How addicted are newly admitted Undergraduate Medical Students to Smartphones?: a Cross-sectional Study from Chitwan Medical College, Nepal

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Abstract
Introduction Increasing smartphone use among adolescents in today's world has made this handy device an indispensable electronic tool, however, it comes at a price of problematic overuse or addiction. We aimed to investigate the prevalence of smartphone addiction among undergraduate medical students and explore its association with various demographic and personal factors.

Methods A pool of 250 undergraduate students enrolled at Chitwan Medical College were included in this cross-sectional study conducted between August to November 2018. A preformed demographic porformal along with 10-point Smartphone Addiction Scale-Short Version was used to collect participant information.

Results Smartphone addiction among medical students was estimated at around 36.8% with higher percentage of male smartphone addicts. Prevalence rates of smartphone related tolerance was reported in 42.8% participants, 37.6% reported phubbing and 60.8% participants reported overuse. Statistically significant association was observed between smartphone addiction and gender, self-acknowledgement of addiction and overuse.

Conclusion This study provides preliminary insights into smartphone use, smartphone addiction and various factors predicting smartphone addiction among early undergraduate medical students from Nepal, which should be extended in future studies. Some fruitful programs and strategies to promote students’ knowledge and awareness about using smartphone seems to be the need of the hour.

Background
With the advancement in science and technology, the way we live, our life style and everything including the way we remain connected to people, has changed drastically. The advances in telecommunication means has evolved our lives from simple to becoming simply complicated. Technology has enabled people to access the previously thought inaccessible information at ones' fingertips.

In recent times, people living in the lesser developed world have encompassed a massive transformation in mobile and internet technology. Nepal Telecom (Nepal Doorsanchar Company Limited) is the incumbent operator, owned by the government of Nepal that provides the telecommunication services in Nepal. All other service providers and communication companies fall under its jurisdiction. The operation of telecommunication service in the country dates back to 1913,
but it was only in 1999 when Nepal Telecom started the GSM Mobile services and 4 years later GSM prepaid services started in the country. Internet service started with the beginning of the century. In a short span of 17 years, the 4G services were provided to Nepalese people in 2017. People have witnessed a huge leap in the telecommunication system. It is estimated that the mobile penetration is 125% with 58% internet penetration.[1] [2]

The launch of “Omnia” and “iPhone” by Samsung and Apple in 2007 marked the introduction of smartphone era in the global arena and in less than a decade, it has reached a substantial 2.1 billion people worldwide.[3] Studies have shown that children as less as 2 years to 17 years use Smartphone more than the older generation although its ownership increases with age.[4]

Increasing smartphone use among adolescents in todays’ world has made this handy device an indispensable electronic tool but it comes at a price of problematic overuse or addiction. Individuals with prolonged and excessive smartphone use present with symptoms like self-absorption, inability to control craving, disturbances in daily schedule, ignoring adverse consequences and withdrawal similar to those presented by patients with “Substance-Related and Addictive Disorders” as described in fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).[5] Similar to pathological gambling, which actually has been stated in DSM-5 as behavioral addiction, internet gaming disorder and smartphone addiction are on line awaiting sufficient evidence.[5] Several studies have been conducted across the world showing addiction of children, adolescents and university students alike to the Smartphone. Likewise, smartphone addiction has also been investigated among medical students reporting hindrance to academic activities and overall academic growth and performance[6, 7] The increasing use of Smartphone among students for a variety of reasons can lead to an obsession of overusing it. Students not only use Smartphone as a communicating tool with family and friends but also for study purposes. The use of internet and the advanced technology offered by it has enabled the vast ocean of knowledge over the fingertips. On the other hand, in spite of its apparent benefits, it has several other pronounced effects that are not at all impressive in the sense it has been labeled as the new addictive advanced tool at the reach of every individual. In the present study, we aim to evaluate the status of smartphone addiction among medical undergraduate students of Chitwan Medical College and its association with various demographic variables.

