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ORIGINAL RESEARCH

Social Media Use and Sleep Quality Among Secondary School Students in Aseer Region: A Cross-Sectional Study

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Background: Use of different social media platforms has increased radically over the past decade, emerging as an important part of adolescents and young people's everyday life. This might exert potential adverse effects on sleep quality and daytime performance of young adults.

Aim of Study: To assess the relation between use of social media platforms and sleep quality among public secondary school students.

Methods: A cross-sectional study was conducted on 961 students in Aseer region, Saudi Arabia. Students were asked to fill in a structured interview questionnaire covering personal data, pattern of social media use, sleep quality using The Pittsburgh Sleep Quality Index (PSQI) and their mental health status using the depression, anxiety and stress scale (DASS-21).

Results: Students' ages ranged from 15 to 20 years with a mean age of 16.7 ± 2.1 years old. A total of 570 (59.3%) students were females. Tiktok (80%), Snapchat (77.9%), Instagram (63.8%) and YouTube (58.8%) were the most reported platforms used. Regarding their sleep quality, 34.7% of students were poor sleepers. TikTok use (OR 1.33, 95% CI 1.01–1.77), hours spent on social media (OR 1.26, 95% CI 1.16–1.37) and having moderate to severe depressive symptoms (OR 1.69, 95% CI 1.19–2.40) were significant independent predictors of poor sleep among the studied sample.

Conclusion: The present study emphasized the association between prolonged use of social media and poor sleep quality among Saudi adolescents. Awareness and behavioral change strategies and activities concerning the drawbacks of poor sleep and proper use of social media are urgently called for to control mental and physical health consequences of poor sleep and social media addiction.

Keywords: adolescents, mental health, Saudi Arabia, screen time, sleep quality, snapchat, social media, students, tiktok

Introduction

Sleep is recognized as a key component and determinant of physical and mental well-being. It plays an important role in metabolic regulation, emotional regulation, immune system function, brain recovery processes, learning and performance.[1,2] Inadequate sleep duration or quality is associated with increased risk of detrimental physical and mental health effects such as diabetes, hypertension, coronary heart diseases, cancer, neuropsychiatric problems, and strokes.[3,4] Despite this, it is generally overlooked in public health education and health awareness messages.[2]

While the sleep process starts maturing during the adolescence period, recently, sleep researchers and clinical professionals have expressed a growing concern that problematic sleep among young people is reaching epidemic levels. They further labelled this phenomenon as insufficient sleep syndrome considering it as a hidden health crisis. Accordingly, insufficient sleep among adolescents is currently recognized as a serious public health concern.[5,6] Sleep

problems among young people have serious implications on adolescents' physical and mental health, it can lead to obesity, impair concentration, cognition and academic performance. Sleep deprivation can interfere with adolescent safety increasing the risk of accidents and injuries safety.[7–9]

Over the past few decades, a major change in lifestyle has taken place due to the incorporation of electronic media device use into people's daily life. Adolescents and children nowadays are faced with major technological challenges where electronic media have become a core part of their lives. They use their smartphones and electronic devices, with their countless applications, for multiples purposes, including communication, including via social media, information retrieval, education, and entertainment.[10,11] In Saudi Arabia, almost 99% of adults own smartphones. Even children are growing up in environments surrounded by electronic media devices.[12]

The impact of screen time on adolescents' health and well-being is receiving significant attention where child and adolescent health academies and researchers are calling for research evidence to support practices and policies. Nevertheless, they debate about the need to avoid studying associations between generic terms such as "screen time" as a generic exposure and poor well-being. They recommend to better investigate the impact of different types of technology on different areas of child and adolescent's well-being.[13]

Communication through social media could be regarded as a double blade weapon where it enforces social connections, builds and maintains relationships with no location barrier. It can be used for work, educational and health purposes.[14,15] Moreover, social media platforms are people resort for self-expression.[16,17] Yet, several potential negative physical and mental health consequences had been found to be associated with social media use, implicating a rising public health concern.[18] Improper use of electronic devices could lead to higher body mass index, neck or shoulder pain, symptoms of unclear vision and eye strain.[19,20] Also, mis and overuse of smartphones and social media can result social media addiction and fatigue, loneliness, poor work performance, psychological distress, depression, anxiety, stress, disruption of interpersonal relationships, poor work efficiency and causes sleep disturbance.[21–27]

Recent studies revealed association between excessive use of social media and problematic sleep.[13,22] Limitless use of social media may also affect users' sleep quality and quantity either through prolonging time to sleep or decreasing sleep duration with the adverse consequences of poor sleep.[28] Smartphone use was considered as an important factor disturbing sleep quality of young people.[29] The blue light emitted from the smartphone screens interferes with melatonin release and regulation of the circadian rhythm affecting sleep quality.[30] Also, the electromagnetic field associated with smart phones affect brain activity disturbing sleep pattern.[31,32.] Yang et al[32] in their systematic review and meta-analysis reported an increased risk of poor sleep quality among smartphone addicts.

