GLOBAL PSYCHIATRY ARCHIVES

GLOBAL PSYCHIATRY ARCHIVES — Vol 8 | Issue 1 | 2025

Dr Surobhi Chatterjee[1*], Dr Sujita Kumar Kar[2]

Association of risky behaviour, psychological changes and sleep quality with excessive smartphone use among medical undergraduates: a cross-sectional study

[1] Postgraduate Resident, Department of Psychiatry, All India Institute of Medical Sciences, Mangalagiri, Andhra Pradesh, India.
[2] Additional Professor, Department of Psychiatry, King George's Medical University, Lucknow, Uttar Pradesh, India.

*email: surochat98@gmail.com

Received: 2022-07-04; Accepted: 2025-03-23
DOI: 10.52095/gpa.2025.5233.1053

Abstract

Background: Smartphones have become essential in modern life. Overuse of smartphones has been increasingly reported and is recognised as a form of behavioural addiction. Excessive smartphone use is associated with several psychological symptoms, risky behaviour and poor sleep quality. This study evaluates the association of this among medical undergraduates.

Methods: A cross-sectional study was conducted among undergraduate medical students at a tertiary care teaching hospital in North India. The recruited participants were assessed using a self-report, semi-structured questionnaire that covered socio-demographic characteristics, smartphone use, adoption of risky behaviours, psychological changes and sleep quality.

Results: Of the 224 medical students surveyed, 88 students (48 males and 40 females) had smartphone addiction and 186 reported using smartphones in risky or inappropriate situations. The most common risky behaviour was usage of smartphones while walking on the road (79.464%), followed by usage while crossing roads (37.500%). Guilt associated with excessive smartphone use was the most common psychological change in females (39.166%), whereas males reported anxiety in areas with poor network coverage (43.269%). Excessive smartphone use was associated with increased risky behaviours, poor psychological health, and poor sleep quality.

Conclusions: Excessive smartphone usage has been linked to an increase in risky behaviours, poor psychological health and diminished sleep quality. By addressing excessive smartphone usage, we can tackle these issues and promote better mental health and wellbeing.

Keywords

Smartphone use, Smartphone addiction, Risky behaviour, Medical undergraduates, Psychological changes, Anxiety and guilt

INTRODUCTION

A smartphone is a compact electronic device that delivers immediate access to a wealth of information, encompassing utility and entertainment. Every year, technology firms pursue advancements in cutting-edge technology and innovative design. Recent decades witnessed an increased use of smartphones in day-to-day life, which is more evident among the young generation (Othman et al., 2018). The smartphone has become the most relied-upon gadget due to its multipurpose capabilities. During the COVID-19 pandemic, its usage increased significantly, and parents found it harder to limit screen time. As a result, they adopted a more permissive attitude towards their children's device usage compared to before the pandemic. (Serra et al., 2021).

Medical students, like their peers in other professional fields, are actively engaging in their education by attending webinars, organising events, preparing for postgraduate studies, and developing new skills – all through the use of smartphones. So excessive use may become a problem.

It is imperative to address the implications of smartphone addiction. The Diagnostic and Statistical Manual (DSM-5) published by the

American Psychiatric Association as a classification system for psychiatric illnesses, describes smartphone addiction as a substance-related addictive disorder as it shares similarities with it, following extensive advocacy and research (Kuss et al., 2017)2013. Problematic smartphone usage combined with over-dependence and tolerance is brought under smartphone addiction's umbrella term (Soni et al., 2017).

Current evidence has shown that smartphone usage while driving ranks as one of the most important global road safety issues. This can be attributed to the understanding that these interactions, both sensory and kinesthetic, include all kinds of sensory involvement (in other words, visual, auditory, manual and cognitive distractions) (Hill et al., 2021). Not just driving, but constantly focusing on and using smartphones has led to increased pedestrian accidents through crossing roads and averting signals, (Mourra et al., 2020).

Psychological changes, including anxiety, guilt, depression, annoyance, social phobia and neuroticism, have all been significantly associated with smartphone overuse (Kim et al., 2019; Lei et al., 2020).

Research has evaluated the relationship between perceived stress and sleep patterns (Dharmadhikari et al., 2019). Also, it was found that individuals who are using smartphones for more than four hours a day encounter several adverse health-related outcomes including heightened stress perception, increased suicidal ideation and inclination to substance use (Cha et al., 2023). A recent study reports that high smartphone use and co-existing poor social support often result in increased risky behaviour (Herrero et al., 2019).

A study among students in Peru, reports the association of problematic mobile phone use with substance use and other risky behaviours (Ramos-Diaz et al., 2020). Students with problematic use of smartphones report poor mental health, poor subjective wellbeing, loneliness, poor sleep quality, social distress, low perceived social support, anxiety and depression (Frydenlund et al., 2023; Osorio-Molina et al., 2021; Shi et al., 2023).

