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Patterns of Smartphone Addiction and Associated Factors: Effects on Mental Health and Academic Performance in Medical Students

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Abstract: ***A smartphone is a fundamental device used in our daily life. So, it is essential to investigate its effect on the medical students.***
Methods: ***A descriptive cross-sectional study was conducted among 298 random medical students. Data was collected by the principal investigator through face-to-face interviews, using a pretested interview schedule. Ethical considerations were thoroughly addressed while ensuring data quality. Data were analysed using SPSS version 25.0 and presented through tables and diagrams.***
Results: ***More than half 162(54.4%) were between 18 to 22 years and significant 174(58.4%) were female while 267(89.6%) were single. Most 93(31.2%) were in their first year. A significant 129(43.3%) were not non-addicts of smartphones and 187(62.7%) were satisfied with their profession. Most 159(53.4%) had no depression while 139(46.6%) had normal levels of anxiety. Most 114(38.2%) of respondents use smartphones for <2 hours and 139(46.6%) use them at night. Most 141(47.3%) had normal weight and a significant 186(62.4%) didn't smoke. More than 224(75.2%) revealed that their exam performance would be better if don't use a smartphone but 218(73.5%) had no parental rules and 228(76.5%) checked smartphones frequently. More than half 156(52.3%) had normal levels of stress and 159(53.4%) had good relations with their classmates. Around two-thirds of 189(63.4%) were at risk of social media addiction. More than half 162(54.4%) had eye strain, 138(46%) had weight gain and 108(36.2%) had back pain.***

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Conclusion: Medical students are habitual with smartphone use and some of them are addicted to it. They are satisfied with their profession and don't have any level of depression with a normal level of anxiety. Most of them use smartphones for a significant amount of time, especially at night. Students had normal weight and didn't smoke but were at risk of social media addiction. Some of them had eye strain, weight gain and back pain.

Keywords: Medica Student, Smartphone, Depression, Stress, Anxiety.

1. INTRODUCTION

Smartphones have become part of our daily lives because of their diversified use. It contains numerous functions like gaming, social media apps, shopping apps, digital media apps, digital cameras, banking apps etc. However uncontrolled use of it is referred to as smartphone dependence. It significantly negatively affects individuals' daily and academic careers [1]. With the increasing number of smartphone users, there is also an increased number of problems related to smartphone overuse. Till now addiction from overuse of the internet was not listed as a psychiatric disorder. However, after numerous discussions with various stakeholders, some authorities recognized internet addiction as one of the types of addiction related to individual behaviours [2]. This problematic use of smartphones may affect medical students' professionalism. Individuals can't imagine even a day without the use of a smartphone. For some people, smartphone use is indispensable. In the healthcare delivery system, now smartphones are one of the most important tools. It is used for treatment guidelines, drugs drug-related information, and visualization of medical data like wound photographs or radiological images [3].

Numerous studies revealed that most young individuals including medical students use smartphones only for entertainment purposes despite it serving numerous other useful purposes [4]. Because of smartphone overuse, there may be economic problems and, in some cases, an increasing number of conflicts with parents as a consequence of overuse of smartphones. For many surveys, it was observed that smartphone use also had effects on campus life and interpersonal relations with their classmates [5]. Because of pathological smartphone use, individuals may suffer from loneliness, uncomfortably, restlessness or even feelings of incompleteness. [6]. Several studies conducted on medical students found that smartphone addiction is significantly associated with sleeping behaviour problems. Depending on assessment instruments, smartphone addiction among various groups of people ranges from 0% to 38%. It is also evident that smartphone use is associated with the academic performance of students, and the daytime activities of medical professionals while also having a significant effect on their sleep duration or quality [7]. It is strongly associated with anxiety, depression, aggressiveness or delinquency. Despite mental health issues, it also causes numerous physical problems like neck pain, back pain, wrist pain, blurred vision of users and many other physical discomforts. However, beyond physical and mental health issues, it also has social impacts like problems in social interactions, problems in academic achievement and problems in social relationships. [8].

