

Study of internet addiction and its association with depression and insomnia in university students

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ABSTRACT

Introduction: Use of internet has increased exponentially worldwide with prevalence of internet addiction ranging from 1.6% to 18% or even higher. Depression and insomnia has been linked with internet addiction and overuse in several studies. **Aims and Objectives:** Present study has looked in to pattern and prevalence of internet addiction in university students. This study has also explored the association of internet addiction with depression and insomnia. **Material and Methods:** In this cross sectional study 954 subjects were enrolled who had been using internet for past 6 months. Information regarding pattern of use and socio demographic characteristics were recorded. Internet addiction Test (IAT), PHQ-9, and insomnia Severity Index (ISI) were applied to measure internet addiction, depression and insomnia respectively. **Results:** Among 954 subjects, 518 (60.59%) were male and 376 (39.41%) were female with mean age of 23.81 (SD ± 3.72). 15.51% study subjects were internet addicts and 49.19% were over users. Several parameters including graduation level, time spent per day on line, place of internet use, smoking and alcohol had significant association with internet addiction. Internet addiction was predominantly associated with depression and insomnia. **Conclusion:** Internet addiction is a rising concern among youth. Several parameters including gender, time spent on line, alcohol, smoking predicts higher risk of internet addiction. Depression and insomnia are more common in internet addicts and overusers.

Keywords: Depression, insomnia, internet addiction

Introduction

Exponential growth in internet use has been observed across the world including India in the last decade. About 205 million internet users were reported in India in 2012 including both rural and urban population and it was predicted that India will become the second leading country after China in internet

usage.^[1] Internet is used for various reasons such as interpersonal communication, exploring information, business transactions, and entertainment. However, it can also provide an opportunity to engage in excessive chatting, pornography, gaming, or even gambling. There have been growing concerns worldwide for what has been labeled as “internet addiction.”

Dr. Ivan Goldberg suggested the term “internet addiction” in 1995 for pathological compulsive internet use.^[2] Excessive internet use was closely linked to pathological gambling by Young^[3] who adapted the DSM IV criteria to relate to internet use in the internet addiction test (IAT) developed by her. The

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prevalence of internet addiction has been reported ranging from 1.6% to 18% in different populations.^[4,5]

General population surveys show a prevalence of 0.3–0.7%.^[6] with addicted spending average 38.5 h/week on a computer as compared to the nonaddicted averaged 4.9 h/week. Goel^[7] has reported 24.8% as possible addicts, and 0.7% as addicts in his study of internet addiction among Indian adolescents.

Overuse of the internet has been linked with many psychological conditions including anxiety, depression, and insomnia. Several studies^[8,9] have shown that among users addicted to the internet, depression has much prevalence than normal users. Akini and Iskender^[10] have reported that depression and anxiety are significant predictors of internet addiction in a study among Turkish students.

There is an influence of problematic internet use or internet addiction on sleep patterns. Increased time spent on the internet may disrupt the sleep-wake schedule significantly, and a higher rate of sleep disturbance takes place among heavy internet users.^[11] Wong^[12] studied the impact of online addiction on insomnia and depression on Hong Kong adolescents. The findings showed that “internet addiction was associated significantly with insomnia and depression”. These data imply that possible complex mechanisms exist between insomnia, internet addiction, and depression.

Internet use has been overwhelmingly increasing in India, involving especially the youth population. Since adolescents contribute a significant proportion of the productive life age of our country, their involvement with internet overuse or addiction may lead to significant adverse consequences such as sleep disturbance, psychological and physical problems leading to academic decline. Although many studies have been conducted regarding internet addiction in India, nevertheless, not much has been studied in the state of Rajasthan in this regard. Hence, the present study was planned to investigate the pattern and prevalence of internet usage in young adults and its relationship with insomnia and depression in college-going youth.