A notable gap exists in the investigation of behavioural changes and risky behaviours attributed to excessive smartphone usage among medical students in India. Given the exponential increase in the number of Android phone users and India's substantial representation in the global internet user base, it is imperative to comprehend the psychological issues, sleep quality and risky behaviours associated with increased smartphone use.

The paper is part of more extensive research (Chatterjee and Kar, 2021) which described the association of excessive smartphone usage with risky behaviour, psychological changes and sleep quality among medical undergraduates in North India.

MATERIALS AND METHODS

Study design and setting

This cross-sectional study was performed among undergraduate medical students studying at a medical university in North India. Before enrollment in the study, written informed consent was obtained from all participants.

Selection criteria, sampling method and allocation

As there were students in five different semesters at the time of the survey, we divided the total sample estimated by five, to get the number of students to be recruited from a given semester. Students who only met the selection criteria of the study were selected randomly. There was no incentive for participating. Consenting to participate and having a smartphone for a minimum duration of the past 12 months were required for inclusion, and having a known medical or psychiatric illness that may affect sleep quality and smartphone usage was excluded (Chatterjee and Kar, 2021).

Students meeting the selection criteria were subjected to randomisation through a computer-generated random number generator (from all semesters). The names and roll numbers of the students of each semester batch were listed in their attendance register. In India, most medical institutions assign a unique roll number to each medical student in that institute, which is marked in the daily attendance register. It helps ensure the attendance and identification of medical students in that institute.

Study duration

The self-reported questionnaire was distributed in person to the participants between August and October 2019 who met the selection criteria.

Assessment tools

The socio-demographic proforma included information regarding the participant's age, years of education, semester, duration of smartphone usage (in hours/day), length of smartphone usage (in years), purpose of smartphone use, use of smartphone in risky or inappropriate situations (while walking on the road, while crossing the road, while driving, during class, before sleep time, just after waking up, when among friends), psychological changes associated with a smartphone and its usage frequency on a Likert scale (a form of ordinal scale), ranging from 1 to 5 (1= never, 2= rarely, 3= less often; 4= often, 5= very often) (Chatterjee and Kar, 2021).

The frequency of psychological changes and risky behaviour were evaluated taking the past one-month timeframe into account.

We documented the psychological changes associated with excessive smartphone use as a variable. Psychological changes refer to any change in emotion or behaviour (irritability, anger, annoyance, guilt, anxiety, frustration and low mood) that is impairing or distressing to the individual. In this study, we operationalised the psychological changes into two categories. The first category refers to "low-level psychological change" which included less frequently occurred psychological changes as reported in the Likert scale (1=never, 2=rarely, 3=less often). The second category refers to "high-level psychological change" which included more frequently occurring psychological changes as reported in the Likert scale (4=often and 5=very often).

Initially created to help identify psychiatric illnesses in general practice setup, the GHQ short version aimed at detecting current psychiatric disturbance, was used for analysing general mental health at baseline, and a GHQ-12 score of more than 12 was indicative of the presence of psychological distress (Goldberg and Blackwell, 1970).

The SAS-SV evaluated daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse and tolerance. In males, a score of more than 31 and in females more than 33, meant they had smartphone addiction (Kwon et al., 2013).

For, the PSQI, a score of less than five indicates poor sleep quality (Buysse et al., 1989).

Sample size: The estimated sample size required for the study was 224. The following assumptions are taken into account while estimating the sample size using the free online software iface (https://sampsize.sourceforge.net/iface/).

- Precision = 5.0%
- Prevalence = 23.0% (Bhatt and Gaur, 2019)
- Population size = 1,250
- 95% confidence interval specified limits [18% – 28%] (these limits equal prevalence plus or minus precision)
- Estimated sample size: n = 224.

The population size of 1,250 was taken as there were a total of 1,250 undergraduate medical students at the time of the survey. In other words, 250 medical

students from all five undergraduate years.

Procedure: We ensured that the anonymity and confidentiality of responses and identifying information were maintained. The administration of the study questionnaire took approximately 20 minutes to complete. Each respondent was assigned a unique code ID for identification purposes. The study data was stored in password-protected files, which were accessible only to the study authors. The complete selection flowchart is provided in Figure 1.

***Ethical approval*:** The present research was approved by the Institutional Ethics Committee of King George's Medical University, India (Ref code: 95th ECM II B IMR-S/P7).

***Statistical analysis*:** The data was analysed by using the statistical software SPSS. The correlation between the variables was established using Pearson's correlation coefficient (as the data was normally distributed) and the results were considered significant at p value <0.05.

