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Associations between social media addiction, social media fatigue, fear of missing out, and sleep quality among university students in Bangladesh: a cross-sectional study

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Abstract

Background The relationship between social media use and sleep quality is complicated and may be impacted by several contextual factors, including age, socioeconomic status, living environment, and other medical issues. It is necessary to explore the relationship between social media usage and poor sleep outcomes among university students. However, little is known about the connection between sleep issues and the detrimental effects of social media use. This study aims to investigate the relationship between social media, social media addiction (SMA), social media fatigue (SMF), fear of missing out (FoMO), and sleep quality (SQ) in Bangladeshi students.

Methods Primary data were collected from 611 university students using a stratified random sampling technique. The Pittsburgh Sleep Quality Index and other variables of scales such as SMA, SMF, and FoMO were used in this survey. Descriptive statistics of participants and logistic regression were used to identify significant factors, and ANOVA was used to compare the means of multiple groups to determine.

Results Findings revealed that 413 (67.57%) respondents have sleep disruption, and most of the participants used social media for 0–2 h daily, however, only a small portion exceeded 8 h. This study also found that SMA, SMF, and FoMO significantly impact the SQ, where students with low SMF scores were 6.85 times more likely to report good sleep quality than those with high SMF scores. Low SMA scores are 2.04 times more likely to have good SQ compared to the high scores of SMA, and for FoMO, the low scores are 2.22 times more likely to have good SQ compared to high scorers of FoMO. Among the participating students, 47% of the students rated their health as "good", 45% as "fair", and 4% as "poor". The study found that sleep SQ has a significant impact on self-reported health status, with good SQ having a 0.598 times lower risk of fair health conditions than those with bad SQ. Moreover, social media use, time spent on social media, and how many hours you usually sleep at night in the past month covariates show a significant impact on student health.

Conclusion University students were more likely to have sleep issues after using social media in ways that caused negative effects like SMF, SMA, and FoMO. Social media overactivity reduces sleep quality and affects on also self-reported health, respectively.

Keywords Bangladesh, Sleep quality, Social media addiction, Social media fatigue, University students

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Introduction

In recent years, the use of social media has become an increasingly popular leisure activity in many countries worldwide. Individuals, especially students, visit social media sites to engage in various entertainment and social activities, including playing games, socializing, passing time, communicating, and posting pictures. Due to the widespread use of social networks, people can interact with a more significant number of people and gain more knowledge about them than they would by meeting them in person [1–3]. So simply, social media is a form of mass media communication on the Internet, where users share information, ideas, and content, while social networking focuses on building communities and audiences. By the end of 2018, there were over 3.48 billion active social media users worldwide, which is approximately four times as many as there were in 2010 and represents 45% of the world's population [4]. As of November 2018, 90.5 million people in Bangladesh had active internet connections, 80.4 million of whom used mobile data. In 2018, 32 million people in Bangladesh utilized social media, 5 million of whom used broadband internet and 27 million of whom used mobile internet [5]. The primary means of communication and exchange for information, private messages, thoughts, and ideas among university students is social media [6].

Approximately 74.5% of university students were found to spend two to six hours a day on social media [7]. However, using social media excessively can have several bad effects, including problematic social media use, poor sleep quality, poor mental health, fear of missing out (FoMO), social media fatigue (SMF), and social media addiction (SMA). It can also impact academic achievement [8]. FoMO drives individuals to constantly check social media to stay updated and connected, leading to compulsive behavior [9]. SMF describes the emotional exhaustion resulting from social media use, including feelings of fatigue, burnout, and reduced interest. SMA is characterized by uncontrollable and excessive use of social media, negatively affecting multiple aspects of life, including academic performance and mental health. Globally, the pooled prevalence of SMA is around 5%. Motivation-related theories, like self-determination theory and uses and gratifications theory, suggest that social and psychological needs drive compulsive social media use. The relationship between social media use and sleep disturbances has garnered increased attention. Recent studies have found significant correlations between FoMO, interpersonal stress, mental health, and insomnia. Since SMF is influenced by SMA and FoMO, a relationship between Social media addiction refers to excessive use of social media platforms to the extent that it interferes with daily life. A survey conducted by the Digital Information World in 2022 revealed that approximately 90% of people in Asia use social media, with 52% reporting symptoms of addiction. In Bangladesh, studies indicate that around 40% of university students exhibit signs of social media addiction, with average daily usage exceeding 4 h [10, 11].

Social media fatigue is characterized by feelings of exhaustion and disengagement from social media platforms due to prolonged use. Research from the Asia–Pacific region indicates that nearly 60% of social media users experience some form of fatigue. In a recent Bangladeshi study, about 45% of students reported symptoms of social media fatigue, highlighting a significant issue that could affect their overall well-being [12]. The negative effects of excessive social media use on sleep quality are well-documented. A study conducted by the Asian Sleep Research Association in 2023 found that over 70% of young adults in Asia suffer from poor sleep quality, largely attributed to late-night social media usage. In Bangladesh, research highlights that 55% of university students experience disrupted sleep patterns due to social media activities, contributing to issues such as insomnia and reduced academic performance [13, 14]. Students at universities usually have trouble sleeping [8]. In one survey, over 76% of university students said they occasionally had sleep issues [15, 16]. In addition, the substantial correlations between interpersonal stress and FoMO and mental health in university students were partially mediated by sleeplessness [17]. A significant correlation between interpersonal stress and FOMO, and mental health was found to be partially mediated by insomnia, according to a recent study [17]. Since SMF is driven by SMA and FoMO [18]. In the current digital era, social media use is increasing among university students in Bangladesh. This is causing psychological problems like social media addiction, social media fatigue, fear of missing out, and cyber-victimization among students [19, 20]. This can have a significant impact on the quality of sleep of students. This can have a negative impact on students' academic performance, mental health, well-being, and daily life [21]. Moreover, SMA, SMF, and FoMO together are related to sleep quality, which has not been adequately studied in the context of a developing country, especially in Bangladesh. Therefore, there is a dearth in the literature examining how these interrelated variables affect sleep quality among university students in Bangladesh. To fill up this backdrop, this study aims to explore the relationship between SMA, SMF, and FoMO and their impact on sleep quality, which can be helpful in raising awareness measures for university students in Bangladesh.

