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PREVALENCE OF SMARTPHONE ADDICTION AND ITS ASSOCIATION WITH IMPULSIVITY AMONG UNDERGRADUATE MEDICAL STUDENTS

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Abstract

Background: The use of smartphones has increased significantly in recent years, and there are 5 million smartphone applications helping users to have immediate access to these limitless facilities. The concept rapidly evolved towards smartphone addiction, which is defined as the inability to control the impulse to excessively use the smartphone, with consequent negative results for the user's quality of life. This study seeks to address this gap in the literature, this research aims to find the prevalence of smartphone addiction in undergraduate students and to its association with impulsivity.

Objectives: 1. To find the prevalence of smartphone addiction in undergraduate students.
2. To find the relationship between smartphone addiction and impulsivity.

Materials and Method: This retrospective study was designed by Department of Psychiatry, GMC, Datia, (M.P.), India and was conducted over a period of 6 months from October 2022 to April 2023. Scales used were Smartphone Addiction Scale Short-version (SAS-SV) and Barratt Impulsiveness Scale-11 Short Form (BIS-11 SF).

Results: Smartphone addiction was found to be present in 64.7 % of the participants in our study. 31.4% of the study participants had total BIS score of >90, which corresponds with high impulsivity, whereas, 64.7% had score of ≥ 29, which signifies addiction. There was significant correlation between BIS and SAS, which suggests that high trait impulsivity is one of the risk factors involved in developing adiction among smartphone users.

Conclusions: A significant burden of smartphone addiction and a tendency for impaired control that compromises the health were prevalent in medical students.

Keywords; Smartphone addiction, Problematic Smartphone use, Impulsivity, ADHD, Medical Students

INTRODUCTION

The proliferation of smartphones has witnessed an extraordinary surge in recent years, empowering individuals to engage in immediate communication through phone calls, texting, and social media platforms. With an extensive array of 5 million smartphone applications at their disposal, users now enjoy boundless access to a plethora of services and conveniences (1). A report published by Newzoo in 2020 revealed that approximately 41% of the global population, encompassing 3.18 billion individuals, owned personal smartphones, with projections anticipating this figure to reach 50% (3.9 billion people) by the close of 2022 (1). In 2019, the average daily internet usage worldwide amounted to a staggering 6 hours and 43 minutes, with mobile devices accounting for over half of this consumption, estimated at 3 hours and 40 minutes. Of this mobile usage, mobile applications occupied more than 90% of the total mobile activity time (2). Consequently, the exponential growth of smartphone applications, accompanied by their captivating features, has resulted in users carving out their personal domains within these devices. This profound connection forged with personal platforms has engendered a significant dependence on smartphones (3). A 2017 study unveiled that around 300 million people in India were avid smartphone users, thereby placing a substantial portion of the Indian population at potential risk of addiction (4). However, an inadequacy of studies pertaining to smartphone addiction exists not only within the Indian population but also among medical graduates. It is especially crucial to explore smartphone addiction within the age group of 17-27 years, comprising individuals born between 1990 and 2000, who were introduced to smartphones during their formative adolescent years (4).

Research conducted almost a decade ago showcased the positive impact of mobile phones on social interaction, quality of life, and the inclusion of vulnerable populations. Mobile applications facilitated immediate communication, access to educational tools or content, and global connectivity, fostering a positive outlook (5,6). However, recent studies have shifted their focus towards the potential negative effects associated with smartphone usage. Consequently, mounting evidence has emerged illustrating a host of adverse consequences stemming from excessive smartphone use, including sleep disorders, anxiety, depression, nomophobia, and detrimental implications in the workplace (9–12). Regrettably, an increasing number of studies now illuminate the negative repercussions of smartphone usage rather than the positive ones. Specifically, these studies highlight the detrimental outcomes resulting from unregulated and excessive smartphone use, such as sleep disturbance, emotional distress, and financial problems (10,11).

This conceptual shift has given rise to the notion of smartphone addiction, characterized by the inability to control the impulse to excessively use smartphones, thereby diminishing the user's overall quality of life (12,13). More recently, the term "problematic mobile phone use" has emerged as an encompassing descriptor for this phenomenon. It signifies the inability to regulate mobile phone usage, leading to negative consequences in one's daily life (12). Problematic smartphone use encompasses excessive and uncontrolled usage, preoccupation with smartphones, frustration when unable to access smartphones, reliance on smartphones to alleviate negative moods, and interference with interpersonal or work-related activities (3,14,15).