RESULTS

A total of 280 students were screened based on selection criteria to get a sample of 224 (Figure 1). The average age of the total population was 21.1 ± 1.79 years. The average age of female students was 22.2 ± 1.10 years and male students was 20.1± 1.12 years. A total of 53.600% female (n=120) and 46.400% male (n=104) students participated in the study. Most of the participants lived in hostels (n=200, 89.3%). The average duration of smartphone use was 2.60±0.94 years.

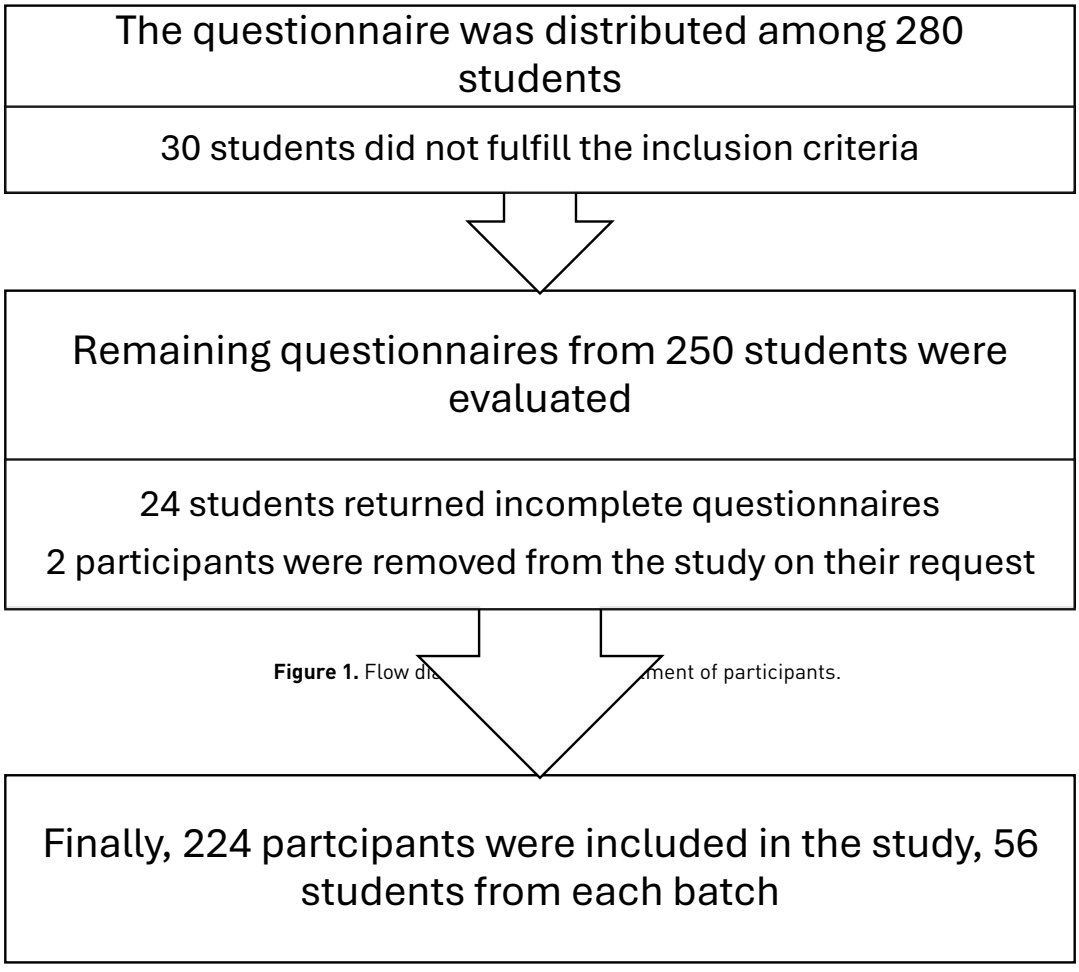

Figure 1. Flow di ment of participants.

The average daily duration of smartphone usage was 6.0242 hours ± 1.0131 hours. Daily smartphone use duration was seen to be significantly higher ($p<0.0001$) in females (6.76 ± 1.09 hours) than in males (5.89± 1.04 hours). A total of 88 participants (39.3%) meet the criteria for smartphone addiction as per the SAS-SV. The prevalence of smartphone addiction was found to be higher among the male participants in comparison to their female counterparts (46.2% versus 33.3%). The general mental health as per GHQ-12 was acceptable (in other words, <3) in 78 participants (34.8%), whereas the rest (65.2%) had compromised general mental health.