Methods and materials

Study design, participants, and data collection

This quantitative, descriptive, cross-sectional study was conducted from November 25 to December 12, 2024, among students of Jahangirnagar University, Bangladesh. The Jahangirnagar University is situated 31 km from Bangladesh's capital, Dhaka. The university has a total enrollment of 17,212 students, of whom 9993 are male and 7219 are female. Participants in the data gathering were undergraduate and graduate students from this university's departments of social science, business, science, theatre, and the arts. They ranged in age from 18 to 26 years. In this study, 4 deaf students and those with 3 serious illnesses who could not give informed consent were excluded from the study because they did not have to put extra mental or physical pressure on them. Those absent from the university on the data collection date were also excluded from the study. After reviewing the relevant literature, a self-administered structured questionnaire consisting of six parts, namely demographic information, social media use, the Pittsburgh Sleep Quality Index, social media fatigue, social media addiction, and fear of missing out, was administered. First, the questions were created in English and then translated into Bengali. Self-administered data was collected in classrooms and student halls at the convenience of the data collectors. Primary data were collected from 640 students using stratified random sampling. The authors excluded 29 participants with missing values from the analysis, ensuring that the final dataset only included complete cases. There were four boys and two girls among the data collectors. The data collectors were trained for three days to ensure the data quality. Data collectors were given an orientation about the purpose of the study before the respondents filled out the questionnaire. Moreover, a professor supervises the data collection process.

Sample size determination

This cross-sectional study's sample size was determined by applying the following formula

$$n = \frac{Z^2 p(1-p)}{d^2},$$

where $Z = 1.96$, p = estimated proportion of the population (no previous record, so the authors used 0.5 for getting the maximum sample size), d = the margin of error (0.05) that provides a sample of size 384 [22]. To improve the study's external validity and generalizability, the authors decided to include more participants than our estimated sample size [23].

Ethical approval

The ethical approval for this study and the procedures were obtained from the Ethics Committee of Jahangirnagar University with the approval reference number BBEC, JU/M 2024/11 (149) on 19 November 2024. Moreover, participants were asked to select the options (Yes/No) of consent to participate in this study before starting the survey, and the study objectives were explained to the participants. Respondents were adequately informed that their information would be confidential and that no identifiable information would be disclosed. Furthermore, it is assumed that the participants can withdraw from the survey at any point.

Variable measurements

Pittsburgh sleep quality index (PSQI)

The Chinese version of the "Pittsburgh Sleep Quality Index" scale was developed with 19 items in 7 subscales: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction. Total scores range from 0 to 21 points (range 0 to 3 points for each subscale) [8, 24]. On this scale, high scores indicate poor sleep quality and low scores indicate good sleep quality. These seven factors divide the category of "poor" and "good" sleep quality. A total score above 5 indicates that the quality of the sleep was inadequate [25].

Social media addiction (SMA)

Liu and Ma first developed the scale, and college students in China mainly used it [26]. This scale contains 21 items rated on a 7-point Likert scale, which ranges from 1 = strongly disagree to 7 = strongly agree. For statistical analysis, participants were split into two groups based on the median SMA score: a high-score group (≥ 83, $n = 611$) and a low-score group (< 83, $n = 611$).

Social media fatigue (SMF)

The scale was developed using earlier research [4, 27, 28]. This scale contains 15 items on three subscales such as cognitive experiences (5 items), behavioral experiences (5 items), and emotional experiences (5 items). Responses to each item are rated on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. A high number denotes a high degree of social media exhaustion. For statistical analysis, participants were split into two groups based on the median SMA score: A high-score group (≥ 41, n = 611) and a low-scoring group (< 41, $n = 611$).

Fear of missing out (FoMO)

The completed Fear of Missing Out scale (FoMO) consists of 10 items [29]. Each question is rated on a 5-point Likert scale ranging from 1 = not at all true of me to 5 = extremely true of me. The participants were divided into two groups using the median FoMO score for statistical analysis: a high-score group (≥ 31, $n = 611$) and a low-score group (< 31, $n = 611$).

Sleep duration

Respondents were asked to assess the information about sleep duration with the following question: How many hours did you usually sleep at night in the past month? The responses for sleep duration were as follows: < 5 h, 5–6 h, 6–7 h, 7–8 h, 8–9 h, and > 9 h [8].

Demographic questionnaire

Demographic information was used to acquire basic ideas about respondents, such as gender, age, residence, education level (undergraduate students, 1st year, 2nd year, 3rd year, or 4th year and above), and self-reported health status (good, fair, destructive, chronic disease, history of serious illness) [8].

Social media use

Internet use was determined with the following items in the questionnaire, such as Purposes of using social media (to stay in touch with what my friends are doing, to research/find products to buy, to find funny or entertaining content, to learn, to keep up-to-date with news and current events, to play games, to share photos or videos with others, to initiate a topic, because a lot of my friends are on them, and others). The number of social media accounts (0–2, 3–4, 5–6, 7–8, 9 or more). Time spent on social media per day (0–2 h, 2–4 h, 4–6 h, 6–8 h, > 8 h). How much time do you spend on social media compared to your offline life? (less, the same, slightly, much). Browsing social media before bed (strongly disagree, disagree, neutral, agree, strongly agree) [8].

Statistical methods

Descriptive statistics of participants' socio-demographic characteristics, internet use, and SMF are described using number (n) and percentage (%), mean ± SD, or median. Logistic regression was used to identify significant factors ($p < 0.05$) associated with sleep quality, sleep duration, social media use, self-reported health, SMF, SMA, FoMO, and demographic information. Additionally, ANOVA is used to compare the means of multiple groups to determine if at least one group differs significantly. For data input, cleaning, and exploratory data analysis, we used KoboToolbox, Microsoft Excel, and the R programming language (R 4.3.3 version).

Results

Demographic information

The demographic information of the respondents ($n = 611$) is presented in Table 1. Results suggest that more than half of the respondents are male (58.59%). This percentage is higher than that of female students (41.40%). Of students, 66.94% of the students having aged 20 to 23 years, and the majority of the students live in University Halls (78.88%). Among the respondents, 22.91%, 26.51%, and 30.11% of the students are from the 1st, 2nd, and 3rd year, respectively; the smallest part of the group of respondent students is from the 4th year and master's. Findings also show that almost half of the students are in good health (47.13%), the lowest in the survey were those with chronic diseases (2.45%) and a history of serious illness (0.82%).

Social media use information

Table 1 shows university students' social media usage, with 30.28% wanting to stay connected with friends, 26.67% wishing to remain updated on news and current events, and 1.31% using it for initiating topics. Most students have (0–2) social media accounts, with 59.08% using—for example, Facebook and WhatsApp, and 30.28% of individuals have 3–4 social media accounts. 41.89% of respondents spend less on social media than in the real world, while 20.46% spend more. Many people spent time on social media for 0–2 h (39.28%). It is higher than the time spent on social media 2–4 h (25.36%), 4–6 h (17.51%), 6–8 h (12.27%), and eighth above (5.56%). Of the respondents, 26.18% agreed and 29.78% disagreed about browsing social media before bed. Approximately the same part of the respondents are neutral (26.67%) on this topic. In this survey, the maximum number of students who sleep between 6 and 7 h (38.13%) is 0.8.51% of respondents sleep less than > 5 h.

