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Association Between Internet Addiction, Depression and Sleep Quality Among Undergraduate Students of Medical and Allied Sciences

Luna Paudel,¹ Pawan Sharma,² Anuj Raj Kadel,³ Kshitiz Lakhey,³ Swarndeeep Singh,⁴ Pratibha Khanal,¹ Rachana Sharma,¹ Pratikshya Chalise,¹ Subhash Chandra Sharma,¹ Sudarshan N Pradhan¹

ABSTRACT

Background: The use of the internet is growing rapidly worldwide with easier availability and affordability in developing countries like Nepal. Apart from several benefits, it has also led to deleterious effects on certain individuals' physical and mental well-being. The present study aimed to assess the burden of internet addiction among nursing, dental and medical undergraduates at a medical school, and examine its relationship with depression and sleep quality.

Methods: A cross-sectional study among 494 students pursuing nursing, dental and medical undergraduate courses at the same medical college in Nepal was conducted. The burden of internet addiction, depression, and sleep disturbance was assessed using Young's Internet addiction test, Beck's depression inventory, and Pittsburgh Sleep Quality Index questionnaires respectively.

Results: The majority of respondents reported either controlled use of internet or mild problem with internet use. However, 4.7% of respondents reported significant problems due to internet use. Further, about 42.3% reported poor sleep quality, and 8.9% screened positive for depression. In both chi-square and logistic regression analyses, internet addiction was significantly associated with poor sleep quality and depression.

Conclusion: The study shows that about half of the participants experienced at least some problems and a small but significant proportion of them reported severe problems due to internet use. This warrants the need to address the issue of internet addiction among medical and allied sciences students in Nepal. Further, internet addiction is associated with both depression and poor sleep quality, highlighting a need to develop effective interventions targeting all three problems holistically.

Keywords: Depression; internet addiction; sleep quality

INTRODUCTION

The omnipresence of the internet has been accompanied by a pattern of excessive or dysfunctional use in a significant number of individuals, which has been termed as internet addiction (IA). It is characterized by excessive or poorly controlled preoccupations, urges or behaviours regarding computer use and internet access leading to significant impairment and/or distress.¹ The association between IA and poor sleep and several mental health related problems has been reported in previous studies.^{2,3} IA has been recognized as an emerging public health problem among adolescents and students in the South-East Asian countries.⁴ Despite the increasing prevalence of IA among both developed and developing countries,⁵ and its possible link with poor mental health and insomnia; only few studies have

examined the inter-relationship between IA, depression, and sleep disturbances among adolescents in Nepalese setting. The present study aimed to assess the burden of internet addiction among nursing, dental and medical undergraduates at a medical school in Nepal, and examine its relationship with depression and sleep quality among them.

METHODS

This was a cross-sectional observational study conducted at a medical college attached with a tertiary health care facility in Nepal using all enumerative sample selection criteria. All the eligible undergraduate students pursuing nursing, dental and medical undergraduate courses at the time of study were approached on days of assessment. All students were approached in group settings. All students

Correspondence: Dr Pawan Sharma, Department of Psychiatry, Patan Academy of Health Sciences, School of Medicine, Lalitpur, Nepal. Email: pawan60@gmail.com, Phone: +9779851211544.

above 18 years of age, either gender and available at the time of study were included. Students who didn't give written informed consent were excluded. On the basis of all enumerative sampling, 495 students who provided the consent were included. No calculation of sample size was done. The study site was chosen as per feasibility i.e. support and permissions convenience of the researchers. The study protocol was approved by the intuitional review committee (ref no: 2311201814), and ethical clearance was obtained prior to the commencement of data collection. The assessment was carried out using self-administered tools as described in the next paragraph. We had used all the questionnaires in English language as the medium of teaching was English language in all the groups. For anonymity no variables which could identify the respondents were collected. The data collected was stored using codes and was entered in a password protected computer by the researchers for confidentiality.

