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Internet addiction: Prevalence and Effect on health profile of engineering students in Bengaluru city

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Abstract
Background: Internet has become a structural part of our day to day life. With smartphones, tablets and the cheap rates of mobile data, internet is "at the fingertips" to the general population. Engineering college students are the most vulnerable group to develop internet addiction. Hence, present study was conducted to assess the extent of internet addiction, its effect on health and various factors influencing internet addiction.
Methodology: A cross-sectional study was conducted at a private engineering college for a period of 4 months. Data was collected from the study subjects having access to the internet for the past 6 months after obtaining written informed consent using a self-administered, semi-structured questionnaire. The Internet addiction test (IAT; Young, 1998)**,** a 20-item 5-point likert scale and Duke's health profile, a 17-item generic questionnaire instrument were used to assess internet addiction and health status. Data was analysed using SPSS 20.0 version.
Results: The extent of internet addiction was found to be 48.1% among the Engineering students. The physical, mental, general, perceived health score was significantly higher among the normal students whereas anxiety, depression, pain and disability score was significantly higher among internet addicts. Arguments in the family, use of internet for more than 3 hours/day and spending more than 200 rupees/month for internet were significantly associated with internet addiction.
Conclusion: Internet Addiction among the study subjects was found to be high, leading to mental health problems. Healthy family environment and less use of internet would overcome the issues.

Keywords: Internet addiction, dukes health profile, mental health, engineering students

Introduction

Internet was developed to make communication easier, quicker, and to facilitate safe exchange of information. The use of internet in a healthy manner is defined as achieving a desired goal within an appropriate time period without experiencing intellectual or behavioural discomfort. Over the years, ever increasing use of internet for work and leisure activities has led to its omnipresent presence across all activities of the day and this has disguised the boundaries between functional and dysfunctional internet use [1].

Internet has become one of the most essential requirement of urban man for various purposes like obtaining information, job opportunities, free expression of thoughts, possibility to access prohibited content, involvement in unique games, education, entertainment, including social media sites and networking and is gradually becoming a structural part of our day to day life. With the advent of new age smart phones, tablets, and computers, the internet is readily accessible to the general population or "at the fingertips" [2].

The term "Internet addiction" was proposed by Dr. Ivan Goldberg in 1995 for pathological compulsive internet use [3]. It is known by different terms such as pathological internet use, problematic internet use, compulsive internet use and internet overuse in the literature [4].

Internet addiction can be described as an individual's inability to control his or her own use of internet causing disturbances and impairment in fulfilment of work, social, and personal commitments [5]. Since 1995, different opinions have been put forward as to whether problematic internet use should be considered as a psychiatric disorder or a mental illness similar to other well established addictive disorders [6]. The appropriate classification of Internet addiction is still controversial. It was classified as impulse-control disorder or as obsessive compulsive disorder or as behaviour addiction [7]. As per DSM-V, Internet gaming addiction was included as a possible disorder recently, while debate is still on-going as to

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whether the condition called "Internet Addiction" (IA) could be fully recognised as an established disorder [8].

Various studies correlate Internet addiction with significant psychiatric disorders such as low self-esteem, impulsivity, poor sleep quality, mood disorder, suicides, alcohol abuse, attention deficit and hyperactivity, depression, and anxiety [9, 10].

College students are most vulnerable to internet addiction because of various reasons like availability of time, ease of use; unlimited access to the Internet, psychological and developmental characteristics of young adulthood, limited parental supervision and also, internet offering a route of escape from exam stress, all of which make internet overuse a significant cause of concern for parents and faculty [11].

Out of these college students, engineering students are the most vulnerable group. Transition in the academic life after joining engineering course sets challenges like solve everyday challenges of staying away from home, study well, form new interpersonal relationships, and gather social and emotional support. Vulnerable individuals can experience boredom, loneliness, and depressive symptoms during this phase of transition and this may indirectly lead to students overusing the internet [5]. Along with that favouring factors such as easy and limitless access to internet, internet dependent courses, communication with peers and mentors through assignments and projects might attribute to the problem [2].

As engineering college students are more vulnerable to internet addiction that may cause psychological problems and that in turn may lead to academic failures, this study was undertaken to determine prevalence of internet addiction, its effect on health and the various factors influencing internet addiction among engineering students.