Purposes of smartphone use

Table 1. Comparison of socio-demographic characteristics and an overview of smartphone addiction, general health, and sleep quality among participants who use smartphones in risky or inappropriate situations versus those who do not

	People showing different levels of psychological changes*		Test of significance (unpaired t-test)
	#Low level of psychological change (n=131)	$High level of psychological change (n=93)	
Age in years (MEAN ± SD)	21.0±1.90	21.1±1.56	p =0.650
Average duration of use in hours/day (MEAN ± SD)	4.22±2.03	5.27±2.34	p <0.001
SAS-SV scores (MEAN ± SD)	26.4±9.49	35.7±9.76	p < 0.001
GHQ-12 scores (MEAN ± SD)	4.77±3.24	5.84±2.98	p =0.013
PSQI scores (MEAN ± SD)	5.43±2.73	6.88±3.38	p <0.001

SAS-SV: Smartphone Addiction Scale – Short Version; GHQ-12: General Health Questionnaire -12; PSQI: Pittsburgh Sleep Quality Index.
*Yes: refers to participants who used smartphones in risky or inappropriate situations
A higher score in SAS-SV means more severe addiction to smartphone.
A higher score in GHQ-12 means more psychological distress.
A higher score in PSQI means poorer quality of sleep.

The smartphones were used for various purposes, the most common being talking (n=219, 97.767%). Close to 90% (n=201) of the total number of medical students use their smartphones for social media and entertainment purposes like watching videos and movies. However, professional work was done by a mere (n=65, 29.0178%) of medical students using smartphones. Online chatting and texting was reported among 92.500% of females (n=111) and 83.653% of males (n=87). Most male students (n=67, 64.423%) used smartphones for playing games, while female students for social media use (n=94, 78.333%).

Psychological changes associated with excessive smartphone usage

The feeling of guilt (41%) is the most common psychological change among the participants, followed by anxiety (34%) and annoyance (25%). But, when it comes to gender, the most common psychological changes were anxiety (reported in males at 43%) and guilt (reported in females at 39%) (Figure 2). A high level of psychological changes was common in older students (mean age- 21.1±1.56), with a longer duration of daily smartphone usage (5.27±2.34 hours), and higher SAS-SV, GHQ-12 and PSQI scores. There was a significant difference between the participants with "low-level psychological change" and those with "high-level psychological change" on the parameters of average duration of smartphone usage (hours/day) ($p<0.001$, $t=3.56$, $df=222$), SAS-SV scores ($p<0.001$, $t=7.61$, $df=222$), PSQI score ($p<0.05$, $t=2.51$, $df=222$) and GHQ-12 score ($p<0.001$, $t=3.53$, $df=222$) scores (Table 2).

Frequency of smartphone usage in risky or inappropriate situations

Female participants more frequently used their smartphones for most of the risky or inappropriate situations except 'while driving', where males

Table 2. Comparison of socio-demographic characteristics, smartphone addiction scores, general health score and sleep quality score among participants showing different levels of psychological changes

	Participants using smartphones in risky or inappropriate situations		Test of Significance (Unpaired t-test)
	YES* (n=186)	NO (n=38)	
Age in years (MEAN ± SD)	21.1±1.72	21.2±2.01	p <0.001
Average duration of use in hours/day (MEAN ± SD)	4.70±2.08	3.71±2.10	p <0.001
SAS-SV scores (MEAN ± SD)	30.0±10.6	25.5±9.17	p <0.001
GHQ-12 scores (MEAN ± SD)	4.96±3.22	4.06±2.84	p <0.001
PSQI scores (MEAN ± SD)	5.94±3.10	5.72±2.92	p <0.001

SAS-SV: Smartphone Addiction Scale – Short Version; GHQ-12: General Health Questionnaire 12-item version; PSQI: Pittsburgh Sleep Quality Index.

*Psychological changes include any noticeable change of emotion, behaviour and thinking (for example, irritability, annoyance, anxiety, frustration, worry, apprehension, pessimism, blaming, restlessness)

#"Low-level of psychological change" included (1=never, 2=rarely; 3=less often) less frequently occurred psychological changes as reported in the Likert scale.

$ "High-level of psychological change" included (4= often; 5=very often) more frequently occurring psychological changes as reported in the Likert scale.

