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Internet Addiction and Its Association with Personality Traits and Depression in Medical Undergraduates, A Cross-Sectional Study from Pakistan

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ABSTRACT

Internet usage has gained an essential role in modern-day life, leading to various undesirable behaviours. Unnecessary internet use can lead to dependence which poses significant mental health risks like depression and specific personality traits, particularly for university medical students, potentially impacting their education and future careers. **Objectives:** To examine Internet addiction among MBBS scholars and investigate the relationship between excessive internet use, depression, personality traits, and socio-demographic variables in this group. **Methods:** A cross-sectional survey was conducted with 206 medical undergraduates from the People's University of Medical and Health Sciences for Women, Nawabshah, Pakistan through convenience sampling by self-administered questionnaire. The Young's Internet Addiction Test assessed Internet addiction, the Patient Health Questionnaire-9 measured depression, and the Ten-Item Personality Inventory and a self-structured questionnaire evaluated personality traits and socio-demographic characteristics respectively. **Results:** The mean age of the female medical students was 21.72 ± 1.631 years. The majority were Sindhi Muslims and unmarried. In 68.3% of the participants, mild internet addiction was found, with a mean score of 40.76 ± 16.495. Approximately half of the participants experienced depression. Participants with conscientiousness (Type 3) and emotional stability (Type 4) personalities were negatively associated with Internet addiction and positively associated with depression, particularly among second-year students. **Conclusions:** It was concluded that internet addiction is an alarming issue in medical students, leading to negative outcomes like depression, poor conscientiousness, and emotional stability. Efforts should be made to raise awareness and develop alternatives.

INTRODUCTION

Incapability to control internet usage time is termed as internet addiction, leading to significant distress, mood changes, and social, occupational, and academic impairments. With the surge in global internet usage, especially in developing countries, nearly 5.45 billion people are now online, and young people, particularly university students, are increasingly showing signs of unnecessary and problematic internet use [1, 2]. Due to this unnecessary internet usage, psychologists and educators are increasingly concerned about the emotional, social, physical, and mental dysfunctions of the students resulting from excessive internet use [3, 4]. Diagnosis of internet addiction involves ascertaining specific criteria, which include spending significantly more time online than intended, being worried and depressed when unable to access the internet, damaging personal and social relationships or career obligations and using it as a coping mechanism [5]. The abundance of free time, the newfound freedom for young adults aged 18 to 22, unlimited internet access, and difficulties with socializing serve as the contributing factors which may cause students to retreat to the internet rather than form in-person connections. Though the Internet is a valuable academic tool and social platform it also poses the risk of dependence and addiction. By 2016, there were over 3.5 billion internet users, with Asia leading the statistics with 1.3 billion users. Research shows that internet addiction is more common in regions where dissatisfaction in life is more prevalent, and

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traffic congestion and pollution are common [6]. Studies also link internet use with certain personality traits, like extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience [7]. University students rely heavily on the Internet for academic activities, entertainment, shopping, and gaming. However, this dependence leads to severe mental health issues, strongly linked to depression, despair, loneliness, and suicidal tendencies [8-10]. Medical students show particularly high rates of addiction, with one study reporting that 52.4% experienced moderate to severe Internet addiction [11]. Cultural norms like social restrictions for women contribute to higher addiction rates among female students. Surveys from various countries reveal a concerning increase in the frequency of internet usage from 1.5% to over 11% [12]. In Iran, 8.3% of high school girls, while South Korea, Finland, China, and Italy report similarly high rates of internet addiction [13]. In Nepal, over 40% of medical students were identified as moderate users, while 3% had severe addiction [14]. In India, a 2019 study found a prevalence of 61.4% [15]. In a meta-analysis of 12 studies the five main personality traits and internet addiction were found to be strongly correlated, particularly neuroticism [16]. In the same way in Iraq, studies have revealed a connection between internet addiction and personality traits [17]. A study from Pakistan in 2014 revealed that university students generally had positive attitudes toward internet use but felt dissatisfied when they could not access it [18]. Among medical students in Karachi, 85% were found to have some level of internet addiction, with females being disproportionately affected [9]. There is a paucity of research in Pakistan on the personality traits among medical students hence this needs to be explored. Literature There is a well-documented link between IA and depression, fretfulness, and even substance abuse. A systematic review of 20 studies reported (75%) a significant affiliation between internet addiction and depression [19, 20]. In Pakistan, a 2019 study on MBBS students in Azad Kashmir concluded that internet addiction was extremely prevalent. (52.4%) and a minor positive association with depression [11]. Neuroticism and aggression, have been shown to correlate with internet addiction [21]. In particular, the Big Five Model has been extensively studied, with neuroticism being positively linked to addiction, while traits like openness, conscientiousness, extraversion, and agreeableness tend to be negatively associated [22]. Nearly 45% of medical students in China's three medical schools participated in a cross-sectional study in 2017 that revealed internet addiction; neuroticism was favourable connected with the condition, while conscientiousness and agreeableness were adversely associated [23, 24].