Moreover, previous research revealed the association between poor sleep quality and adverse mental health consequences with each having substantive impacts on both individuals and community health.[33–35] A systematic review reported association between poor sleep quality and poor mental health outcomes among young people who excessively use social media.[36] Nevertheless, sleep problems and mental health difficulties are also interlinked where mental health problems are assumed to lead to sleep problems also the reverse could also be true.[37,38] Poor sleep quality and insomnia were found to be associated with depression, anxiety,[39] post-traumatic stress,[40] eating disorders[41] and suicidal ideation especially among youth.[42]

As in the different regions of the World, use of social media has become an essential part for everyone daily life even in Saudi Arabia (SA hereafter). It is now widely used for different purposes such as communication, education, and daily work.[43] Supportive research evidence is continuously needed to understand the pattern of use and the effect of excessive use of electronic devices and social media, on health and well-being of young adults who represent Saudi future adults. Hypothesizing that excessive use of social media among Saudi young people could be associated with disturbance in their sleep quality. The present study aims to investigate the pattern of social media use and the association between the use of different social media platforms and sleep quality among secondary school students in Aseer region in SA.

Subjects and Methods
Study Design, Setting and Population
From March 12 to March 17, 2023, a cross-sectional survey was carried out in public high schools in Aseer region of SA. The study included male and female public secondary school students.

Tools for Data Collection

Students who and their parents agreed to join the study were asked to fill a structured self-administered interview questionnaire. The questionnaire consisted of three sections. The first section included personal and demographic data such as age, gender, nationality, academic year, academic performance, physical exercise frequency, social media platforms used and duration of use. The second section included The Pittsburgh Sleep Quality Index (PSQI) which is a self-report questionnaire that evaluates the quality of sleep over the last of a month.[44] The questionnaire consists of 19 self-reported items belongs to one of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The seven components are further combined to give an overall single global PSQI score. The global PSQI score ranges from 0 to 21 with lower scores denoting better sleep quality. The reliability of the scale was evaluated by Cronbach's alpha test yielding a value of (0.7). The total global PSQI score was further categorized at cut off point of 7 where those who had global score of 7 points or less were considered to have good sleep quality (good sleepers) while others with global score of more than 7 points were considered to have moderate to poor sleep quality (poor sleepers). The third section included the validated Arabic version of the Depression, Anxiety Stress Scale-21 (DASS-21). This is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.[45] Scoring of the three scales finally categorizes participants on a spectrum from normal to severe for each of depression, anxiety and stress states.

The content validity of the questionnaire items was assessed by 3 staff members at Faculty of Medicine, King Khaled University. They also examined the tool for clarity, significance, comprehensiveness, wording, and understanding. Their suggestions and recommendations were taken into consideration. A pilot test of the tool was conducted on a group of 30 secondary school students to examine clarity of the questions as well as to estimate the required time of the interview. Those who participated in the pilot test were excluded from the main study sample.

Study Sample and Sampling Techniques

The sample size was calculated using the Epi-info software based on the assumption of a precision of 5%, a confidence interval of 95%, and an average sleep disorder of 37.7%[46] among social media users and design effect 2. The minimum sample size was calculated to be 722. The final number of students who participated in the study was 961 students. The Ministry of Education in the Aseer Region provided a list of public secondary schools in the cities of Abha and Khamis Mushait, along with their addresses. Using a stratified random sample method, four secondary schools for boys and four secondary schools for girls were chosen. Using the simple random sample method, students from the chosen public schools were asked to participate in the study with the aid of a students' guide.

Ethical Considerations

After receiving the approval of the King Khalid University Research Ethics Committee (HAPO-06-B-001) with approval number ECM#2022-1901, the researchers asked the approval of the Ministry of Education to conduct the study and collect the required data from public secondary schools in the cities of Abha and Khamis Mushait. Public secondary schools were chosen based on the aforementioned sampling strategy. To collect the required data, the researchers paid a firsthand visit to the chosen public secondary schools presenting the Ministry of Education's letter of approval. After approval of the school administration researchers asked to send parents notification concerning the informed consent to get parental consent for interviewing their children after explaining the purpose of the study and the nature of the data to be collected. Following the parental consent, students were asked to participate in the study during their free time. Students whom their parents accepted to participate in the study were asked to fill in the study questionnaire.

Data Analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS version 24.0). Categorical variables and were presented as frequencies and percentages while mean and standard deviation were used for quantitative variables. For bivariate analysis, qualitative variables were correlated using Pearson's chi-squared test. While Independent *t*-test was used to compare means between two groups. For logistic regression analysis, variables with significance ≤ 0.2 in

the univariate analysis and showing no collinearity with other variables were used in the logistic regression model. For all the statistical tests used, the results were considered significant if the p-value was lower than 0.05.