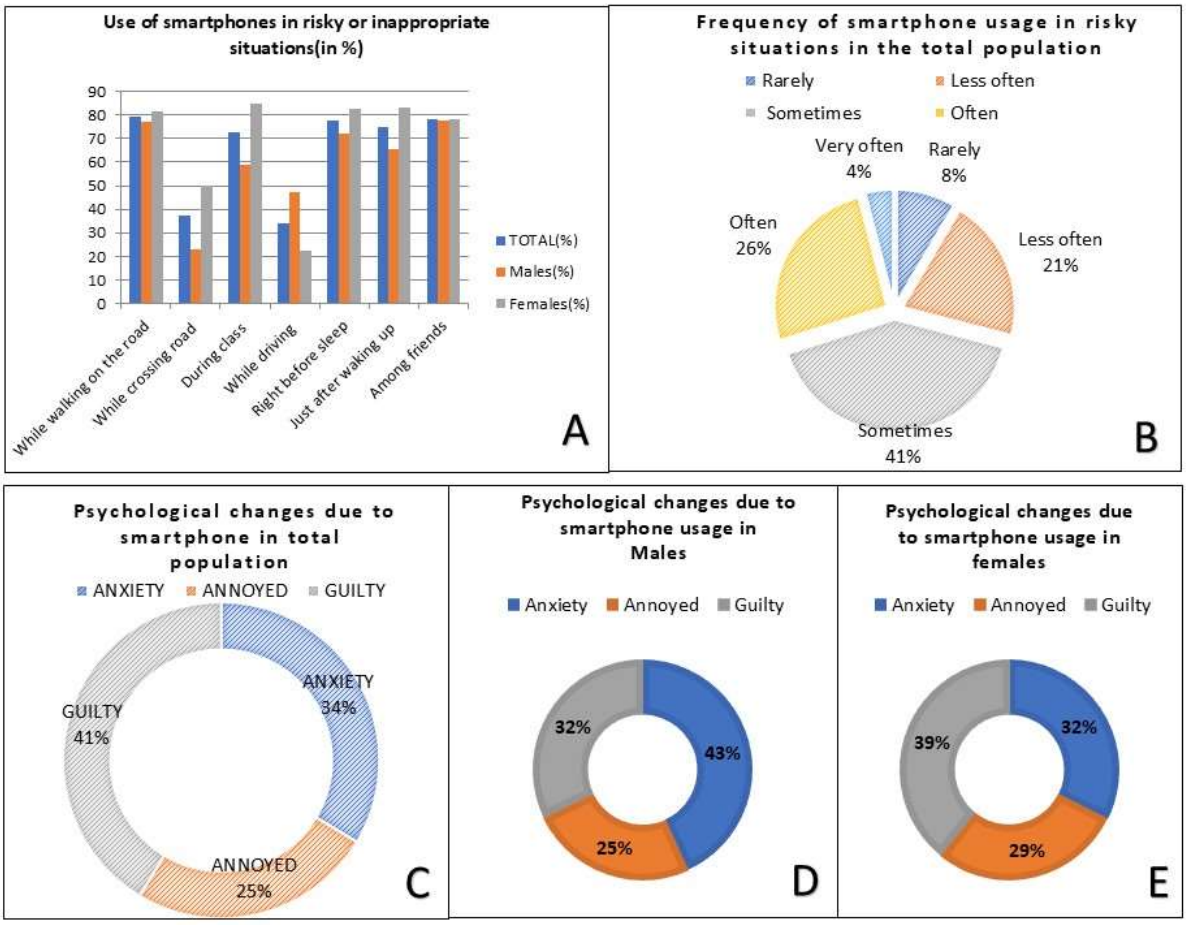

Figure 2. Shows use of smartphone in the risky or inappropriate situations (A), frequency of smartphone uses in the risky situations (B), psychological changes due to smartphone use in total participants (C), male participants (D) and female participants (E)

more commonly reported using it during driving (Figure 2).

Risky or inappropriate behaviour patterns and association with evaluated scores

In this study, 186 participants displayed risky or inappropriate behaviour. Students displaying risky or inappropriate behaviours were younger than those who were not displaying such behaviour. They also had longer daily smartphone usage durations (4.70 ± 2.08 hours) and higher SAS-SV, GHQ-12 and PSQI scores (Table 1).

A higher score in SAS-SV means more severe addiction to smartphone. A higher score in GHQ-12 means more psychological distress. A higher score in PSQI means poorer quality of sleep.

DISCUSSION

This article explores the relationship between excessive smartphone use, risky behaviour, the quality of sleep, and general mental health among medical students.

In our study, daily smartphone use duration was seen to be significantly higher in females than in males. Close to 90% of the total number of medical students use their smartphones for social media and entertainment purposes.

In a study of medical students, Chen et al found the prevalence of smartphone addiction to be close to 30% with no major differences in the dependence across genders (Chen et al., 2017). This study also found an association of smartphone addiction with depression, anxiety, poor sleep quality, social media use and gaming. Our study also found a similar kind of association between smartphone addiction with general mental health and sleep quality, which has been published earlier (Chatterjee and Kar, 2021).

Another study from Taiwan also reports no differences in gender concerning the prevalence of smartphone addiction (Wu and Chou, 2023). An Indian study revealed that female adolescents spend significantly more time on smartphones than males (Taywade and Khubalkar, 2019).