Material and Method

This cross-sectional study included 1000 students of both sexes using the internet for the past 6 months from different streams in the University of Rajasthan and affiliated colleges. Formula $n = z^2 \times pq/d^2$ was used to determine the study sample size where n represents a total number of sample, z corresponds to value at 95% confidence interval, P stands for the prevalence of internet addiction in the previous study i.e. almost 44 percent,^[13] and d represents allowable error. Thus, a sample size of about 600 students was considered appropriate. This study included 1000 students out of which 46 students opted out in the middle of the study, hence 954 students finally constituted the study sample. The study participants were selected using simple random sampling. Approval was obtained from the concerned authority. Participants were informed about the nature and purpose of the study before including them in the study.

Only those participants constituted the study group who had been using the internet for the past 6 months and were willing to participate in the study. Those who did not choose to participate, having major medical or surgical problems, history of psychosis or mania, MDD, or any other mental disorder were excluded from the study.

Information was collected on a specially designed semi-structured performa containing details of demographics, educational qualification, and status, purpose of using the internet (by choosing among the options like education, entertainment, social networking or other purpose), money spent per month, place of access (home, cybercafé, or workplace if working part-time), the time of day when the internet is accessed the most (by choosing between morning, afternoon, evening, or night), and the average duration of use per day.

Measures

Internet addiction, depression, and insomnia were assessed on IAT, patient health questionnaire (PHQ-9), and insomnia severity index (ISI), respectively.

Internet addiction test (IAT)

The IAT^[3] is a 20-item 5-point Likert scale that measures the severity of self-reported compulsive use of the internet. According to Young's criteria, total IAT scores 20–39 represent average users with complete control of their internet use, scores 40–69 represent over-users with frequent problems caused by their internet use, and scores 70–100 represent the internet addicts with significant problems caused by their internet use.

Patient health questionnaire (PHQ-9)

A self-report version of PRIME-MD11 which assesses the presence of major depressive disorder using modified diagnostic and statistical manual, fourth edition (DSM-IV) criteria.^[14] In this study, the Hindi version of PHQ-9 was used. It has been validated in the Indian population and is considered to be a reliable tool for the diagnosis of depression. For the diagnosis of depression, we define clinical significant depression as a PHQ-9 score of 8–9 as minor depression, a PHQ-9 score of 10 or greater as moderate depression; a score of 15 or more and one of the two cardinal symptoms (either depressed mood or anhedonia) as definite major depression. We considered PHQ 9 score of 10 or more as depression in this study.

Insomnia severity index (ISI)

ISI is one of the most commonly used disease-specific measures for self-perceived insomnia severity. The ISI has 7 items describing insomnia-related health impairments.^[15] Each item is rated on a 5-point Likert scale. In clinical assessments, the ISI total summary score falls into 1 of 4 ISI categories; with scores 0–7, 8–14, 15–21, and 22–28 indicating no clinically significant insomnia, sub-threshold insomnia, moderate insomnia and, clinically severe insomnia, respectively.

Table 1: Distribution of study subjects according to the level of internet usage

	Number	Percentage
Addicts	148	15.51
Average users	394	41.30
Over user	412	43.19

Table 2: Distribution of various study variables among participants

Variable	No	Percentage
Gender		
Male	578	60.59
Female	376	39.41
Total	954	100.00
Education		
UG	417	43.71
PG	537	56.29
Total	954	100.00
Use of the internet		
Education	782	81.97
Entertainment	435	45.60
Social networking	669	70.13
Total	954	100.00
Place of internet use		
Work Place	270	28.30
Home	854	89.52
Total	954	100.00
Mode of internet use		
Laptop/Desktop	930	97.48
Mobile	954	100.00
Tablets	89	9.33
Total	954	100.00
A time slot of internet use		
Day	852	89.31
Night	797	83.54
Total	954	100.00
Internet use as per personal habits		
Smoking	86	9.01
Alcohol	88	9.22
Total	954	100.00
Duration of use of internet		
2 h or Less	525	55.03
>2 h	429	44.97
Total	954	100.00
Money spend on internet:		0.00
500 or less	59	6.18
>500	895	93.82
Total	954	100.00
Insomnia in IN Users		
Yes	437	45.81
No	517	54.19
Total	954	100.00
As per PHQ 9		
≥10 PHQ9	421	44.13
<10 PHQ9	532	55.77
Total	954	100.00

We used the Hindi version of the ISI^[6] Clinically, significant insomnia was detected only when the ISI score was >14.