A semi-structured proforma was used to collect information pertaining to socio-demographic profile of participants (e.g. age, gender, religion, address etc.). The Young's Internet Addiction Test (YIAT) is the first and most widely used study instrument to assess internet addiction in a reliable and valid manner.⁶ A recent systematic review and meta-analysis of studies assessing the psychometric properties of YIAT found it to have adequate content and convergent validity, with excellent internal consistency (Cronbach $\alpha > 0.90$) and good test-retest reliability ($r = 0.83-0.85$) values.⁷ Based on 20 self-report items, the YIAT assesses for the presence of addiction to the internet, electronic entertainment, social media, and general use of electronic devices. A Score of 20-39 points is an average online user who has complete control over his/her usage, A score of 40-69 signifies frequent problems due to Internet usage, and a score of 70-100 means that the Internet is causing significant problems.⁸ It assesses the following areas with respect to internet use: escape, compulsion, neglecting duties, anticipation, lack of control, social avoidance. The permission to use this scale in this study was taken from the Stoelting, holder of the copyright for license materials of YIAT after submission of license fees. The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire which assesses sleep quality and disturbances over past one-month time period.⁹ It is regarded as one of the most rigorously validated instrument to screen for sleep related problems in both clinical and non-clinical samples, and has been widely used for populations of all age groups ranging from college students to elderly people.¹⁰ A systematic review and meta-analysis of studies assessing

the psychometric properties of PSQI found that it has good construct validity (i.e. ability to differentiate between people having a disorder associated with poor sleep and healthy people), convergent validity (i.e. having moderate to strong association/ correlation with related constructs like depression or anxiety), divergent validity (i.e. having weak or no association/ correlation with unrelated constructs like anger or vomiting), and good internal consistency (Cronbach $\alpha = 0.73-0.80$).¹¹ It consists of 19 individual items assessing the following seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of all item scores provides a global score, with higher values associated with more poor sleep quality. A global score of five or greater indicates a "poor" sleep quality. The Beck Depression Inventory (BDI) is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression. Internal consistency for the BDI ranges from .73 to .92 with a mean of .86. It is one of the widely used tools to assess depression throughout the world. In case of general population a cut off score of 13 has been reported to yield a 100% sensitivity and 99% specificity, with a positive predictive value of 0.72 in the Nepalese population.¹² Hence, this cut-off score was used in this study.

The data were analyzed using SPSS version 16.0 (Armonk, NY, IBM Corp). Descriptive statistics using mean, standard deviation, frequency and percentage were used to describe the socio-demographic profile, YIAT, PSQI, and BDI scale scores of the study participants. Additionally, median and inter-quartile range was used to describe variables with skewed distribution. The proportion of participants with significant problems due to internet addiction, poor sleep quality, and depression were calculated using the YIAT, PSQI, and BDI scale cut-off scores as described in the description of these questionnaires above. The data was checked for normal distribution using the Kolmogorov-Smirnov test, and non-parametric tests (Spearman correlation) were used for variables with skewed distribution. Bivariate analysis using appropriate inferential statistics (chi-square and independent t-test) were conducted to examine the bivariate associations between different variables and internet addiction (mild to severe problems due to internet use). A multivariate analysis was performed using the binary logistic regression with having significant problems due to internet addiction as the dependent variable, and all factors having significant bivariate association with it entered as independent variables in the model. A *p-value* of less than 0.05 was considered

significant for all the tests. There was no missing value imputation done.

RESULTS

The females outnumbered the males in study sample, with 317 out of 494 participants belonging to female gender (64.2%). The average age of study sample was 20.86 years [Standard deviation (SD): 1.90]. The study sample comprised of 114, 160, and 220 students pursuing nursing, dental, and medical undergraduate courses respectively. The detailed demographic and clinical profile of study sample is given in Table 1.

Table 1. Descriptive profile of study participants (N=494).

Study variable	Mean ± SD/ Median (IQR) or Frequency (percentage)
Age (In years)	20.86 ± 1.90
Gender:	
Male	177 (35.8%)
Female	317 (64.2%)
Religion:	
Hindu	458 (92.7%)
Others	36 (7.3%)
Marital status:	
Not married	493 (99.7%)
Married	1 (0.3%)
Place of origin:	
Nepal	456 (92.4%)
Outside Nepal	38 (7.6%)
YIAT score	40.51 ± 14.87/ 39.00 (28.75-50.00)
PSQI score	4.48 ± 2.56/ 4.00 (3.00-5.00)
BDI score	10.24 ± 8.09/ 9.00 (5.00-14.00)

SD: Standard Deviation; IQR: Inter-quartile range; YIAT: Young's Internet Addiction Test; PSQI: Pittsburgh Sleep Quality Index; BDI: Beck's Depression Inventory.