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2. RELATED WORK

Adolescents were more susceptible to developing smartphone addiction than younger people. Many other recent studies found that smartphone use was related to age, gender and health condition of the users. Young students' smartphone ownership rate is 8% higher than all other age groups [9]. A recent study conducted on medical students found that 44.7% of students had an addiction to smartphone use and 51.3% were suffering from poor quality of sleep. They also found a statistically significant association between smartphone use and poor sleep quality [7]. Nowadays, it is an important component of teaching and also gives access to their textbook and other internet-based learning tools. Smartphones can also benefit them by assessing their current educational standard through interactive quizzes [3]. Most internet users use smartphones through wireless connection and own a smartphone [10]. Smartphone overuse may result from the uncontrolled use of smartphones. Sometimes it causes negligence in other important activities. Some individuals may continue to use smartphones despite knowing their potential harm [11]. Considering the huge negative effect of smartphone use, researchers conducted a study to find out the risks related to smartphone use among young people [6]. Regarding using of digital devices, around 97% of individuals own smartphones, 2.9% play games, 19.4% used to watch TV and 12.4% reported using a PC [12]. A recent study found that 89.7% of medical students use the Internet for coursework, 88.7% to search for relevant information and 85.7% use Internet to watch movies or news [13]. A survey conducted by Holden *et al.*, found that around 21% of smartphone users reported having difficulties in their educational institutes or work place. It was also found that 45.8% had feelings of anxiety when they were not holding their smartphone, 27.1% opined to spending too much time with their smartphone but 22.6% tried to reduce their smartphone use time and failed more than once. That is why numerous scales were developed to measure the addiction to smartphone use level. [8].

3. MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at a selected medical college in Dhaka, Bangladesh, enrolled across various academic years. 298 students participated in the study and were selected through a simple random sampling method to minimise selection bias and enhance the findings' generalizability. The study was conducted to capture a snapshot of the relevant variables at a single time. Data collection was carried out using a structured face-to-face interview method. The principal investigator conducted the interviews using a pretested and validated interview schedule to ensure reliability and accuracy. The pretesting phase involved a pilot study with a small subset of students to identify any potential issues with the questionnaire and to refine the tool. This step ensured that the instrument was clear, unambiguous, and suitable for capturing the necessary information. Each interview was conducted in a private and comfortable setting to ensure participant privacy and encourage honest responses. The average duration of each interview was around 10 minutes. Before initiating the data collection process, the purpose and details of the study were clearly explained to each participant. Verbal informed consent was obtained from all participants. The study assured participants of full confidentiality and data were anonymized during

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analysis and reporting. Participants were also informed of their right to withdraw from the study at any point without providing a reason. It was emphasized that participation was voluntary, and there were no physical, social, or psychological risks associated with the study. Once the interviews were completed, the principal investigator carefully reviewed the completed questionnaires to ensure data accuracy, completeness, and consistency. Any discrepancies were promptly addressed by contacting the participant, where feasible, to clarify or correct any missing responses. Following the data collection, the data were entered into a database and analyzed using SPSS version 25.0. Descriptive statistics, including frequency distributions, percentages, means, and standard deviations, were used to summarize the data, providing a clear overview of the study population and their responses. In addition to descriptive analysis, inferential statistics were applied using the Chi-Square test to explore relationships between categorical variables. The results of the analyses were presented in the form of tables and diagrams to enhance clarity and facilitate the interpretation of findings.

4. RESULT AND DISCUSSION

The age range of medical students was between 18 to 29 years old; most 162(54.4%) were from 18 to 22 years old with a mean age of 20.9±2.8 years. Around three-fifths 174(58.4%) were female and near two-fifths 124(41.6%) were male. A significant number 267(89.6%) of respondents were single and 31(10.4%) were married. Nearly all 287(96.3%) respondents had adjunct families while only 11(3.7%) had broken families. A significant number 93(31.2%) of medical students were in the first year, around one-fourths 71(23.8%) were in the second year, 54(18.1%) in the third year, 47(15.8%) were in the fourth year and 33(11.1%) were in the fifth year. More than four-fifths 258(86.6%) were hosteller and 40(13.4%) were day scholar. Nearly half 129(43.3%) opined themselves as non-addicts, 86(28.8%) revealed themselves as addicts to smartphones and 83(27.8%) were not sure about it. Regarding professional satisfaction, 187(62.7%) were delighted with their profession, 72(24.2%) had moderate satisfaction and 39(13.1%) had low satisfaction with their profession. The majority of 159(53.4%) medical students had no depression, 68(22.8%) had mild, 43(14.4%) had moderate and 28(9.4%) had severe depression.