This study aims to examine Internet addiction among medical students and explore the association between excessive internet use, depression, personality traits, and socio-demographics in this group.

METHODS

The study design was cross-sectional and descriptive. A convenience sampling strategy was employed to collect data from MBBS scholars at the People University of Medical and Health Sciences for Women in Nawabshah, Pakistan, spanning their first to final academic year. The sample size was calculated using Open Epi software, with a 95% confidence interval, a 5% margin of error, and an 85% frequency of internet dependence grounded on a former study. The minimum sample size was 196, with an additional 5% included to enhance the study's power. The projected sample size was 206. The study commenced in September 2021 and continued for one year. Ethical approval was attained from the Peoples University of Medical and Health Sciences for Women, Nawabshah, Pakistan, and the Malaysian Allied Health Sciences Academy University Ethics Committee (RMC/ EC04/ 2020). Informed consent was attained. The questionnaire comprised four sections 1. Socio-demographics, 2. Internet Addiction Test (IAT), 3. Ten- Item Personality Inventory (TIPI), and 4. Patient Health Questionnaire (PHQ-9) for depression. Internet addiction (IA) is characterized as inordinate or inadequately regulated prepossessions, urges, or actions related to computer use and Internet access that lead to impairment or anguish. The IAT consists of 20 questions, each with 5 response druthers (1=Rare to 5=Always) to assess the impacts of the internet on daily life, particular effectiveness, emotional well-being, and sleep habits. Scores vary from a minimum of 20 to a max of 100. Scores between 20 and 49 denote minimum users, scores from 50 to 79 signify moderate, and scores ranging from 80 to 100 represent insane users. Cronbach's Alpha equals 0.899. Psychologists assert that personality is innovated on five top traits openness, meticulousness, extraversion, agreeability, and neuroticism inclusively appertained to as the Big-Five dimensions. The reverse-scored particulars on the Ten-point Personality Inventory (TIPI) were quantified by recoding values (e.g., a score of 7 was converted to 1, 6 to 2, 5 to 3, and so on). Particulars 2, 4, 6, 8, and 10 are reverse-scored. Calculating the mean of the two factors comprising each scale (the traditional item and the recoded reverse-scored item). Participants estimate the particulars using a 7- 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Urdu interpretation created by Fareeha Arshad, flaunting Cronbach's Alpha of 0.62 for English and 0.63 for Urdu. Depression is characterized by feelings of dejection, melancholy, and a lack of interest in daily activities. Measurement was conducted exercising the Patient Depression Questionnaire (PHQ-9). It was

