**Original article**

**Internet addiction and associated health risks among medical undergraduates in North India**

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**Introduction**

Over the past few years, the exponential technological growth and excessive internet use have led to its entry into practically every aspect of daily life. The same can be said about the pervasive presence and usage of internet across all generations This use of digital technology has completely transformed the lifestyle of the present generation making lives easier and enriched in a variety of ways, but this technological progress comes at a heavy price associated with the risks of its overuse [1].

The result of maladaptive use of internet is now becoming evident in all users, with the youth being most vulnerable as overuse can easily change into abuse to the extent that it interferes with the ability to engage in routine activities. It is now believed that certain attributes of internet use can foster compulsive addictive behaviour in context to what has been recognised as Internet addiction (IA) or 'compulsive Internet use' [2]. The term Internet Addiction was first introduced by Young, who defined it as an impulse control disorder in the absence of an intoxicant [3]. It refers to an individual's helplessness to control the use of the internet, resulting in significant anguish and functional damage in daily life [4]. Thus, IA portrays a state of a psychological

dependence on the internet, notwithstanding the activities that may be pursued after logging in [5].

Studies world over have indicated that IA among the youth can lead to health consequences; psychological, physical, as well as social problems including impaired function at work, poor academic performance, sleep deprivation, poor dietary habits, headache, eye strain, social isolation, and relationship problems [6-8]. Individuals addicted to the internet fear facing the real world and tend to increase their internet use where their virtual demands are easily met [9]. The American Psychiatric Association recently published the updated version of the Diagnostic and statistical manual of mental disorders (DSM-V) and included Internet Gaming Disorder in Section III as a condition in need of further research to help establish a globally approved definition and diagnostic guidelines for internet addiction [10]. Previous studies have shown that the prevalence of internet overuse and addiction ranges from 3.0 % to 74.0 % across mild, moderate and severe forms depending on the study population, methodology, and diagnostic tools used for assessment [11]. A recent study conducted among medical students at Qassim University showed that 12.4% of medical students are addicted to the internet, and 57.9% are at risk of becoming addicted [12].

On average, internet use for 38 hours per week or more can cause lack of sleep and excessive tiredness along with poor concentration and academic performance [13]. Judicious usage of internet is the need of the hour and is recommended by psychologists and educators to minimize its health impact [14].

The emerging consequences of dependence on the internet are overtly visible as the youth can be seen spending more time online for academic and social purposes due to ease of connectivity and engaging online activities at the cost of sacrificing basic social activities. To date, most studies

conducted in India have highlighted the use of internet and its addiction in youth. The current study focuses on the impact of IA on physical, mental and social health risks specifically among the medical undergraduates who represent the future caregivers. The health of future physicians should be considered a public health priority of national concern. This section of the young population has to keep their patients' interests in mind while themselves being exposed to the seriousness and the perils of this digital dilemma as it transcends beyond the levels of normality to affect their behaviour at the expense of virtual attention. As the existing literature on internet usage is limited among medical students who are particularly vulnerable to its addictive use while being prone to its negative associations, the present study was undertaken with the aim to assess the prevalence of internet addiction among undergraduate medical students and the health risks associated with IA.

## Methods

### *Setting & Study Design*

A descriptive cross-sectional study was carried out among undergraduate medical students in a medical college in the rural area of western Haryana. The study duration was two months.

The sample size was calculated assuming a prevalence rate of internet addiction (IA) as 44.0% (as reported by previous studies) [15] with 15.0 % relative precision.

Sample size (n) = $Z^2$ pq÷$e^2$,

= $(1.96)^2$ (0.44) (0.56) ÷ $(0.066)^2$ =217

The total sample size calculated was 217.

In order to meet ethical considerations, a brief introduction regarding the study was given to the students before distributing questionnaires. The present research was approved by the Institutional Ethics Committee vide letter no. AMCH/BIO/2020/03/04. The study group included

medical undergraduate students (I and II Year) of both sexes, and those who did not consent to participate in the study were excluded.

Students were enrolled using two-stage sampling. First, the students were stratified according to their year of academic years, i.e., 1st & 2nd academic year after which the required number of study participants were selected by simple random sampling method from each group (110 students from Year 1 and 107 students from year 2) to have equal representation from each academic year in the study sample. Questionnaires were administered to the consenting students by the authors. The average time taken by students to complete the questionnaires was 15-20 minutes (approximately). Participation in the study was voluntary, and any student not willing to participate in the study was replaced by the next student. Written informed consent was obtained from all the study participants after explaining the purpose of the study to them. Study participants were assured that the information given by them would be anonymous and confidential to avoid any type of reporting bias.