**Methods**
A total of 250 first year undergraduate students at Chitwan Medical College, Bharatpur, Nepal were recruited from the pool of “School of Medicine”, “School of Dental Surgery”, “School of Nursing” and “School of Allied Sciences”. All 261 first year undergraduate students enrolled at the college were invited to participate in the study on February 2019, but only 95.7% (250) of students entered the survey. In the survey, researcher briefed the students about the objectives and procedure of the
study. The participants were also informed about the voluntary nature of participation and non-participation would not bear any academic consequences. A written consent was obtained from the students for participation in the study. Ethical clearance for the study was obtained from Institutional Review Committee of Chitwan Medical College (ref no: CMC-IRC/075/076-123). The first section included demographic information (age, gender, faculty, duration of smartphone use per day during weekdays, purpose of smartphone use, and self-evaluation of smartphone addiction) and the second section included a 10 item shorter version of smartphone addiction scale (SAS-SV) [8]. Participants were instructed to rate the items on a 6-point Likert scale, 1= “strongly disagree”, 2= “disagree”, 3= “slightly disagree”, 4= “slightly agree”, 5= “agree” and 6= “strongly agree” so that the addiction score ranged from 10 to 60. As recommended by the guideline, an overall score of greater than 33 in males and greater than 31 in females was considered addiction.[8] The SAS-SV considers 5 parameters of smartphone addiction; 1. Disturbance in daily life (3 questions), 2. Withdrawal (4 questions), 3. Overuse (1 question), 4. Tolerance (1 question) and 5. Virtual relationship (1 question). Using smartphone for longer than 5 hours daily during weekdays was labeled as “overuse”. The purpose of smartphone use included 3 multiple choice options namely communication, social networking and gaming and study purposes. Participants were also instructed to self-evaluate their addiction status. Statistical analysis was done using SPSS-20. Numerical values were expressed as mean±SD and categorical variable as percentage. Chi-square test was used to seek association between demographic variables in addicted and non-addicted samples.

Results

The sample consisted of 250 undergraduate students 38.8% males (97/250) and 61.2% females (153/250) with mean age of 19.7±1.68 years (range 18-29 years). The pool of participants included 87 students from school of medicine, 51 from school of dental surgery, 96 from school of nursing and 16 from school of allied sciences. Most of the participants (224) attended private or boarding schools before joining medical school. 74% (185) of the participants currently resided in college hostel. Smartphones were commonly found to be used for communication, social networking, gaming and study purposes (26.8%). Smartphone overuse was reported in 42.8% (107/250) of the respondents. (Table 1)

Table 1. Characteristics of study participants
| Variables                      | Frequency (%) | Reasons for using Smartphone                      | Variables                          | Freq |
|-------------------------------|---------------|---------------------------------------------------|------------------------------------|------|
| Gender                        |               | Way to use the Smartphone                         |                                    |      |
| Male                          | 97 (38.8%)    | Communication                                     | 16 (6.4%)                          |      |
| Female                        | 153 (61.2%)   | Social networking and gaming                      | 23 (9.2%)                          |      |
|                               |               | Studying                                         | 12 (4.8%)                          |      |
| Faculty                       |               | Communication, social networking and gaming       | 25 (10%)                           |      |
| School of medicine            | 87 (34.8%)    | Social networking, gaming and study purposes      | 59 (23.6%)                         |      |
| School of Dental Surgery      | 51 (20.4%)    | Communication and study                           | 48 (20.4%)                         |      |
| School of Nursing             | 96 (38.4%)    | Communication, social networking, gaming and study purposes | 67 (27.6%) |      |
| School of Allied sciences     | 16 (6.4%)     | Self-Perception of Smartphone addiction           |                                    |      |
| Past Educational Institute    |               | Way to use the Smartphone                         |                                    |      |
| Yes                           | 67 (27.6%)    |                                                   |                                    |      |
| Private/ Boarding School      | 224 (89.6%)   | No                                                | 105 (42.0%)                        |      |
| Government/ Public School     | 26 (10.4%)    | Don’t Know                                        | 78 (31.2%)                         |      |
| Hostel                        | 185 (74%)     | Duration of Smartphone use (weekdays)             |                                    |      |
| Day-scholar                   | 65 (26%)      | >5 hours/weekdays                                 |                                    |      |
|                               |               | ≤5 hours/weekdays                                 |                                    |      |

