological arousal, anxiety, and stress, which further contribute to sleep disturbances.

Medical students are particularly vulnerable to internet addiction and sleep problems because of academic pressure, easy access to internet-enabled devices, hostel living, and frequent dependence on online educational resources. Several studies conducted among medical students have demonstrated a significant association between internet addiction and poor sleep quality [5]. Research findings have also shown that students with higher levels of internet addiction are more likely to experience insomnia, daytime sleepiness, fatigue, impaired academic performance, and psychological distress.

Despite increasing concern regarding internet addiction and sleep disturbances, limited data are available from India, especially among medical students [6]. Understanding the relationship between internet addiction and sleep quality is important for developing preventive strategies, promoting healthy internet usage habits, and improving the physical and psychological well-being of future healthcare professionals [7].

Therefore, the present study titled “Association between Internet Addiction and Sleep Quality among Medical Students” was undertaken to evaluate the association between internet addiction and sleep quality among medical students and to highlight the importance of healthy internet practices for maintaining adequate sleep and overall well-being.

### Materials and Methodology

**Study Area:** The study was conducted in the Department of Physiology, Dr. S.N. Medical College, Jodhpur, Rajasthan.

**Study Design:** The present study was a cross-sectional observational study.

**Study Period:** The study was conducted over a period of one year after obtaining approval from the Institutional Ethics Committee, including sample collection, data analysis, and preparation of the final report.

**Study Population:** The study population comprised MBBS students of the 2021 batch who had been using mobile internet for one year or more.

**Sample Size:** The sample size was calculated at 95% confidence interval with 20% relative allowable error using the formula for estimation of a single sample proportion.

$N$  = Standard normal deviate for 95% confidence interval (1.96)

$P$  = Expected proportion of internet addiction among medical students in Jodhpur, Rajasthan (44% as reported by Jain et al.)

$E$  = Relative allowable error taken as 20% of  $P$

The calculated sample size was 122 students, which was rounded up to 150 subjects to improve the reliability of the study.

### Inclusion Criteria:

1. Medical students aged 18–24 years.
2. Both male and female students.
3. Students who had passed first year and entered second year MBBS.
4. Students using mobile internet for one year or more.

### Exclusion Criteria:

1. Students suffering from chronic diseases.
2. Students previously diagnosed with depression, anxiety, stress, or sleep disorders.
3. Students taking medications for psychiatric illness or sleep disorders.

### Methodology

The study was conducted after obtaining approval from the Institutional Ethics Committee of Dr. S.N. Medical College, Jodhpur. Written informed

consent was obtained from all participants before enrollment in the study.

Data were collected using a pre-structured questionnaire in English language. The questionnaire included socio-demographic details such as age, gender, residence (hostel/home), duration of internet usage (<6 hours/day or >6 hours/day), purpose of internet usage (emails, social media, education, or both), time of internet use (daytime or nighttime), and academic performance.

Three standardized self-administered questionnaires were used for data collection:

- 1. Young's Internet Addiction Test (IAT):** Young's Internet Addiction Test developed by Dr. Kimberly Young was used to assess internet addiction among medical students. The test consists of 20 items evaluating the extent of internet use and its impact on daily activities, academic performance, social life, and emotional behavior. Responses were recorded on a Likert scale, and the total score categorized participants into different levels of internet addiction.
- 2. Depression Anxiety Stress Scale-21 (DASS-21):** The Depression Anxiety Stress Scale-21

was used to assess symptoms of depression, anxiety, and stress among the participants. The scale contains 21 items divided into three subscales with seven items each for depression, anxiety, and stress. Scores were interpreted according to standard scoring guidelines.

- 3. Pittsburgh Sleep Quality Index (PSQI):** The Pittsburgh Sleep Quality Index was used to assess sleep quality among the participants. The PSQI evaluates subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the previous month. A global PSQI score was calculated, with higher scores indicating poorer sleep quality.