Results

A total of 961 secondary school students were included. Students' ages ranged from 15 to 20 years with a mean age of 16.7 ± 2.1 years old. More than half of the students (570; 59.3%) were females and most of them (853; 88.8%) were Saudi. A total of 309 (32.2%) were in their first year, 346 (36%) were in the second year and 306 (31.8%) were third-year students. Most of them (821;85.4%) earned excellent in their academic grades. Above one-quarter of the students (281;29.2%) never practiced any sports. More than one-third of them (350; 37.5%) practiced sports 1–2 times/week while 142 (14.8%) practiced sports five times or more per week (Table 1).

The use of social media platforms by secondary school students in Aseer region is shown in Table 2. As for the frequently used social media platforms, the most reported platforms used were Tiktok (769; 80%), Snapchat (749; 77.9%), Instagram (613; 63.8%) and YouTube (565; 58.8%). Regarding the single most frequently used social media platform, Tiktok (36.5%), snapchat (29.4%), Instagram (16.5%), and YouTube (5.9%) were cited most. Concerning the duration of use, 389 (40.5%) used social media platforms for 5 hours or more daily. Only (28; 2.9%) use social media platforms for less than 1 hour.

Table 1 Personal Characteristics of Secondary School Students, Aseer Region, Saudi Arabia

Personal Data	No	%
Age in years		
15-	146	15.2%
16-	317	33.0%
17-	349	36.3%
18+	149	15.5%
Gender		
Male	391	40.7%
Female	570	59.3%
Nationality		
Saudi	853	88.8%
Non-Saudi	108	11.2%
Study year		
1st secondary year	309	32.2%
2nd secondary year	346	36.0%
3rd secondary year	306	31.8%
Academic performance		
Good	18	1.9%
Very good	122	12.7%
Excellent	821	85.4%

(Continued)

Table 1 (Continued).

Personal Data	No	%
Do you practice sports?		
Never practiced sports	281	29.2%
Once per week	223	23.2%
Twice per week	137	14.3%
Three times / week	117	12.2%
Four times / week	61	6.3%
Five times / more / week	142	14.8%

Table 2 Social Media Platform Used by Secondary School Students, Aseer Region, Saudi Arabia

Social Media Platforms	No	%
Frequently used social media platforms		
Tiktok	769	80.0%
Snapchat	749	77.9%
Instagram	613	63.8%
YouTube	565	58.8%
WhatsApp	488	50.8%
Telegram	339	35.3%
Twitter	317	33.0%
Facebook	22	2.3%
Video games	71	7.4%
The single most frequently used social media platform		
Tiktok	351	36.5%
Snapchat	283	29.4%
Instagram	159	16.5%
YouTube	57	5.9%
WhatsApp	52	5.4%
Twitter	32	3.3%
Telegram	13	1.4%
Netflix	12	1.2%
Facebook	2	0.2%

(*Continued*)

Table 2 (Continued).

Social Media Platforms	No	%
How many hours do you spend per day on social media?		
< 1 hour	28	2.9%
1- < 2 hours	83	8.6%
2 - <3 hours	132	13.7%
3 - < 4 hours	156	16.2%
4 - < 5 hours	173	18.0%
5 - < 6 hours	138	14.4%
6 hours / more	251	26.1%

The PSQI components among the study participants using are illustrated in Table 3. Sleep latency (time to fall asleep), was the worst sleep component among the studied students where 419 (43.6%) showed very bad to fairly bad sleep latency. As for subjective sleep quality, it was very bad to fairly bad among 237 (24.7%) of the students. Exactly 131 (13.6%) of the students slept 5 hours or less. Regarding sleep efficiency, 131 (13.6%) scored less than 75% while 254 (26.5%) had high to very high levels of sleep disturbance. Use of sleep medications was reported among 209 (21.7%) of

Table 3 Distribution of Pittsburgh Sleep Quality Index (PSQI) Components Among Secondary School Students, Aseer Region, Saudi Arabia

Sleep Components	No	%
Subjective sleep quality		
Very good	255	26.5%
Fairly good	469	48.8%
Fairly bad	192	20.0%
Very bad	45	4.7%
Sleep latency		
Very good	258	26.8%
Fairly good	284	29.6%
Fairly bad	308	32.0%
Very bad	111	11.6%
Sleep duration		
> 7 hours	129	13.4%
6–7 hours	701	72.9%
5–6 hours	103	10.7%
< 5 hours	28	2.9%

(Continued)

Table 3 (Continued).

Sleep Components	No	%
Habitual sleep efficiency		
> 85%	183	19.0%
75–84%	647	67.3%
65–74%	85	8.8%
< 65%	46	4.8%
Sleep disturbances		
Very low	190	19.8%
Fairly low	517	53.8%
Fairly high	237	24.7%
Very high	17	1.8%
Use of sleeping medication		
Not used	752	78.3%
Less than once	119	12.4%
Once or twice	55	5.7%
Three or more times	35	3.6%
Daytime dysfunction		
Very low	378	39.3%
Fairly low	411	42.8%
Fairly high	155	16.1%
Very high	17	1.8%
Global PSQI *Mean (SD)* *Median* *Range*	6.6 (3.2) 6 1–16	

the sampled students and 172 (17.9%) had fairly high to very high daytime dysfunction. Concerning the PSQI score, it ranged from 0 to 16 with mean score of 6.6 ± 3.2 out of 21 points (31.4%). Based on this score, 333 (34.7%) were classified as poor sleepers while 628 (65.3%) had good sleep quality Figure 1.