Figure 1 shows four types of variable scores of the data set, including the mean with standard deviation. The first variable, sleep quality (SQ) scores, shows us that, on average, individuals score around 7.09, but scores vary ± 2.95. For this, calculations indicate that average sleep quality is moderate. Secondly, SMF (Social media fatigue) scores show us that, on average, individual scores are around 41.87, and scores vary from ± 7.66. For this, people indicate notably moderate and higher fatigue levels than others. Social media addiction shows that, on average, individuals score around 82.17, however, scores vary ± 22.31. A higher score suggests a higher level of addiction. Fear of missing out shows us that individuals score around 30.02 on average, but scores vary by ± 7.06.

Table 1 Demographic and social media use information of the respondents ($n=611$)

Variable	Category	Frequency	Percentage
Gender	Male	358	58.59
	Female	253	41.4
Age (years)	Less than 20	29	4.74
	20 to 23	409	66.94
	Greater than 23	173	28.32
Area of current residence	University hall	482	78.88
	Family	101	16.53
	Outside the campus area	28	4.58
Year of study	1st year	140	22.91
	2nd year	162	26.51
	3rd year	184	30.11
	4th year	59	10.8
	masters	66	9.65
Self-reported health status	Good	288	47.13
	Fair	276	45.17
	Bad	27	4,42
	Chronic disease	15	2.45
	History of serious illness	5	0.82
Purpose of using social media	To stay in touch with what my friends are doing	185	30.28
	To stay up-to-date with news and current events	163	26.67
	To find funny or entertaining content	115	18.82
	To learn any curriculum	40	6.55
	To research/find products to buy	38	6.22
	Because a lot of my friends are on them	23	3.76
	To share photos or videos with others	14	2.29
	Others	13	2.13
	Playing game	12	1.96
	To initiate a topic	8	1.31
Social media account	0–2	361	59.08
	3–4	185	30.28
	5–6	42	6.87
	7–8	13	2.13
	9 and Above	10	1.63
Spend social media than real-world	Less	256	41.89
	Much	125	20.46
	The same	124	20.29
	Slightly	106	17.35
Time spent on social media	0–2 h	107	39.28
	2–4 h	240	25.36
	4–6 h	155	17.51
	6–8 h	75	12.27
	8 h above	34	5.56
Browsing social media before bed	Disagree	182	29.78
	Neutral	163	26.67
	Agree	160	26.18
	Strongly Disagree	61	9.98
	Strongly Agree	45	7.36

Table 1 (continued)

Variable	Category	Frequency	Percentage
Sleep duration	< 5 h	52	8.51
	5–6 h	163	26.67
	6–7 h	233	38.13
	7–8 h	112	18.33
	8–9 h	41	6.71
	> 9 h	10	1.64

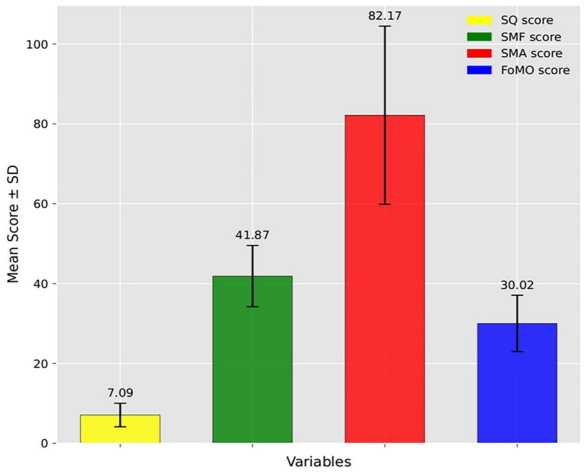

Fig. 1 Mean score and error bar chart for continuous covariates

It is moderately high. The error bars suggest a fair amount of variability in these experiences as well, though less pronounced than for SMA. Moreover, the error bar of the SQ score indicates that poor sleep quality is a relatively consistent issue among participants.

Factors associated with sleep quality

The association between socio-demographic factors and sleep quality among university students is presented in Table 2. Age, Self-reported health status, Social media use than real-world Time spent on social media, Sleep duration, Social Media Fatigue (SMF), Social Media Addiction (SMA), and Fear of Missing Out (FOMO) all these variables have ($p < 0.001$) were significantly associated with sleep quality. Students between the ages of 20 and 23 years gave the highest amount of information in our study. About 66.99% of students 20–23 years old have poor sleep quality, while 33.01% have good sleep quality. About 72.25% of students over 23 years old have poor sleep quality, and 27.75% have good sleep quality. Students aged less than 20 years possessed better sleep quality than others in our study. Of students who think they are in good health, about 58.33% possess poor sleep quality, and 41.67% have good sleep quality. In comparison, a few students who have a history of serious illness (almost 100% of them) and chronic disease (nearly 80% of them) can't sleep properly (poor sleep quality). Students who spend less time on social media (0–2 h) (about 50.47% of them) have good sleep quality, but students who spend more than 8 h on social media (only 11.27% of them) have good sleep quality. Students who devote more time to social media than to the real world (almost 80% of them) have poor sleep quality, and only 20% have good sleep quality. On the other hand, of students who spend less time on social media, 59.77% have poor sleep quality, and the remaining 40.23% have good sleep quality. Among the participants, 96.15% of students who slept less than 5 h at night in the past month have bad sleep quality, and 3.85% of them have good sleep quality, while students who slept more than 9 h at night in the past month (almost 100% of them) have good quality. Therefore, sleep duration can help us /identify sleep quality levels among University students. For students with high levels of social media fatigue, 87.84% have bad sleep quality. In contrast, for students with low levels of social media fatigue, only 43.97% of them have bad sleep quality, and the remaining 56.03% of students possess good sleep quality. Students who have social media addiction and fear missing out on high scores have worse sleep quality than those who have lower scores. 83.66% of students (who have a social media addiction, a high score) possess poor sleep quality, and 81.35% of students (who have a fear of missing out on a high score) have bad sleep quality.

Factors associated with self-reported health

From Table 3, the relationship between demographic characteristics and self-reported health among university students can be described. Among university students, self-reported health was directly associated with gender, times spent on social media daily, sleep duration, sleep quality, SMA, and SMF, with statistically significant ($p < 0.05$). In the case of females, 6.72% reported poor

Table 2 Results of bivariate analysis and chi-square test among factors associated with Sleep quality (SQ) among university students

