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A Cross Sectional Study in Indian Adult Population to Assess the Internet Addiction and its Effect on the Quality of Sleep

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Abstract

In contemporary society, the internet has become an integral aspect of daily life, alongside a concerning rise in internet addiction characterized by an overwhelming compulsion to engage with online activities. This phenomenon is particularly prevalent among the youth population in India, leading to various physical, mental, and emotional challenges. Despite its widespread impact, internet addiction has yet to be officially recognized as a disorder in diagnostic manuals like the DSM. A comprehensive meta-analysis spanning 80 studies across 31 countries revealed a global prevalence of internet addiction at 6%. In the Indian context, a study sponsored by the Indian Council of Medical Research surveyed 2,755 adults aged 18-65, identifying a prevalence rate of approximately 1.3%. Examining a sample of 303 adult participants in India, it was found that 33.3% exhibited signs of internet addiction, with 1.7% classified as severely addicted, 10.2% as moderately addicted, and 20.8% as mildly addicted. Notably, the majority of severely addicted individuals were in the 26-35 age group, while addiction rates were higher among males compared to females [1, 2]. Furthermore, analysis revealed a correlation between internet addiction and poor sleep quality, affecting 22.6% of addicted individuals, particularly males aged 18-25 and 26-35. These findings underscore the urgent need for further research and interventions to address the growing issue of internet addiction and its associated health impacts.

Keywords: *b-PSQI, Compulsive Disorder, Internet Addiction Disorder (IAD), Prevalence, Sleep Quality.*

Introduction

As the internet advanced and became a part of the normal routine of human activities in the past two-three decades [3], reliance and dependency of people also has grown on the internet. Now several online social platforms are available for people of all ages like WhatsApp, Facebook, and similar others alluring people to spend around 6 hours every day in the US as per the Pew Research. This was Dr. Kimberly Young (1996) who made internet addiction famous by publishing multiple pages and creating Internet Addiction Tool (IAT) which is being used worldwide by several mental health experts. The prevalence ranges of internet addiction varied from 1.5-8.2% [4] and 6% to 18.5% [5] where, latter was based on multiple studies using IAT. Hypothetically, internet addiction depends upon the (over) time spent on the internet [6, 7] and could be due to other indistinctive reasons like individual and/or behavioral problems [8].

The prevalence rates of internet addiction among adolescent populations exhibit considerable variability, ranging from 0.8% to 26.7% across multiple studies [7, 9-12]. Similarly, in adult samples from various countries outside India, prevalence rates range from 1.2% to 22.8% [13-17] indicating notable disparities.

Furthermore, gender differences are evident in the susceptibility to internet addiction, with males exhibiting a higher propensity compared to females [18-20]. This observation

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underscores the importance of considering gender-specific factors in understanding and addressing internet addiction behaviors. A meta-analysis encompassing empirical studies conducted between 1996 and 2012, involving a total of 89,281 participants globally, revealed a prevalence of internet addiction at 6% [95% CI 5.1-6.9] [21].

In the Indian context, limited studies have examined internet addiction prevalence, with findings indicating a prevalence of 1.3% in the general population [22]. However, compared to Western and Eastern countries, research on internet addiction in India is relatively scarce, with a predominant focus on adolescent populations.

The disparity in prevalence rates may be attributed primarily to variations in assessment tools utilized across studies, rather than differences in age groups. Additionally, discrepancies in the populations studied, such as internet users versus the general population, contribute to the observed differences.

Commonly associated outcomes among individuals with internet addiction include anxiety, depression, and sleep disturbances [23-25], often accompanied by comorbid conditions like muscle pain, obesity, and cardiovascular problems.

Challenges in determining the prevalence of internet addiction in the Indian population include the need for broader representation across regions, including rural areas, and addressing illiterate populations.

The development and utilization of new assessment tools, such as the Chen Internet Addiction Scale (CIAS) and its revisions, offer alternative approaches to measure internet addiction, with tailored tools for the Indian population being recommended to mitigate response manipulation based on social strata.

Acknowledging internet gaming disorder in the DSM-V underscores the significance of addressing internet addiction, with various therapeutic interventions being explored. Serotonin-reuptake inhibitors (SSRIs), physical exercise, and psychotherapy, including Motivational Interviewing and Multilevel counseling, are among the treatment modalities utilized, with psychotherapy being the preferred approach by clinicians [26-31].

Methods

Survey research has consistently been favored for its ability to collect information not readily accessible through other means [32-34]. In this study, two types of questionnaires were employed. The first set comprised internationally validated instruments, including the Internet Addiction Test (Young, 1999) and the brief Pittsburgh Sleep Quality Index (PSQI) to assess the sleep quality of such addicted individuals.

Ethical considerations were paramount throughout the study, with approval obtained from the ethical committee to ensure research integrity. The research protocol was formulated through collaborative discussions involving a psychiatrist, multiple researchers, acquaintances, and the research supervisor.

The study employed a cross-sectional design, utilizing close-ended, self-administered questionnaires distributed to the Indian public aged 18 and above, as well as experts in the field. Data collection was facilitated through Google Forms, with questionnaire links disseminated via various platforms such as LinkedIn, WhatsApp, emails, and word of mouth through personal networks. Participants from the general public were provided with an option to voluntarily consent to participate, and anonymity of responses was maintained.

Analysis of data collected from the general public focused on establishing the prevalence of internet addiction among Indian adults and its association with poor sleep quality in affected individuals.

Summary of the Study Design

Data was gathered from 303 participants more than and equal to 18 years of age who consented voluntarily to share the requested information about the use of the internet and associated experiences which could have affected their mental, physical, and emotional patterns.

Inclusion criteria for participants were.

1. Adult Indian >= 18 years.
2. Literate and use the internet.
3. All genders.
4. Consent voluntarily to participate in the study.