Association of students' characteristics and their sleep quality are depicted in Table 4. None of the personal characteristics (age, gender, nationality, academic years, academic performance or sports practice) of students were significantly associated with students' sleep quality. On the other hand, Table 5 demonstrates the pattern of social media use and students' sleep quality. Among the frequently used platforms only Tiktok and Snapchat use were significantly associated with higher rates of poor sleep quality versus other platforms (36.4% vs 27.6%, p = 0.022 and 37.1% vs 25.9%, p = 0.003, respectively). However, investigating the students' reported single platform preference and usage, only Tiktok users had higher poor sleep quality compared to other platforms (39.6% vs 31.8%, p=0.014). Regarding the number of platforms used, poor sleepers showed significantly higher mean number of platforms used compared to good sleepers (4.3 ± 1.6 vs 3.9 ± 1.6, p = 0.011). As for the duration spent on social media, 45% of students who spent 5 hours
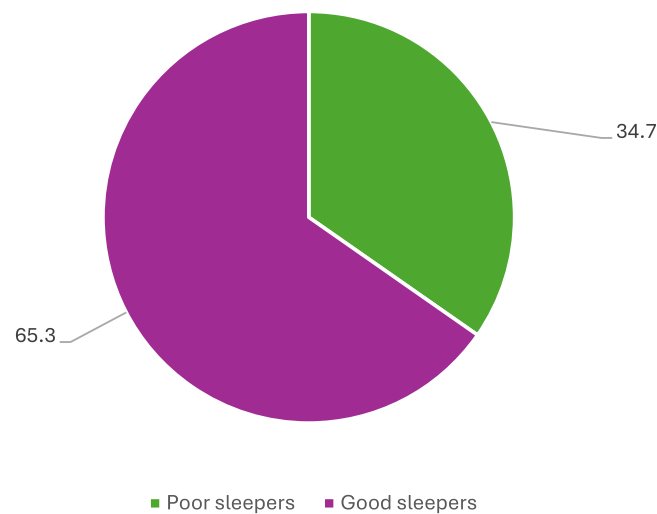
Figure 1 Sleep hygiene (based on PSQI) among high school students, Aseer region, Saudi Arabia.

or more on social media were poor sleepers in comparison to 31.5% among 2 to less than 5 hours users and 11.7% of less than 2 hours users (p < 0.001).

In the multivariate analysis (Table 6), TikTok use (OR 1.33, 95% CI 1.01–1.77), time spent on social media (OR 1.26, 95% CI 1.16–1.37), having depressive symptoms (moderate to extremely severe) (OR 1.69, 95% CI 1.19–2.40) were the only significant predictors of poor sleep among the studied sample. Keeping other predictors constant, participants using TikTok mostly were showed 33% more risk to have a poor sleep than those who did not. Similarly, participants with moderate to extremely severe depressive symptoms had 69% more chance of being poor sleepers than those with no or mild symptoms. Regarding hours spent on social media, for each 1-hour increase in duration spent on social media, there is about a 26% increase in the odds of having poor sleep.

Table 4 Secondary School Students' Sleep Quality and Their Personal and Mental Health Characteristics Associated with Their Sleep Quality, Saudi Arabia

Personal Data	Sleep Hygiene				p-value
	Poor Sleepers 333 (34.7%)		Good Sleepers 628 (65.3%)		
	No.	%	No.	%	
Age in years					0.469
15-	47	32.2%	99	67.8%	
16-	106	33.4%	211	66.6%	
17-	132	37.8%	217	62.2%	
18+	48	32.2%	101	67.8%	
Gender					0.835
Male	137	35.0%	254	65.0%	
Female	196	34.4%	374	65.6%	

(Continued)

Table 4 (Continued).

Personal Data	Sleep Hygiene				p-value
	Poor Sleepers 333 (34.7%)		Good Sleepers 628 (65.3%)		
	No.	%	No.	%	
Nationality					0.071
Saudi	304	35.6%	549	64.4%	
Non-Saudi	29	26.9%	79	73.1%	
Study year					0.391
1st secondary year	98	31.7%	211	68.3%	
2nd secondary year	127	36.7%	219	63.3%	
3rd secondary year	108	35.3%	198	64.7%	
Academic Performance					
Good	8	44.4%	10	55.6%	0.678
Very Good	42	34.4%	80	65.6%	
Excellent	283	34.5%	538	65.5%	
Frequency of practicing sports					0.226
Never	104	37.0%	177	63.0%	
1–2 times / week	130	36.1%	230	63.9%	
3 times or more / week	99	30.9%	221	69.1%	
Depressive symptoms (DASS)					
Normal/mild	155	27.7%	404	72.3%	<0.001*
Moderate/severe/very severe	178	44.3%	224	55.7%	
Anxiety symptoms (DASS)					
Normal/mild	211	31.4%	462	68.6%	0.001*
Moderate/severe/very severe	122	42.4%	166	57.6%	
Stress symptoms (DASS)					
Normal/mild	213	30.5	485	69.5	<0.001*
Moderate/severe/very severe	120	45.6	143	54.4	

Notes: P: Pearson X^2 test. *P < 0.05 (significant).