Variable with category	Sleep Quality		
	Bad, n = 413 (%)	**Good, n = 198 (%)**	**Total, N = 611 (%)**
Gender			
Male	248 (69.27)	110 (30.73)	358 (58.59)
Female	165 (65.22)	88 (34.78)	253 (41.41)
Age*			
> 20	14 (48.28)	15 (51.72)	29 (4.75)
20–23	274 (66.99)	135 (33.01)	409 (66.94)
> 23	125 (72.25)	48 (27.75)	173 (28.31)
Area of residence			
University hall	322 (66.8)	160 (33.2)	482 (78.89)
Family	67 (66.34)	34 (33.66)	101 (16.53)
Outside campus area	24 (85.71)	4 (14.29)	28 (4.58)
Year of study			
1st Year	92 (65.71)	48 (34.29)	140 (22.91)
2nd Year	110 (67.9)	52 (32.1)	162 (26.51
3rd Year	120 (65.22)	64 (34.78)	184 (30.11)
4th Year	42 (71.19)	17 (28.81)	59 (9.66)
Master's	49 (74.24)	17 (25.76)	66 (10.8)
Self-reported health status*			
Good	168 (58.33)	120 (41.67)	288 (47.14)
Fair	209 (75.72)	67 (24.28)	276 (45.17)
Bad	19 (70.37)	8 (29.63)	27 (4.42)
Chronic disease	12 (80.0)	3 (20.0)	15 (2.45)
History of serious illness	5 (100.0)	0(0.0)	5 (0.82)
Purpose of using social media			
To stay in touch with what my friends are doing	120 (64.86)	65 (35.14)	185 (30.28)
To research/find products to buy	33 (86.84)	5 (13.16)	38 (6.22)
To find funny or entertaining content	78 (67.83)	37 (32.17)	12 (1.96)
Learning	24 (60.0)	16 (40.0)	40 (6.55)
To stay up-to-date with news and current events	106 (65.03)	57 (34.97)	163 (26.68)
Playing games	10 (83.33)	2 (16.67)	12 (1.96)
To share photos or videos with others	11 (78.57)	3 (21.43)	14 (2.29)
To initiate a topic	6 (75.0)	2 (25.0)	8 (1.31)
Because a lot of my friends are on them	17 (73.91)	6 (26.09)	23 (3.76)
Others	8 (61.54)	5 (38.46)	13 (2.13)
Social media account number*			
0–2	230 (63.71)	131 (36.29)	361 (59.08)
3–4	133 (71.89)	52 (28.11)	185 (30.28)
5–6	34 (80.95)	8 (19.05)	42 (6.87)
7–8	6 (60.0)	4 (40.0)	10 (1.64)
More than 9	10 (76.92)	3 (23.08)	13 (2.13)
Social media use than real-world**			
Less	153 (59.77)	103 (40.23)	256 (41.9)
The same	83 (66.94)	41 (33.06)	124 (20.29)
Slightly	77 (72.64)	29 (27.36)	106 (17.35)
Much	100 (80.0)	25 (20.0)	125 (20.46)
Time spent on social media**			
0–2 h	53 (49.53)	54 (50.47)	107 (17.51)

Table 2 (continued)

Variable with category	Sleep Quality		
	Bad, n = 413 (%)	Good, n = 198 (%)	Total, N = 611 (%)
2–4 h	162 (67.5)	78 (32.5)	240 (39.28)
4–6 h	112 (72.26)	43 (27.74)	155 (25.37)
6–8 h	56 (74.67)	19 (25.33)	75 (12.27)
More than 8 h	30 (88.24)	4 (11.76)	34 (5.56)
Browsing social media before bed			
Strongly disagree	47 (77.05)	14 (22.95)	61 (9.98)
Disagree	121 (66.48)	61 (33.52)	182 (29.79)
Neutral	106 (65.03)	57 (34.97)	163 (26.68)
Agree	105 (65.62)	55 (34.38)	160 (26.19)
Strongly agree	34 (75.56)	11 (24.44)	163 (26.68)
How many hours did you usually sleep at night in the past month?**			
< 5 h	50 (96.15)	2 (3.85)	52 (8.51)
5–6 h	134 (82.21)	29 (17.79)	163 (26.68)
6–7 h	154 (66.09)	79 (33.91)	233 (38.13)
7–8 h	55 (49.11)	57 (50.89)	112 (18.33)
8–9 h	20 (48.78)	21 (51.29)	41 (6.71)
> 9 h	0 (0.0)	10 (100.0)	10 (1.64)
Social media fatigue (SMF)**			
High score	289 (87.84)	40 (12.16)	329 (53.85)
Low score	124 (43.97)	158 (56.03)	282 (46.15)
Social media addiction (SMA)**			
High score	256 (83.66)	50 (16.34)	306 (50.08)
Low score	157 (51.48)	148 (48.52)	305 (49.92)
Fear of missing out (FoMO)**			
High score	253 (81.35)	58 (18.65)	311 (50.9)
Low score	160 (53.33)	140 (46.67)	300 (49.1)

* Significant at a 5% level of significance ($p < 0.05$)

** Significant at a 1% level of significant ($p < 0.01$)

health, 3.16% chronic health problems, and 48.62% fair health. On the other hand, males reported better health, with 51.96% describing their health as good, and only 2.79% reported bad health. The area of current residence showed relevance to self-reported health. Students living in the University Hall (482) were reported to have bad health (8.91%). On the contrary, 3.53% of students who lived outside of campus reported bad health. Students (50.0%) from the first year had good health compared to others. However, 48.48% of master's students were close to them in terms of good health. Students who spend more time on social media than in the real world have a direct association with self-reported health. Students spending more time on social media are more prone to destructive and chronic health issues. The fear of missing out (FOMO) is in a zone that is neither significant nor insignificant for self-reported health growth.

According to the ANOVA results presented in Table 4, the F-value of 4.863 and the p-value of 0.000725 shows that SMU social media usage has significant differences in FOMO (Fear of Missing Out) scores. This p-value ($p < 0.001$) is extremely significant. Based on the amount of time spent on social media, we reject the null hypothesis and conclude that there are significant differences in the FOMO scores between the groups.

Tukey's post-hoc test is used for additional analysis to identify the precise differences between these groups. Those who spend 4–6 h, 6–8 h, and more than 8 h on social media have significantly higher FOMO scores than the reference group of people who spend 0–2 h on social media. For the 4–6 h group, the mean difference in FOMO scores is 2.851 ($p = 0.0106$); for the 6–8 h group, it is 2.983 ($p = 0.0376$); and for those who spend more than 8 h on social media, it is 4.828 ($p = 0.0043$). These results imply that the FOMO score rises with the

Table 3 Results of bivariate analysis and Chi-square test among factors associated with self-reported health among university students