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innovated on nine top symptoms of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) depression disorder and their circumstance throughout the anteceding two weeks. Responses are estimated on a scale of 0 to 27, with scores assigned as follows 0 for not at all, 1 for some days, 2 for more than half the days, and 3 for nearly every day. Scores below 10 signify the absence of depression, but scores of 10 or over indicate the presence of depression. The data were analyzed exercising the Statistical Package for Social Sciences (SPSS 23.0). Descriptive statistics were conducted for socio-demographics, internet dependence, depression, and personality factors. Mean and standard deviation (SD) were calculated for all continuous data, while frequencies and percentages were determined for categorical variables. The correlation between internet dependence and personality traits, as well as the age of scholars, was examined using the Pearson Correlation Coefficient test to assess the strength and relationship between variables at a statistically significant position (p-value≤0.05). The T-test was employed to estimate the mean score of online dependence between groups with two categorical factors, whereas the ANOVA test was employed to compare the mean score of internet dependence among groups with more than two categorical variables. A multivariate regression analysis was performed to identify the elements that most significantly contribute to internet dependence among scholars.

RESULTS

The study participants' mean age was 21.72 + 1.631 years. More than half of the students were Sindhi (55.3%). 90.9% were unmarried and 90% of them were Muslims. The income of 68.9 % of respondents was >50000pkr (179.7 USD) which comes under the average salary range in Pakistan. Only 2.7% of the student's family income was <15000pkr(54 USD)(Table 1).

Table 1: Socio-Demographic Traits of the Study Participants (n=206)

Variable	Min-max	Mean ± SD
Age in Years	19-27	21.72 +1.631
Variable		**Frequency (%)**
Ethnicity	Punjabi	22 (11%)
	Sindhi	114 (55.3%)
	Muhajir	46 (22.4%)
	Others	24 (11.4%)
Marital Status	Married	19 (9%)
	Unmarried	187 (91%)
Year of Study	Academic Year 1	44 (21.5%)
	Academic Year 2	38 (18.3%)
	Academic Year 3	50 (24.2%)
	Academic Year 4	36 (17.8%)
	Final Academic Year	38 (18.3%)
Religion	Muslims	185 (90%)
	Non-Muslims	21 (10%)
Total Family Income	<Rs 15,000Pkr	6 (2.7%)
	Rs 15,000 - 30,000Pkr	13 (6.4%)
	Rs 30,000 - 50,000Pkr	45 (21.9%)
	>Rs 50,000Pkr	142 (68.9%)

IA was identified as mild in 68.3% of cases, moderate in 31.2%, and severe in 0.5%. The total internet addiction score varies from 3 to 83, with a mean of 40.76 + 16.49. The mean IA score was high in 2nd year MBBS students, 48.4% of the participants had depression which is nearer to the no depression found in 51.6% of the participants. The students with type 2 personality show the highest mean value and students with type 1 personality show the lowest mean value among all other personality traits (Table 2).

Table 2: Internet Addiction, Depression and Personality Traits (n=206)

Category	Min-max	Mean ± SD	Frequency (%)
Internet Addiction			
1st Year	6-74	40.77±17.307	--
2nd Year	6-83	46.80±15.008	
3rd Year	6-77	43.51±16.206	
Final Year	11-75	39.18±15.593	
Total IAT Score	3-83	40.76±16.495	
Mild Internet Addiction	-	-	141 (68.3%)
Moderate Internet Addiction	-	-	64 (31.2%)
Severe Internet Addiction	-	-	1 (0.5 %.)
Depression (PHQ-9)			
Yes	-	-	100 (48.4%)
No	-	-	106 (51.6%)
Ten Item Personality Measure (TIPI)			
Extraversion	1-7	3.65 +1.405	-
Agreeableness	2-7	4.97+1.281	
Conscientiousness	1-7	4.70+1.642	
Emotional Stability	1-7	4.19+1.432	
Openness	1-7	4.62+1.390	

0-20=no internet addiction, 21-49= mild internet addiction, 50-79=moderate internet addiction, 80-100= severe internet addiction. <10 is no depression, >=10 is depression. Personality type 1=Extraversion, Personality type 2=Agreeableness, Personality type 3=Conscientiousness, Personality type 4=Emotional Stability, Personality type 5=Openness