Statistical analysis

All data collected were entered into the Microsoft excel 2007 worksheet in the form of a master chart. These data were classified and analyzed as per the aims and objectives. The data on sample characteristics were described in the form of tables. Categorical variables were tabulated using frequencies and percentages. Inferential statistics such as the Chi-square test were used to find out the association of internet usage with various factors. Odds ratio (OR) was used to find out the association of insomnia and PHQ levels with internet usage.

Results

This study was a cross-sectional questionnaire-based study conducted among university students from different faculties.

Around 954 subjects with age ranging from 17 to 34 years were included in this study. The mean age was 23.81 years with a 3.72 standard deviation. Males were 578 (60.59%) and females were 376 (39.41%). Out of total subjects, 412 (43.19%) were internet over users and 148 (15.51%) were addicts [Table 1].

Out of 954 subjects, 537 were postgraduates while 417 were undergraduates [Table 2]. Among postgraduates (PG) 96 (17.88%) had internet addiction and 241 (44.88%) were over users, whereas the proportion of internet addicts and over users among undergraduates (UG) was 12.47% and 41.01%, respectively [Table 3]. This association was statistically significant. Similarly, on application of Chi-square test, significant association was found between place of internet usage and addiction as 68 (25.19%) subjects were addicted and 128 (47.41%) were over users among those who were using internet at workplace as compared to 141 (16.51%) addicts and 360 (47.41%) over users among those using it at home. In this study, 86 subjects were smokers and 88 were alcoholics and the association of these personal habits and internet usage was also significant on the application of the Chi-square test. Out of them 86 smokers, 27 (31.40%) were addicted and 34 (39.53%) were over users and out of 88 alcoholics, 10 (11.36%) were addicted and 45 (51.14%) were over users. Considering duration of internet usage, it was observed that those using internet for more than 2 h a day were more addicted and over users [85 (19.81%) and 188 (43.82%), respectively] as compared to those using internet for less than 2 h a day [63 (12%) and 224 (42.67%), respectively] and this association was found significant. A total of 437 (45.81%) subjects reported insomnia among whom 107 ((24.49%) were internet addicts and 241 (55.15%) were over users whereas those subjects without insomnia comprised only 47 (7.93%) addicts and 171 (33.08%) over users. This association was again statistically significant. Similar results were noted with regard to the presence of depression. Depression was reported in 421 (44.13%) subjects

Table 3: Association of various study variables and level of internet usage among study participants