Methods
A descriptive cross-sectional study was conducted among Bachelor of Engineering (B.E) students from a private engineering college, Bengaluru, for a period of 4 months from September to December 2018. Ethical clearance was obtained from Institution Ethical Committee. From the previous studies, considering 42% Prevalence of Internet addiction among college students in Bengaluru, minimum sample size of 395 was estimated, [11] assuming 15% nonresponse rate, sample size of 455 was estimated. After obtaining permission from the Head of the Institution, students who were using internet for the past 6 months from all the branches were included in the study. Those who were not willing to participate were excluded from the study. Line list of the participants was prepared and a total of 455 students were selected by simple random sampling. Written informed consent was obtained from the study participants. A self-administered semi-structured, pretested questionnaire consisting of Socio-demographic details was administered to the study participants. The study tools used to assess the Internet addiction and health profile of study participants were Young's Internet Addiction Test and Duke's health profile respectively.

Young's internet addiction test
It is a 20-item scale developed by Dr. Kimberly S. Young, the first psychologist to document internet addiction. The 20-item questionnaire measures characteristics and behaviours associated with compulsive use of the Internet that include compulsivity, escapism, and dependency.

Questions are again divided in to exam items for assessing a pattern of symptom complaints ie., Salience related (questions 10, 12, 13, 15, and 19), Excessive use related (questions 1, 2, 14, 18, and 20), Neglect work related (questions 6, 8, and 9), Anticipation related (questions 7, 11) and Lack of control related (questions 5, 16, and 17) to consider other aspects of psychological functioning exhibited by the person. Questions are randomized and each statement is weighted along a Likert-scale continuum that ranges from 0 to 5 indicating 0= Does not apply, 1= Rarely, 2= Occasionally, 3= Frequently, 4= Often, 5= Always. The IAT total score ranges, with the higher the score representing the higher level of severity of Internet compulsivity and addiction. Overall scores ranging from 0 to 30 are considered normal level of Internet usage; scores of 31 to 49 indicate the presence of a mild level of Internet addiction; 50 to 79 reflect the presence of a moderate level; and scores of 80 to 100 indicate a severe dependence upon the Internet [12].

The duke health profile
This is a 17-item generic questionnaire instrument designed to measure adult self-reported functional health status quantitatively during past 1-week time window. It is appropriate for both patient and non-patient adult populations. It can be administered by the respondents themselves or by another person. The administration time is less than 5 min. It is crucial that each question is answered. There are 11 scales with maximum score for each scale being 100 and minimum being 0. It has six scales to measures function (i.e., physical health, mental health, social health, general health, perceived health, and self-esteem), higher scores indicating better health. Five scales to measure dysfunction (i.e., anxiety, depression, anxiety-depression, pain disability), with high scores indicating greater dysfunction. Necessary permission was obtained to use this tool in our study [13].

Data collection: The nature and purpose of the study was explained to the participants. Self- administered questionnaires were distributed to the participants in classroom settings at a predetermined time and were collected onsite after 30 min.

Statistical analysis: Data was entered in to Microsoft Excel worksheet and was analysed using SPSS 20.0 version. Descriptive statistics (percentage, mean, standard deviation, range) were used to summarize baseline characteristics of the study subjects. Socio-demographic variables were denoted by frequency tables. The prevalence of Internet addiction was described in terms of percentage. An association between two categorical variables was analysed by using Chi-square test and Mann-Whitney U test. $P<0.05$ was considered to be statistically significant.

Results
A total of 455 study participants were included in this study. A higher proportion of the participants (82.2%) were aged 18 years and above (Range: 17-21 years) with a mean age of 17.96 ± 0.59 years. Majority of study participants were males (67.9%), 286 (62.8%) were day scholars. Out of the 286 day scholars, 50.5% of students belonged to nuclear family. 5.3% of the study participants gave history of substance abuse. [Table-I]

In the current study, Majority of the students, i.e., 85.9% accessed the internet via their mobile while, 13.5% of them used any of the gadgets available at home and three students (0.6%) relied on cybercafé. Mostly, the students spent more time on the internet during evening (48.3%) or night (44.8%) respectively. Slightly more than half of the students. e., 51.7% used internet for more than 180 minutes per day and 50.4% students spent more than 200 rupees per month for internet. [Table II]

Most of the students used the internet for movie/video streaming and instant messaging, i.e., 29.8% and 29.4% respectively, which were closely followed by chat rooms at 24.1%, online gaming at 22.1%. Usage for online shopping was 12.5% while recreational surfing and news sites were next with 12.3% each. These were followed by discussion forums at 10.5%, email at 9.2% and adult entertainment sites being least at 8.3% [Graph 1].