Variable and category	Self-reported health					
	Bad, n = 27(%)	Chronic, n = 15(%)	Fair, n = 276(%)	Good, n = 288 (%)	History of serious illness, n = 5 (%)	Total n = 611 (%)
Gender*						
Female	17 (6.72)	8 (3.16)	123 (48.62)	102 (40.32)	3 (1.19)	253 (41.41)
Male	10 (2.79)	7 (1.96)	153 (42.74)	186 (51.96)	2 (0.56)	358 (58.59)
Age						
< 20	1 (3.41)	0 (0.00)	185 (45.23)	188 (45.97)	4 (0.98)	29 (4.75)
20–23	21 (5.13)	4 (2.31)	79 (45.66)	84 (48.55)	1 (0.58)	409 (66.94)
> 23	5 (2.89)	0 (0.00)	12 (41.38)	16 (55.17)	0 (0.0)	173 (28.31)
Area of current residence						
Univ. hall	9 (8.91)	3 (2.97)	48 (47.52)	40 (39.6)	1 (0.99)	482 (78.89)
Family	1 (3.57)	0 (0.00)	16 (57.14)	11 (39.29)	0 (0.00)	101 (16.53)
Out. campus	17 (3.53)	12 (2.49)	212 (43.98)	237 (49.17)	4 (0.83)	28 (4.58)
Year of study						
1st year	7 (5.0)	4 (2.86)	58 (41.43)	70 (50.0)	1 (0.71)	140 (22.91)
2nd year	8 (4.94)	5 (3.09)	76 (46.91)	71 (43.83)	2 (1.23)	162 (26.51)
3rd year	9 (4.89)	2 (1.09)	86 (46.74)	86 (46.74)	1 (0.54)	184 (30.11)
4th year	1 (1.69)	2 (3.39)	26 (44.07)	29 (49.15)	1 (1.69)	59 (9.66)
Masters	2 (3.03)	2 (3.03)	30 (45.45)	32 (48.48)	0 (0.00)	66 (10.8)
Others	1 (7.69)	0 (0.0)	8 (61.54)	3 (23.08)	1 (7.69)	13 (2.13)
Number of social media accounts						
0–2	15 (4.16)	6 (1.66)	166 (45.98)	173 (47.92)	1 (0.28)	361(59.08)
3–4	10 (5.41)	7 (3.78)	77 (41.62)	88 (47.57)	3 (1.62)	185(30.28)
5–6	0 (0.00)	1 (2.38)	23 (54.76)	17 (40.48)	1 (2.38)	42 (6.87)
7–8	1 (10.00)	0 (0.00)	7 (70.0)	2 (20.0)	0 (0.00)	10 (1.64)
9 above	1 (7.69)	1 (7.69)	3 (23.08)	8 (61.54)	0 (0.00)	13 (2.13)
Do you spend more time on social media than in the real world?**						
Less	6 (2.34)	5 (1.95)	100 (39.06)	145 (56.64)	0 (0.0)	256 (41.9)
Much	8 (6.4)	8 (6.4)	59 (47.2)	48 (38.4)	2 (1.6)	125 (20.46)
Slightly	3 (2.83)	1 (0.94)	50 (47.17)	51 (48.11)	1 (0.94)	106 (17.35)
The same	10 (8.06)	1 (0.81)	67 (54.03)	44 (35.48)	2 (1.61)	124 (20.29)
Time spent on social media per day (h)**						
0–2 h	5 (4.67)	2 (1.87)	29 (27.1)	70 (65.42)	1 (0.93)	107 (17.51)
2–4 h	10 (4.17)	6 (2.5)	105 (43.75)	118 (49.17)	1 (0.42)	240 (39.28)
4–6 h	7 (4.52)	2 (1.29)	78 (50.32)	66 (42.58)	2 (1.29)	155 (25.37)
6–8 h	2 (2.67)	2 (2.67)	42 (56.0)	29 (38.67)	0 (0.00)	75 (12.27)
8 h above	3 (8.82)	3 (8.82)	22 (64.71)	5 (14.71)	1 (2.94)	34 (5.56)
How many hours did you usually sleep at night in the past month?**						
< 5 h	2 (3.85)	3 (5.77)	25 (48.08)	20 (38.46)	2 (3.85)	52 (8.51)
5–6 h	10 (6.13)	2 (1.23)	88 (53.99)	63 (38.65)	0 (0.00)	163 (26.68)
6–7 h	6 (2.58)	6 (2.58)	95 (40.77)	125 (53.65)	1 (0.43)	233 (38.13)
7–8 h	7 (6.25)	1 (0.89)	46 (41.07)	56 (50.0)	2 (1.79)	112 (18.33)
8–9 h	0 (0.00)	2 (4.88)	18 (43.9)	21 (51.22)	0 (0.00)	41 (6.71)
9 above	2 (20.0)	1 (10.0)	4 (40.0)	3 (30.0)	0 (0.0)	10 (1.64)
Sleep quality (SQ)**						
Bad	19 (4.6)	12 (2.91)	209 (50.61)	168 (40.68)	5 (1.21)	413 (67.59)
Good	8 (4.04)	3 (1.52)	67 (33.84)	120 (60.61)	0 (0.0)	413 (67.59)

Table 3 (continued)

Variable and category	Self-reported health					
	Bad, n = 27(%)	Chronic, n = 15(%)	Fair, n = 276(%)	Good, n = 288 (%)	History of serious illness, n = 5 (%)	Total n = 611 (%)
Social media fatigue (SMF)**						
High score	18 (5.47)	9 (2.74)	162 (49.24)	135 (41.03)	5 (1.52)	329 (53.85)
Low score	9 (3.19)	6 (2.13)	114 (40.43)	153 (54.26)	0 (0.0)	282 (46.15)
Social media addiction (SMA)**						
High score	14 (4.58)	10 (3.27)	160 (52.29)	118 (38.56)	4 (1.31)	306 (50.08)
Low score	13 (4.26)	5 (1.64)	116 (38.03)	170 (55.74)	1 (0.33)	305 (49.92)
Fare of missing out (FoMO)*						
High score	12 (3.86)	8 (2.57)	158 (50.8)	130 (41.8)	3 (0.96)	311 (50.9)
Low score	15 (5.0)	7 (2.33)	118 (39.33)	158 (52.67)	2 (0.67)	300 (49.1)

*Significant at a 5% level of significance ($p < 0.05$)

**Significant at a 0.1% level of significant ($p < 0.001$)

Table 4 Analysis of variance (ANOVA) to check group difference of FoMO Score by time spent on social media

ANOVA					
Sources	**Df**	**SS**	**MS**	**F-Value**	***p*-value**
Time spent on social media per day (h)	4	947	236.67	4.863	< 0.001**
Error	606	29,492	48.67		
Total	610	30,439	49.89		

Tukey's Post-Hoc test for pairwise comparisons				
Comparison	**Mean difference**	**95% CI lower**	**95% CI upper**	**Adjusted p-value**
2–4 h vs 0–2 h	1.48255	− 0.73615	3.70126	0.3582
4–6 h vs 0–2 h	2.85137	0.4524	5.25035	0.0106**
6–8 h vs 0–2 h	2.98255	0.10816	5.85695	0.0376*
8 h above vs 0–2 h	4.82765	1.07005	8.58526	0.0043**
4–6 h vs 2–4 h	1.36882	− 0.59798	3.33562	0.3161
6–8 h vs 2–4 h	1.5	− 1.02494	4.02494	0.4817
8 h above vs 2–4 h	3.3451	− 0.15244	6.84264	0.0686
6–8 h vs 4–6 h	0.13118	− 2.55354	2.81591	0.9999
8 h above vs 4–6 h	1.97628	− 1.6383	5.59087	0.5655
8 h above vs 6–8 h	1.8451	− 2.10107	5.79127	0.7041

*Significant value: ($p < 0.001$)**, Significant value: ($p < 0.05$)*, Confidence Interval (CI)

amount of time spent on social media, especially when groups using social media for more than four hours are contrasted with those using it for less than 2 h (Table 4).

