

Prevalence of Internet Addiction and Its Association with Psychological Disorders Among Medical Students in Saudi Arabia

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Background: Internet addiction is increasing worldwide. Internet addiction (IA) refers to excessive Internet usage in an uncontrolled and time-consuming manner, causing loss of time and disruption of daily life. However, the prevalence of IA may vary according to age, sex, and ethnicity, and is more prevalent among college students. There is a strong link between problematic Internet usage and an increased risk of developing Post Traumatic Stress Disorder PTSD and depression symptoms. Medical students were chosen for this study due to their unique stressors, including rigorous academic demands, extensive study hours, and clinical practice requirements. It is critical to address behavioral addictions and their psychological effects in this group, as they are linked to the future quality of healthcare provision compared with their non-medical peers.

Objective: To estimate the prevalence of Problematic Internet Use (PIU) in medical students and explore their correlation with the medical students' PTSD and Patient Health Questionnaire –9 (PHQ9) scores.

Methods: A cross-sectional online survey was conducted including 506 medical students in the second year of medical school up to internship year at Imam Abdulrahman bin Faisal University (IAU) between June 2021 and January 2022. The questionnaire consisted of consent forms, sociodemographic data, and screening tools for PTSD, the GPIU, and PHQ-9.

Results: The prevalence of problematic internet usage (PIU) was 30.6% in the sample group. Students with moderate-to-moderately severe PTSD were 1.7 times more likely to have PIU OR (95% CI): 1.7 (1.091, 2.879). Students with moderate to severe depression were 2.2 times more likely to have PIU OR (95% CI); 2.2 (1.333, 3.950). Having a Saudi nationality, lower income, and being single was significantly associated with PIU.

Conclusion: Single Saudi medical students with lower income are at risk of developing more problematic internet use. Especially those who score moderate to high on PTSD and PHQ-9 scales.

Keywords: university students, academic performance, internet addiction, mental health

Introduction

Behavioral addiction is a repetitive, compulsive, and persistent behavior that can lead to functional impairment or distress.¹ Kleptomania, pathological gambling pyromania, compulsive sexual behaviors, compulsive buying, and Internet addiction are all considered behavioural addictions.² There has been a noticeable change in the prevalence of addiction worldwide. A systematic review in 2022 showed that food addiction would increase from 16.2% to 21%, shopping addiction from 4.9% to 7.2%, and Internet addiction from 6.0% to 10.6%.³

Internet addiction (IA) refers to excessive Internet usage in an uncontrolled and time-consuming manner, causing loss of time and disruption of daily life.⁴ Internet addiction has dramatically increased among young adults and college

students, with rates of 27.7% for Internet abuse and 38% for Internet addiction range.⁵ IA prevalence may vary according to age, sex, and ethnicity, and is more prevalent among college students.^{6,7}

A cross-sectional study in 2018 conducted at Ayub Medical College in Abbottabad, Pakistan, showed that the overall prevalence of Internet addiction among medical and dental students was 7.9%.⁸ A meta-analysis of IA among medical students concluded that the prevalence of IA was approximately five times higher than that in the general population.^{9,10}

Extensive Internet usage has been associated with poor sleep quality, impulsivity, decreased physical activity, mood disorders, low self-esteem, suicide, migraine, back pain, and obesity.⁶ In addition, there is a strong link between problematic Internet usage and an increased risk of developing Post Traumatic Stress Disorder PTSD, depression, and anxiety symptoms.¹¹ As a result of the link between mental illness and IA, it is crucial to determine the risk factors that mediate Internet addiction among college students, specifically medical students, due to the heavy stress they encounter.⁶

Internet addiction is rapidly increasing among adolescents and young adults in Saudi Arabia.¹² Its prevalence ranged from 4% to 6% in 2014–2015 and 30% to 60% in 2019.¹² Notably, rates have increased with Internet coverage, as more than 90% of the population now has access to the Internet.¹² The rate of Internet addiction among university students in a study in Saudi Arabia was 42.5%.¹³ Another study conducted on medical students at Qassim University revealed that 12.4% were addicted to the Internet, and 57.9% had the potential to become addicted.¹⁴ Another Saudi Arabian study of medical students revealed that around 6% were categorized as Internet addicts, with 42% having occasional problems.¹⁵

An Egyptian study found that 48.6% of female students were classified as average Internet users. Nevertheless, 49.5% and 1.9% of students developed moderate or severe addiction, respectively.¹⁶ Among medical students, it is critical to address behavioral addiction and its psychological effects. This is especially important because it has been linked to the future quality of healthcare provision.¹⁷

This study aimed to measure the prevalence of Internet addiction among medical students using validated questionnaires while assessing psychological distress disorders, namely, post-traumatic stress disorder and depression.