Some hypotheses posit that internet addiction may involve neurophysiological mechanisms intertwined with impulsivity (16). Previous studies have linked excessive internet usage to behavioral problems among children and adolescents, ranging from irritability and aggression to social withdrawal (17,18). Additionally, several studies conducted across European countries have identified an association between internet addiction and symptoms of depression, anxiety, behavioral disorders, impulsive tendencies, as well as suicidal ideation and impulsive suicide attempts (18). While not every smartphone user encounters such issues, those with underlying psychological conditions like Attention Deficit Hyperactivity Disorder (ADHD) and impulse control disorders exhibit a higher propensity for developing problematic smartphone use (12,19). ADHD, characterized by symptoms of inattention, hyperactivity, and impulsivity as per the DSM-IV (American Psychiatric Association, 2006), tends to manifest in childhood and typically persists into adulthood. Children with ADHD often exhibit deficits in social interaction skills, accompanied by aggression, inattentiveness, and

disruptive behavior, leading to peer rejection and isolation (21,22). Previous studies have explored internet addiction and video game dependency, delving into their implications (23,24).
Recent studies have unveiled a significant prevalence of smartphone addiction among university students, extending beyond urban areas to include rural school students as well (25,26). Nevertheless, research examining the impact of smartphone usage on individuals' lives remains at an incipient stage. Studies conducted among medical students in Jammu and Kashmir, Delhi, and Maharashtra have disclosed a high prevalence of smartphone addiction, ranging from 34% to 40% (25–27). Consequently, this study endeavors to bridge this literature gap by investigating the prevalence of smartphone addiction among undergraduate students and establishing the relationship between smartphone addiction and impulsivity

Material and Methods

This retrospective study was meticulously devised by the Department of Psychiatry at the esteemed Government Medical College in Datia, Madhya Pradesh. The study was conducted within the college premises and the surrounding areas, spanning a duration of three months, commencing from November 2022 to January 2023, subsequent to receiving formal authorization from the Institutional Ethics Committee. Given the medical college setting, students who willingly provided their consent were included in the study, while those who declined consent were excluded from participation. To ensure a representative sample, the process of sample collection employed purposive sampling techniques. A total of 516 undergraduate students were recruited for the study, considering that the institute typically enrolls a maximum of 500-600 students for the MBBS course at any given time. Thus, the entire student population enrolled in the MBBS program during the designated study period constituted the study sample. The collection of data was meticulously carried out utilizing a semi-structured proforma, facilitating comprehensive data collection and analysis.

Smartphone Addiction Scale Short-version (SAV-SV)

The abbreviated version of the Smartphone Addiction Scale (SAV-SV) was specifically developed to assess individuals' addiction to their smartphones. Comprising 10 items, the scale delves into various aspects such as daily life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationships, overuse, and tolerance. Participants are required to rate each item on a Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). A cumulative score is calculated, wherein higher scores indicate a more pronounced smartphone addiction. The SAV-SV exhibits a unidimensional factor structure, with scores ranging from 10 to 60 points. Internal consistency analysis has demonstrated a commendable coefficient of 0.87, indicative of the scale's reliability (28). To aid in the interpretation of the scores, gender-specific cut-off values have been established. For male participants, the cut-off value is set at 31, yielding a sensitivity value of 0.867 and a specificity value of 0.893. Similarly, for female participants, the cut-off value is set at 33, accompanied by a sensitivity value of 0.875 and a specificity value of 0.886 (28). These thresholds provide valuable insights into the risk of smartphone addiction, allowing for effective identification and intervention strategies.

Barratt Impulsiveness Scale (Revised)

The Barratt Impulsiveness Scale (BIS-11), currently in its 11th revision, serves as a comprehensive self-report questionnaire comprising 30 items. It assesses the multidimensional personality and behavioral construct of impulsiveness. The development of the BIS-11 Short Form (BIS-11 SF) can be attributed to Spinella, stemming from the original BIS created by Barratt in 1995. Each item is rated on a four-point Likert scale, ranging from 1 (Rarely/Never) to 4 (Almost Always/Always). The total scores on the scale encompass a range of 30 to 120, with higher scores indicating elevated levels of impulsiveness. The BIS-11 SF consists of three distinct subscales: non-planning impulsiveness, motor impulsiveness, and attentional impulsiveness. These subscales provide a comprehensive understanding of impulsivity across different domains. The BIS-11 has exhibited commendable internal consistency in various populations, as evidenced by Cronbach's alpha values ranging from

0.69 to 0.83 (28,29). The scale's reliable performance in different contexts underscores its suitability for assessing impulsivity and contributes to its widespread adoption in research and clinical settings.