Figure 2 shows crosstabulation percentages between gender and social media addiction (SMA), sleep quality (SQ), indicating good or bad. Of which 58.6% were male and 41.4% were female. Then, in the percentage of males, 48.9% had high social media addiction, and 84.6% of them had poor sleep quality. And 51.1% had low social media addiction, and 45.4% had good sleep quality. On the other hand, among female students, 51.8% had high social media addiction, and 82.4% had poor sleep quality. And 53.3% of those who had low social media addiction had good sleep quality.

Figure 3 represents the mean score of FoMO, SMA, and SMF of students whose sleep duration is below < 5 h, which indicates poor sleep. Later, when the sleep duration of students increases, FoMO, SMA, and SMF decrease relatively, which means good sleep symptoms. A clear trend is observed across all three variables: as sleep duration increases, the mean scores for FoMO, SMA, and SMF consistently decrease. Individuals sleeping less than

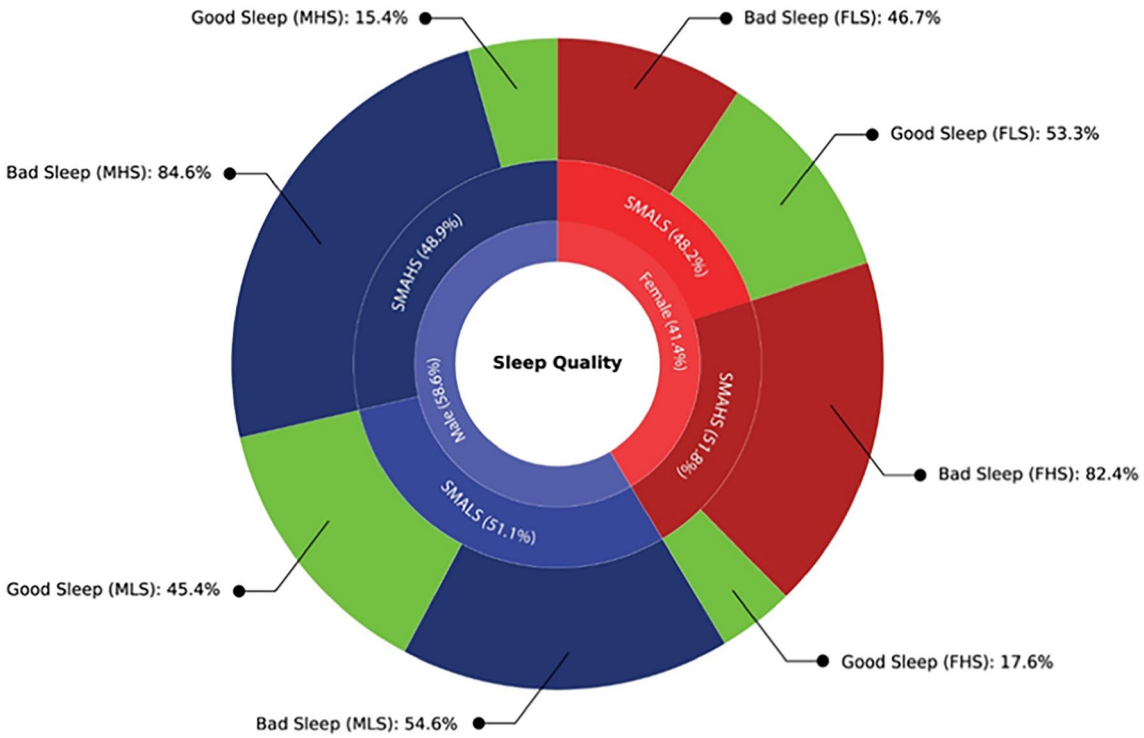

Fig. 2 Crosstabulation between Gender, SMA, and SQ

5 h exhibit the highest SMA score, nearing 90, indicating a strong association between reduced sleep and higher levels of social media addiction. This score gradually declines, reaching approximately 70 in individuals who sleep more than 9 h. Similarly, SMF scores drop from about 47 in the shortest sleep group to around 38 in the longest sleep group, showing that longer sleep is linked with lower fatigue from social media. FoMO scores are the lowest among the three variables and show a milder decline, decreasing from around 32 in the < 5 h group to about 26 in the > 9 h group (Fig. 3).

Factors associated with sleep quality with demographic variables

Results of binary and multivariable logistic regression are presented in Table 5, identifying the factors associated with sleep quality and self-reported health with demographic variables among university students in Bangladesh. Adjusted Odds Ratios (AOR) and Relative Risk Ratios (RRR) with their 95% confidence intervals (CI) are used to present the findings. SMA, SMF, FOMO, and time spent on social media per day (h) are the independent variables used in the test, with the binary outcome (good and bad) being sleep quality. First of all, the result of the binary logistic regression, the odds of having good sleep quality (AOR = 2.040, 95% CI 1.287–3.243, p < 0.001) are significantly more than two times or 4% higher with lower social media addiction (SMA). This indicates that people with low SMA scores had higher-quality sleep than those with high SMA scores. Similarly, the odds of having good sleep quality (AOR = 6.859, 95% CI 4.498–10.638, $p < 0.001$) have a significant association with lower social media fatigue (SMF). From the result of the table, the odds of having good sleep quality are significantly more than six times higher with lower social media fatigue (SMF). The odds of having good quality sleep (AOR = 2.222, 95% CI 1.439–3.4, $p < 0.001$) are also significantly more than two times with a lower fear of missing out (FOMO). This means that students with low SMF and FOMO scores had higher-quality sleep than those with high SMF or FOMO scores. The odds of having good quality sleep are mixed with the time spent on social media per day (h). The odds of having good sleep quality (AOR = 0.525, 95% CI 0.298, 0.917, $p < 0.001$) are significantly 1.8 times lower with time spent on social media per day, 2-4 h. On the other hand, the odds of having good sleep quality (AOR = 0.204, 95% CI 0.210–1.008, $p < 0.001$) are 0.204 times lower, with time spent on social media per day above 8 h. It indicates that students who spend less time on social media per day (h) have a higher chance of having good sleep quality than students who spend more than eight hours on social media.