The results of the Pearson coefficient test indicated a strong negative association between IA and personality trait 3 (conscientiousness) and personality trait 4 (emotional stability). This means participants with higher conscientiousness and emotional stability showed less internet addiction. Whereas no relation was found between IA and the age of the students. Before applying the t-test and One-way ANOVA assumptions of normality and homogeneity of variances (tested by Levene's T-test and

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Levene's F-test) were fulfilled. High internet addiction was found in depressed students with a mean value of 48.12 ± 14.583 and a significant difference was seen between groups on applying a one-way ANOVA test. Post-HOC using least significant difference (LSD) statistics was utilized to explore the difference between groups (Table 3).

Table 3: Association of Internet Addiction with Personality Traits, Depression and Socio-Demographics (n=206)

Variable	Internet Addiction	Mean ± SD	T-value (df)	f-value (df)	p-value
Correlation Analysis					
Age	-0.086	-	-	-	-
Personality 1 (Extraversion)	-0.075	-	-	-	-
Personality 2 (Agreeableness)	-0.099	-	-	-	-
Personality 3 (Conscientiousness)	-0.166*	-	-	-	-0.086
Personality 4 (Emotional Stability)	-0.196**	-	-	-	-0.075
Personality 5 (Openness)	-0.075	-	-	-	-
T-Test Analysis					
Depression	-	48.12 ± 14.583	-7.085 (217)	-	0.000
Marital Status	-	41.25 ± 16.527	0.140 (217)	-	0.889
Religion	-	40.55 ± 16.527	-0.549 (217)	-	0.584
One-Way ANOVA Analysis					
Ethnicity	-	2.34 ± 0.822	-	0.888 (3)	0.448
Year of Study	-	46.80 ± 15.008	-	4.520 (4)	0.002
Total Family Income	-	3.57 ± 0.735	-	1.982 (3)	0.118

The multi-collinearity assumption was evaluated using the Tolerance statistic and Variance Inflation Factor (VIF) across all conducted regressions. All tolerance values were above 0.10, and the VIF did not surpass 10. The Durbin-Watson statistic was employed to evaluate independent errors. The Durbin-Watson coefficient in the present study was 1.7, falling within the range of 1.50 to 2.50. This signifies the absence of autocorrelation in the analysis of multiple linear regression data. In the multiple regression analysis, the results indicated that the predictors accounted for 25.1% of the variance (R^2=0.251, F (7, 211) =10.126, p<0.01). A positive correlation between internet addiction and depression was observed, alongside a negative correlation between internet addiction and both Conscientiousness and emotional stability, when considering explanatory power. Correlation coefficient (r=0.501; **p<0.01). Internet addiction has a negative association with personality trait 3 (conscientiousness) and personality trait 4 (emotional stability), whereas year 2 depression has a favourable correlation with internet addiction. Among these characteristics, depression (p=0.000) and year 2 (p=0.001) were substantially correlated with IA (Table 4).

Table 4: Multiple Regression Analysis for Variables Association to Internet Addiction (n=206)

Variables	B	SE b	β	p-value
Constant	40.833	5.035	-	0.000
Depression	11.341	2.117	0.344	0.000
Conscientiousness	-1.343	0.618	-0.134	0.031
Emotional Stability	-1.377	0.758	-0.120	0.071
Year 1	6.701	3.289	0.167	0.043
Year 2	10.686	3.307	0.251	0.001
Year 3	8.089	3.299	0.211	0.010
Year 4	6.607	3.299	0.154	0.046