Exclusion Criteria:

1. Illiterate candidate.
2. Age < 18 years.

Recruitment methods:

1. Local networking including friends, family, relatives, & colleagues.
2. Via phone and e-mail.
3. Social Networking websites (WhatsApp, LinkedIn etc.)

Study Duration

November 2022 to Jun 2023.

Ethical Consideration

While the study's non-interventional nature didn't necessitate ethical approval, seeking approval from the Ethics Committee was undertaken to reassure volunteers that their information would remain confidential, solely utilized for data analysis within the confines of this research.

Sample Size

The sample size was determined using a 95% confidence interval (CI) and a 5% margin of error, resulting in a calculated requirement of 271 adult volunteers from various states of India. These individuals were invited to participate in the survey by accessing the questionnaire through Google Forms. By June 2023, a total of 303 responses had been received. It is noted that the questionnaires utilized in this study are internationally validated and accessible in the public domain, requiring no formal permissions for reproduction, translation, display, or distribution for academic purposes.

Formula used: $$\frac{\frac{z^2 \times p(1-p)}{e^2}}{1+\left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

Where, N = population size; e = Margin of error (percentage in decimal form); z = z-score. The z-score is the number of standard deviations a given proportion is away from the mean. The right z-score considering 95% CI would be 1.96.

Study Design

The study questionnaire had section for voluntary consent of potential study participants and questions from the Young's Internet Addiction Tool (IAT) [Table 1] and brief Pittsburgh Sleep Quality Index (PSQI) [Table 2].

The Internet Addiction Tool (IAT) [35] developed by Young in 1998 consisted of 20 statements, each rated on a 5-point Likert scale, with scores ranging from 0 to 100. A score of 80 or higher indicated severe addiction, while scores falling between 50 and 79 suggested problematic internet use (moderate addiction), and scores equal to or below 49 indicated controlled internet usage. Respondents were asked to select the most appropriate response from a drop-down menu, with options including Not Applicable (0), Occasionally (2), Rarely (1), Frequently (3), Often (4), and Always (5).

Table 1. The Internet Addiction Tool (IAT)

S. No.	Questions	S. No.	Questions

1	How often do you find that you stay online longer than you intended?	11	How often do you find yourself anticipating when you will go online again?
2	How often do you neglect household chores to spend more time online?	12	How often do you fear that life without the Internet would be boring, empty, and joyless?
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?
4	How often do you form new relationships with fellow online users?	14	How often do you lose sleep due to being online?
5	How often do others in your life complain to you about the amount of time you spend online?	15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?
6	How often do your grades or schoolwork suffer because of the amount of time you spend online?	16	How often do you find yourself saying "just a few more minutes" when online?
7	How often do you check your email before something else that you need to do?	17	How often do you try to cut down the amount of time you spend online and fail?
8	How often does your job performance or productivity suffer because of the Internet?	18	How often do you try to hide how long you've been online?
9	How often do you become defensive or secretive when anyone asks you what you do online?	19	How often do you choose to spend more time online over going out with others?
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

The brief version of Pittsburgh's Sleep Quality Index (PSQI) to assess the sleep quality and disturbances over the past one month. This questionnaire had 5 components with certain questions and specified scores quantifying the sleep latency (C1), sleep duration (C2), sleep efficiency (C3), sleep disturbances (C4) and daytime dysfunction

(C5) which when summed together, overall sleep quality is assessed. Every component is scored from 0 to 3 where 0 is no difficulty at all while 3 stands for severe difficulty. These component scores are further summed to obtain a global score where any score more than 4 is indicative of poor sleep quality and should be looked into or such individuals should seek an expert's advice. Higher scores indicate worse sleep quality. These subjective questions pertain to the usual sleep habits of any individual during the past month only. The brief version of PSQI improved its efficiency and applicability and yielded a favorable sensitivity of 75.82% and specificity of 76.99% to measure different (poor) sleep patterns thus establishing it as a reliable and measurable screening tool [36].

Table 2. Brief Pittsburgh Sleep Quality Index (PSQI)

1. During the past month, what time have you usually gone to bed at night?	2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	3. During the past month, what time have you usually gotten up in the morning?	4. During the past month, how many hours of actual sleep did you get at night? *(This may be different than the number of hours you spent in bed.)*	
5. During the past month, how often have you had trouble sleeping because you…	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Cannot breathe comfortably				
d. Cough or snore loudly				
e. Feel too hot				
f. Have bad dreams				
g. Have pain				
6. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				

	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
7. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				

Data Collection and Analyses

Responses to the questionnaire were gathered online via Google Forms. Subsequently, the data was inputted into Microsoft Excel 365 for analysis. Various Excel formulae were employed to conduct analyses, and the results were presented through tables, graphs, and figures. The collected data underwent review and moderation to ensure accurate placement and ease of further calculation. Excel facilitated the segregation of data, detailed description, and creation of multiple pivot tables, charts, and tables to support the content and outcomes. Means, percentages, and other derived information were easily obtained using Excel. Each collected piece of information, including responses to the Internet Addiction Test (IAT) and the Pittsburgh Sleep Quality Index (PSQI), was reviewed, and explained separately, while establishing relationships among them.

Results

Demographics

Out of the total 303 responses received, 181 (59.7%) were male, 120 (39.6%) were female, and the remaining 2 (0.7%) did not disclose their gender [Figure 1].