	Average	Percentage	Over User	Percentage	Addicts	Percentage	Total
Gender							
Male	223	38.58	265	45.85	90	15.57	578
Female	171	45.48	147	39.10	58	15.43	376
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=5.032 with 2 degrees of freedom; P=0.081							
Education							
UG	194	46.52	171	41.01	52	12.47	417
PG	200	37.24	241	44.88	96	17.88	537
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=10.132 with 2 degrees of freedom; P=0.006							
Use of the internet for							
Education	343	43.86	319	40.79	120	15.35	782
Entertainment	165	37.93	186	42.76	84	19.31	435
Social networking	285	42.60	272	40.66	112	16.74	669
Other purpose	369	41.93	377	42.84	134	15.23	880
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=6.700 with 6 degrees of freedom; P=0.350							
Place of internet use							
Work Place	74	27.41	128	47.41	68	25.19	270
Home	353	41.33	360	42.15	141	16.51	854
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=20.080 with 2 degrees of freedom; P<0.001							
Mode of internet use							
Laptop/Desktop	389	41.83	393	42.26	148	15.91	930
Mobile	394	41.30	412	43.19	148	15.51	954
Tablets	25	28.09	43	48.31	21	23.60	89
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=7.844 with 4 degrees of freedom; P=0.097							
A time slot of internet use							
Day	329	38.62	380	44.60	143	16.78	852
Night	313	39.27	350	43.91	134	16.81	797
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=0.090 with 2 degrees of freedom; P=0.956							
Internet use as per personal habits							
Smoking	25	29.07	34	39.53	27	31.40	86
Alcohol	33	37.50	45	51.14	10	11.36	88
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=10.424 with 2 degrees of freedom; P=0.005							
Duration of use of internet							
2 Hrs or Less	238	45.33	224	42.67	63	12.00	525
>2 Hrs	156	36.36	188	43.82	85	19.81	429
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=13.963 with 2 degrees of freedom; P<0.001							
Money spend on internet:							
500 or less	28	47.46	21	35.59	10	16.95	59
>500	366	40.89	391	43.69	138	15.42	895
Total	394	41.30	412	43.19	148	15.51	954
Chi-square=1.501 with 2 degrees of freedom; P=0.472							
Insomnia in IN Users							
Yes	89	20.37	241	55.15	107	24.49	437
No	305	58.99	171	33.08	41	7.93	517
Total	394	41.30	412	43.19	148	15.51	954

Contd...

Table 3: Contd...

	Average	Percentage	Over User	Percentage	Addicts	Percentage	Total
Chi-square=154.117 with 2 degrees of freedom; P<0.001							
As per PHQ 9							
≥10 PHQ9	83	19.71	225	53.44	113	26.84	421
<10 PHQ 9	311	58.46	187	34.96	35	6.58	533
Total	394	41.30	412	43.19	148	15.51	954

Chi-square=166.072 with 2 degrees of freedom; P<0.001

Table 4: Association of Insomnia and PHQ level with internet usage among study participants

	Insomnia		OR (95% CI)			
	Yes	No	Total			
Over users	348	62.14	212	37.86	560	5.62 (4.20 to 7.53)
Average users	89	22.59	305	77.41	394	
Total	437	45.81	517	54.19	954	
	PHQ level			Total	OR (95% CI)	
	>10	≤10				
Over users	338	60.36	222	39.64	560	5.70 (4.25 to 7.67)
Average users	83	21.07	311	78.93	394	
Total	421	44.13	533	55.87	954	

including 113 (26.84%) internet addicts and 225 (53.44%) over users. Among those subjects without depression number of internet addicts and over users was 35 (6.58%) and 187 (34.96%), respectively. This observation was statistically significant.

On the application of OR considering internet usage as exposure, it was observed that chances of insomnia were more than five times on the internet over users as compared to average users [OR = 5.62 (4.20 to 7.53)]. Similarly, the estimated risk of PHQ ≥10 was observed more than five times on the internet over users as compared to average users. [OR = 5.70 (4.25 to 7.67)] [Table 4].

Discussion

The present study is an attempt to understand the pattern of internet use and the prevalence of internet addiction in youth college students. The mean age of the study population was 23.8 years.

Our study showed 15.5% of students with internet addiction. Wide variations ranging from 1.6% to 18% in the prevalence of internet addiction among adolescents have been reported.^[4]

Prevalence of PIU (problematic internet use) among adolescents in a multicentric study in Europe was reported ranging from 1.2% to 11.8%.^[5]

Another study on Indian adolescents reported the prevalence of possible addicts and addicts as 24.8% and 0.7%, respectively.^[7] Similarly Kawabe *et al.*^[17] in his study among 853 adolescents in Japan determined the prevalence of internet addiction using IAT. The prevalence of possible addicts and addicts was 21.7% and 2.0%, respectively.