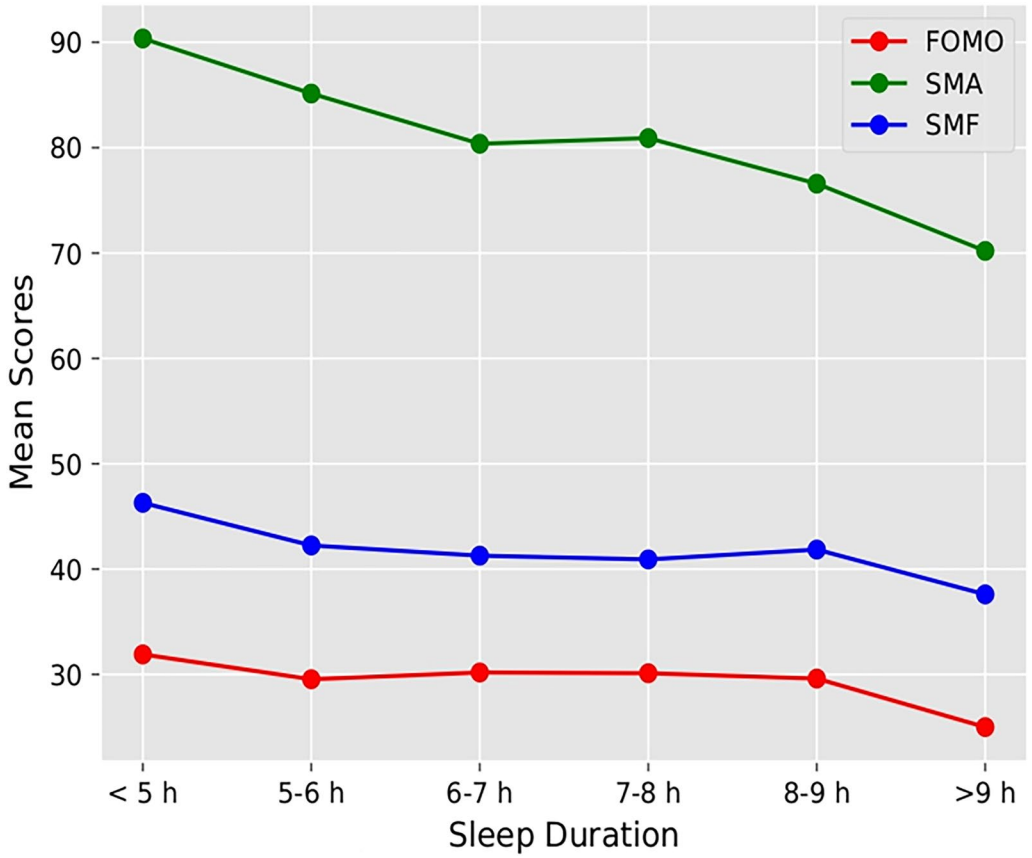

Fig. 3 Mean score of SMF, SMA, and FoMO across sleep duration

Factors associated with self-reported health on demographic variables

Now, for the self-reported health levels, analysis indicates that students who spent 4–6 h on social media per day had a relative risk ratio (RRR) of 2.029 (95% CI 1.047, 3.847) compared to those who spent 0–2 h on social media per day. This indicates that students who spend 4–6 h on social media daily are more likely to have a higher risk of fair health conditions than those who spend 0–2 h daily. Students who reported spending 6–8 h on social media daily had a significantly higher risk of fair health conditions (RRR: 2.751; CI 1.267, 5.968) compared to those who reported spending 0–2 h on social media per day. Additionally, those who spent more than eight hours had a higher risk (RRR: 9.111; CI 2.714, 30.584), suggesting a strong link between worsening health and excessive social media use. This implies a strong correlation between increased social media use and a higher chance of adverse health outcomes. Students who spent more time on social media than in the real world had a significantly higher risk of bad health conditions (RRR: 5.075; CI 1.598, 16.113) compared to those who spent less time on social media than in the real world.

Moreover, students who spent the same time on social media and the natural world had a significantly higher risk of bad health conditions (RRR: 5.428, CI 1.924, 15.312) than those who spent less time on social media than in the real world. This indicates that spending more time on social media than in the real world is closely associated with the health conditions of students. Therefore, students who spend the same time on social media or as much time in the real world hurt their health conditions. Another significant variable (browsing social media before bed) is related to the self-reported health status of students. Students who disagreed to browse social media before bed had a significantly lower risk of fair health conditions (RRR: 0.608, CI 0.376, 0.983) than those who agreed to browse social media before bed. In addition, students who strongly disagreed to browse social media had the lowest risk of fair health conditions (RRR: 0.357, CI 0.174, 0.729) compared to those who agreed to browse social media before bed. Thus, poorer health conditions correlate with browsing social media before bed. Students who slept more than 9 h had a significantly higher risk of harmful health conditions (RRR: 24.573, CI 3.136, 192.516) than those who slept

Table 5 Binary and multinomial logistic regression are used to identify the factors associated with sleep quality and self-reported health with demographic variables among university students

Variables	Categories	Sleep quality (Ref = Bad)	Self-reported health (Ref = Good)	
		Good	Fair	Bad
		AOR (95% CI)	RRR (95% CI)	RRR (95% CI)
(Intercept)		0.12 (0.06, 0.22)**	1.40 (0.69, 2.84)	0.22 (0.06, 0.83) *
SMA	Low score	2.04 (1.28, 3.24)**	0.77 (0.50, 1.17)	0.62 (0.27, 1.42)
SMF	Low score	6.85 (4.49, 10.63)**	0.87 (0.57, 1.31)	0.53 (0.23, 1.21)
FoMO	Low score	2.22 (1.43, 3.44)**	0.74 (0.50, 1.1)	1.47 (0.66, 3.25)
Time spent on social media per day (h)	0–2 h	Ref	Ref	Ref
	2–4 h	0.52 (0.29, 0.91) *	1.71 (0.98, 2.96)	0.59 (0.20, 1.70)
	4–6 h	0.55 (0.29, 1.03)	2.02 (1.04, 3.84) *	0.35 (0.10, 1.26)
	6–8 h	0.46 (0.29, 1.03)	2.75 (1.26, 5.96) **	0.19 (0.03, 0.96) *
	Above 8 h	0.20 (0.210, 1.00) *	9.11 (2.71, 30.58) **	1.68 (0.30, 9.36)
Time spent on social media than the real world	Less		Ref	Ref
	Much		0.75 (0.40, 1.38)	5.07 (1.59, 16.11) *
	Slightly		0.92 (0.55, 1.55)	1.19 (0.35, 4.08)
	Same		1.40 (0.83, 2.37)	5.42 (1.92, 15.31) **
Browsing social media	Agree		Ref	Ref
	Disagree		0.60 (0.37, 0.98) *	0.49 (0.18, 1.30)
	Neutral		0.97 (0.59, 1.58)	0.67 (0.25, 1.75)
	Strongly agree		0.95 (0.44, 2.04)	1.23 (0.34, 4.43)
	Strongly disagree		0.35 (0.17, 0.72) **	0.83 (0.27, 2.50)
Sleep duration	5–6 h		Ref	Ref
	< 5 h		0.74 (0.35, 1.53)	1.62 (0.51, 5.12)
	6–7 h		0.64 (0.41, 1.01)	0.86 (0.35, 2.12)
	7–8 h		0.74 (0.42, 1.30)	1.75 (0.62, 4.89)
	8–9 h		0.85 (0.39, 1.88)	0.76 (0.14, 4.03)
	> 9 h		2.79 (0.53, 14.56)	24.573 (3.13, 192.51) **
Sleep quality	Bad		Ref	Ref
	Good		0.59 (0.37, 0.94) *	0.49 (0.18, 1.31)

Signifiant codes: ($p < 0.001$)**, ($p < 0.01$)*, 0.05 '.'

only 5–6 h. Students with good sleep quality had a significantly lower risk of fair health conditions (RRR: 0.598, CI 0.378, 0.947) than those with bad sleep quality.