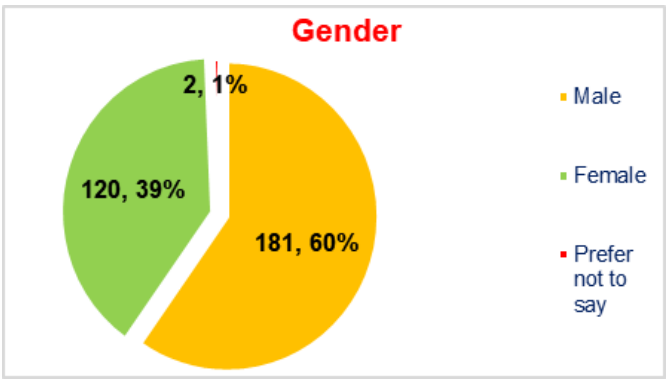

Figure 1. Gender Distribution

These participants were then categorized into different age groups [Figure 2] to facilitate analysis. Specifically, 135 participants fell into the 18-25 years age bracket, 92 were in the 26-35 years age group, and 69 were aged 36-45 years. Additionally, 6 participants were between 46-60 years old, while 1 participant was over 60 years old. The two individuals who did not disclose their gender were distributed in the 26-35 year and 36-45 years age groups, with one person in each group.

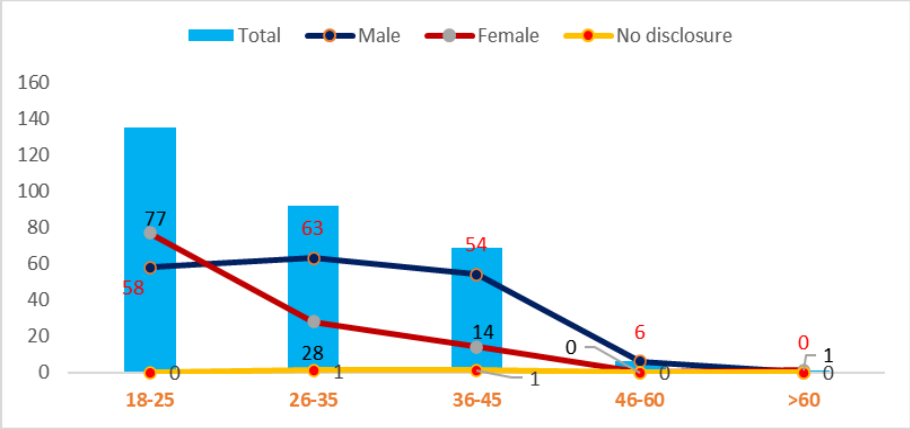

Figure 2. Age Group with Gender Distribution

Given the focus of the thesis on internet addiction, the duration of internet usage [Table 3] holds significance. On average, participants began using the internet at 18 years old, with an average duration of use of 10 years. The maximum duration observed was 20 years, categorized into four intervals of 0-5, 5-10, 10-15, and 16-20 years for analysis, with usage decreasing as age increased.

Table 3. Comparison between Age Group and Internet Use-Age

Internet Use-Age			**18-25 years**		**26-35 years**		**36-45 years**		**46-60 years**		**>60 years**	
Year Range	Total	Total %	Total	Total %	Total	Total %	Total	Total %	Total	Total %	Total	Total %
0 - 5	37	12.2%	32	86.5%	3	8.1%	2	5.4%	0	0.0%	0	0.0%
6 – 10	142	46.9%	83	58.5%	35	24.6%	21	14.8%	2	1.4%	1	0.7%
11 - 15	107	35.3%	20	18.7%	45	42.1%	39	36.4%	3	2.8%	0	0.0%
16 - 20	17	5.6%	0	0.0%	9	52.9%	7	41.2%	1	5.9%	0	0.0%

The majority of participants (72.3%) reported using the internet for both work and study, while 11.9% and 15.8% used it solely for work or study, respectively [Figure 3].

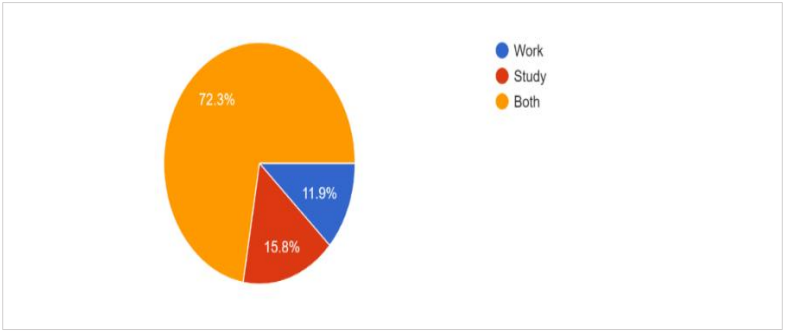

Figure 3. Internet Usage Distribution

Regarding professions [Figure 4], the largest shares were among students/working students (50.2%) and private/corporate employees (40.6%).

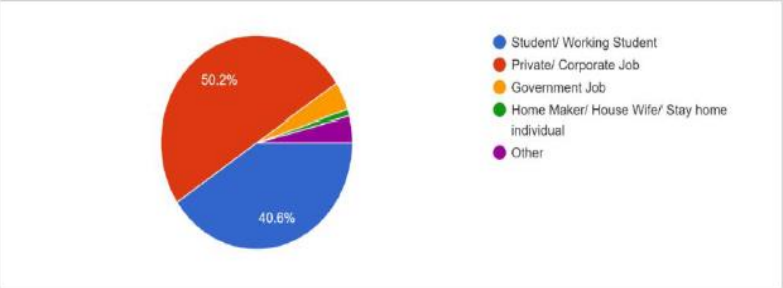

Figure 4. Profession-Wise Distribution

Additional demographic parameters assessed included marital status [Figure 5], concomitant substance use [Figure 6], and existing health issues [Figure 7].