In the present study boys were more internet addicts and over user than the girls. Similar observations have been made in several other studies in the past.^[18] Since boys are given more liberty in our society and have more frequent access to use the internet in private than the girls predisposing them to become an addict and over the user. Studies have also shown that boys tend to play more online games and surf adult sites more often than girls.^[19] Male also tend to use more addictive substances than female and it has also been reported in a meta-analysis of internet addiction that a person with a history of addiction to other substances is at higher risk of internet addiction.^[20]

Internet addiction and overuse were more prevalent in postgraduate students than undergraduates. Kwabe *et al.*^[17] has also reported that the number of students with internet addiction increases as their grades increase. Likewise, XinM.^[21] in his study of 6468 Chinese adolescents also observed more internet addiction among older grade students. It is possible that the study course in PG is more demanding to access the internet and the affordability in this group to bear the expenses of the internet is much stronger than UG. It was also evident in general that educational activity was the most commonly cited purpose for internet use.

The workplace was the most preferred area for internet use among addicts. Goel *et al.*^[7] in his study has also yielded similar results. Lesser restriction, a company of colleagues, and accessibility to free internet may have been the possible reason for this observation.

Alcohol consumption and smoking were significantly associated with internet addiction in the present study. Several other studies in the past have made similar observations where pathological internet use (PIU) or internet addiction was possibly associated with alcohol and smoking.^[22]

Sung *et al.*^[23] in his analysis of a large study sample of adolescents established a positive association of internet addiction with alcohol and smoking. Neuropsychological explanation proposes that nicotine and alcohol shares a common reward pathway.^[24] which may also include the nature of internet usage as observed in many studies for e.g. striatal activation in online games when confronted with cues from their favorite games.^[25] Studies have also suggested that adolescents with internet addiction may have personalities vulnerable to any other addiction and hence are at increased risk of substance abuse.^[26]

In this study mean daily time spent on internet use was positively correlated with internet addiction. In a review of research on

internet addiction, people at risk of internet addiction were reported to have spent significantly more time online.^[27] In another study by Kuss^[19] daily use of the internet and increased time online was positively correlated with internet addiction.

This study revealed a strong positive association between internet addiction and insomnia. Similar results were also established by Bhandari *et al.*^[28] in his study of 984 undergraduate students, who reported 35.4% of the study sample having poor sleep quality and internet addiction as well. Cheung^[29] in his study of 719 Chinese adolescents in Hong Kong observed high comorbidity between internet addiction and insomnia; 51.7% of students among internet addicts were insomniacs.

Association between internet addiction and depression in this study corresponds to another study among university students in Turkey by Orsala *et al.*^[30] who reported an alarming association between internet addiction and depression. A high score of depression has also been reported in a study among Indian adolescents with internet addiction.^[7,31,32] In an article on association between internet addiction and depression, the authors after taking into account several studies proposed four models of such association including escape model, bidirectional model, negative consequence model, and shared mechanism model. Grossly the association between internet addiction and psychological problems including depression are reported to have an interdependent relationship. Depression may lead to internet addiction and vice versa. Internet use in this population serves as a remedy to overcome their problems and negative perception about the situation. Such use over a period of time becomes a habit and eventually addiction, as some positive emotions like happiness and excitement are felt while being on the internet. When internet addict does not use the internet, negative emotions flare up and can only be replaced by positive emotions by using the internet.^[8]

The association between internet addiction, insomnia, and depression was explored in a study that observed that internet addiction and sleep quality independently mediated 16.5% and 30.9% indirect effect of each other on depression.^[28]

Conclusion

Internet addiction among youth has become increasingly a great concern. Various parameters including gender, time spent on the internet, graduation level, place of internet use, smoking, and alcohol have been associated with internet addiction. In addition, insomnia and depression are more common in internet addicts and may have a bidirectional relationship.

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Conflict of interest

There is no conflict of interest.

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