Methods

Study Design

A cross-sectional online survey of medical students between the second and sixth years of medical school and interns was conducted at Imam Abdulrahman bin Faisal University (IAU) between June 2021 and January 2022.

Recruitment and Setting

The medical students were approached by team leaders at each academic year. The participants were instructed to distribute the survey. IAU is a university located in the eastern province of Saudi Arabia. Class representatives distributed an electronics-based questionnaire to all the students of the College of Medicine at IAU through WhatsApp. The initial distribution by the class representatives ensured that all students had an equal opportunity to participate and were informed about the purpose of the study. The selection did not focus on a specific group, such as gender or grade. Once the link was shared, students voluntarily consented to participate before joining the study.

Sampling and Sample Size

A minimum of 506 students were required to fulfill a margin of error of less than 5% and a 95% confidence level. The numbers were calculated using the Epi Info online sample size calculator with the following statistical formula: $[n = Z^2 \times P(1-P)/d^2]$.

Data Collection Plan, Technique, and Tools

Using three validated questionnaires, we conducted a cross-sectional survey of medical students at Imam Abdulrahman Bin Faisal University. We assessed Internet addiction with the Generalized Problematic Internet Use Scale 2 (GPIUS2). The overall reliability of the composite GPIUS2 (where all 15 scale items are included) was $\alpha = 0.91$.¹⁸ PTSD was assessed using the Posttraumatic Stress Disorder (PTSD) Checklist-Civilian Version with high internal consistency, a Cronbach's alpha of 0.96 for the total scale.¹⁹ Depression was assessed with the Patient Health Questionnaire (PHQ-9)

for Brief Depression Severity Measure, The PHQ-9 has demonstrated high internal consistency, with Cronbach's alpha coefficients typically ranging from 0.86 to 0.89.²⁰ In addition, we examined how these combined effects affected academic performance by asking students about their GPA. The questionnaire consisted of consent forms, sociodemographic data, PTSD, the GPIU, and the PHQ-9.^{18–20}

Data Management

Missing Data and Outliers Examination

Missing data were examined by assessing the completeness of responses for each questionnaire item, and participants with incomplete responses were excluded from relevant analyses.

Outliers were identified through visual inspection of box plots and descriptive statistics (mean, median, standard deviation). Each outlier was carefully reviewed, and appropriate action was taken accordingly.

Normality Assessment

The normality of continuous variables (GPIUS2 scores, PTSD scores, PHQ-9 scores) was assessed using the Shapiro–Wilk test and visual inspection of histograms. Skewness and kurtosis were also examined to understand the distribution shape. Variables not meeting the assumption of normality were analyzed using appropriate non-parametric tests (eg, Mann–Whitney *U*-test).

Data Processing and Analysis

Data were collected in Excel and analyzed using SPSS software version 21. Nominal variables were summarized using proportions and expressed as frequencies and percentages. Statistical differences between proportions were tested using the Chi-square test. Bivariate analysis using binary logistic regression was performed to examine the association between the PIU scores and other scales, namely the PHQ-9 and PTSD. Results were considered to be statistically significant if ($p \leq 0.05$).

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of Imam Abdulrahman Bin Faisal University (IAU). The IRB number was obtained after an earlier IRB (IRB-2021-01-325), followed by IRB number (IRB-2023-01-424). The study was performed following the 1964 Helsinki Declaration and its later amendments.

Results

The final study sample included for the statistical analysis comprised of 506 medical students. Of the respondents, 60% were female ($n=302$, 59.7%). Most respondents were aged between 21 and 24 years old ($n=404$, 79.8%) and most were of Saudi nationality ($n=495$, 97.8%). A detailed description of the study sample is presented in [Table 1](#).

Table 1 Demographic Variables.

Variables	N	%
Gender		
Females	302	59.7
Males	204	40.3
Age		
17–20	89	17.6
21–24	404	79.8
25 and above	13	2.6

(Continued)

Table 1 (Continued).