*Study Instruments*

The data was collected by using a semi-structured questionnaire for socio-demographic characteristics and following tools:

*Young's internet addiction test (IAT)* is a self-rated scale developed by Dr K. Young for screening internet use and measures IA level. This is a valid scale with established reliability (alpha coefficient 0.93) in Indian population and college students for estimating the extent of an individual's involvement with the internet and classifies addictive behaviour as a mild, moderate, or severe impairment. The IAT comprises 20 items, each of which is rated on a five-point Likert scale: "rarely or never" (1), "occasionally" (2), "frequently" (3), "often" (4), or "always". The total IAT score is obtained by adding the scores for each response provided by the study

participant. The higher the score, the higher the level of addiction to the internet; normal range: 0-30 points, mild: 31- 49 points, moderate: 50-79 points, and severe: 80-100 points [8].

*Duke Health profile* is a 17-item generic questionnaire (alpha coefficient 0.91) which measures self-reported functional health. Each item has been measured with a scale ranging 0- 100. Of the 11 scales, six scales, i.e., physical health, mental health, social health, general health, perceived health and self-esteem measure are indicative of better health if they score high, i.e., 100 indicates the best health status while '0' indicates the worst health. The remaining scales that measure anxiety, depression, anxiety-depression, pain, and disability indicate dysfunctional health with higher scores, i.e., 100 indicates the worst health status and 0 indicates best health status [16].

*Statistical Analysis*

Data collected was checked for its consistency and completeness. Then was analysed using SPSS version 20 (SPSS Inc., Chicago, IL). Descriptive statistics were reported for all the variables using percentages, mean with standard deviation. ANOVA with Tukey's posthoc test was used to measure the differences across various groups of internet addicts. $P < 0.05$ was considered as statistically significant.

**Results**

A total of 217 MBBS students from the year I and II were included in the study. Representation from male and female students was almost equal (M=103, F=114). All respondents were in the age group of 18 -20 years and reported using the internet daily for 3-4 hours for the last six months. Majority of the respondents (96.0%) used smartphones for accessing the internet. Around 83.0% of the respondents reported using the internet for academic purposes, while

84.0% of them also used it to access social networking sites. Most of the respondents (94.0%) used the internet at night time.

The sex and year-wise distribution of respondents as per Young's criteria of IA is shown in Table- 1. In our study, only four students (1.84%) reflected a normal level of internet usage (classified as no IA with remaining 98.16% of the students exhibiting some degree of IA. Mild IA was slightly higher in Year I students, whereas Moderate and Severe IA was observed to be higher among Year II students. This difference, however, was not statistically significant.

**Table-1: Profile of respondents as per Internet addiction test (IA) scores**

| IAT Score | | Females (n = 103) | Males (n = 114) | Total (n = 217) | | P value |
|---|---|---|---|---|---|---|
| | | n | n | n (%) | | |
| No IA (0-30) | Year I | 03 | 01 | 04 (1.84%) | 04 (1.84%) | - |
| | Year II | 00 | 00 | 0 (0.00%) | | |
| Mild IA (31-49) | Year I | 17 | 24 | 41 (18.89%) | 59 (27.19%) | 0.27 |
| | Year II | 11 | 07 | 18 (8.30%) | | |
| Moderate IA (50-79) | Year I | 24 | 35 | 59 (27.19%) | 130 (59.91%) | 0.63 |
| | Year II | 33 | 38 | 71 (32.72%) | | |
| Severe IA (80-100) | Year I | 04 | 02 | 06 (2.76%) | 24 (11.06%) | 0.37 |
| | Year II | 11 | 07 | 18 (8.30%) | | |

A comparison of Duke Health profile scores across various degrees of IA is shown in Table-2. It can be seen that the physical health score differs significantly among respondents with no IA (95±5.77), mild IA (88.14 ± 10.08), moderate (71.54±18.23) and severe IA (67.08± 19.66)

reflecting much better physical health scores for respondents with less dependence on the internet. Similarly, poorer scores were seen for mental health (p< 0.01), general health (p <0.01), perceived health (p < 0.01) and self-esteem (p <0.01) with increasing severity of IA and this difference was found to be statistically significant. Anxiety, Depression & Anxiety-depression scores showed a similar trend with increasing severity of IA.