About 49.8% (n=246), 45.5% (n=225), 4.7% (n=23) of study participants reported controlled internet use, mild problems due to internet use, and severe problems due to internet use respectively. About 42.3% (n=209) of participants reported poor quality of sleep using the PSQI cut-off score of five, and about 30.2% (n=149) of participants screened positive for depression according to the cut-off score of 13 on the BDI. There was significant positive correlation of the total YIAT score with the PSQI ($\rho = 0.19, p < 0.05$) and BDI scores ($\rho = 0.26, p < 0.05$) among study participants. The bivariate analysis

assessed the relationship of different study variables with internet addiction (Table 2). Internet addiction was significantly more common among participants reporting poor sleep quality ($\chi^2 = 9.67, p < 0.05$) and screening positive for depression ($\chi^2 = 20.68, p < 0.05$).

Table 2. Bivariate association between study variables and internet addiction (N=494).

Study variable	Addicted [Mean ± SD/ Median (IQR) or Frequency (percentage)]	Not Addicted [Mean ± SD/ Median (IQR) or Frequency (percentage)]	Test statistic (p-value)
Age (In years)	20.79 ± 1.87	20.94 ± 1.93	^a 0.86 (0.38)
Gender			
Male	89 (50.3%)	88 (49.7%)	^b 0.001 (0.97)
Female	159 (50.2%)	158 (49.8%)	
Religion			
Hindu	232 (50.7%)	226 (49.3%)	^b 0.51 (0.47)
Others	16 (44.4%)	20 (55.6%)	
Marital status			
Not married	248 (50.3%)	245 (49.7%)	^c 1.01 (0.49)
Married	zero	1 (100.0%)	
Place of origin			
Nepal	230 (50.4%)	226 (49.6%)	^b 0.13 (0.71)
Outside Nepal	18 (47.4%)	20 (52.6%)	
Poor sleep quality			
Yes	122 (58.4%)	87 (41.6%)	^b 9.67 (0.002*)
No	126 (44.2%)	159 (55.8%)	
Screened positive for depression			
Yes	98 (65.8%)	51 (34.2%)	^b 20.68 (<0.001*)
No	150 (43.5%)	195 (56.5%)	

*SD: Standard Deviation; ^a Independent t-test; ^b Chi-square test; ^c Fishers Exact test; * p-value<0.05.*

The Hosmer and Lemeshow test (for goodness of fit) was not significant ($\chi^2 = 1.51, p = 0.46$), implying that the model predicted was sound. The participants with poor quality of sleep [Odds ratio (OR): 1.49; 95% confidence interval (CI): 1.02-2.16], and those screening positive for depression (OR: 2.26; 95% CI: 1.50-3.41) were more likely to report internet addiction as compared to others. The overall regression model was statistically significant ($\chi^2 = 25.28; p < 0.001$) and explained 70.0% of the total variance observed in the internet addiction status (Table 3).

Table 3. Binary logistic regression analysis of variables associated with internet addiction in Nepal.

Variables	OR	95% CI	p-value
Poor sleep quality (applying PSQI)	1.49	1.02-2.16	0.03*
Positive depression screen (applying BDI)	2.26	1.50-3.41	<0.001*

PSQI: Pittsburgh Sleep Quality Index; BDI: Beck's Depression Inventory; * $p < 0.05$; OR: Odds ratio; CI: Confidence interval. Model chi-square= 25.28; $p < 0.001$; Cox-Snell $R^2 = 0.050$; Nagelkerke $R^2 = 0.067$.

DISCUSSION

The present study examined the burden of internet addiction among undergraduate students of a medical college from nursing, dental and medical streams. Further, the relationship between internet addiction, depression, and poor sleep quality was evaluated. The majority of study participants were female, which might be because the study sample partly consisted of nursing undergraduate students and the concept of male population studying nursing is not very popular in Nepal. Also, more than 90% of the participants were Hindu that is in line with the recent census data of Nepal.¹³

About 4.7% of the undergraduate students reported severe problems due to internet use in the present study, and were likely to have problematic internet use or internet addiction. This is less than the prevalence of 8.4% for problematic internet use reported among undergraduate students from eight countries¹⁴, and 12.6% among undergraduate students from Nepal alone.¹⁴ However, the present study finding is more in line with the global prevalence estimate of 6.0% reported in a recent meta-analysis of different prevalence studies from 31 nations across seven world regions.¹⁵ Moreover, the pooled prevalence of internet addiction is reported to be as high as 30.1% in a meta-analysis of studies conducted among medical students.¹⁶ This difference in the burden could be explained on the basis of a lack of consensus in the field regarding assessment of internet addiction, and a lack of well-accepted gold standard tool.¹⁷