Discussion

The present investigated the association between social media use and sleep quality among secondary school adolescent students in Aseer Region, SA. Findings of the current study showed that all students were social media users. This is in line with findings from a similar study conducted in SA.[46] Such finding indicate that similar to other countries, social media use is an integral part of adolescent daily lives in SA.

Poor sleep quality among the study participants represented 34.7%. This rate is consistent with the figure reported in a similar study conducted SA examining sleep quality among Saudi adolescents.[47] While all participants were social

Table 5 Sleep Quality and Social Media Platform Used Among the Study Participants

Social Media	Sleep Hygiene				p-value
	Poor Sleepers 333 (34.7%)		Good Sleepers 628 (65.3%)		
	No	%	No	%	
Frequently used social media platforms					0.022*
Tiktok	280	36.4%	489	63.6%	
Other platforms	53	27.6%	139	72.4%	
Snapchat	278	37.1%	471	62.9%	0.003*
Other platforms	55	25.9%	157	74.1%	
Instagram	222	36.2%	391	63.8%	0.176
Other platforms	111	31.9%	237	68.1%	
YouTube	201	35.6%	364	64.4%	0.472
Other platforms	132	33.3%	264	66.7%	
Single most frequently used platform					
Tiktok	139	39.6%	212	60.4%	0.014*
Other platforms	194	31.8%	416	68.2%	
Snapchat	100	35.3%	183	64.7%	0.773
Other platforms	233	34.4%	445	65.6%	
Instagram	50	31.4%	109	68.6%	0.943
Other platforms	283	35.3%	519	64.7%	
Number of social media platforms used					0.011*$
Mean (SD)	4.3 (1.6)		3.9 (1.6)		
How many hours do you spend per day on social media?					<0.001*
< 2 hours	13	11.7%	98	88.3%	
2- < 5 hours	145	31.5%	316	68.5%	
5 hours or more	175	45.0%	214	55.0%	

Notes: P: Pearson X^2 test. $: independent *t* test.*P < 0.05 (significant).

media users, 34.7% of them were poor sleepers with the subsequent hazards of disturbed sleep. High rates of sleep disturbance among frequent social media users were previously cited in national and international literature.[12,48–53] The study conducted in USA[52] was a longitudinal one revealing stronger evidence.

Also another study conducted in SA suggested that smartphone addiction is negatively associated with sleep quality.[12] While we did not assess addiction in our current study, however, we reported significant association between poor sleep quality and prolonged use of social media (5 hours/day).

However, a recent study contradicted the association between social media use and sleep disturbance, yet their conclusion was based only on short use duration where they did not infer their conclusions on long use.[54] Similar contradiction was revealed in another cross-sectional study conducted in SA.[47] However, such contradiction may be attributed to the difference in the assessment tools used in those studies. In addition, our findings are derived from

Table 6 Multivariate Logistic Regression Analysis Showing Predictors of Sleep Disturbance Among the Study Participants

	B	p-value	OR	95% CI
Nationality	−0.187	0.433	0.83	0.52–1.32
Hours spent on social media	0.231	<0.001*	1.26	1.16–1.38
Tiktok use	0.285	0.049*	1.33	1.01–1.77
Depression	0.515	0.004*	1.68	1.17–2.38
Anxiety	−0.058	0.760	0.94	0.65–1.36
Stress	0.158	0.438	1.17	0.79–1.74

Notes: Logistic regression with odds ratio (OR) and 95% confidence interval (CI), *: significant <0.05.

a cross-sectional study which fails to prove temporal association or causality. In other words, our design could not determine whether social media use contributed to sleep disturbance or sleep disturbance contributes to increased social media use, or both. Longitudinal and long-term studies on different populations are needed to alleviate this conflict.

The association between social media use and sleep disturbances can be explained by several assumptions. Researchers suggested that social media use is a form of unstructured activity with no clear beginning or an end. Thus, it is more likely to be prolonged.[18] Moreover, use of social media is an entertaining effortless activity, which may alter sleep duration and quality.[46] Staying up late at night on social media (posting pictures or watching videos) may delay or reduce sleep. The content may prolong the arousal such as exciting or provoking contents videos may disturb person's sleep. Also engaging in discussions at bedtime may delay sleep and shorten its duration.[48] Furthermore, the blue light from using screens can prevent the body's usual sleep rhythms, with experienced difficulty to fall asleep and stay asleep.[55] This is in line with our finding that poor sleepers use a higher mean number of platforms than good sleepers where different platforms allow for different activities (texting, posting, studying, discussing, reading, watching) that may delay students' sleep. Also, the afore-mentioned research findings could explain how longer duration of social media use was among the independent predictors of poor sleep.