In this study, 48.1% of the study participants were found to have Internet addiction, among them 36% had mild, 11.4% had moderate and 0.7% severe internet addiction with their scores lying between 31 to 49, 50 to 79 and 80 to 100 respectively [Table III].

Among the study subjects, 48.3% students had lack of control related internet addiction symptoms, while 214 students (47%), 203 students (44.6%), 191 students (41.9%), 190 students (41.7%) and 161 students (35.3%) had neglect of social life related, salience related, neglect work related, excessive use related and anticipation related internet addiction symptoms respectively [Table IV].

Using Duke's Health profile, it was found that addicts have poor physical, mental, general and perceived health score and this was found to be statistically significant (*P*<0.001). No significant relationship was found between social health and self-esteem score and internet addiction. Addicts had high pain, disability, anxiety, depression, and anxiety depression score and this was also found to be statistically significant (*P*<0.001) [Table V].

In the present study, students who reported more arguments in the family, those who used internet for more than 180 minutes per day and those who spent more than 200 rupees for internet per month were found to be addicted to internet and this was found to be statistically significant. (*P*<0.001) Whereas there was no significant association between age, gender, place of stay, type of family and substance use and internet addiction. (*P*>0.05) [Table VI]

Discussion
This study was conducted in an urban private engineering college in view of vulnerability of engineering students to fall prey to internet addiction and its dastardly effects on health. In our study, majority of the participants were aged >18 years with a range of 17-21 years which is comparable to the findings of Thakur A *et al*. [2] Majority of study participants were males which is similar to study by Sunil Kumar DR *et al*. [14] 5.3% of the study participants gave history of substance abuse which is lower than the findings of Anand N *et al* who observed substance abuse in 9.1% study subjects which may be due to lower reporting [1]

Krishnamurthy S *et al* noted that most used gadget for accessing internet was mobile phone which is similar to our studyresults [11]. Anand N *et al* in his study observed that majority of the students used internet when necessary and had no preferred time for its usage whereas in our study the most preferred time for internet usage noted was evening

hours due to availability of free time [1].
In our study, most of the students used internet for movie/video streaming and instant messaging followed by chat rooms, online gaming and shopping, according to Sunil Kumar DR *et al* study also the most of students used internet for accessing social media followed by shopping, gaming [14]. Social media is on the high nowadays and this is a worrying situation as this may affect their academic performance and activity.

In the present study, the prevalence of internet addiction was found to be 48.1% among the study participants, in comparison to 42.9% and 67% among other engineering colleges in Bengaluru respectively, [11, 14] 50% among engineering college students of Hassan, Karnataka, [15] 56.5% among university students in South India [16] and 74% among engineering college students in North India [2]. Our study findings are comparable to studies from South Indian cities whereas prevalence is lower than study from North Indian city, this difference may be due to different study settings, lifestyle patterns, accessibility, availability, and cultural acceptability of internet use.

In this we found that 36.0% had mild, 11.4% had moderate and 0.7% had severe addiction to internet respectively, whereas according to study findings of Subhashini KJ *et al* they had more students falling under moderate addiction category than our study ie., 32.7%, 24% and 1% of mild, moderate and severe internet addiction respectively, [15] whereas Anand N *et al*. in his study noted 29.9% mild, 16.4% moderate and 0.5% severe internet addiction among university students [1].