In our study 42.3% of the participants reported poor quality of sleep as per the PSQI score. This is in line with the findings of more frequent sleep-related problems and insomnia reported among medical and nursing undergraduates than their non-medical counterparts in the available literature.¹⁸ The use of different measures for assessment of sleep-related problems in the medical students have yielded prevalence ranging from 16 % to as high as 90% in the available literature.¹⁹ Thus, the

extent of poor sleep quality observed in the present study is comparable to that reported in some previous studies,^{18,21} and is slightly more than that reported in few other studies.^{22,23} This prevalence of poor sleep quality is in line with a population based study done in western Nepal among adolescents which reported poor sleep quality among 39% of respondents Nepal.²⁴ 514 adolescents from different schools were selected by the probability proportionate to size (PPS). This finding is also similar to a school based survey from Nepal among 390 adolescents that reported poor sleep quality among 31 % participants.²⁵ But this finding is less than that reported by Khadka et al, 2019 among 504 college students.²⁶

The participants were screened for depression using the BDI, and slightly less than one-third (30.2%) of the total participants were positive for depression. This finding is also in line with the global literature,²⁷ and a little higher than that reported in a previous study from Nepal.²⁸ The prevalence of depression is lesser than that reported in a previous study conducted among nursing students from Nepal.²⁹ This might be because of the differences in the characteristics of study population, and different scales being used for the assessment of depression in these studies.

In both bivariate and multivariate logistic regression analyses, internet addiction was significantly associated with poor sleep quality and depression. This adds more evidence supporting the association between internet addiction and sleep problems reported in previous studies from other countries.^{30,31} A recent meta-analysis analyzed data of 35,684 participants, and reported a pooled odds ratio of 2.20 (95% CI: 1.77-2.74) for having sleep problems if the individual was addicted to the internet.³² Similarly, the association between internet addiction and depression has also been reported in studies available from different countries.³³ A meta-analysis of eight studies comprising 1,641 patients with internet addiction and 11,210 controls reported that there was a strong association between internet addiction and depression (OR=2.77, 95% CI=2.04-3.75).³³ However, our study finding is in contrast to the study done in India among 221 undergraduate medical students which showed no relationship of sleep and internet addiction.³⁴ The same study showed a significant relationship of internet addiction with depression similar to our study finding.³⁴ Another study from Nepal among 390 adolescents showed a significant relationship between internet addiction and sleep, similar to our study.²⁵ Also, a study by Bhandari et al, done among 984 students from 27 colleges showed that internet

addiction statistically mediated 16.5% of the indirect effect of sleep quality on depressive symptoms and sleep quality, on the other hand, statistically mediated 30.9% of the indirect effect of internet addiction on depressive symptoms.³⁵ The present study findings also supports this inter-relationship reported between internet addiction, depression, and poor sleep quality.³⁵ Our study findings are also in line with a study from Saudi Arabia among nursing studies, that showed a positive moderate correlation between internet addiction and depression and a positive weak correlation with sleep quality.³⁶ $p < 0.001$

This is one of the very few studies conducted among the medical and allied sciences undergraduate students in Nepal. There are certain limitations to this study too. This was a cross-sectional study, and thus it is not possible to infer directionality or causality in the relationship between internet addiction, sleep quality and depression. Also, due to the use of self-administered questionnaire, the study might have suffered from social desirability and recall biases. The pilot study using 10 percent of sample wasn't done to test for the psychometric properties of the questionnaires which could be another limitation. An important aspect to consider is that this study has taken the respondents from a single medical school, and caution should be kept while so generalizing the study findings for the entire country. Future research with a more representative study sample and longitudinal study design is needed to better characterize the extent of internet addiction and its relationship with depression and sleep disturbances. We would also like to recommend a more contextualized version of internet addiction test for Nepalese setting.

CONCLUSIONS

The study highlights that about half of the participants experienced at least some problems due to internet use, with a small but significant proportion (4.7%) of them reporting severe problems due to their internet use (internet addiction). The problem of internet addiction should not be ignored among medical and allied sciences students in Nepal. The association between internet addiction, depression and poor sleep quality, highlighting a need to develop effective interventions targeting all the three problems in a holistic manner. However, further research with a more representative study sample and longitudinal study design is warranted exploring the pattern and potential intervention strategies for prevention and treatment of this emerging public health concern in Nepal and other developing countries.

Author Affiliations

¹Department of Psychiatry, Kathmandu Medical College, Kathmandu, Nepal

²Department of Psychiatry, Patan Academy of Health Sciences, School of Medicine, Lalitpur, Nepal

³Department of Medical Education, Kathmandu Medical College, Kathmandu, Nepal

⁴Department of Psychiatry, All India Institute of Medical Sciences, New Delhi, India.

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