Regarding the most used social media platform and their association with sleep disturbance Tiktok and Snapchat were the most frequent platforms used. TikTok and Snapchat are the most popular short-video platforms ranked 4th and 5th most used globally.[56] They are more preferred among adolescents.[57] Tiktok is different from other social media platforms like Facebook, Twitter, Instagram, which mainly focus on images and text. TikTok enables users to browse, watch and produce short video contents.[58,59] Social media companies provide their service aiming to prolong users stay as long as possible.[59] Both platforms were associated with poor sleep among students. Such association could be interpreted by the content and structure of the platform that prolong individual use of it. A similar study conducted in the United States reported that Snapchat was the only platform associated with sleep disturbance.[60] In our study this could be attributed to them being the most commonly used platforms in SA which are used for long times consequently affecting sleep quality. Further research is needed to understand why TikTok and Snapchat are the most used platforms.

Poor sleep quality showed no association with gender of the participants. However, similar studies conducted in SA revealed that females were more to be social media users.[12,61] This might be explained by the type of the platforms assessed in previous studies or the method of assessment. On the other hand, our finding might suggest that with increasing use of social media males tend to use social media equally as females. Furtherly, it is to be considered in social media hazards awareness activities both males and females should be targeted.

According to the current study, logistic regression results revealed that depressive state was found to be independently associated with poor sleep. Generally, both sleep and mental health are regarded as global public health challenges where both problems are considered interlinked.[33,37] Previous studies suggested that the association between mental health problems and sleep is bidirectional.[37,38,62] Thus, such bidirectional causal relation assume that poor sleep could have led to the depressive state among participants leading to more problematic sleep, such

interpretation implies the complicated negative effects of prolonged use of social media on individual sleep quality and mental health. Future in-depth research is called for to investigate such interplay between social media use, poor sleep and depressive state.

Study Limitations

Despite the useful findings obtained through our study, some limitations still exist. The cross-sectional design fails to prove the temporal or the causal association between sleep quality and social media use. Longitudinal studies or studies with multiple follow-ups are needed to obtain more solid evidence. Conducting the study over a short timeframe limits its ability to capture seasonal or long-term trends, accordingly, the results' generalizability and reliability. Also, the results are confined to public school attendants only. Also, students' responses were mainly subjective and purpose and the pattern of their use of social media plat form, especially at night, were not assessed.

Conclusion

The most frequent and preferred social media platforms used by participants were Tiktok and Snapchat. More than one-third of them were poor sleepers with Tiktok use, extended duration of use and depressive state of participants were significantly associated with poor sleep quality. Those factors interplay together to disturb their sleep where Tiktok, as a preferred platform, with appealing structure and content attracts adolescents to use them for prolonged duration affecting their physiological sleep process. Our findings reveal an urgent call for awareness as well as social and behavioral communication change strategies and activities among secondary school students and their parents. Stakeholders including ministry of education, ministry of health, health educators, school administration and teachers should co-operate to adopt strategies and activities focusing on sleep hygiene and consequences of poor sleep, and the negative impact of limitless and inappropriate use of smart phones and social media to prevent hazards of poor sleep and social media addiction. Also, further in-depth studies are needed to understand why adolescents prefer certain platforms over others, and why sleep disturbance was associated with certain social media platforms than others investigating their content and structure. Longitudinal studies are needed to assess causality and temporal relationship between social media and problematic sleep.

Ethics Approval and Consent to Participate

The study was approved by the King Khalid University Research Ethics Committee (HAPO-06-B-001) with approval number ECM#2022-1901. All steps of conduction of the present study took place in accordance with the guidelines and regulations of the Declaration of Helsinki. Ministry of Education approval was sought before study conduction and data collection from public secondary schools in the cities of Abha and Khamis Mushait. After approval of the school administration, researchers sought parental consent for interviewing their children after explaining the purpose of the study and the nature of the data to be collected. Following the parental consent, students were asked to participate in the study during their free time. Students who, and their parents, accepted to participate in the study were asked to fill in the study questionnaire.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Mehta KJ. Effect of sleep and mood on academic performance—at interface of physiology, psychology, and education. *Humanit Soc Sci Commun*. 2022;9(1):16. doi:10.1057/s41599-021-01031-1
2. Perry GS, Patil SP, Presley-Cantrell LR. Raising awareness of sleep as a healthy behavior. *Prev Chronic Dis*. 2013;10:E133. doi:10.5888/pcd10.130081
3. Walker M. *Why We Sleep: The New Science of Sleep and Dreams*. Penguin UK; 2017.
4. Moorcroft WH, Belcher P. *Understanding Sleep and Dreaming*. Springer; 2003.
5. Chattu VK, Chattu SK, Burman D, Spence DW, Pandi-Perumal SR. The interlinked rising epidemic of insufficient sleep and diabetes mellitus. In: *Healthcare*. MDPI; 2019.
6. Bin Eid W, Lieu AA, Neoh MJY, Al-Zoubi SM, Esposito G, Dimitriou D. Characteristics of Sleep Patterns in Adolescents: comparisons between Saudi Arabia and the UK. In: *Healthcare*. MDPI; 2022.