Table 1: Respondents by level of depression

Depression Level	Frequency	Percentage
No Depression	159	53.4
Mild Depression	68	22.8
Moderate Depression	43	14.4
Severe Depression	28	9.4
Total	**298**	**100.00**

Almost half 139(46.6%) had normal level of anxiety, 51(17.1%) had mild level, 62(20.8%) had moderate anxiety, 27(9.1%) had severe and only 19(6.4%) had extremely severe level of anxiety. Most of the respondents 217(72.8%) had one smartphone and the rest, which is more than one-fourths 81(27.2%) owned more than one smartphone. A significant number of

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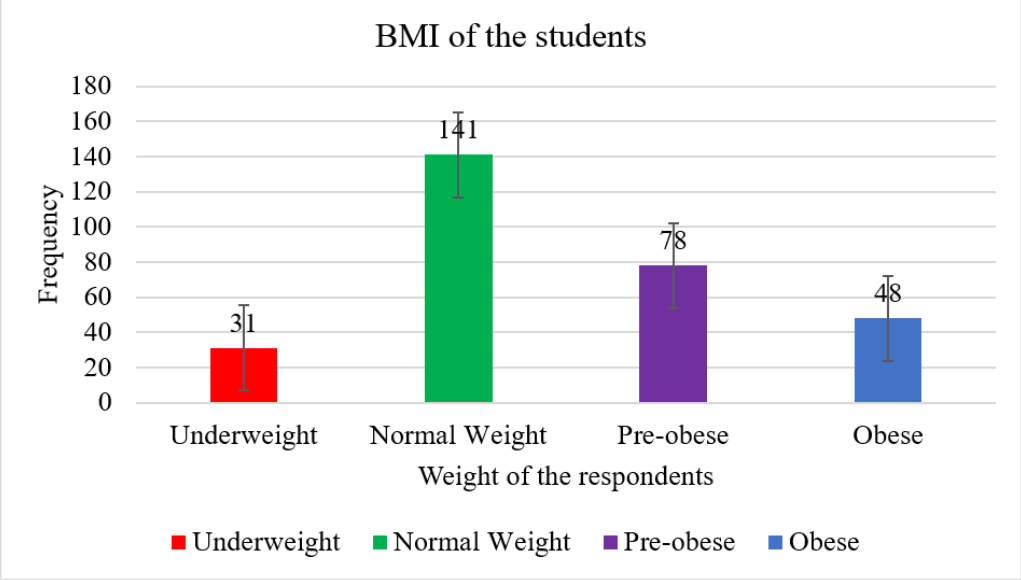
114(38.2%) respondents use smartphones for less than 2 hours, 79(26.5%) used it for 2 to 3 hours, 48(16.1%) used it for 3 to 4 hours and 57(19.2%) use the smartphone for more than 4 hours. Among the respondents, the majority 139(46.6%) use smartphones at night, 126(42.3%) use them in the evening, 27(9.1%) in the afternoon and 6(2%) use smartphones in the morning. All of them had access to both mobile data and wireless internet. Cent of cent medical students used smartphones for using social media, more than four-fifths 258(86.6%) used smartphones for academic purposes, 163(54.7%) used them for gaming and 67(22.9%) used them for other different purposes. Of students, nearly half 132(44.3%) had sleep more than 7 hours, around one-thirds 88(29.5%) had sleep duration around <7 to ≥6 hours, around one-fifths 58(19.5%) had sleep duration <6 to ≥5 hours and 20(6.7%) sleep for less than 5 hours. Regarding BMI, more than one-tenth 31(10.4%) were underweight, nearly half 141(47.3%) had normal weight, more than one-fourths 78(26.2%) were pre-obese and only 48(16.1%) were obese.

Fig 1: Respondents by BMI of the students



More than one-thirds112(37.6%) smoke cigarettes and 186(62.4%) does not. A significant 224(75.2%) opined that their exam performance would be better if they didn't use smartphones and 74(24.8%) revealed that smartphone use does not affect them. Among medical students, 218(73.5%) respondents had no parental rules due to smartphone use, 66(22.4%) had rules and 14(4.1%) didn't want to answer the question. Majority of them 228(76.5%) check smartphone frequently while 70(23.5%) were not. Around one-thirds108(36.2%) opined to have high study stress, 156(52.3%) had a general level and 34(11.5%) had a low level of stress. Most of them 159(53.4%) had good relations with their classmates, 118(39.6%) had general and 21(7%) had poor relationships with their classmates. A significant number 189(63.4%) were at risk of social media addiction while 109(36.6%) were normal. The majority of 174(58.4%) students never awakened at night to use smartphones, 88(29.5%) use it occasionally, 24(8.1%) of few times and 12(4%) do it almost

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every day. More than half 162(54.4%) had eye strain, 138(46%) had weight gain and 108(36.2%) had back pain. There is also a statistically significant ($p<0.005$) association between the risk of social media addiction and the effect of social media use on their exam performance.