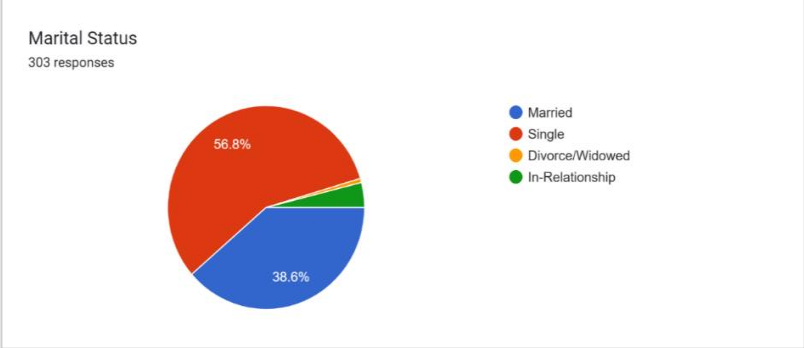

Figure 5. Marital Status Distribution

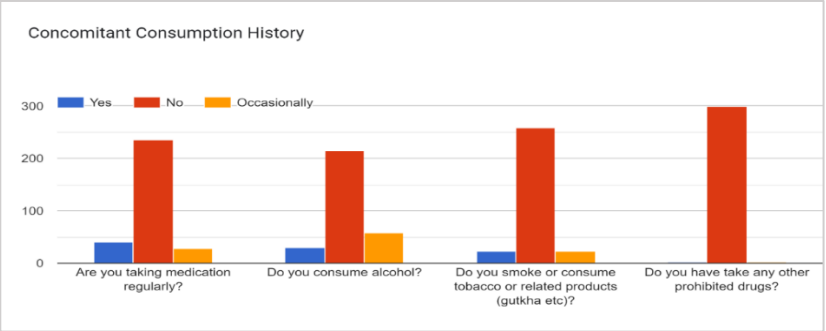

Figure 6. Concomitant Consumption Distribution

Four individuals (1.3%) reported psychiatric or mental health issues [Figure 7], which were excluded from the final analysis. Other health issues did not appear to significantly impact internet addiction or vice versa.

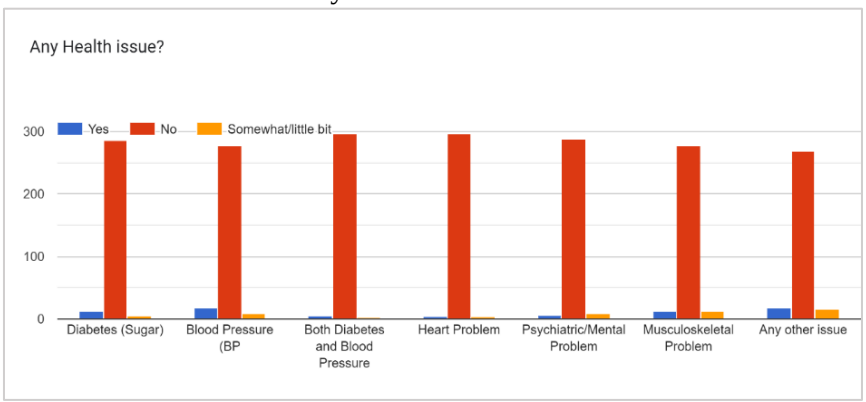

Figure 7. Medical History-Wise Distribution

Prevalence of the Internet Addiction using Internet Addiction Test (IAT)

Out of the total 303 participants, 103 individuals (34%) were identified as being addicted to the internet. Addiction was observed across three age groups: 18-25 years, 26-35 years, and 36-45 years. The prevalence of addiction was highest in the 18-25 years age group (13.5%), followed by the 26-35 years age group (12.2%), and then the 36-45 years age group (8.3%). These age groups were further analyzed based on gender to better understand addiction patterns [Table 4].

A breakdown by gender revealed a higher prevalence of internet addiction among males (65%) compared to females (34%), a trend consistent with findings from previous research. Notably, in the youngest age group, there was a slight numerical predominance of females.

Table 4. Internet Addiction Status - Overall

IAD-Overall										
Overall			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	103	34.0 %	TOTAL Addicted	41	*39. 8%	TOTAL Addicted	37	*35. 9%	TOTAL Addicted	25	*24. 3%
Male	67	65.0 %	Male	20	48.8 %	Male	29	78.4 %	Male	18	72.0 %
Female	35	34.0 %	Female	21	51.2 %	Female	8	21.6 %	Female	6	24.0 %
Gender Unknown	1	1.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	1	4.0 %

Approximately 70% of participants reported spending more time on the internet than necessary. Additionally, nearly half of the participants expressed a preference for checking their emails before engaging in other activities. Around 44%-45% of participants exhibited symptoms of internet overuse, such as neglecting household chores and experiencing feelings of loneliness and boredom. Participants aged over 60 years were not found to be addicted and were therefore excluded from further analysis.

Among the 103 addicted participants, the severity of internet addiction was classified as mild (21.1%) [Table 7, Figure 10], moderate (10.6%) [Table 6, Figure 9], and severe (2.3%) [Table 5, Figure 8].

Table 5. Internet Addiction Status – SEVERE

IAD-Severe										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	7	6.8%	TOTAL Addicted	1	14.3%	TOTAL Addicted	5	71.4%	TOTAL Addicted	1	14.3%
Male	4	57.1%	Male	0	0.0%	Male	3	60.0%	Male	1	100.0%

Female	3	42.9%	Female	1	100.0%	Female	2	40.0%	Female	0	0.0%
Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%

Table 6. Internet Addiction Status – MODERATE

IAD-Moderate										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	32	31.1 %	TOTAL Addicted	16	50. 0%	TOTAL Addicted	9	28. 1%	TOTAL Addicted	7	21.9%
Male	23	71.9 %	Male	9	56. 3%	Male	8	88. 9%	Male	6	85.7%
Female	9	28.1 %	Female	7	43. 8%	Female	1	11. 1%	Female	1	14.3%
Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0%