Discussion

This study is the first to evaluate the combination of SMA, SMF, and FoMO factors with sleep quality in Bangladesh, to the best of our knowledge. Participants in this study reported poor sleep quality, decreased social connections in real life, and prolonged non-academic usage of social media, including FOMO, SMA, and SMF. Non-academic use of social media reduced the quality of sleep. A previous study mentioned that social media use can divert college students' attention, negatively impact their academic achievement and interpersonal relationships, and cause sleep to be postponed [30]. Our study findings align with existing literature, which indicates that high levels of SMA and SMF are significantly correlated with sleep disturbances. In 2014, research based on a nationally representative sample of 1788 U.S. young adults aged 19–32 years showed that participants with higher social media use volume and frequency had significantly greater odds of having sleep disturbances [31]. SMF was especially noticeable because college students mostly depend on different social media platforms to interact with others and use social media for non-academic activities. SMF can lead to unhealthy habits and is strongly correlated with people's physical and emotional well-being [32]. It is observed that students who spend more than four hours daily on social media are more likely to experience sleep disturbances. This finding supports the relationship between screen time with decreased (poor) sleep quality. Researchers highlighted that a direct correlation was observed

between the duration of social media usage and sleep disturbances, with increased usage leading to poor sleep quality and difficulty concentrating on daily activities in Afghanistan [33]. Browsing social media before bed also has a significant influence on the health condition of students. This is further supported by evidence from a national health survey in Norway, which found strong negative associations between screen time and sleep quality [34].

Higher FoMO scores are greatly associated with poor sleep quality. Fear of missing out and smartphone addiction mediate the relationship between positive and negative affect and sleep quality among university students in China [35]. Students with high negative affect were more likely to have high levels of FoMO and were more prone to smartphone addiction, as well as experiencing poor sleep quality [35]. The findings of this study revealed a significant relationship among SMA, SMF, FoMo, and self-reported health condition as well. This aligns with another existing study that highlights that compulsive media use significantly triggers social media fatigue, which later results in elevated anxiety and depression in India [36]. Researchers mentioned that the age group [19–22] had the poorest sleep quality in Pakistan [37]. The self-reported health of more than half of the students is reported as good. This number is comparatively better than the students in the Middle East [38].

Findings show that most of the students want to stay connected with friends (30.28%). Some other reasons include entertainment, getting updated with news, or gaming. The reason for using social media could vary from country to country. The 4th-year and master's students had poor sleep quality and a higher ratio of spending time on social media. Higher addiction to social media and disturbing sleeping patterns are prominent around the globe among postgraduate students [39]. Students who spend more time on social media than real world are more prone to FOMO, SMA, and SMF symptoms. There is much scope for discussion on whether excessive use of social media has any impact on health in the long run. But the inverse relation between time spent on social media and sleep quality is visible [40]. Further, students' reliance on social media platforms for nonacademic purposes has led to a significant increase in (SMF). Sleep quality and SMF are closely linked, with sleep disturbance and short sleep duration being common symptoms. This study confirms the association between fatigue and sleep problems, particularly in students who spend more time on social media than on real-world [8]. The result of sleep quality might be related to other factors like natural calamities, national emergencies, or external factors in a region like Bangladesh. Further researchers may include variables keeping these things in consideration. Reducing the time spent on social media (Facebook, LinkedIn, X, TikTok, etc.) among university students is necessary and needs to take some strategies, e.g., conduct workshops or seminars on digital health, time management, and the psychological effects of excessive social media use. Moreover, by increasing awareness and participation in clubs, sports, volunteering, and campus events, we can shift attention away from screens. We should promote face-to-face social interactions to replace online engagement, as well as promote mindful activities like reading or relaxation in the campus area.

Limitations

Our study focuses exclusively on university students aged 18–26 years. The authors did not include school or college-going students below this age range or individuals beyond the university level in our study. Our study aimed to identify the causes and severity of social media addiction and fatigue level; however, it was limited by not encompassing all age groups. Social media addiction and fatigue are increasingly common among younger age groups nowadays, due to social changes, parental employment, and other factors, leading to Computer Vision Syndrome, changes in eating behaviour, reduction of physical activity, academic decline, etc. This exclusion of these younger and older age groups is a limitation of our study. Another limitation of the study is the exclusion of potentially confounding factors such as academic stress and physical activity, highlighting the potential to expand the study in future research for broader insights. The findings will differ due to sampling variability. A countrywide study is necessary to generalize the outcome in the context of Bangladesh, and the relationship between the constructs (SMA, SMF, FoMO, SQ) has been extensively studied in other countries, incorporating cultural or contextual factors.

Conclusions

The overall research demonstrates that social media addiction, social media fatigue, and fear of missing out have substantial negative effects on sleep quality among Bangladeshi university students. Research shows that students using social media excessively outside academic activities develop negative sleep patterns, which negatively threaten their health. Increased SMA, SMF, and FoMO levels among students create sleep disturbances; therefore, it becomes essential to develop strategies for promoting healthy social media usage behaviors. In addition, it demonstrates how long and unnecessary social media usage leads to sleep irregularities and possible adverse health effects. The solid associations demand educational efforts about digital mental health from universities and policymakers,

social media usage programs, and sleep management initiatives targeted at students. Additional investigations should use longitudinal data to establish direct links between variables while studying other psychological aspects and environmental circumstances that affect sleep quality in this population.

Abbreviations

SMA	Social media addiction
SMF	Social media fatigue
FoMO	Fear of missing out
SQ	Sleep quality
PSQI	Pittsburgh sleep quality index
h	Hours
SD	Standard deviation
CI	Confidence interval
MHS	Male high social media addiction
MLS	Male low social media addiction
FLS	Female low social media addiction
FHS	Female high social media addiction
AOR	Adjusted odds ratio
RRR	Relative risk ratio
Univ. hall	University hall

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Author contributions
"MR and MMH made a substantial contribution to the conceptualization and design of the study. MR and MFR conceptualized and led the design and development of the study proposal. MR, MRK, MAAB, RA, and OS supervised data collection. MR, MRK, and MFR led the data analysis and drafted the manuscript under the guidance of MMH. MR, RA, OS, and HSE play a vital role in interpreting and writing manuscripts. MMH critically revised the manuscript and supervised the whole study. MRK, MR, and MMH revised the manuscript based on the review comments. All authors read and approved the final version of the manuscript. "

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Data availability
The data will be made available upon reasonable request by the first author.

Declarations

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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