Smartphone addiction can contribute to the development of psychological changes (Enez Darcin et al., 2016a; Gedam et al., 2017). In our study, we found the daily smartphone use duration in female students to be significantly higher than the male students. Our study, also confirms that high levels of psychological changes (more frequently occurring emotional and behavioural changes) are common among participants with longer duration of daily smartphone use.

Smartphone use was increasingly associated with distracted walking as per a field experiment study. In real life, as per our study, smartphone use was associated with usage in risky situations like while walking and crossing roads. It has been reported that the use of mobile phones while driving and crossing roads increases the risk of road traffic accidents and fatalities (Chand et al., 2021). The risk of road traffic accidents increases approximately four times more among mobile phone users on the road than those who do not use it in such risky situations (Ahmed et al., 2023). Distracted walking is a potential road safety hazard as reported in a study (Nasar and Troyer, 2013). Although pedestrian injury rates have decreased over the years, the percentage of phone-related injuries to pedestrians has increased due to distracted driving. Another study, which evaluated college students' smartphone internet browser usage while crossing a virtual street, found an increased frequency of vehicular collisions (Byington and Schwebel, 2013). In our study, female participants more frequently used their smartphones in most of the risky or inappropriate situations except 'while driving', where males reported it more commonly. Another study found that smartphone addiction is increasingly associated with driving safety hazards. This was because of a positive attitude towards mobile phone use while driving and overconfidence regarding multi-tasking such as reading and responding to text messages, which proportionately increased mobile phone usage while driving (Mourra et al., 2020). Although some

legislations ban smartphone use while driving, it remains widespread. A recent study by Chen et al. suggests this persistence may stem from the automatic habit formed. Perceived enjoyment from the use of smartphones reinforces the formation of habits around excessive smartphone use (Chen et al., 2019). The studies mentioned above strengthen our finding that smartphone addiction is associated with frequent risky behaviour and behavioural changes in participants. This is alarming and serves as a potential safety hazard that can lead to increased road traffic accidents. In our study, it was found that students displaying risky or inappropriate behaviours were younger than those who were not displaying such behaviour. They also had longer daily smartphone usage durations, higher severity of smartphone addiction, and poor mental wellbeing. Most of the studies on the topic of smartphone addiction only address the risky situations, however, we also evaluated how students neglect their 'needful hours' (the time right before sleeping and right after waking up) to spend more time with smartphones. To our knowledge, none of the studies done on medical students so far have evaluated the frequency of behavioural changes and correlated it with three crucial parameters of smartphone addiction, general health and sleep quality.

Social phobia and feelings of loneliness and anxiety are vulnerability factors of excess smartphone use (Enez Darcin et al., 2016b; Pera, 2020). Similarly, it has been reported that smartphone addiction is associated with poor sleep quality and psychological distress (Abuhamdah and Naser, 2023; Shoukat, 2019). There is a bidirectional relationship between psychological wellbeing and smartphone addiction. In our study, we found that feelings of guilt (41%) are the most common psychological change among the participants followed by anxiety (34%) and annoyance (25%).

High levels of psychological change were common in older students with a longer duration of daily smartphone usage and higher SAS-SV, GHQ-12 and PSQI scores. It is difficult to establish a causal association due to the cross-sectional study design in the present study.

There are, however, certain limitations to the present study, first and foremost it being a cross-sectional study, with no definitive causal relationship interpretation. Therefore, we urge that longitudinal studies on the subject are needed to understand the causal association better. Moreover, the research relied on self-reporting of risky behaviour and behavioural changes, which may not disclose the full extent of the participant's actions due to inaccurate reporting, attributed to inherent bias and social stigma surrounding mental health.

CONCLUSION

The high prevalence of smartphone use among medical students and its correlation with use in risky situations is concerning. Guilt feelings are the most common psychological change associated with excessive smartphone use. Smartphone use while walking on the road is the most common risky behaviour that is seen among medical students. There is a significant association between excessive smartphone use, poor sleep quality and poor mental wellbeing. Limiting the use of smartphones and using them in a healthy way is expected to improve the mental wellbeing of medical graduates as well as minimising risky behaviours. Longitudinal studies assessing the impact of medical students' smartphone use in risky situations are needed so that road safety risks and accidents associated with distraction can be assessed in real situations.

DECLARATIONS

Acknowledgement: We would like to thank the Research Cell, KGMU for their support and funding through the intramural undergraduate research grant.

Disclosure of interest: None.

Author contribution: SC – conceptualisation, planning, software, data curation, writing original draft, visualisation, investigation and funding acquisition.

SK – methodology, supervision, validation, writer-reviewing and editing and project administration.

Ethical approval: The present research was approved by the Institutional Ethics Committee of King George's Medical University (Ref Code- 95th ECM II B IMR-S/P7).

Informed consent: Written informed consent was obtained from all the participants in the study.