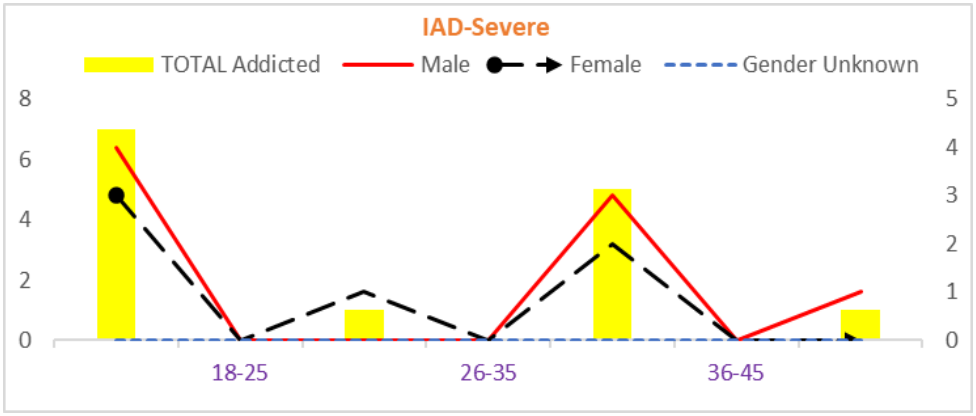

Figure 8. Internet Addiction Status - SEVERE

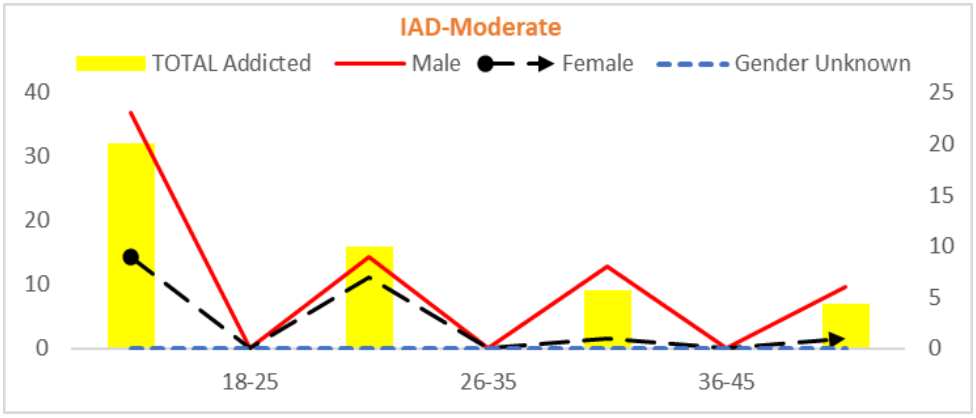

Figure 9. Internet Addiction Status - MODERATE

Table 7. Internet Addiction Status - MILD

IAD-Mild											
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	64	62.1%	TOTAL Addicted	24	37.5%	TOTAL Addicted	23	35.9%	TOTAL Addicted	17	26.6%
Male	40	62.5%	Male	11	45.8%	Male	18	78.3%	Male	11	64.7%
Female	23	35.9%	Female	13	54.2%	Female	5	21.7%	Female	5	29.4%
Gender Unknown	1	1.6%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	1	5.9%

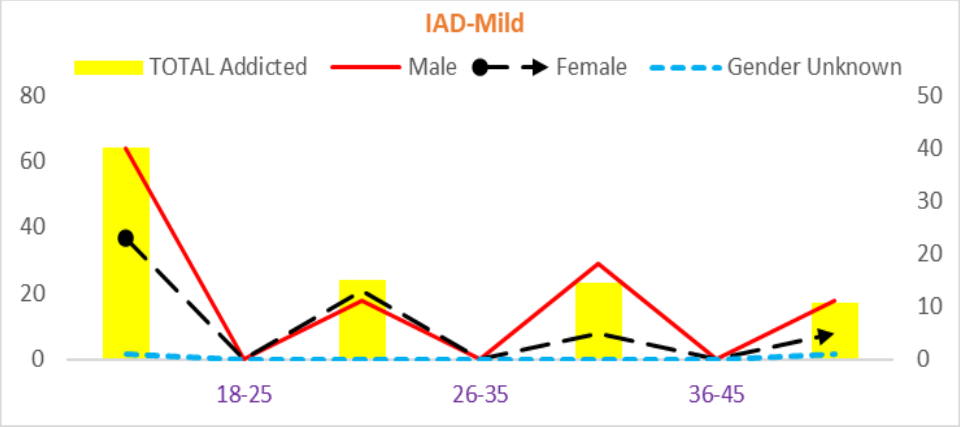

Figure 10. Internet Addiction Status - MILD

All seven individuals classified as severely addicted to the internet exhibited mental and sleep-related problems. The age group with the highest prevalence of severe addiction was 26-35 years, accounting for five individuals (71.4%), followed by one individual each from the 18-25 years and 36-45 years age groups. These participants demonstrated a propensity to spend prolonged periods online compared to what would be expected. Additionally, the majority of moderately addicted participants (28 out of 32, or 87.5%) reported excessive internet use outside of their regular hours, with a higher representation from the 18-25 years age group. None of the participants aged over 45 years were found to be moderately addicted and were thus excluded from further analysis. Furthermore, a significant proportion of both severely and moderately addicted individuals (35 out of 39, or 89.7%) reported using the internet for work, study, or both, suggesting a potential confounding factor regarding the extended hours of internet usage. Despite this, these individuals are deemed either fully addicted or predisposed to addiction, warranting expert intervention. The data indicates a correlation between internet addiction and excessive internet usage. The remaining 62.1% of the addicted population (21.1% of the total 303 respondents) were categorized as mildly addicted. Among the 64 mildly addicted individuals, 24 (37.2%) reported using the internet beyond normal hours and exhibited symptoms of sleep disturbances.