7. Owens J, Au R, Carskadon M; Adolescent Sleep Working G; Committee on A, et al. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics*. 2014;134(3):e921–e932. doi:10.1542/peds.2014-1696

8. Lo JC, Ong JL, Leong RLF, Gooley JJ, Chee MWL. Cognitive performance, sleepiness, and mood in partially sleep deprived adolescents: the need for sleep study. *Sleep*. 2016;39(3):687–698. doi:10.5665/sleep.5552

9. Alshoaibi Y, Bafil W, Rahim M. The effect of screen use on sleep quality among adolescents in Riyadh, Saudi Arabia. *J Family Med Prim Care*. 2023;12(7):1379–1388. doi:10.4103/jfmpc.jfmpc_159_23

10. Alzhrani AM, Johnstone KR, Winkler EAH, Healy GN, Cook MM. Using touchscreen mobile devices—when, where and how: a one-week field study. *Ergonomics*. 2022;65(4):561–572. doi:10.1080/00140139.2021.1973577

11. Lund L, Sølvhøj IN, Danielsen D, Andersen S. Electronic media use and sleep in children and adolescents in western countries: a systematic review. *BMC Public Health*. 2021;21(1):1598. doi:10.1186/s12889-021-11640-9

12. Alzhrani AM, Aboalshamat KT, Badawoud AM, et al. The association between smartphone use and sleep quality, psychological distress, and loneliness among health care students and workers in Saudi Arabia. *PLoS One*. 2023;18(1):e0280681. doi:10.1371/journal.pone.0280681

13. Scott H, Biello SM, Woods HC. Social media use and adolescent sleep patterns: cross-sectional findings from the UK millennium cohort study. *BMJ open*. 2019;9(9):e031161. doi:10.1136/bmjopen-2019-031161

14. Alkhalaf AM, Tekian A, Park YS. The impact of WhatsApp use on academic achievement among Saudi medical students. *Med Teach*. 2018;40 (sup1):S10–S14. doi:10.1080/0142159X.2018.1464652

15. Alshahrani A, Siddiqui A, Khalil S, et al. WhatsApp-based intervention for promoting physical activity among female college students, Saudi Arabia: a randomized controlled trial. *East Mediterr Health J*. 2021;27(8):782–789. doi:10.26719/emhj.21.012

16. Baccarella CV, Wagner TF, Kietzmann JH, McCarthy IP. Social media? It's serious! Understanding the dark side of social media. *Eur Manage J*. 2018;36(4):431–438. doi:10.1016/j.emj.2018.07.002

17. Cheng C, Lau Y-C, Luk JW. Social capital–accrual, escape-from-self, and time-displacement effects of internet use during the COVID-19 stay-at-home period: prospective, quantitative survey study. *J Med Internet Res*. 2020;22(12):e22740. doi:10.2196/22740

18. Frank E, Akpan-Ekpo E, Ekong I. Social media use and sleep disturbances among medical undergraduates in southern Nigeria. *Saudi J Med*. 2016;1(3):63–70.

19. Kwok SWH, Lee PH, Lee RLT. Smart device use and perceived physical and psychosocial outcomes among Hong Kong adolescents. *Int J Environ Res Public Health*. 2017;14(2):205. doi:10.3390/ijerph14020205

20. Shan Z, Deng G, Li J, Li Y, Zhang Y, Zhao Q. Correlational analysis of neck/shoulder pain and low back pain with the use of digital products, physical activity and psychological status among adolescents in Shanghai. *PLoS One*. 2013;8(10):e78109. doi:10.1371/journal.pone.0078109

21. Bright LF, Logan K. Is my fear of missing out (FOMO) causing fatigue? Advertising, social media fatigue, and the implications for consumers and brands. *Internet Res*. 2018;28(5):1213–1227. doi:10.1108/IntR-03-2017-0112

22. Tandon A, Kaur P, Dhir A, Mäntymäki M. Sleepless due to social media? Investigating problematic sleep due to social media and social media sleep hygiene. *Computers in Human Behavior*. 2020;113:106487. doi:10.1016/j.chb.2020.106487

23. Herrero J, Torres A, Vivas P, Arenas ÁE, Urueña A. Examining the empirical links between digital social pressure, personality, psychological distress, social support, users' residential living conditions, and smartphone addiction. *Soc Sci Comput Rev*. 2022;40(5):1153–1170. doi:10.1177/0894439321998357

24. Mahapatra S. Smartphone addiction and associated consequences: role of loneliness and self-regulation. *Behaviour Inf Technol*. 2019;38 (8):833–844. doi:10.1080/0144929X.2018.1560499

25. Squires LR, Hollett KB, Hesson J, Harris N. Psychological distress, emotion dysregulation, and coping behaviour: a theoretical perspective of problematic smartphone use. *Int J Ment Health Addict*. 2021;19(4):1284–1299. doi:10.1007/s11469-020-00224-0

26. Miksch L, Schulz C Disconnect to reconnect: the phenomenon of digital detox as a reaction to technology overload; 2018.