Funding: The research was funded through an intramural research grant provided by the Research cell, KGMU (Ref Code- 1647/R.Cell-18) as part of its intramural student research fellowship for undergraduate students.

REFERENCES

Abuhamdah, S.M.A., Naser, A.Y., 2023. Smart phone addiction and its mental health risks among university students in Jordan: a cross-sectional study. BMC Psychiatry 23, 812. https://doi.org/10.1186/s12888-023-05322-6

Ahmed, S.K., Mohammed, M.G., Abdulqadir, S.O., El-Kader, R.G.A., El-Shall, N.A., Chandran, D., Rehman, M.E.U., Dhama, K., 2023. Road traffic accidental injuries and deaths: a neglected global health issue. Health Sci. Rep. 6, e1240. https://doi.org/10.1002/hsr2.1240

Bhatt, S., Gaur, A., 2019. Psychological risk factors associated with internet and smartphone addiction among students of an Indian dental institute. Indian J. Public Health 63, 313–317. https://doi.org/10.4103/ijph.IJPH_330_18

Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R., Kupfer, D.J., 1989. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 28, 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Byington, K.W., Schwebel, D.C., 2013. Effects of mobile Internet use on college student pedestrian injury risk. Accid. Anal. Prev. 51, 78–83. https://doi.org/10.1016/j.aap.2012.11.001

Cha, J.H., Choi, Y.-J., Ryu, S., Moon, J.-H., 2023. Association between smartphone usage and health outcomes of adolescents: a propensity analysis using the Korea youth risk behavior survey. PLOS ONE 18, e0294553. https://doi.org/10.1371/journal.pone.0294553

Chand, A., Jayesh, S., Bhasi, A.B., 2021. Road traffic accidents: an overview of data sources, analysis techniques and contributing factors. Mater Today: Proc. 47, 5135–5141.

Chatterjee, S., Kar, S.K., 2021. Smartphone addiction and quality of sleep among Indian medical students. Psychiatry 84, 182–191. https://doi.org/10.1080/00332747.2021.1907870

Chen, B., Liu, F., Ding, S., Ying, X., Wang, L., Wen, Y., 2017. Gender differences in factors associated with smartphone addiction: a cross-sectional study among medical college students. BMC Psychiatry 17, 341. https://doi.org/10.1186/s12888-017-1503-z

Chen, C., Zhang, K.Z.K., Gong, X., Lee, M., 2019. Dual mechanisms of reinforcement reward and habit in driving smartphone addiction: the role of smartphone features. Internet Res. 29, 1551–1570. https://doi.org/10.1108/INTR-11-2018-0489

Dharmadhikari, S.P., Harshe, S.D., Bhide, P.P., 2019. Prevalence and correlates of excessive smartphone use among medical students: a cross-sectional study. Indian J. Psychol. Med. 41, 549–555. https://doi.org/10.4103/IJPSYM.IJPSYM_75_19

Enez Darcin, A., Kose, S., Noyan, C.O., Nurmedov, S., Yılmaz, O., Dilbaz, N., 2016a. Smartphone addiction and its relationship with social anxiety and loneliness. Behav. Inf. Technol. 35, 520–525. https://doi.org/10.1080/0144929X.2016.1158319

Enez Darcin, A., Kose, S., Noyan, C.O., Nurmedov, S., Yılmaz, O., Dilbaz, N., 2016b. Smartphone addiction and its relationship with social anxiety and loneliness. Behav. Inf. Technol. 35, 520–525. https://doi.org/10.1080/0144929X.2016.1158319

Frydenlund, G., Guldager, J.D., Frederiksen, K.O., Egebæk, H.K., 2023. Do young people perceive their smartphone addiction as problematic? A study in Danish university college students. Heliyon 9, e20368. https://doi.org/10.1016/j.heliyon.2023.e20368

Gedam, S.R., Ghosh, S., Modi, L., Goyal, A., Mansharamani,

H., 2017. Study of internet addiction: prevalence, pattern, and psychopathology among health professional indergraduates. Indian J. Soc. Psychiatry 33, 305. https://doi.org/10.4103/ijsp.ijsp_70_16

Goldberg, D.P., Blackwell, B., 1970. Psychiatric illness in general practice: a detailed study using a new method of case identification. Br. Med. J. 2, 439–443.