**Table-2: Duke Health profile scores in varying degrees of IA (using ANOVA)**

| Degree of IA / Duke's Health Profile scoring | No IA (n=4) Mean ± SD | Mild IA (n=59) Mean ± SD | Moderate IA (n=130) Mean ± SD | Severe IA (n=24) Mean ± SD | P Value |
|---|---|---|---|---|---|
| Physical Health Score | 95 ± 5.77 | 88.14 ± 10.08 | 71.54 ± 18.23 | 67.08 ± 19.66 | **<0.01\*** |
| Mental Health Score | 95 ± 5.77 | 76.95 ± 18.50 | 69 ± 16.46 | 62.5 ± 21.52 | **<0.01\*** |
| Social Health Score | 75 ± 12.91 | 70 ± 20.84 | 63.92 ± 20.78 | 57.08 ± 16.01 | **0.04\*** |
| General Health Score | 83.335 ± 3.85 | 78.25 ± 11.64 | 68.72 ± 10.25 | 62.22 ± 13.99 | **<0.01\*** |
| Perceived Health Score | 100 ± 0 | 75.42 ± 32.66 | 61.15 ± 34.25 | 58.33 ± 43.41 | **<0.01\*** |
| Self-Esteem Score | 80 ± 0 | 80.85 ± 16.22 | 71.15 ± 15.03 | 73.75 ± 18.13 | **<0.01\*** |
| Anxiety Score | 24.99 ± 9.62 | 27.40 ± 16.88 | 40.13 ± 15.28 | 48.26 ± 18.22 | **<0.01\*** |
| Depression Score | 10 ± 11.55 | 25.76 ± 19.84 | 35.69 ± 17.69 | 44.17 ± 20.41 | **<0.01\*** |
| Anxiety Depression Score | 7.143 ± 8.25 | 21.91 ± 16.61 | 31.89 ± 13.93 | 38.39 ± 19.85 | **<0.01\*** |
| Pain Score | 0 ± 0 | 19.49 ± 27.88 | 43.85 ± 35.23 | 33.33 ± 24.08 | **<0.01\*** |
| Disability Score | 0 ± 0 | 1.69 ± 9.13 | 21.54 ± 36.80 | 31.25 ± 38.48 | **<0.01\*** |

*\*Highly Significant at 1% Level of significance, \*\*Significant at the 0.05 level of significance*

In order to specifically identify the degree of IA that impacts mental health and its sub-components a comparative analysis was carried out between the pairings of degrees of IA with the mental health scores using Tukey's test for post hoc analysis (Table-3).

The mental health scores were found to differ significantly between mild and moderate (P = 0.02) and mild and severe (p < 0.01) degree of IA. Likewise, Anxiety, depression and anxiety-depression scores also differed significantly between mild and moderate and mild and severe degree of IA.

**Table-3: Comparison of mental health scores with pairings of degrees of IA (using Tukey's post hoc test)**

| Duke's Health Profile scoring | IA Level | Mean Difference | Standard Error | 95% CI | P Value |
|---|---|---|---|---|---|
| **Mental Health Score** | **Mild Vs Moderate** | 7.95 | 2.75 | 0.82 to 15.08 | **0.02**\*\* |
| | **Mild Vs Severe** | 14.45 | 4.25 | 3.45 to 25.45 | **<0.01**\* |
| | **Moderate Vs Severe** | 6.50 | 3.90 | -3.59 to 16.59 | 0.34 |
| **Anxiety Score** | **Mild Vs Moderate** | -12.73 | 2.51 | -16.23 to -6.22 | **<0.01**\* |
| | **Mild Vs Severe** | -20.86 | 3.87 | -30.89 to -10.83 | **<0.01**\* |
| | **Moderate Vs Severe** | -8.14 | 3.56 | -17.34 to 1.07 | 0.10 |
| **Depression Score** | **Mild Vs Moderate** | -9.93 | 2.91 | -17.47 to -2.39 | **<0.01**\* |
| | **Mild Vs Severe** | -18.40 | 4.49 | -30.03 to -6.78 | **<0.01**\* |
| | **Moderate Vs Severe** | -8.47 | 4.12 | -19.14 to 2.19 | 0.17 |
| **Anxiety - Depression Score** | **Mild Vs Moderate** | -9.98 | 2.41 | -16.23 to -3.73 | **<0.01**\* |
| | **Mild Vs Severe** | -16.48 | 3.72 | -26.11 to -6.85 | **<0.01**\* |
| | **Moderate Vs Severe** | -6.50 | 3.41 | -15.34 to 2.34 | 0.23 |

*\*Highly Significant at 1% Level of significance, \*\* Significant at the 0.05 level of significance*