Table 3: Association between the effect of smartphone use on exam and Risk of social media addiction

Effect of smartphone use on exam	Risk of social media addiction		Total n (%)	P value
	At risk	Normal		
Affected	141	103	244	<0.005
Not affected	48	6	54	
Total	189	109	298	

* $\chi 2$ df=1 = 18.437

Discussion

Current study respondents were between 18 to 29 years while the majority 162(54.4%) of them were between 18 to 22 years with a mean age of 20.9±2.8 years. This is supported by the findings of Alkhateeb A and team, where the respondents were between 17 to 27 years with a mean age of 21.5±2.68 years [14]. A significant number 174(58.4%) were female and 124(41.6%) were male. This is more or less similar to the findings of Xin C and associates where 62.48% were female and 37.52% were male [15]. More than four-fifths 267(89.6%) of respondents were single and only 31(10.4%) were married. This is substantiated by findings of the study conducted by Salehi M and team, where 87% of medical students were single and 13% of them were married [16]. Almost cent 287(96.3%) had adjunct family while 11(3.7%) had broken family. This is vindicated by the findings of Chomon RJ found that 90.3% had adjunct families and 9.7% had broken families [17]. Around one-thirds 93(31.2%) were in the first year, approximately one-fourths 71(23.8%) were in second year, 54(18.1%) in third year, 47(15.8%) were in fourth year and 33(11.1%) were in fifth year. The findings of Alageel AA *et al*., corroborate this study's conclusions where they found that 26.93% of their respondents were in the first year, 32.08% were in the second year, 20.40% were in the third year, 10.30% were in the fourth year and 10.30% were in the fifth year [18]. A significant number 258(86.6%) were hosteller and 40(13.4%) were day scholar. This is vindicated by the findings of Awasthi S *et al*., where 94.70% were hostellers and 5.30% were day scholars [19]. Of the respondents, 129(43.3%) reported themselves as non-addict of smartphone use, 86(28.8%) opined themselves as addicts and 83(27.8%) were not sure about it. This is similar to the findings of Kwon M and their team who found that 57.8% reported themselves as non-addict of smartphone use, 24.8% were addicts and 17.4% didn't know about it [20]. Regarding satisfaction with their profession, 187(62.7%) were highly satisfied with their profession, 72(24.2%) had moderate satisfaction and 39(13.1%) had low satisfaction with their profession. This is close to the study findings of Liu H *et al.*, where 45.1% were highly satisfied, 50.3% were mediumly satisfied and 4.7% had a low level of satisfaction with their profession [21]. More than half 159(53.4%) had no depression, 68(22.8%) had mild depression, 43(14.4%) had moderate and 28(9.4%) had severe depression. This is substantiated by findings of the study conducted by Chomon RJ where 41.35% had no

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depression or had minimal depressive symptoms, 16.03% had mild depression, 24.05% had moderate depression and 18.56% had severe depression [17]. The majority 139(46.6%) had normal level of anxiety, 51(17.1%) had mild anxiety, 62(20.8%) had moderate anxiety, 27(9.1%) had severe and only 19(6.4%) had extremely severe level of anxiety. This is more or less similar to the findings of Said AH *et al.,* where 38.5% had normal, 11.3% had mild, 19.3% had moderate, 13.8% had severe and 17.1% had extremely severe levels of anxiety [22]. Of medical students, 81(27.2%) owned more than one smartphone and 217(72.8%) had one smartphone. This is dissimilar to the findings of Said AH *et al.,* where they found that 88.4% of medical students had ≤1 smartphone and 11.6% had ≥2 smartphones. This difference might be attributed to variations in the study area and sample size [22].

Around two-fifths114(38.2%) of medical students use smartphone for <2 hours, 79(26.5%) used it for 2 to 3 hours, 48(16.1%) used it for 3 to 4 hours and 57(19.2%) use smartphone for more than 4 hours. This is more or less in line with the study finding of Machado J and team found that 32.6% used it for <2 hours, 21.1% for 2 to 3 hours, 18.5% for 3 to 4 hours and 27.8% used a smartphone for more than 4 hours [23]. Among the respondents, majority 139(46.6%) use smartphone at night, 126(42.3%) used it on evening, 27(9.1%) in afternoon and 6(2%) used smartphone at morning. This is close to the study findings of Machado J and associates found that around three-fifths 57.4% use smartphones at night, 39.3% in the evening, 3% in the afternoon and only 0.4% mostly use smartphones at night [23]. Cent per cent of medical students had access to both mobile data and wireless internet. This is not substantiated by the findings of the study conducted by Amano A. *et al.,* where 63.8% had wireless internet, 5.5% had cable internet and 30.7% had access to mobile data. This difference might be attributed to variations in the study area and sample size [24]. Of the respondents, cent of cent medical students used smartphones for using social media, 258(86.6%) used smartphones for academic purposes, 163(54.7%) used them for gaming and 67(22.9%) used them for other different purposes. This is substantiated by findings of the study conducted by Al-Shahrani MS, where they found that 91.5% used smartphones for social media, 65.4% for academic purposes, 18.6% for athletics and 14.4% for other purposes [25]. Regarding the duration of sleep 132(44.3%) had sleep >7 hours, 88(29.5%) had sleep duration around <7 to ≥6 hours, 58(19.5%) had sleep duration <6 to ≥5 hours and 20(6.7%) sleep for less than 5 hours. This is more or less similar to the findings of Karim MR and team found that 49% had sleep duration of more than 7 hours, 29.3% for <7 and ≥6 hours, 14.2% for <6 and ≥5 hours and 7.5% for less than 5 hours [26].