Variables	N	%
Nationality		
Saudi	495	97.8
Non-Saudi	11	2.2
Educational year		
2nd year	13	2.6
3rd year	121	23.9
4th year	139	27.5
5th year	116	22.9
6th year	67	13.2
Intern	50	9.9
GPA		
More than 4.5	186	36.8
Less than 3.5	34	6.7
3.5–4.5	286	56.5
Marital status		
Single	468	92.5
Married	38	7.5
Monthly income		
<2000	323	63.8
2000–5000	107	21.1
>10,000	76	15.0
Problematic internet use PIU (GPISU2)		
Suggestive of PIU	155	30.6
Not suggestive to PIU	351	69.4
POSI	125	24.7
MR	242	47.8
CP	120	23.7
CIU	189	37.4
NO	125	24.7
PHQ-9		
No to Minimal depressive symptoms	4445	87.9
Depression symptoms (moderate to severe)	61	12.1

(Continued)

Table 1 (Continued).

Variables	N	%
PTSD		
Little to no severity	299	59.1
Some PTSD symptoms	21	4.2
Moderate to Moderately High severity of PTSD symptoms	105	20.8
High Severity of PTSD symptoms	81	16

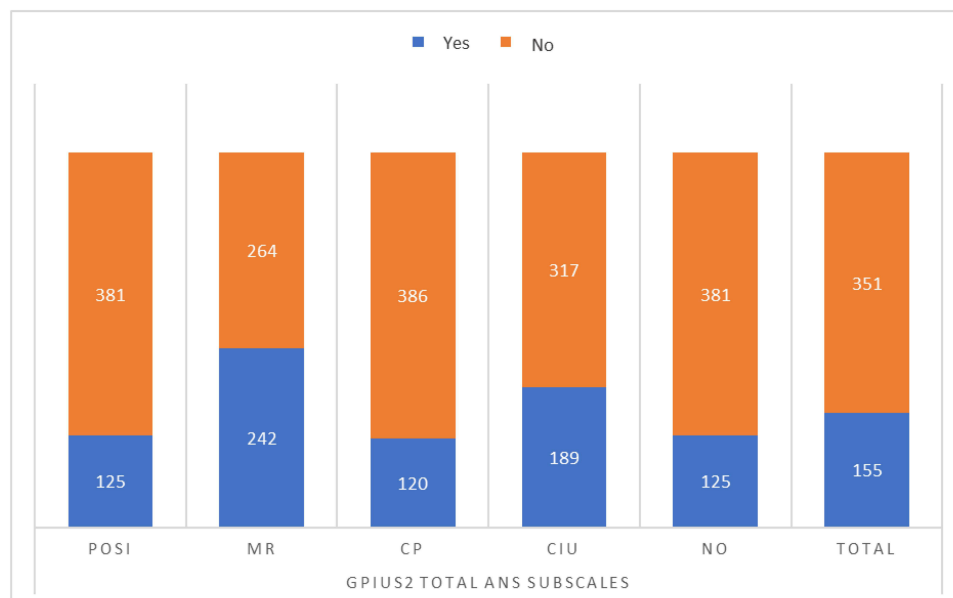
Abbreviations: POSI, Preference for online social interaction; MR, Mood regulation; CP, Cognitive preoccupation; CIU, Compulsive internet use; NO, Negative outcomes.

Findings regarding educational level showed that 27.5% of the respondents were 4th year students and 24% were 3rd year students. More than half the students had a GPA between 3.5 and 4.5 out of 5 ($n=286$, 56.5%). Most students were single ($n=468$, 92.5%). Around 64% of students had an income of less than 2000 Saudi Riyal (SR) per month ($n=323$, 63.8%). Students with a GPA between 3.5 and 4.5 represented 56.5% of the total students, and 18% had a PIU.

Of the 506 students, 155 (30.6%) scored higher than 60 on GPIUS2, indicating PIU. Further, the proportion of students scoring above the cutoff threshold score of 12 on the Preference for online social interaction (POSI), Internet use for Mood Regulation (MR), Cognitive Preoccupation by Internet use (CP), Compulsive Internet Use Behavior (CIU), and Negative Outcomes (NO) due to Internet Use subscales of the GPIUS2 are described in Figure 1.

Bivariate analysis assessed the relationship between different demographics and problematic Internet use (Table 2). The nationality of the students was significantly associated with PIU, as 29% of the Saudi students were suggestive of PIU (p -value <0.05). Similarly, single students were significantly associated with PIU (29%; $p < 0.05$). Having a low income of <2000 SR per month was also associated with PIU, since 21% of students receiving less than 2000 SR were suggestive of PIU ($p < 0.05$).

Table 3 shows the relationship between PIU and other scales, such as the Post-Traumatic Stress Disorder (PTSD) and Patient Depression Questionnaire (PHQ-9). A significant association was detected between moderate-to-moderately high-severity PTSD symptoms and PIU. Students with moderate-to-moderately severe PTSD symptoms were 1.7 times more likely to have PIU [OR (95% CI): 1.7 (1.091, 2.879)].