**Discussion**

The present study was conducted to investigate the problem of internet addiction (IA) among the young medical students and its effects on their health if any. Using Young's criteria of IA [8], it was appalling to find that 98.16% of the studied medical students were found to have some degree of IA with the majority of females and males falling in the category of mild to moderate IA. There is little doubt about the need & utility of the internet in academia; however, concerns about the looming possibility of its adverse effects among students are extremely disturbing considering the unavoidable proliferation of internet based social media and its pervasion into daily life. Previous studies among medical undergraduates have revealed a prevalence of 74.13, with the majority of the respondents having mild to moderate addiction (58.70% & 15.0% respectively) [15]. Findings by other authors like Duraimurugan et al. show the prevalence of IA as 56.61% in a South Indian medical college [17]. A growing body of researchers globally has recognized the perceptible adverse consequences of IA, especially among students. These studies have shown that students with IA not only perform poorly on the academic front [18,19], but their compulsive and uncontrollable over-engagement may lead to unfavorable consequences such as anxiety, depression, insomnia, subjective well-being, subjective vigor and life satisfaction.

In index study, even though, most of the students were categorized as having mild to moderate degree of IA, 11.06% lay in the category of severe IA. The present study used the Duke Health profile to evaluate the respondents' health status in relation to their internet use and addiction [16]. The results were very conclusive with ill-effects of IA seen across all health parameters through physical, mental, general health, and self-esteem.

Comparable findings have been reported by Dong et al. with significantly higher scores in depression, anxiety, hostility, interpersonal sensitivity and psychosis [20]. Likewise, another study conducted among Turkish University students also reported loneliness and depression as predictors of problematic internet use [21]. A meta-analysis study published in 2018 revealed the pooled prevalence of IA among medical students to be five times more than that of the general population [22]. The variation in prevalence can be attributed to the heterogeneity of study samples and different diagnostic tools. Research conducted by Panicker and Sachdev et al. also reported a significant relationship between IA and depression [23].

Notably, our results showed that the social health scores declined with increasing degree of IA. However, these social health scores may need to be analyzed further, considering that 84.0% of students reported using internet for social networking. Given the fundamental nature of youth to relate socially through interpersonal communication via social media sites, this finding can suggest the virtual nature of relationships built online through social networking sites. Further, it requires deeper research on the possibility of real-life interpersonal deficiency that may explain 'why' and 'how' individuals with excessive dependence on internet experience relationship issues, interpersonal communication issues, and have poor academic and work performance compared to their peers with less internet exposure.

In our study, a comparison of mental health score, anxiety, depression, and anxiety-depression score with different IA degrees also revealed that the psychological attributes worsened with increasing severity for each of these categories. A highly significant difference was observed between mild and severe degrees of IA in all categories. Nevertheless, the comparison between moderate and severe degrees of IA did not reveal any significant difference in mental health-related parameters.

Findings similar to our study have been reported by Akin and Iskender, who identified a positive correlation between IA and anxiety (r = 0.63) [24]. Research in this arena by different national and international researchers has depicted a significant positive association between IA and anxiety. However, further assessment of the health impact of internet use and its causal association is needed to corroborate our findings.

The overall impact on the health of individuals addicted to internet mandates timely interventions to recognize and address their effects as early as possible. Most of these interventions promote a moderate and controlled use of the internet instead of total abstinence. Highly relevant therapeutic strategies have been suggested by Young [25] for IA, that include; encouraging the practice of the opposite, in order to replace the internet use pattern by a new schedule, exposing users to real-life events by replacing their online activities, setting specific achievable goals, abstinence from the most attractive and uncontrollable application of the internet, reminder cards to breaking the addiction, making the users explore new activities put on hold at the cost of internet use, support groups and family therapy to address relational problems that may have resulted from IA [26].

The current study has certain limitations. The sample size in our study was relatively small, which limits the generalizability of the findings and the reliance on self-reporting of the surveyed study participants. Furthermore, the difficulty level of medical undergraduate studies may have a confounding effect on the health status of student participants to presume a cause-and-effect relationship between IA and health status of study participants. Thus, this study calls for further research to determine the reasons for such a high prevalence of IA among medical undergraduates.

To conclude, given that the internet technology and its use have become indispensable in our lives, our study has revealed an exceedingly high prevalence (98.16%) of IA with potential health risks associated with its overuse and addiction among medical undergraduates. Despite its varied applicability, it is pertinent to protect the youth from the adverse effects of the digital world. Our study found a relationship between IA and the medical undergraduate students' health, thereby necessitating appropriate interventional and preventive measures to realize and limit its use to safeguard students' physical and mental health.

**Conflict of Interest:** None declared

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