**Statistical Analysis:** The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Quantitative variables were expressed as mean  $\pm$  standard deviation, while qualitative variables were expressed as percentages and proportions. Association between internet addiction and sleep quality was analyzed using suitable statistical tests. A p-value of less than 0.05 was considered statistically significant.

### Observations and Results

**Table 1: Association between Internet Addiction and Sleep Quality among Medical Students**

Variable	Observation
Total participants	150
Mean age	20.30 years
Mean IAT score	47.95
Mean PSQI score	6.02
Internet addiction prevalence	13.33%
Internet overuse prevalence	31.33%
Poor sleep quality prevalence	50.7%
Participants using internet >6 hrs/day	76%
Night-time internet use	84%
Hostel residents	77.3%

Table 1 summarizes the baseline demographic and behavioral characteristics of the study participants. A total of 150 medical students participated in the study, with a mean age of 20.30 years, indicating that the majority of participants belonged to early adulthood. The mean Internet Addiction Test (IAT) score was 47.95, suggesting moderate internet use among the participants, while the mean Pittsburgh Sleep Quality Index (PSQI) score was 6.02, indicating overall poor sleep quality in the study population. The prevalence of internet addiction was observed in 13.33% of participants, whereas 31.33%

demonstrated internet overuse behavior. Poor sleep quality was reported in 50.7% of the students, reflecting a substantial burden of sleep disturbances among medical students. A large proportion of participants used the internet for more than 6 hours daily (76%), and night-time internet use was reported by 84% of students, which may contribute to sleep impairment. Hostel residents constituted 77.3% of the study population, highlighting the predominance of hostel living among medical students and its possible influence on internet usage patterns and sleep habits.

**Table 2: Distribution of Internet Addiction Grades**

IAT Grade	Percentage
Normal	1.3%
Average User	54.0%
Over User	31.3%
Internet Addict	13.3%

Table 2 demonstrates the distribution of participants according to grades of internet addiction based on IAT scoring. Only 1.3% of participants were categorized as normal internet users, while the majority (54%) were classified as average users. A considerable proportion of students (31.3%) were identified as over-users, indicating excessive but not

addictive internet usage. Importantly, 13.3% of participants fulfilled the criteria for internet addiction. These findings suggest that problematic internet use is highly prevalent among medical students and may represent a growing behavioral health concern requiring early intervention and awareness programs.

**Table 3: Sleep Quality among Participants**

Sleep Quality	Percentage
Good Sleep	49.3%
Poor Sleep	50.7%

Table 3 presents the distribution of sleep quality among study participants. Nearly half of the students (49.3%) reported good sleep quality, whereas a slightly higher proportion (50.7%) demonstrated poor sleep quality according to PSQI scoring. This indicates that sleep disturbances are highly prevalent

among medical students, potentially due to academic stress, irregular schedules, and excessive internet use. The high prevalence of poor sleep quality underscores the need for sleep hygiene education and mental health support within medical institutions.

**Table 4: Correlation between Internet Addiction and Psychological Variables**

Variable	Correlation Coefficient (r)	P-value
Depression	0.565	<0.0001
Anxiety	0.509	<0.0001
Stress	0.549	<0.0001
PSQI	0.484	<0.0001

Table 4 highlights the correlation between internet addiction and psychological parameters including depression, anxiety, stress, and sleep quality. Internet addiction showed a significant positive correlation with depression ( $r = 0.565$ ), anxiety ( $r = 0.509$ ), stress ( $r = 0.549$ ), and PSQI score ( $r = 0.484$ ). All correlations were statistically highly significant with p-values less than 0.0001. These findings indicate that higher internet addiction scores are

associated with increased psychological distress and poorer sleep quality. The strongest correlation was observed with depression, suggesting that excessive internet use may have a profound impact on emotional well-being. The positive association with PSQI further confirms that internet addiction contributes significantly to sleep disturbances among medical students.