Statistical analysis

The data collected for this study was analyzed using the IBM Statistical Package for the Social Sciences (SPSS), version 25.0 for Windows, developed by International Business Machines (IBM) Corporation, Armonk, NY. Descriptive statistics such as means and percentages were utilized to present the data. To compare means between two groups, the Student t-test was employed, with a two-tailed p-value threshold of < 0.05 set as the level of significance.

Results

A total of 516 undergraduate medical students were selected based on the study criteria, and their data were subjected to thorough analysis. Table 1 provides a comprehensive overview of the socio-demographic data and academic performance of the study participants.

Table 1

Variable	Mean ± SD
Age (in years)	21.22 ± 1.765
Gender	Male 52.7% (272) Female 47.3% (244)
Locality	Rural 27.5% (142) Urban 72.5 % (374)
Prof. year	1st 47.3% (244) 2nd 35.3% (182) 3rd 15.1% (78) 4th 2.3% (12)
Religion	Hindu 88.4% (456) Non-Hindu 11.6% (60)
Family type	Joint 35.3% (182) Nuclear 64.7% (334)
Mean score (Barratt impulsivity scale)	78.66 ± 17.20
Mean score (SAS-10)	32.57 ± 9.383

Table 2

Pearson Correlation	Total impulsivity score	Total addiction score
Total impulsivity score	1	.420**

**. Correlation is significant at the 0.01 level (2-tailed).

There was a moderate but significant correlation between BIS and SAS as demonstrated by Table 2

Table 3

Barratt impulsivity scale	Frequency	Percent
1 - 90	354	68.6
91 - 180	162	31.4

SAS -10	Frequency	Percent
<= 29	182	35.3
30 - 58	334	64.7

Table 3 demonstrates that 31.4% of the study participants had total BIS score of >90, which corresponds with high impulsivity, whereas, 64.7% had score of ≥ 29, which signifies addiction.

Table 4

	Gender	Frequency	Mean ± SD	P-value
BIS	male	272	78.71± 17.83	0.966
	female	244	78.61± 16.56	

SAS-10	male	272	32.59± 8.02	0.796
	female	244	32.84± 7.29	

There was no significant difference in the mean score of BIS and SAS-10 for gender.The distribution of total BIS and SAS is the same across categories of professionals as shown in table 4.

Table 5

SAS-10	Mean	Std. Deviation
Missing planned work due to smartphone use	3.61	1.550
Having a hard time concentrating in class, whiledoing assignments, or while working due tosmartphone use	3.55	1.455
Feeling pain in the wrists or at the back of the neckwhile using a smartphone	3.47	1.503
My life would be empty without my smartphone	3.33	1.630
Feeling impatient and fretful when I am not holdingmy smartphone	2.96	1.506
Having my smartphone in my mind even when I amnot using it	2.78	1.463
I will never give up using my smartphone even when my daily life is already greatly affected by it	2.79	1.463
Constantly checking my smartphone so as not tomiss conversations between other people ontwitter or facebook	3.26	1.459
Using my smartphone longer than I had intended	3.59	1.500
The people around me tell me that I use mysmartphone too much	3.24	1.529

Table 6

BIS-30	Mean	Std. Deviation
Attentional facet		
I don't "pay attention"	2.20	1.011
I concentrate easily.	2.67	.996
I "squirm"at plays or lectures.	2.49	1.062
I am a steady thinker.	2.84	.984
I am restless at the theater or lectures.	2.41	1.134
I have "racing" thoughts.	2.61	1.023
I change hobbies.	2.36	1.087
I often have extraneous thoughts when thinking.	2.73	.999
Total score of attentional facet	*20.22*	*5.34*
Motor facet		
I do things without thinking.	2.36	1.125
I make up my mind quickly.	2.69	1.053
I am happy-go- lucky.	2.81	1.012
I "act" on impulse.	2.61	1.041
I act on the spur of the moment.	2.57	.994
I buy things on impulse.	2.38	1.032
I spend or charge more than I earn.	2.49	1.194
I change jobs.	1.98	1.186
I change residences.	2.09	1.210
I can think only about one thing at a time.	2.53	1.041
I am future oriented.	3.04	.922
Total score motor facet	*27.49*	*8.09*
Planning facet		
I plan tasks carefully.	3.04	.905
I plan trips well ahead of time.	2.83	1.008
I am self-controlled.	2.96	.986