As IAT total score yields only an estimate of the overall severity of Internet addiction, in our study we also considered other aspects of psychological functioning exhibited by the person, particularly any co-morbid symptoms of chronic impulsively, clinical depression, or relational difficulties that may elevate scores. Among them, majority of students had lack of control related internet addiction symptoms which means respondent has trouble managing his or her online time, frequently stays online longer followed by neglect of social life related symptoms indicating respondent most likely utilizes online relationships to cope with situational problems and/or to reduce mental tension and stress [12]

Our study had physical, mental, general, perceived health scores significantly higher among the normal students, whereas pain, disability, anxiety, depression, and anxiety depression scores were significantly higher among internet addicts. Similar to the studies done by D. Goel *et al* and Mishra S *et al*, which showed that addicts have poor mental, physical, and mental health score. Addicts had high anxiety, depression, and anxiety depression score. No significant relationship was found between self-esteem score and internet addiction in any of these studies [17, 18]

Current study showed that the arguments in the family was significantly associated with internet addiction which is similar to the findings of Niedorys B *et al* who concluded that repeated conflicts with parents were more frequent among students at risk of addiction than who were not addicted [19].

The amount of time an individual spends on internet is a crucial factor which increases risk of internet addiction. The research evidence from many studies consistently suggests that the severity levels of IA increase with increasing duration of internet use [2, 5]

In the present study we noted that use of internet for more than 180 minutes (> 3 hrs) per day and spending more than 200 rupees per month for internet were all associated with internet addiction which is similar to the findings of Thakur A *et al* who also observed those who spent > 4 hrs/day and spent more money (> 500 Rs/day) for internet usage were found to have a significant association with internet addiction [2].

Limitation of the study: The study lacks the generalizability as it is done in one engineering college in the city. A multi centric study needs to be done with larger samples to generalize the results.

Table I: Socio-demographic characteristics of the study subjects

Variable	Category	Number (n=455)	Percentage (%)
Age (years)	<18	81	17.8
	>18	374	82.2
Gender	Male	309	67.9
	Female	146	32.1
Place of stay	Home	286	62.8
	Hostel	169	37.2
Type of family	Nuclear	230	50.5
	3rd Generation	24	05.5
	Joint	32	07.0
Substance use	Yes	24	05.3
	No	431	94.7

Table II: Details of internet usage among the study subjects

Variable	Category	Number (n=455)	Percentage (%)
Place of access	Home	61	13.5
	Mobile Internet	391	85.9
	Cybercafé	03	00.6
Internet access time	Morning	07	01.5
	Afternoon	06	01.4
	Evening	238	52.3
	Night	204	44.8
Use of internet/day (in minutes)	<180	220	48.3
	>180	235	51.7
Money spent/month (in rupees)	<200	226	49.6
	>200	229	50.4

Table III: Prevalence of internet addiction

Internet addiction (score)	Number (455)	Percentage (%)
Normal (0-30)	236	51.9
Mild internet addiction (31-49)	164	36.0
Moderate internet addiction (50-79)	52	11.4
Severe internet addiction (80-100)	03	00.7

Table IV: IAT score for a pattern of symptom complaints

Pattern of symptom complaints	Median Score	Number (n=455)	Percentage
Salience-related	>7	203	44.6
Excessive use-related	>8	190	41.7
Neglect work-related	>4	191	41.9
Anticipation-related	>3	161	35.3
Lack of control-related	>5	220	48.3
Neglect of social life-related	>1	214	47.0

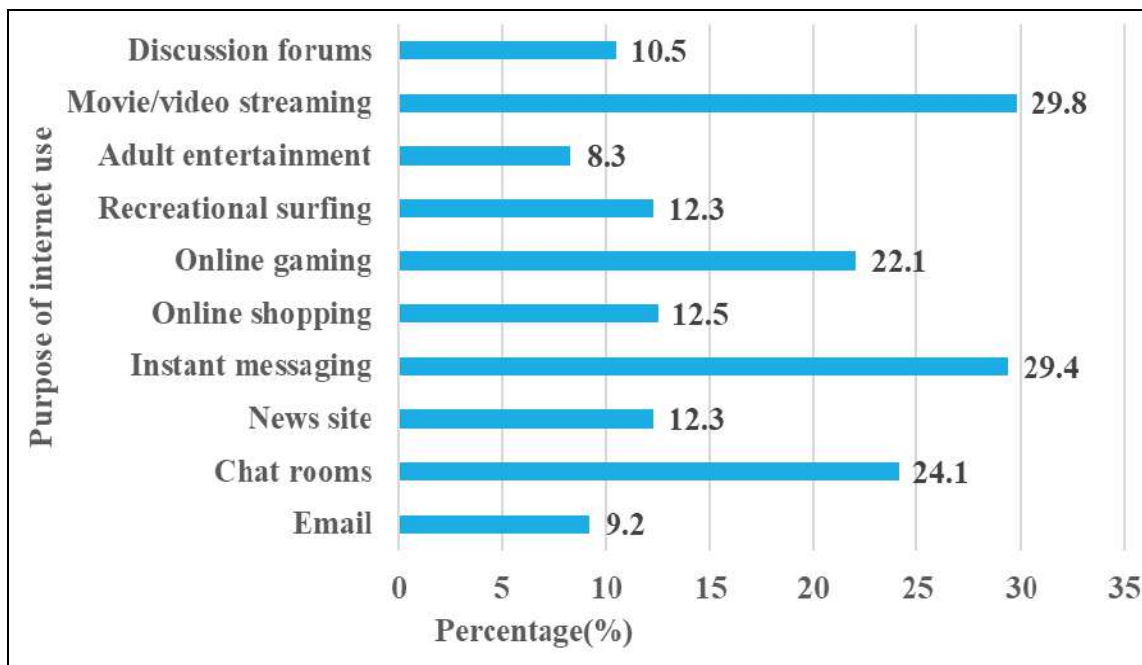**Table V:** Comparison of duke's health profile scoring