**Table 5: Mean Scores according to Gender**

Variable	Male Mean	Female Mean	P-value
IAT Score	53.03	42.88	0.0017
Depression	14.99	10.69	0.0029
Anxiety	11.81	9.17	0.011
Stress	15.33	11.49	0.0042
PSQI Score	6.8	5.24	0.0017

Table 5 compares the mean scores of internet addiction, depression, anxiety, stress, and sleep quality between male and female participants. Male students demonstrated significantly higher mean IAT scores (53.03) compared to females (42.88), indicating greater internet use among males. Similarly, male participants showed higher mean

depression, anxiety, and stress scores than female participants. The PSQI score was also significantly higher among males (6.8 versus 5.24), suggesting poorer sleep quality in male students. All observed differences were statistically significant with p-values below 0.05. These findings imply that male medical students may be more vulnerable to

problematic internet use, psychological distress, and sleep disturbances.

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### Distribution of Internet Addiction Grades

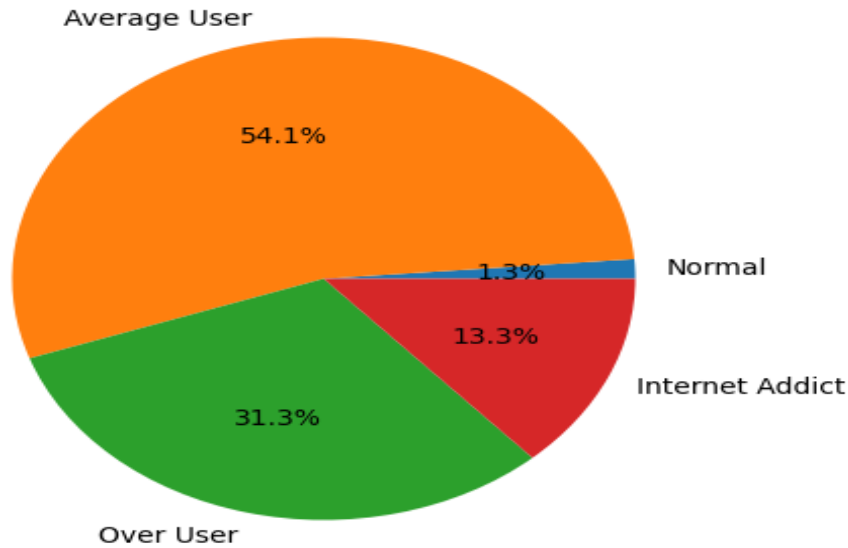


Figure 1: Distribution of Internet Addiction Grades

Figure 1 graphically illustrates the distribution of internet addiction grades among participants. The figure clearly demonstrates that the majority of students were average users, while a substantial proportion were over-users or internet addicts. The

graphical representation emphasizes the burden of excessive internet usage among medical students and allows easy visualization of the progression from normal usage to addiction.