Regarding BMI, 31(10.4%) were underweight, 141(47.3%) had normal weight, 78(26.2%) were pre-obese and 48(16.1%) were obese. This is corroborated by the findings of Vaghasiya S *et al.,* where 36.6% were underweight, 54.1% had normal weight, 7.8% were pre-obese and 1.5% were obese [27]. Of 298 respondents, more than one-thirds112(37.6%) smoke cigarettes and 186(62.4%) does not. This is similar to the findings of Fekih-Romdhane F *et al.,* who found that 27.1% were smokers and 72.9% were not [28]. Around three-fourths 224(75.2%) opined that their exam performance would be better if they didn't use smartphones, while 74(24.8%) revealed that smartphone use does not affect their exam performance. This is vindicated by the findings of Reddy S and team, where they found that 60% of respondents' exam performance would be affected by smartphone use [29]. Of the respondents, 218(73.5%) respondents had no parental rules due to smartphone use, 66(22.4%) had parental

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rules and 14(4.1%) didn't want to answer. This is close to the study findings of Lederer-Hutsteiner T *et al.,* where 79.5% had no parental rules, 17.5% had it and 3% didn't want to disclose it [30]. Around three-fourths 228(76.5%) check smartphone frequently while 70(23.5%) were not. This is more or less similar to the findings of Zeerak Q *et al.,* who found that 58.7% of medical students have the habit of checking their phones frequently [31]. Of the respondents, around one-thirds108(36.2%) of respondents opined to have high study stress, 156(52.3%) had a general level of stress and 34(11.5%) had a low level of stress. This is corroborated by the findings of Zhang M *et al.,* where 29.9% had a high level of study stress, 47.4% had a general level and 22.7% had a low level of stress [32]. More than half 159(53.4%) had good relations with their classmates, 118(39.6%) had general and 21(7%) had poor relationships with their classmates. This is vindicated by the findings of Dong W *et al.,* who found that 48.5% had good, 48.7% had general and 2.8% had poor relationships with their classmates [33]. Around two-thirds 189(63.4%) were at risk of social media addiction while 109(36.6%) were normal. This is substantiated by findings of the study conducted by Sserunkuuma J *et al.,* where they found that 76.95% of medical students had a risk of social media addiction and 23.05% were not [34]. Around three-fifths 174(58.4%) never awakened at night to usage smartphone, 88(29.5%) usage it occasionally, 24(8.1%) of few times and 12(4%) do it almost every day. The findings of Machado J corroborate this and the team found that 51.9% never use smartphones, 35.9% occasionally, 8.9% for few times a week and 3.3% do it almost every day [23]. Of the respondents, most 162(54.4%) had eye strain, 138(46%) had weight gain and 108(36.2%) had back pain. This is more or less in line with the findings of the study conducted by Daniyal M and associates found that among cell phone users around 33.5% suffered from eye strain but 39.5% had it for sometimes and 27.0% were not suffering from it. About 36.0% had weight gain among the users and 33% had weight gain for sometimes while 30.3% did not affect their weight. Of the respondents, 27% had back pain, 56% had it for sometimes while 17% had no problem in their back [35].

5. CONCLUSION

Medical students are young and most of them are single females. They have adjunct families but hostellers. Students are not addicted to smartphones and are satisfied with their profession with no depression. Most of them had normal levels of anxiety and owned one smartphone. Most of them use social media for significant duration at night with wireless internet. Students have normal weight and don't smoke cigarettes. Their exam performance is affected by smartphone use but don't have parental rules and are used to checking smartphones frequently. Medical students have general levels of stress and have good relations with their classmates while they are at risk of social media addiction. A significant don't use smartphones at night but still have problems like eye strain, weight gain and back pain.

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