Duke's health profile score	Mean rank (Median score)		P value (Mann-Whitney U test)
	Normal (n=236)	Addicts (n=219)	
Physical health score	254.01 (80)	199.97 (70)	< 0.001*
Mental health score	254.75 (80)	199.17 (70)	< 0.001*
Social health score	232.90 (70)	222.72 (70)	0.404
General health score	255.63 (73.3)	198.23 (66.6)	< 0.001*
Perceived health score	240.08 (100)	214.98 (100)	0.02*
Self-esteem score	237.20 (80)	218.08 (80)	0.12
Anxiety score	199.84 (33.3)	258.34 (41.6)	< 0.001*
Depression score	201.35 (30)	256.72 (40)	< 0.001*
Anxiety-depression score	195.58 (28.6)	262.93 (35.7)	< 0.001*
Pain score	208.79 (0)	248.70 (50)	< 0.001*
Disability score	217.47 (0)	239.34 (0)	< 0.001*

*P value <0.05 is statistically significant

Table VI: Association of various factors determining internet usage

Variable	Category	Internet addiction		Chi square value	P value
		Present (n=219)	Absent (n=236)		
Age (years)	<18	40 (49.4)	41 (50.6)	0.0618	0.8037
	>18	179 (47.9)	195 (52.1)		
Gender	Male	155 (50.1)	154 (49.9)	1.5895	0.2074
	Female	64 (43.8)	82 (56.2)		
Place of stay	Home	140 (49.0)	146 (51.0)	0.207	0.6491
	Hostel	79 (46.7)	90 (53.3)		
Type of family	Nuclear	108 (47.0)	122 (53.0)	5.0202	0.0812
	3rd generation	17 (71.0)	07 (29.0)		
	Joint	15 (47.0)	17 (53.0)		
Substance use	Yes	14 (58.3)	10 (41.7)	1.0562	0.3040
	No	205 (48.0)	226 (52.0)		
Arguments in family	Never	16 (26.6)	44 (73.3)	16.1927	0.0013*
	Occasionally	81 (53.0)	73 (47.0)		
	Often	25 (58.1)	18 (41.9)		
	Almost daily	18 (62.1)	11(37.9)		
Use of internet/day (in minutes)	<180	74 (33.0)	152 (67.0)	42.5936	<0.0001*
	>180	145 (63.3)	84 (36.6)		
Money spent/month (in rupees)	<200	88 (40.0)	132 (60.0)	11.2827	0.0007*
	>200	131 (55.7)	104 (44.3)		

*P value <0.05 is statistically significant

Graph I: Distribution of study participants based on the Purpose of internet use

Conclusion
- The prevalence of internet addiction was found to be 48.1% among the Engineering students.
- The physical, mental, general, perceived health scores were significantly higher among the normal students whereas pain, disability, anxiety, depression and anxiety depression scores were significantly higher among internet addicts.
- Factors associated with internet addiction were arguments in the family, use of internet for more than 3 hours per day and spending more money per month on internet usage.

Declarations
Conflict of interest: None.
Ethical approval: The study was approved by the Institutional Ethics Committee.

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