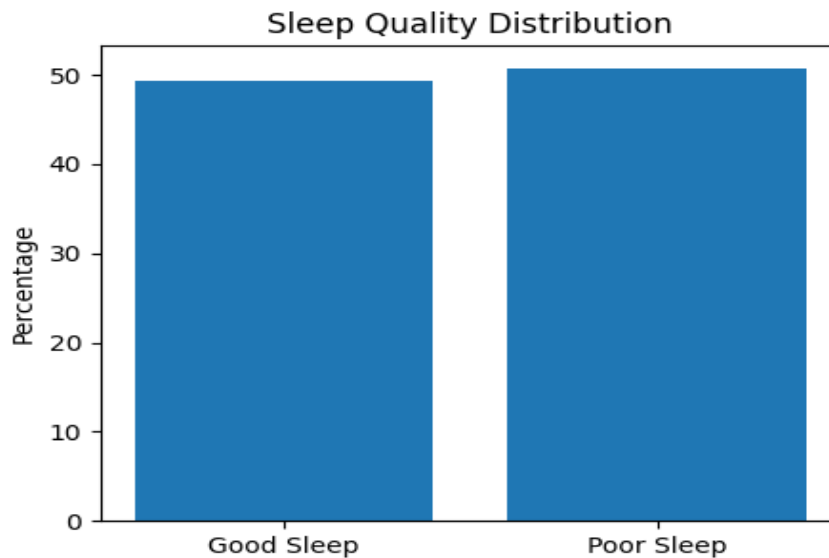


Figure 2: Sleep Quality Distribution

Figure 2 depicts the proportion of participants with good and poor sleep quality. The graph demonstrates that poor sleep quality was slightly more prevalent than good sleep quality. This finding highlights the

widespread occurrence of sleep disturbances among medical students and supports the need for interventions targeting sleep hygiene and healthy lifestyle practices.

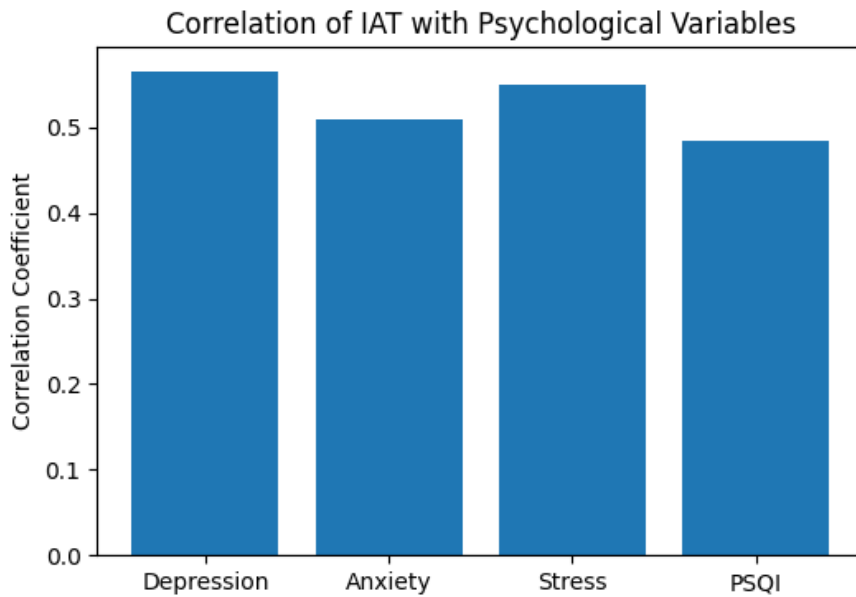


Figure 3: Correlation between IAT and Psychological Variables

Figure 3 demonstrates the positive correlation between internet addiction scores and psychological variables such as depression, anxiety, stress, and sleep quality scores. The graphical trend indicates that as internet addiction severity increases,

psychological distress and sleep disturbances also increase proportionately. This figure provides strong visual evidence supporting the relationship between problematic internet use and adverse mental health outcomes.