**Figure 1** Generalized Problematic Internet Use Scale 2.

Abbreviations: POSI, Preference for online social interaction; MR, Mood regulation; CP, Cognitive preoccupation; CIU, Compulsive internet use; NO, Negative outcomes.

Table 2 Correlation Between Problematic Internet Use and Other Variables

Variable	Problematic internet use, N (%)				P-value
	No problematic internet use Total= 506	%	Problematic internet use Total= 506	%	
Gender					
Females	213	42.1	89	17.6	0.277
Males	138	27.3	66	13.0	
Age					
17–20	56	11.1	33	6.5	0.079
21–24	284	56.1	120	23.7	0.093
25 and above	11	2.2	2	0.4	0.216
Nationality					
Saudi	348	68.8	147	29.1	0.002*
Non-Saudi	3	0.6	8	1.6	
Educational year					
2nd year	7	1.4	6	1.2	0.176
3rd year	84	16.6	37	7.3	0.542
4th year	95	18.8	44	8.7	0.419
5th year	78	15.4	38	7.5	0.324
6th year	49	9.7	18	3.6	0.286
Intern	38	7.5	12	2.4	0.182
GPA					
More than 4.5	143	28.3	52	10.3	0.185
Less than 3.5	22	4.3	12	2.4	0.332
3.5–4.5	195	38.5	91	18.0	0.287
Marital status					
Single	321	63.4	147	29.1	0.012*
Married	30	5.9	8	1.6	
Monthly income					
<2000	217	42.9	106	20.9	0.044*
2000–5000	73	14.4	34	6.7	0.429
>10,000	61	12.1	15	3.0	0.016*

Notes: *Significant (p-value<0.05).

In addition, high severity of PTSD symptoms was significantly associated with PIU. Students with a high severity of PTSD symptoms were 3.8 times more likely to have PIU [OR (95% CI); 3.8 (2.301, 6.423)]. In addition, moderate-to-severe depression was significantly associated with PIU. Students with moderate to severe depression were 2.2 times more likely to have PIU [OR (95% CI); 2.2 (1.333, 3.950)].

Table 3 PIU Vs Other Scales Using Binary Logistic Regression

Variables	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Little to no severity	Reff.*							
Some PTSD symptoms	0.737	0.470	2.461	1	0.117	2.090	0.832	5.253
Moderate to Moderately High severity of PTSD symptoms	0.572	0.248	5.343	1	0.021*	1.772	1.091	2.879
High Severity of PTSD symptoms	1.347	0.262	26.428	1	0.000*	3.844	2.301	6.423
PHQ-9 (Minimal depression)	Reff.							
PHQ9 (Moderate to severe depression)	0.830	0.277	8.980	1	0.003*	2.294	1.333	3.950

Notes: Reff.=Reference, *significant (p-value<0.05).

Discussion

In our study, the prevalence of problematic Internet use (PIU) was 30.6%. This finding is lower than that of research conducted in a medical college in South India, where the prevalence of Internet addiction among medical students in that region was higher (61.4%).²¹

Surprisingly, when comparing these results with previous studies conducted among medical students, a consistent trend of elevated prevalence rates became apparent. For instance, a study conducted among medical students in Malaysia in 2016 reported an incidence of 36.9%, further emphasizing the higher prevalence rates observed in a South Indian study.¹³ Additionally, studies carried out in China and Iran in 2010 and 2011, respectively, revealed lower prevalence rates of Internet addiction among medical students at 16.2% and 10.8%, respectively.²¹ A local study conducted at Taibah University in Saudi Arabia in 2020 reported that approximately 6% of medical students were classified as Internet addicts, while 42% experienced occasional problems related to Internet usage.¹⁵ This study showed no difference in PIU between males and females.¹⁵

It is essential to consider the common biological, psychological, and societal pathways that may be associated with both mental diseases and Internet addiction.²² This study found no differences between the sexes; however, students scoring higher in PIU were more likely to be single with a lower income. The results were consistent with other research that showed no gender differences in internet addiction. However, other studies such as in China and Malaysia discovered that male students were more addicted to the internet than female students.²¹

The study highlights a significant link between severe depressive symptoms and problematic Internet usage (PIU). Specifically, our findings indicate that students who scored between moderate and severe depression were 2.2 times more likely to have PIU. Similarly supporting our observations, a study conducted in Delhi, India, reported that 9.9% of participants with Internet addiction also had depressive symptoms.²³ Additionally, a study conducted among 269 medical students at a Ugandan public university during the COVID-19 pandemic found that 16.73% of respondents had depression, and its severity was significantly and positively associated with Internet addiction severity scores.²⁴