R^2 =0.251 Adjusted R^2 =0.2227

DISCUSSION

Given the participants' age, the Internet has overtaken our routine life from learning to research, and information sharing to social networking, particularly for medical students [25]. This study focused exclusively on female medical students, as previous research has demonstrated that female students exhibit higher rates of internet addiction [26]. The mean age of the participants (21.72 ± 1.631 years) aligns with findings from similar research. Additionally, the majority of participants were Sindhi Muslims, reflecting the demographic composition of the university, which is located in the Sindh province of Pakistan and primarily enrolls students from the region. In this study, the overall mean IA score of the participants was 40.76 ± 16.495. In 2019, a descriptive cross-sectional study among 210 MBBS students at Poonch Medical College, Azad Kashmir, reported a high prevalence of internet addiction (52.4%) [11]. Similarly, another prevalent study at the Northwest School of Medicine in Peshawar, Pakistan, reported a total mean Internet Addiction score of 50.52 ± 18.8, with the mean score for female students being 45.37 ± 18.74 slightly higher than the findings in our study [27]. In contrast, a 2016 cross-sectional observational study in India, involving 140 medical students, reported a mean IA score of 33.94 ± 13.592, which is slightly lower than our results. This difference may be attributed to variations in cultural context and gender dynamics between the two countries [25]. Approximately 48.4% of the medical undergraduates experienced depression, a finding

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consistent with previous research [28, 29]. A cross-sectional study in the Faculty of Medicine, Ramathibodi Hospital in Thailand, reported a lower prevalence of depression at 28.8% among medical students [30]. In contrast, a 2018 study in medical colleges of the Kingdom of Saudi Arabia identified a higher prevalence of depression, with 55.9% of students affected, particularly among first-year students [31]. Depression is more prevalent among pre-clinical students, likely due to the increased academic pressure they face during the early stages of their education, where achieving a high grade point average is a primary concern. This contrasts with students in their final years, who may feel more confident in their knowledge. Furthermore, hostile students exhibited elevated levels of depression relative to their peers residing with family, potentially attributable to insufficient social support. We identified two negatively significant personality traits among medical students: conscientiousness and emotional stability. Numerous studies have highlighted the impact of higher levels of neuroticism and lower levels of conscientiousness, which supports our findings that neuroticism is a predominant personality trait in medical students. While there has been no research specifically examining personality traits among medical students in Pakistan, limited studies from other countries provide relevant insights. For instance, a 2014 cross-sectional study conducted in Malaysia found significant variability in personality traits among medical students, with higher levels of extroversion, conscientiousness, agreeableness, and openness, and lower levels of neuroticism [25]. These findings are similar to our study. The heightened stress and emotional burden experienced by medical students due in part to their distance from family and limited social interaction likely contribute to the prominence of neuroticism in this population. A study conducted at Bolan University of Medical and Health Sciences, Pakistan found higher levels of internet addiction among 2nd and 3rd-year MBBS students, which aligns with our study's findings [32]. Medical students experience greater psychological stress compared to students in other disciplines, and research has shown that unnecessary internet use, which disrupts normal life, also increases the risk of depression. In our study, we identified a significant positive association between IA and depression (48.4%). [11, 27]. Additionally, we observed a statistically significant negative association between IA and the personality traits of conscientiousness and emotional stability. To alleviate the detrimental consequences of excessive internet usage among medical students, awareness campaigns should be implemented in universities and colleges to promote early detection of warning signs and establish healthy internet use boundaries. Encouraging students to engage in alternative healthy activities can help reduce the impact of IA.

CONCLUSIONS

It was concluded that the study concluded and revealed a significant Internet addiction (IA) among medical students, highlighting an alarming future trend. A strong positive association between IA and depression suggests that depression may predispose medical students to IA, as they might use the internet to cope with their sadness. Additionally, the study identified a negative significant link between IA, conscientiousness, and emotional stability, suggesting that personality traits influence Internet addiction. Addictive behaviours are associated with personality characteristics such as high emotional reactivity, stress proneness, and impulsivity.

Authors Contribution

Conceptualization: FR, NA
Methodology: FR, MZ, NA
Formal analysis: FR
Writing review and editing: MZ

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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