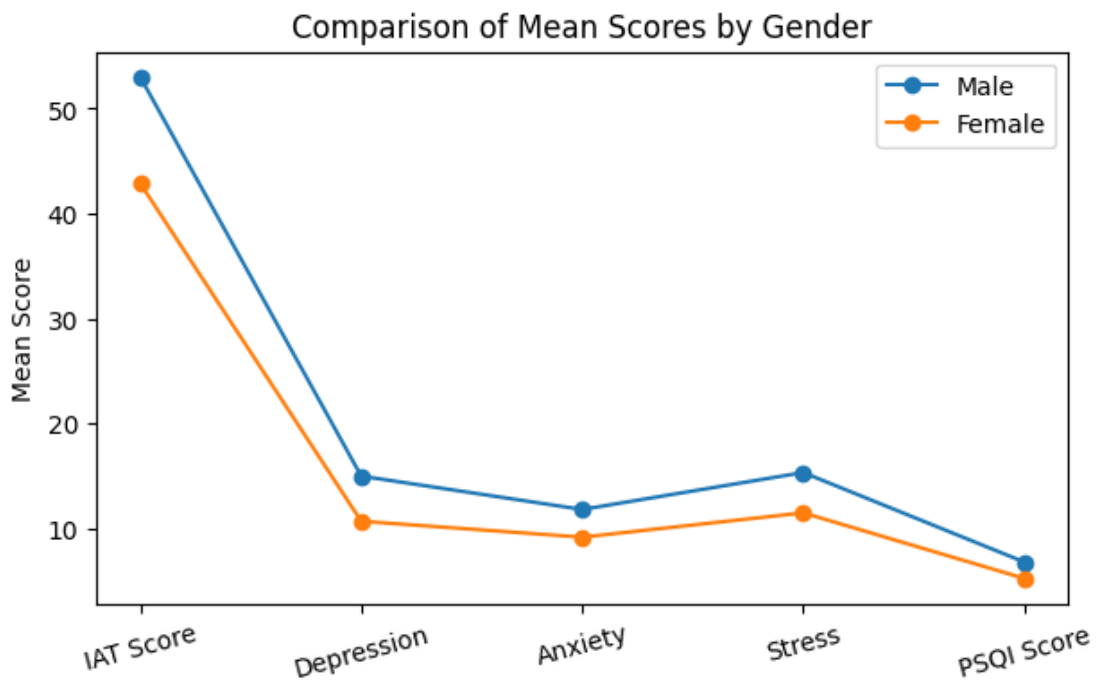


Figure 4: Comparison of Mean Scores by Gender

Figure 4 compares the mean scores of internet addiction, depression, anxiety, stress, and PSQI

between male and female students. The graphical representation demonstrates consistently higher

mean scores among male participants across all variables. The figure effectively highlights gender-based differences in internet addiction and associated psychological consequences, indicating the greater vulnerability of male students to these issues.

The study demonstrated a significant association between internet addiction and poor sleep quality among medical students. Students with higher internet addiction scores had significantly higher PSQI scores, indicating poorer sleep quality. Internet addiction was positively correlated with depression, anxiety, stress, and poor sleep quality. Male students and hostel residents showed comparatively higher mean scores for internet addiction and sleep disturbances. The prevalence of internet addiction was 13.33%, while 50.7% of participants had poor sleep quality.

## Discussion

**Association between Internet Addiction and Sleep Quality among Medical Students:** The present study explored the association between internet addiction and sleep quality among medical students. Medical education is recognized as academically demanding, and students are increasingly dependent on the internet for academic activities, communication, entertainment, and social networking [8]. Excessive internet usage, however, may negatively affect sleep quality and psychological well-being. The findings of the present study highlighted a significant relationship between internet addiction and poor sleep quality among medical students.

**Prevalence of Internet Addiction:** The study demonstrated that a considerable proportion of medical students showed features of problematic internet use. Approximately 13.33% of participants were categorized as internet addicts, while 31.33% were classified as over-users. This suggests that excessive internet use is increasingly common among medical students [9]. Similar findings have been reported in previous studies conducted among medical and university students globally, where academic stress, easy smartphone accessibility, and social media usage contributed significantly to internet addiction. The prevalence observed in this study may be attributed to the extensive use of online educational resources, prolonged screen exposure, and increased reliance on digital communication among students [10].

**Sleep Quality among Medical Students:** The present study found that nearly half of the participants experienced poor sleep quality, as indicated by elevated Pittsburgh Sleep Quality Index (PSQI) scores. Medical students often experience irregular sleep patterns due to academic workload, clinical duties, examination stress, and late-night

internet use [11]. The prevalence of poor sleep quality in this study was comparable to findings reported in previous research conducted among healthcare students. Sleep deprivation and poor sleep quality may impair concentration, memory, learning efficiency, and emotional regulation, which can adversely affect academic performance and mental health [12].