Issues with the Sleep Quality Using Brief Pittsburgh's Sleep Quality Index (b-PSQI)

Out of 303, 144 (47.5%) participants scored more than 4 on b-PSQI (overall C) scale i.e., presented symptoms of poor or disrupted sleep quality. Quality could be sum of sleep latency (C1, 75, 52.1%), reduced sleep efficiency (C3, 50, 34.7%) and disturbance with the sleep (C4, 71, 49.3%). The total number of males (92, 63.9%) were higher overall (including all age groups) than females (52, 36.1%) [Figure 11] however, age group of 18-25 years had more females than males with complains of sleep issues i.e., 30 (females) vs 27 (male) in 'overall' sleep quality issues [Table 8, Figure 12]. 11 (36.7%) female participants in this age group confirmed not getting sleep for over 5.5 hours whereas 13 (43.3%) experienced trouble sleeping sound due to any of following reasons, pain, cough, breathing problems, or bad dreams. Males, on the other hand, were dominant in all other age groups presenting issues with their overall sleep quality with disruption in the sleep and took relatively longer to sleep after going to the bed. Only 6 (4.2%) of the total with sleep issues belonged to the age of >45 years. hence, not being assessed. C1, C3 and C4 are described later in this section.

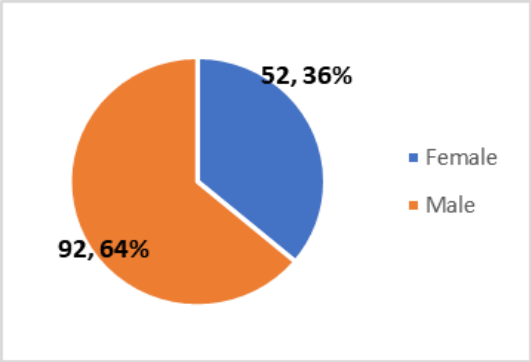

Figure 11. Gender Distribution

Table 8. PSQI (Overall C Score) - Age & Gender Wise Distribution

Overall Sleep Quality (C Score >4) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	30 (52.6%)	12 (25.0%)	9 (27.3%)	1 (16.7%)	52 (36.1%)
Male	27 (47.4%)	36 (75.0%)	24 (72.7%)	5 (83.3%)	92 (63.9%)
Grand Total	57	48	33	6	144

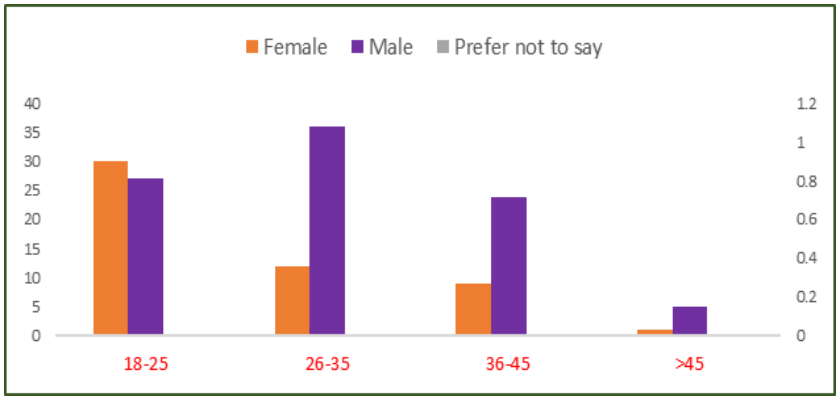

Figure 12. Overall C Score - Age and Gender Wise Distribution

Sleep Disturbance (C4) [**Table 9**] can be defined if the participant experienced discomfort during the sleep which could be due to cough, breathing problem, pain, bad dream, feeling too hot and/or person woke up in the middle of the night or early morning. Responses to questions 5(b) to 5(g) were scored as below:

Table 9. C4 Score Determination

Responses to Q 5(b)-5(g)	**Response Score**	**Sum of scores 5(b)-5(g)**	**C4 Score**
Not during the past month	0	0	0
Less than once a week	1	≥1≤6	1
Once or twice a week	2	>1≤12	2
Three or more times a week	3	>12	3

Here's the age and gender wise distribution of participants with difficulty in sleep [**Table 10**]. Number of participants in age group 26-35 years were higher than any other groups. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females. More participants were found in the age group, 26-35 years though almost equal to the youngest group.

Table 10. Sleep Disturbance - Age and Gender Wise Distribution

Sleep Disturbance (C4 Score >=2) with reference to AGE and GENDER					
Gender	18-25	26-35	36-45	>45	Grand Total

Female	13 (48.1%)	6 (12.5%)	3 (9.1%)	0 (.0%)	22 (15.3%)
Male	14 (24.6%)	22 (45.8%)	13 (39.4%)	0 (.0%)	49 (34.0%)
Grand Total	27	28	16	0	71

Sleep Efficiency (C3) is the percentage of time a person sleeps [Table 11]. This can be obtained by dividing the total number of hours asleep by total number of hours in bed. Scores ≥2 translated to <75% of the sleep efficiency. The distribution of the scores would be as below table:

Table 11. C3 Score Determination

Range %age of C3	**C3 Score**
>85%	0
75-84%	1
65-74%	2
<65%	3

Here's the age and gender wise distribution of participants with less sleep efficiency [**Table 12**]. Number of participants were found to be same in both the age groups 18-25 and 26-35 years. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females.

Table 12. Sleep Efficiency Issues - Age and Gender Wise Distribution

Sleep Efficiency (C3 Score >=2) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	11 (64.7%)	5 (10.4%)	5 (15.2%)	0 (.0%)	**21 (14.6%)**
Male	6 (10.5%)	12 (25.0%)	10 (30.3%)	1 (16.7%)	**29 (20.1%)**
Grand Total	**17**	**17**	**15**	**1**	**50**

Sleep Latency (C1) is the time taken by an individual to 'actually' sleep after laying on the bed [Table 13]. To calculate the total C1 score, scores from question 5a were added to the original C1 to obtain the final score. The distribution of the scores were as below:

Table 13. C1 Score Determination

Component scoring per response provided to Q#2	**Total SUM (after addiction of score from Q# 5a)**	**Total C1 Score**
<15 min = 0	0	0
16-30 min = 1	1-2	1
31-60 min = 2	3-4	2
>60 min =3	5-6	3

C1 score ≥2 means the participants took more than 30 minutes to sleep. Here's the age and gender wise distribution of participants with less sleeping hours [Table 14]. The number of participants in the age group 18-25 years was higher than any other group. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females.