Research has consistently indicated a significant correlation between excessive Internet use and the manifestation of depressive symptoms. This suggests that individuals involved in problematic Internet use more vulnerable to psychological disorders, including depression, and vice versa. Additionally, excessive Internet usage can result in gray matter atrophy in the brain. This neurological consequence negatively affects various cognitive functions, including concentration and memory, as well as the capacity to make decisions, set goals, and may lead to development of psychological disorders, such as IA, depression, and anxiety.²³

Research on the relationship between PTSD and Internet addiction among medical students is scarce indicating a significant gap in our understanding of how these two conditions interact.²⁵ In our study, we found that higher severity of PTSD symptoms was strongly linked to problematic Internet usage (PIU). Specifically, students with more severe PTSD symptoms were 3.8 times more likely to exhibit PIU. This association suggests that Internet addiction could be

used as a way to cope with or escape from the distress caused by PTSD symptoms among medical students. Moreover, the stressful and demanding nature of medical education, which includes high levels of academic pressure and exposure to traumatic situations, may increase medical students vulnerability to both PTSD and Internet addiction.

Further studies are required to determine the link between Internet addiction and PTSD among medical students. Qualitative studies could delve into the personal experiences and coping strategies of medical students dealing with both conditions. Additionally, interventions aimed at addressing both Internet addiction and PTSD should be developed and assessed within educational and clinical settings.

Internet addiction has a considerable impact on the academic performance of university students, and medical students are no exception. A cross-sectional study conducted at the College of Medicine, Qassim University, Buraydah, Saudi Arabia revealed a distinct connection between Internet Addiction (IA) and students' well-being, along with its impact on their academic performance.¹⁴ The research findings indicated that 12.4% of medical students suffered from Internet addiction, which adversely affected the academic performance of 63.1% of them. Our study did not show that GPA was affected in students scoring moderate to high on PTSD, PHQ9 with significant PIU.

Another cross-sectional study conducted at Ayub Medical College, Abbottabad, stated that when compared to non-addicts Internet addicts had significantly lower academic achievement ($p=0.01$).⁸ In our study, 195 students had a GPA of 3.5 to 4.5 and 18% had PIU, whereas 22 students with a GPA greater than 4.5 reported 10% of PIU. Therefore, appropriate interventions and preventive measures are essential to encourage responsible Internet usage and protect students' physical and mental well-being.¹⁴ Moreover, one study highlighted that 71.8% of students experienced sleep disturbances due to late-night Internet use, which affected their attendance in morning activities. This highlights the complex influence of Internet addiction on students' lives.¹⁴ In line with this, another study suggested that prolonged Internet use may have adverse effects on student's academic performance, behaviour, and customs.²¹

Based on the study findings, practical steps can be taken to address problematic Internet usage (PIU) among medical students. These include implementing intervention programs, such as workshops and counseling, to reduce PIU, establishing policies that promote balanced Internet use, and educating students about the risks of excessive Internet use on mental health and academic performance. In addition, to support effective interventions, future research should focus on exploring the long-term effects of PIU on mental health outcomes like depression and PTSD among medical students. It is also important to investigate the underlying mechanisms linking PIU with mental health issues. Furthermore, comparing PIU prevalence and impacts across different medical schools or regions to identify influencing factors is recommended. Implementing these recommendations can help mitigate the impact of PIU on medical students well-being and academic performance.

Strengths and Limitations with Suggested Areas of Research

Limitations: The interns in this study may have been rotating from a different university, as the college accepts a small percentage of rotators.

Suggested areas of research: Examining other health variables that may be affected, such as sleep.

Conclusion

The study revealed a significant prevalence of problematic Internet usage (PIU) among medical students (30.6%), aligning with global trends. Findings are consistent with studies conducted in India, Malaysia, and Saudi Arabia, which highlight the widespread nature of this problem. Moreover, the investigation revealed a strong link between depressive symptoms and PIU, emphasizing the global interplay between mental health and problematic Internet behavior. Additionally, the study shows an association between PTSD symptoms and PIU, highlighting the need for further exploration, given the limited existing literature on this relationship observed in university students. Future studies could be carried out to provide deeper insights into problematic internet behavior. These studies can provide more information on the causality between PIU and other mental health issues and track the changes in PIU prevalence and its effects over time, especially if future interventional strategies are applied.

Disclosure

The authors report no conflicts of interest in this work.

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