I am a careful thinker.	2.97	.952
I plan for job security.	2.92	.985
I say things without thinking.	2.43	1.091
I save regularly.	2.63	.959
I like to think about complex problems.	2.93	.945
I am easily bored when solving thought problems.	2.43	1.010
I am more interested in the present than in the future.	2.90	.959
I like puzzles.	2.97	.976
Total score planning facet	*30.94*	*6.89*

Table 7

BIS	Gender	Mean±SD	p-value
Attentional facet	**Male**	20.5294± 5.20	0.341
	Female	19.8934± 5.49	
Motor facet	**Male**	27.7500± 8.35	0.588
	Female	27.2049± 7.72	
Planning facet	**Male**	32.0515± 6.95	**0.006**
	Female	29.7049±6.63	

There was a significant difference between male and female for planning facet, but not for attentional and motor facet as shown in table 7.

Discussion

In our study, we observed a nearly equal distribution of male (n=272) and female (n=244) medical students, which aligns with similar studies conducted in India and Nepal (30). The mean age of our study participants was 21.22 ± 1.765 years, which falls within the expected range for undergraduate medical students in India and is consistent with previous studies conducted in India (5,26). There was no significant difference in the mean age between genders. The majority of participants (72.5%) hailed from urban areas, which can be attributed to the data collection being conducted in a medical college situated within a city. Smartphone addiction was found to be present in 64.7% of the participants in our study. These findings are comparable to studies conducted by Awasthi et al., Basu et al. in North India, and Alhazmi et al. in Saudi Arabia (5,26,31). However, Sethuraman AR et al. reported a much higher prevalence of smartphone addiction (85%) in a medical college in Andaman and Nicobar Islands. This disparity could be due to the geographical seclusion of the Andaman and Nicobar Islands, limiting alternative avenues for social interactions and recreational activities for students from mainland India (32).

In our study, 31.4% of the participants exhibited a total Barratt Impulsiveness Scale (BIS) score of >90, indicating high levels of impulsivity. Additionally, 64.7% of the participants had a score of ≥29 on the Smartphone Addiction Scale Short-version (SAS-10), indicating addiction. Thus, approximately 65% of the participants who self-reported their smartphone usage demonstrated addictive behaviors based on the SAS-SV questionnaire. These findings highlight the participants' self-awareness regarding their excessive smartphone use, which is consistent with the observations made by Karki et al. among students in terms of smartphone addiction self-acknowledgment (30).

No significant gender differences were observed in the mean scores of BIS-11 and SAS-10, which is in line with the findings of Yılbaş B, Günel Karadeniz P et al., where no gender-based differences were reported in terms of smartphone addiction (28). The distribution of total BIS and SAS scores was also similar across different batches of undergraduate students, and the duration of daily smartphone and internet use did not differ significantly between genders. While some studies have reported higher scores on the Smartphone Addiction Scale among females compared to males, others have found no significant gender differences (33,34).

In our study, a moderate but significant correlation was found between BIS and SAS, which is consistent with studies conducted by Lee et al. and Cao et al. on adolescents, indicating that individuals with internet addiction tend to exhibit higher levels of impulsivity compared to control

groups (35,36). Previous studies have also highlighted the relationship between impulsivity and smartphone addiction, suggesting that higher impulsivity levels increase vulnerability to smartphone addiction (7,34). Our study indicates that impulsivity among adolescents with smartphone addiction is higher compared to normal users, aligning with previous findings that identified impulsive tendencies among college-going adolescents (34).

Furthermore, we observed a significant difference between males and females in the planning facet of impulsivity but not in attentional and motor facets. This contrasts with Antons et al., where the groups did not differ in non-planning and motor impulsivity but exhibited a difference in attentional impulsivity, albeit with a small effect size (37). However, there is a dearth of data regarding facets of trait impulsivity, thus future studies should explore how these factors interact with affective and cognitive responses when users are confronted with smartphone-related stimuli.
Our study has several limitations. Firstly, it was conducted in a single medical college in Madhya Pradesh (Government Medical College, Datia), necessitating caution when generalizing the study findings. Secondly, the study employed a self-report survey conducted online, which may have influenced the results as no direct assessments were performed. Thirdly, the study design was cross-sectional, precluding the establishment of cause-and-effect relationships between smartphone addiction and impulsivity.

Conclusion

In conclusion, our study revealed a significant burden of smartphone addiction and a propensity for impaired control among medical students, which compromises their health and well-being. It is imperative to take measures to address this challenge in light of the current era of rapid information technology growth. Future studies should focus on designing and testing interventions to tackle this emerging public health issue and behavioral concern.

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Conflicts of interest
There are no conflicts of interest.

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