More than 69.2% of participants in our study reported indications of disturbance in daily life (43.2% reported having missed planned work due to smartphone use, 25.6% students reported hard time concentrating in class or completing a task due to smartphone use and 39.2% reported pain in hand or wrist due to excessive use). The study also reported nomophobia among 72.4% of participants (56.8% reported being unable to stand without having a smartphone, 43.6% reported feeling of impatience and fretfulness when not having smartphone with self and 14.4% reported unwillingness to change even if life is greatly affected by smartphone use). Likewise, phubbing and maintaining virtual relationship of constantly wanting to check smartphone as to not miss any conversation was reported in 37.6% participants. Overuse was reported in 60.8% of participants. Tolerance was observed in 42.8% participants responding positively to peoples concern over using too much smartphone. (Table 2)

**Table 2. Prevalence of smartphone addiction (SAS-SV) symptoms among study participants**

| Symptoms                      | Items                                                                 |
|-------------------------------|----------------------------------------------------------------------|
| Disturbance in daily life     | I have missed planned work due to Smartphone use.                    |
|                               | I have a hard time concentrating in class, while doing my assignments or while working due to Smartphone use. |
|                               | I feel pain in the wrist or on the back of my neck due to smart phone use. |
| Withdrawal                    | I will not be able to stand not having a Smartphone.                 |
|                               | I feel impatient and fretful when I am don’t have my Smartphone with me. |
|                               | I have Smartphone on my mind even when I am not using it.            |
|                               | I will not give up using my Smartphone even when my daily life is already greatly affected by it. |
| Virtual relationship          | I constantly check my Smartphone so as not to miss conversation between other people on twitter, Facebook, Viber, WeChat, snapchat. |
| Overuse                       | I feel like I am using my Smartphone more than I had intended.        |
| Tolerance                     | The people around me tell me that I use my Smartphone too much.        |

Smartphone addiction was found among 36.8% (92/250) of the participants with equal numbers of male and females (46) however, a higher percentage of males were found to be addicted to smartphones (M=47.42% F=30.06%). The average addiction score among males was 30.23±9.40 and that among females was 28.89±8.63. A higher average addiction score was obtained among females.
Participants using smartphone for communication, study, gaming and social networking had the highest addiction scores (40.37±6.04). Participants accepting self-addiction reported highest addiction scores followed by those who used smartphones for longer duration during weekdays. (Table 3)

26.8% (67/250) of the participants self-rated themselves as addicted to smartphone, 42% (105/250) did not rate themselves as addicted and the rest 31.2% (78/250) had no opinion of the same. Among the 92 addicted to smartphone, 44 (65.7%) self-rated themselves as addicted, whereas 15(14.3%) denying addiction were found to be addicted, and 33 (42.3%) of those who did not opine were addicted to smartphone. (Table 3)

Table 3. Smartphone addiction (total SAS-SV score) and participants’ characteristics

| Parameters | Overall SAS-SV score mean± SD (n) | Addiction Score mean ±SD (n) |
|------------|-----------------------------------|------------------------------|
| Gender     |                                   |                              |
| Male       | 30.23±9.40 (97)                   | 38.21±5.63(46)               |
| Female     | 28.89±8.63 (153)                  | 39.36±5.45(46)               |
| Faculty    |                                   |                              |
| School of Medicine | 30.29±9.23 (87) | 38.49±5.50(39) |
| School of Dental Surgery | 28.66±10.85 (51) | 40.69±7.10(17) |
| School of Nursing | 28.34±7.35 (96) | 38.10±3.47 (28) |
| School of Allied Sciences | 30.62±10.09 (16) | 38.86±4.54(8) |
| Past Educational Institute |                                   |                              |
| Private/ Boarding School | 29.67±9.17(224) | 39.06±5.58(85) |
| Government/ Public School | 27.15±6.30(26) | 35.42±3.65(7) |
| Reasons for using Smartphone |                                   |                              |
| Communication | 24.43±5.09(14)   | 33.11±0.63(2)               |
| Social networking and gaming | 28.34±8.43(23) | 38.41±3.92(7) |
| Studying    | 28.91±6.30(12) | 34±2.99(5)                  |
| Communication, social networking and gaming | 26.44±9.12(25) | 36.50±5.07(8) |
| Social networking, gaming and study purposes | 28.77±9.49(59) | 38.98±6.54(20) |
| Communication and study | 29.64±7.85(48) | 37.77±3.88(18) |
| Communication, social networking, gaming and study purposes | 32.56±9.59(67) | 40.37±6.04(34) |
| Duration of Smartphone use / weekday |                                   |                              |
| >5hours     | 32.66±10.04(42) | 39.72±6.95(23) |
| <=5hours    | 28.75±8.58(208) | 38.46±5.01(69) |
| Self-Perception of Smartphone addiction |                                   |                              |
| Yes         | 35.55±8.18(67) | 39.80±6.66(44) |
| No          | 25.17±6.87(105) | 36.86±2.74(15) |
| Don’t Know  | 29.85±8.94(78) | 38.26±4.45(33) |
| Residence at present time |                                   |                              |
| Hostellers  | 28.81±8.80(185) | 38.89±5.18(32) |
| Day-scholars | 31.92±9.20(65) | 38.72±5.79(60) |