**Association between Internet Addiction and Sleep Quality:** One of the major findings of the study was the statistically significant positive association between internet addiction and poor sleep quality. Students with higher internet addiction scores were found to have significantly higher PSQI scores, indicating poorer sleep quality. Excessive internet use, particularly during night hours, may delay sleep onset, reduce total sleep duration, and disturb circadian rhythms. Exposure to blue light emitted from electronic devices can suppress melatonin secretion, thereby affecting normal sleep physiology. Additionally, psychological stimulation associated with online gaming, social media interactions, and continuous internet browsing may contribute to difficulty initiating and maintaining sleep [13].

**Psychological Correlates:** The study also demonstrated significant positive correlations between internet addiction and depression, anxiety, and stress scores. Students with problematic internet use tended to report higher levels of psychological distress. This finding supports earlier studies that identified excessive internet usage as both a coping mechanism and a contributing factor for mental health problems. Increased online engagement may lead to social isolation, reduced physical activity, academic neglect, and emotional disturbances, which collectively worsen psychological well-being [14].

**Gender Differences:** Male students were found to have significantly higher mean internet addiction scores and poorer sleep quality compared to female students. This finding may be explained by greater involvement of male students in online gaming, video streaming, and prolonged internet engagement. Similar gender differences have been documented in previous studies. However, some studies have reported no significant gender variation, suggesting that internet addiction patterns may vary according to sociocultural and environmental factors [15].

**Hostel Residence and Internet Use:** Hostel residents demonstrated comparatively higher internet addiction scores and poorer sleep quality than day scholars. Hostel environments may provide greater independence, late-night internet access, peer influence, and reduced parental supervision, thereby encouraging prolonged online activities.

Irregular sleep schedules among hostel students may further aggravate sleep disturbances.

The findings of the present study are consistent with previous national and international research that reported a significant relationship between excessive internet use and poor sleep quality among adolescents and university students. Several studies have shown that internet addiction contributes to delayed bedtime, reduced sleep efficiency, daytime sleepiness, and impaired academic performance. The positive correlation observed between internet addiction and psychological distress in this study further supports the growing evidence regarding the negative psychosocial impact of excessive internet use.

**Possible Mechanisms:** Multiple biological and behavioral mechanisms may explain the association between internet addiction and poor sleep quality. Prolonged screen exposure during night hours suppresses melatonin release and disrupts circadian rhythms. In addition, excessive internet use may increase cognitive and emotional arousal, delaying relaxation and sleep initiation. Internet addiction may also reduce time allocated for physical activity and healthy sleep routines. Furthermore, dependence on social networking platforms and online entertainment may encourage compulsive late-night usage behaviors.

**Public Health Implications:** The findings of this study have important public health implications. Poor sleep quality and internet addiction can negatively influence academic achievement, emotional health, professional performance, and quality of life among medical students. Early identification of problematic internet use and sleep disturbances is essential. Educational institutions should implement awareness programs regarding healthy internet practices, sleep hygiene, stress management, and mental health support services. Counseling and behavioral interventions may help students develop healthier digital habits and improve sleep quality.

**Strengths and Limitations:** The study included standardized assessment tools such as the Internet Addiction Test (IAT) and Pittsburgh Sleep Quality Index (PSQI), which enhanced the reliability of the findings. However, certain limitations should be acknowledged. The cross-sectional study design limits the ability to establish causal relationships between internet addiction and sleep quality. Self-reported data may also introduce recall bias and response bias. The study was conducted among medical students from a single institution, which may limit generalizability to other populations.

Overall, the study demonstrated a significant association between internet addiction and poor sleep quality among medical students. Excessive

internet use was also associated with increased depression, anxiety, and stress levels. These findings emphasize the need for early preventive strategies, mental health support, and awareness regarding responsible internet use and healthy sleep practices among medical students.

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