Table 14. Sleep Latency Issues - Age and Gender Wise Distribution

Sleep Latency (C1>=2) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	17 (56.7%)	7 (14.6%)	6 (18.2%)	0 (.0%)	**30 (20.8%)**
Male	13 (22.8%)	16 (33.3%)	13 (39.4%)	3 (50.0%)	**45 (31.3%)**
Grand Total	**30**	**23**	**19**	**3**	**75**

Relationship between Internet Addiction and Sleep Problems

Of these 144 subjects, 7 (4.9%) had severe internet addiction (IAT) while 24 (16.6%) and 40 (27.7%) participants were moderately and mildly addicted to the internet, respectively, and had sleep quality issues [Figure 13]. This data included 4 people who had medical history of mental problems like psychiatric issues or depression so to avoid any influence on the outcome, these were removed. After removing these four individuals the total number of individuals both addicted to the internet and who had sleep issues was reduced to 67 from 71 [Table 15].

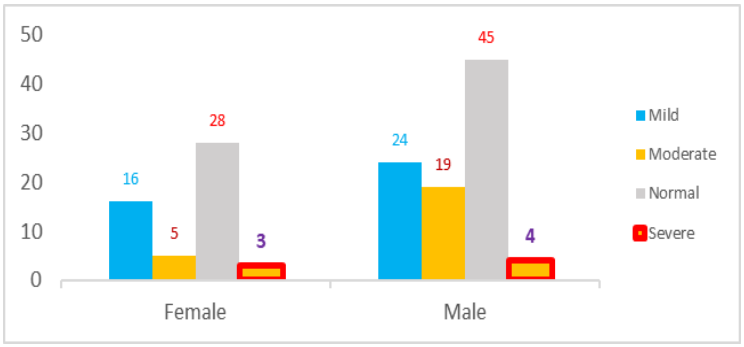

Figure 13: Comparison between IAD with PSQI>4

Table 15. Relationship between the Internet Addiction and Sleep Quality

Overall C Score / IAT Outcome	5	6	7	8	9	10	11	12	13	14	Grand Total
Mild	6	8	8	9	5	2	1				39
Moderate	1	7	8	1	2		2	1	1		23
Severe				1			1		1	2	5
Grand Total	**7**	**15**	**16**	**#**	**7**	**2**	**4**	**1**	**2**	**2**	**67**

5 (7.5%) were severely addicted and had sleep issues. Females were higher than males in this category i.e., 3:2 and had severe sleep problems too with their C Score ≥11. Males (82.6%) were more in number than females (17.4%) in the moderate category comprised of 23 (34.3%) participants. Here too, 6 individuals experienced severe sleep quality issues (C score ≥9). 58.2% participants (41% Females and 59% Males) had mild addiction to the internet and experienced comparatively less sleep disruption. 8 individuals complained of moderate to severe sleep issues with a C score of ≥8 [**Table 16**].

Table 16. Relationship Between the Internet Addiction and Sleep Quality (Gender wise Distribution)

	Gender	Female								Male									Grand Total
	C-Score	5	6	7	8	9	10	11	14	5	6	7	8	9	10	11	12	13	
IAT Outcome	Mild	2	4	4	2	2	1	1		4	4	4	7	3	1				39
	Moderate		1	2				1		1	6	6	1	2		1	1	1	23
	Severe							1	2				1					1	5
	Grand Total	2	5	6	2	2	1	3	2	5	10	10	9	5	1	1	1	2	67

Interestingly the distribution of the participants was equal between the two age groups, 18-25 [Table 17] and 26-35 years [Table 18] where male and female distribution

was 50% i.e., 13 each in the former age group whereas in the latter group, males (20,76.9%) were more than females (6, 23.1%). Number of individuals with both severe internet addiction and sleep quality issues were found in the age group 26-35 years which again proved that this age group was prominent on addiction and sleep issues front. Here, both males and females were equal in number i.e., 2 each but different C score severity. 1 female person with severe IAD and high C Score was from 18-25 years' age group.

The number of moderately addicted and with higher C-Score were higher in the age group 18-25 years (9) followed by 8 in 26-35 years and 6 in 36-45 years [Table 19] age group where number of males was higher in all these groups. None of the participants with >45 years of age presented both the symptoms, hence, were not included in the analyses.

Table 17. Relationship Among IAD, C-Score and Gender in Participants of 18-25 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Moderate**	**Severe**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Female**	**Male**	**Female**	
18-25 Years	5	1	1				2
	6	4	1	1	3		9
	7	2	1	1	3		7
	8		3				3
	9	2	1				3
	11			1		1	2
	Grand Total	**9**	**7**	**3**	**6**	**1**	**26**

Table 18. Relationship Among IAD, C-Score and Gender in Participants of 26-35 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Severe**	**Severe**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Male**	**Female**	**Male**	
26-35 Years	5	1	2	1			**4**
	6		2	3			**5**
	7	2	2	2			**6**
	8	1	4	1		1	**7**

	9			1			**1**
	13					1	**1**
	14				2		**2**
	Grand Total	**4**	**10**	**8**	**2**	**2**	**26**

Table 19. Relationship Among IAD, C-Score and Gender in Participants of 36-45 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Moderate**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Female**	**Male**	
36-45 Years	5		1			1
	6		1			1
	7		1	1	1	3
	8	1				1
	9		2		1	3
	10	1	1			2
	11	1			1	2
	12				1	1
	13				1	1
	Grand Total	**3**	**6**	**1**	**5**	**15**

3 (42.9%) participants were consuming alcohol and /or tobacco in both severe and moderate category which may also affect the sleep cycle unless these people were addicted to that which is very subjective. 5 individuals (4 in moderate and 1 in severe category) had confirmed some musculoskeletal problems which may with rare chances affect the sleep quality and cause internet addiction due to idle nature (subjective, may or may not happen) and could be a confounding factor. Marital and professional status didn't seem to affect the addiction or sleep quality of participants; however, their extended hours on internet could be because of their job profile or personal requirements. The other factors like health issues barring the psychiatric problem participants didn't support any impact or plausible cause to the sleep disruption in the internet addicted individuals.