Smartphone addiction was found to be associated with gender, duration of use and self-perception of addiction towards smartphone. It was not associated with faculty, past educational institute, place of residence at current time and purpose of smartphone use. (Table 4)

Table 4. Association between smartphone addiction and participants’ characteristics
| Variable                              | Addiction                       | $\chi^2$ |
|---------------------------------------|---------------------------------|----------|
|                                      | Addicted $n$                    | Not-addicted $n$ |
| Gender                               |                                 |           |
| Male                                 | 46                              | 51        |
| Female                               | 46                              | 107       |
| Faculty                              |                                 |           |
| School of Medicine                   | 39                              | 48        |
| School of Dental Surgery              | 17                              | 34        |
| School of Nursing                    | 28                              | 68        |
| School of Allied Sciences            | 8                               | 8         |
| Past Educational Institute           |                                 |           |
| Private/Boarding School              | 85                              | 139       |
| Government/ Public School            | 7                               | 19        |
| Reasons for using Smartphone         |                                 | NA        |
| Communication                        | 0                               | 16        |
| Social networking and gaming         | 7                               | 16        |
| Studying                             | 5                               | 7         |
| Communication, social networking and gaming | 8                              | 17        |
| Social networking, gaming and study purposes | 20                             | 39        |
| Communication and study              | 18                              | 30        |
| Communication, social networking, gaming and study purposes | 34                             | 33        |
| Duration of Smartphone use / weekday |                                 |           |
| >5 hours                             | 23                              | 19        |
| <=5 hours                            | 69                              | 139       |
| Self-Perception of Smartphone addiction |                                 |           |
| Yes                                  | 44                              | 23        |
| No                                   | 15                              | 90        |
| Don’t Know                           | 33                              | 45        |
| Residence at present time            |                                 |           |
| Hostellers                           | 32                              | 153       |
| Day-scholars                         | 60                              | 5         |

**Discussion**

The Smartphone technology is sweeping the world at an alarming rate but the advancement in smartphone technology comes at a price; the risk of jeopardizing social life and being addicted to the virtual world. The fondness of owning, overusing and engaging in virtual social life has massively engulfed the youth of the 21st century. The Mobile phone penetration in Nepal is 123% with mobile internet penetration around 58%. [2] In the present study, the smartphone was owned by all 250 (100%) participants. Smartphone addiction in the present study was found to be around 36.8% similar to a study among adolescents in India. [9] The similarity could have been because of similar socio-economic conditions. Nomophobia in the present study reported dissimilarities with previous studies at 72.4%. [6, 10] The difference in the timing of the study could have been the reason for this discrepancy with earlier studies reporting a much lower percentage of nomophobia. Also, earlier, the smartphone and internet penetration was reportedly low, however, a rapid rise has been reported in recent studies with some even reporting a mammoth 92% smartphone addiction among medical students. [11] Moreover, the lack of validated questionnaire previously could as well be a reason for the variation. Also, the anxiety of separation from family and friends and loneliness at the start of medical school could as well contribute to smartphone addiction and nomophobia. [12] Similar findings have been reported from China [13] and Lebanon. [14]

Our study reported pain in the wrist or on the back of neck due to excessive smartphone use among
39.2% participants which may lead to future physiological and psychological complications.

The result of the present study reported a higher percentage of male to female smartphone addicts similar to a study among Iranian and Chinese medical students and unlike others reporting higher female addiction percentage.[13, 15, 16] The evolution of internet and smartphone based games and its gaining popularity among males could be a cause of such a finding in our study.[14, 17] Our present study reported that females used smartphones mostly for communication and social networking while males used smartphone mostly for communication and gaming. This finding was concurrent with a study from China. [13] The similarity could have been a result of parallel nature of either gender of similar age and field of study. The present study is not in a situation to speculate the similarity and a need for further studies is recommended to resolve the inconsistent prevalence of smartphone addiction among gender. More internet and gaming addiction studies could prove such a finding in Nepal’s context.