Herrero, J., Urueña, A., Torres, A., Hidalgo, A., 2019. Smartphone addiction: psychosocial correlates, risky attitudes, and smartphone harm. J. Risk Res. 22, 81–92. https://doi.org/10.1080/13669877.2017.1351472

Hill, T., Stephens, A.N., Sullman, M.J.M., 2021. Mobile phone applications use while driving in Ukraine: self-reported frequencies and psychosocial factors underpinning this risky behaviour. PloS One 16, e0247006. https://doi.org/10.1371/journal.pone.0247006

Kim, S.-G., Park, J., Kim, H.-T., Pan, Z., Lee, Y., McIntyre, R.S., 2019. The relationship between smartphone addiction and symptoms of depression, anxiety, and attention-deficit/hyperactivity in South Korean adolescents. Ann. Gen. Psychiatry 18, 1. https://doi.org/10.1186/s12991-019-0224-8

Kuss, D.J., Griffiths, M.D., Pontes, H.M., 2017. DSM-5 diagnosis of internet gaming disorder: some ways forward in overcoming issues and concerns in the gaming studies field. J. Behav. Addict. 6, 133–141. https://doi.org/10.1556/2006.6.2017.032

Kwon, M., Kim, D.-J., Cho, H., Yang, S., 2013. The smartphone addiction scale: development and validation of a short version for adolescents. PLOS ONE 8, e83558. https://doi.org/10.1371/journal.pone.0083558

Lei, L.Y.-C., Ismail, M.A.-A., Mohammad, J.A.-M., Yusoff, M.S.B., 2020. The relationship of smartphone addiction with psychological distress and neuroticism among university medical students. BMC Psychol. 8, 97. https://doi.org/10.1186/s40359-020-00466-6

Mourra, G.N., Sénécal, S., Fredette, M., Lepore, F., Faubert, J., Bellavance, F., Cameron, A.-F., Labonté-LeMoyne, É., Léger, P.-M., 2020. Using a smartphone while walking: the cost of smartphone-addiction proneness. Addict. Behav. 106, 106346. https://doi.org/10.1016/j.addbeh.2020.106346

Nasar, J.L., Troyer, D., 2013. Pedestrian injuries due to mobile phone use in public places. Accid. Anal. Prev. 57, 91–95. https://doi.org/10.1016/j.aap.2013.03.021

Osorio-Molina, C., Martos-Cabrera, M.B., Membrive-Jiménez, M.J., Vargas-Roman, K., Suleiman-Martos, N., Ortega-Campos, E., Gómez-Urquiza, J.L., 2021. Smartphone addiction, risk factors and its adverse effects in nursing students: a systematic review and meta-analysis. Nurse Educ. Today 98, 104741. https://doi.org/10.1016/j.nedt.2020.104741

Othman, M.N.A., Rashid, M.A.A., Poly-Tech, K.U., 2018. Technology intimacy: the extend of Malaysian generation Z dependency on technology, in: Conference: Issues and Challenges in Business and Accounting. Kuala Lumpur. Presented at the 1 st National Conference on Multidisciplinary Research and Practice 2018, COMRAP Malaysia, Kuala Lumpur, Malaysia, pp. 20–33.

Pera, A., 2020. The psychology of addictive smartphone behavior in young adults: problematic use, social anxiety, and depressive stress. Front. Psychiatry 11. https://doi.org/10.3389/fpsyt.2020.573473

Ramos-Diaz, J., Jiang, Q., Ramos-Sandoval, R., Griffiths, M.D., 2020. Problematic mobile phone use and risky behaviors among college students in Peru, in: 2020 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS). Presented at the 2020 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS), pp. 253–258. https://doi.org/10.1109/ICIMCIS51567.2020.9354318

Serra, G., Lo Scalzo, L., Giuffrè, M., Ferrara, P., Corsello, G., 2021. Smartphone use and addiction during the coronavirus disease 2019 (COVID-19) pandemic: cohort study on 184 Italian children and adolescents. Ital. J. Pediatr. 47, 150. https://doi.org/10.1186/s13052-021-01102-8

Shi, X., Wang, A., Zhu, Y., 2023. Longitudinal associations among smartphone addiction, loneliness, and depressive symptoms in college students: disentangling between–and within–person associations. Addict. Behav. 142, 107676. https://doi.org/10.1016/j.addbeh.2023.107676

Shoukat, S., 2019. Cell phone addiction and psychological and

physiological health in adolescents. EXCLI J. 18, 47–50.

Soni, R., Upadhyay, R., Jain, M., 2017. Prevalence of smart phone addiction, sleep quality and associated behaviour problems in adolescents. Int. J. Res. Med. Sci. 5, 515–519. https://doi.org/10.18203/2320-6012.ijrms20170142

Taywade, A., Khubalkar, R., 2019. Gender differences in smartphone usage patterns of adolescents. Int. J. Indian Psychol. 7, 516–523.

Wu, Y.-Y., Chou, W.-H., 2023. Smartphone addiction, gender and interpersonal attachment: A cross-sectional analytical survey in Taiwan. Digit. Health 9, 20552076231177134. https://doi.org/10.1177/20552076231177134