Discussion

In total, 32.7% of Indian adults were identified as internet addicted, with an average

internet usage duration of 15.5 years. The highest prevalence of internet addiction was observed among individuals aged 26-35 years (14.2%), followed by those aged 18-25 years (10.2%). Notably, a majority (71.4%) of severely addicted individuals belonged to the 26-35 years age group. Males exhibited a higher addiction rate (57.1% vs. 42.9%) and susceptibility to internet addiction (71.9% vs. 28.1%) compared to females.

According to previous literature, internet addiction prevalence among the Indian adult population ranged from 1.3% [22] to 6% globally [21]. The findings of this study align closely with the reported Indian percentage, indicating 1.7% severely addicted individuals, although severity mapping was not specified in the referenced figures. Other studies conducted in various states in India provided a broad range of mild and moderate internet addiction prevalence, ranging from 24% to 35% for mild addiction and approximately 7-24% for moderate addiction [23, 24, 37]. The data collected for this thesis also falls within this range, with 20.8% of participants exhibiting mild internet addiction and 10.2% confirmed as moderately addicted.

After removing the four participants with historical mental issues, the total number of addicted participants would be 99 with 63 (63.6%) mildly, 31 (31.3%) moderately and 5 (5.1%) were severely addicted to the internet. Of these 99, 67 (67.7%) individuals confirmed having ‘overall’ sleep quality issues which could be trouble getting sleep (sleep latency), relatively less sleeping hours (sleep efficiency) and disturbed sleep due to bad dreams or pain or breathing problems or cough/snore problems i.e., people with C-Score > 4. 100% of the severely ‘internet’ addicted individuals had sleeping issues with overall C score ranged between 8-14 meaning, sleep is affected by the overuse of the internet. Even for the participants with previous mental problems but severe IAT score had poor quality of sleep (c score = 8). 23 (74.2%) of moderately addicted participants had c-scores ranging from 5 to 13. Mildly (internet) addicted participants also showed symptoms of sleep issues where 39 (61.9%) were mildly addicted and had c-scores between 5-11. The analyses confirmed that as severity of addiction to the internet increases so as the worsening of the overall quality of sleep [27, 38-43].

Overall males (44, 65.7%) were 47.7% more in number than females (23, 34.3%) who were both addicted to the internet and had trouble with sleep affecting their overall quality of sleep. The percentage of individuals both addicted and have disrupted quality of sleep per severity (severe to mild) was 7.5%, 34.3% and 58.2%, respectively with 67 (22.1%) as total. Interestingly, more severe cases could be observed from the age group, 26-35 years while more mild and moderate individuals with sleep issues belonged to 18-25 years. Concomitant medication and previous medical history were also reviewed, and the observation was that these couldn’t affect either internet addiction or sleep quality of the individuals. Marital (38.8%) and professional status didn’t seem to affect the addiction or sleep quality of participants; however, their extended hours on internet could be because of their job profile or personal requirements. Overall, these factors don’t seem to affect or contribute to internet addiction and/or sleep quality; however, this can’t be totally ruled out as these could be potential confounding factors which require further study.

The data established the direct relationship between internet addiction and poor sleep quality and suggested that such patients should be treated and/or managed properly using various suitable means depending upon the addiction level.

Next Steps

Extensive epidemiological research on internet addiction is imperative, employing

stringent criteria to mitigate confounding factors. This research should encompass individuals of all ages, backgrounds, and socioeconomic statuses, utilizing various data collection methods such as interviews, face-to-face interactions, and remote surveys where appropriate. Collected data must undergo thorough review and cleaning to ensure accuracy prior to final analysis and conclusions.

There is a pressing need for localized studies, conducted regularly at smaller scales such as schools, regions, or states, ideally on a biennial or triennial basis. This data should be shared with an independent entity for statistical analysis, with resultant outcomes guiding necessary interventions to mitigate the consequences of internet addiction.

Research efforts should prioritize investigating all potential pathological manifestations stemming from internet addiction. Encouraging participation from a diverse array of clinicians, psychologists, psychiatrists, and mental health counsellors is crucial. Their input can inform tailored treatment and therapy approaches across various demographic categories.

Conclusion

Internet addiction is a verifiable phenomenon, as evidenced by the provided metrics. Males exhibit a heightened susceptibility to internet addiction and its associated sleep disturbances. The data indicates that young and middle-aged Indian adults face an elevated risk of internet addiction and consequent sleep issues, including sleep apnea and disruptions caused by factors like pain, nightmares, or respiratory issues. The more time spent on non-productive or unnecessary internet use correlates directly with increased risk of addiction, which in turn contributes to poor sleep quality and a host of related problems. Early detection of such signs and symptoms is crucial, with prompt advice from mental health professionals strongly recommended. Recognizing internet addiction as a silent yet significant psychopathological condition, initiatives such as seminars, public discussions, and educational platforms should be established to support the younger generation and practitioners in addressing this societal concern.

Conflict of Interest

There is not conflict of interest.

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