Likewise, our study reported a higher rate of self-perception of smartphone addiction among females than males (42:25) similar to a study in Turkey, [15] however, the mean addiction score was higher among males than females (30.23±9.40:28.89±8.63).

Studies have shown bidirectional influence of smartphone on psychiatric conditions. Some suggest smartphone addiction to cause insomnia, restlessness, stress, depression and impulsive behavior [18, 19] whereas some studies show smartphone addiction to be a cause of all these disorders. [20] These conflicting evidences warrant further studies. In the present study, we postulated impulsive overuse of smartphone as probable cause of smartphone addiction.

Using smartphone for more than 5 hours a day during weekdays and self-perception of being addicted to smartphone were found to be the most significant predictors of smartphone addiction. This finding was similar to the one reported in Lebanon. [14] The excessive use could be a sign of addiction and carefree nature as evidenced on 42.8% of participants who reported being told about excessive use of smartphone by people nearby. The present study reported smartphone overuse among 16.8% (42/250) participants and its association with addiction similar to a study among medical students in Iran. The similarity could have been a result of homogenous sample population. [21] Self-acceptance was another factor closely associated with smartphone addiction reinforcing the fact that self-admission and self-esteem had direct effect on mobile phone addiction. This was consistent with study from Korea [19] unlike from China. [22]

The study showed a significant association between gender and smartphone addiction (p<0.01)
unlike one reported in India as recent as 2016.[11] The association could have been observed because of larger female sample population. More such studies are necessary to confirm such fact. Previous educational institute namely government or private academic institutions showed no correlation with smartphone addiction in either sexes which was consistent with a study among nursing students in India.[7]

The study was conducted among first year undergraduate students and a tendency of decrease in smartphone addiction with progressive year has been observed in India.[23, 24] Further studies involving all level of undergraduate students is recommended to establish such a fact.

Studies have shown the use of smartphone for learning purpose as a protective factor over unproductive use for smartphone addiction.[25, 26] In our study only 12/250 (M=5 and F=7) used smartphone solely for study purpose. This could as well be a reason for higher percentage of smartphone addiction in the current study. Use of smartphone for social networking was the commonest cause of smartphone addiction.

There was no correlation between accommodation (hosteller and living with family) and smartphone addiction (p>0.05)

Conclusions
Smartphone addiction was common among the investigated participants suggesting smartphone addiction as a new public health issue among medical students. Anything new, trending and appealing allures the younger generation, however excessive use may lead to the risk of addiction. Responsible use can benefit individuals and any form of addiction can be checked by a strong will. We suggest a need for intervention to reduce smartphone addiction among undergraduate medical students probably incorporating health education about the use of mobile phone. Today’s youths should be advised and educated about conscientious use of smartphone to avoid detrimental impact on daily life. Further studies will be required to reveal smartphone addiction in different levels of education.

Declarations

List of Abbreviations

SAS-SV: Smartphone Addiction Scale- Short version
-Ethics Approval and Consent to participate

Ethical approval was obtained from Institutional Review Board of Chitwan Medical Collge, Bharatpur-10, Chitwan, Nepal (ref no: CMC-IRC/075/076-123). Written consent was obtained from all the
palliative patients for participation in the study. The consent also informed the participants that the data obtained could be used and made public under anonymity. All procedures were in accordance with the Helsinki declaration and its later amendments.

-Consent for Publication

Not applicable

-Availability of data and material

The datasets obtained and/or analyzed during the current study are not publicly available due to confidentiality consent of the study but can be obtained from the corresponding author on reasonable request.

-Competing Interests

The authors declare no competing interests.

-Funding

No funding was available for the study. The investigators shared the cost of the study.

-Authors Contribution

SK conceptualized the study, participated in formulating study tool, wrote the manuscript and helped in revising the draft. ST obtained ethical approval, collected data from the participants, re-wrote the manuscript and helped in data analysis. JPS analysed the data, helped in formulating the initial draft and helped in revising the draft. All authors read and approved the final manuscript.

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