27. Kelly Y, Zilanawala A, Booker C, Sacker A. Social media use and adolescent mental health: findings from the UK Millennium cohort study. *EClinicalMedicine*. 2018;6:59–68. doi:10.1016/j.eclinm.2018.12.005

28. Hale L, Kirschen GW, LeBourgeois MK, et al. Youth screen media habits and sleep: sleep-friendly screen behavior recommendations for clinicians, educators, and parents. *Child Adolesc Psychiatr Clin N Am*. 2018;27(2):229–245. doi:10.1016/j.chc.2017.11.014

29. McGranahan MJ, O'Connor PJ. Exercise training effects on sleep quality and symptoms of anxiety and depression in post-traumatic stress disorder: a systematic review and meta-analysis of randomized control trials. *Mental Health Phys Act*. 2021;20:100385. doi:10.1016/j.mhpa.2021.100385

30. Silvani MI, Werder R, Perret C. The influence of blue light on sleep, performance and wellbeing in young adults: a systematic review. *Front Physiol*. 2022;13:943108. doi:10.3389/fphys.2022.943108

31. Al-khlaiwi T, Habib SS. Association of excessive mobile phone usage with sleep quality and fatigue severity: an epidemiologic survey in Saudi population. *Khyber Med Univ J*. 2021;13(2):60–65.

32. Yang J, Fu X, Liao X, Li Y. Association of problematic smartphone use with poor sleep quality, depression, and anxiety: a systematic review and meta-analysis. *Psychiatry Res*. 2020;284:112686. doi:10.1016/j.psychres.2019.112686

33. Scott AJ, Webb TL, Martyn-St James M, Rowse G, Weich S. Improving sleep quality leads to better mental health: a meta-analysis of randomised controlled trials. *Sleep Med Rev*. 2021;60:101556. doi:10.1016/j.smrv.2021.101556

34. Chattu VK, Manzar MD, Kumary S, Burman D, Spence DW, Pandi-Perumal SR. The global problem of insufficient sleep and its serious public health implications. *Healthcare*. 2018;7(1):1. doi:10.3390/healthcare7010001

35. Robotham D. Sleep as a public health concern: insomnia and mental health. *J Public Mental Health*. 2011;10(4):234–237. doi:10.1108/17465721111188250

36. Alonzo R, Hussain J, Stranges S, Anderson KK. Interplay between social media use, sleep quality, and mental health in youth: a systematic review. *Sleep Med Rev*. 2021;56:101414. doi:10.1016/j.smrv.2020.101414

37. Baglioni C, Nanovska S, Regen W, et al. Sleep and mental disorders: a meta-analysis of polysomnographic research. *Psychol Bull*. 2016;142 (9):969. doi:10.1037/bul0000053

38. Alvaro PK, Roberts RM, Harris JK. A systematic review assessing bidirectionality between sleep disturbances, anxiety, and depression. *Sleep*. 2013;36(7):1059–1068. doi:10.5665/sleep.2810

39. Taylor DJ, Lichstein KL, Durrence HH, Reidel BW, Bush AJ. Epidemiology of insomnia, depression, and anxiety. *Sleep*. 2005;28(11):1457–1464. doi:10.1093/sleep/28.11.1457

40. Harvey AG, Jones C, Schmidt DA. Sleep and posttraumatic stress disorder: a review. *Clinic Psychol Rev*. 2003;23(3):377–407. doi:10.1016/S0272-7358(03)00032-1

41. Lauer CJ, Krieg J-C. Sleep in eating disorders. *Sleep Med Rev*. 2004;8(2):109–118. doi:10.1016/S1087-0792(02)00122-3

42. Slanitz C, Fuchshuber J, Fink A, Unterrainer H-F. Anxious and depressive symptoms mediate the influence of sleep quality on suicidality in young adults. *Front Public Health*. 2024;12:1322069. doi:10.3389/fpubh.2024.1322069

43. Alfaya MA, Abdullah NS, Alshahrani NZ, et al. Prevalence and determinants of social media addiction among medical students in a selected university in Saudi Arabia: a cross-sectional study. In: *Healthcare*. MDPI; 2023.

44. Buysse DJ, Reynolds Iii CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193–213. doi:10.1016/0165-1781(89)90047-4

45. Moussa MT, Lovibond P, Laube R, Megahead HA. Psychometric properties of an Arabic version of the depression anxiety stress scales (DASS). *Research on Social Work Practice*. 2016;27(3):375–386. doi:10.1177/1049731516662916

46. Asiri AK, Almetrek MA, Alsamghan AS, Mustafa O, Alshehri SF. Impact of Twitter and WhatsApp on sleep quality among medical students in King Khalid University, Saudi Arabia. *Sleep Hypn*. 2018;20(4):247–252. doi:10.5350/Sleep.Hypn.2018.20.0158

47. Nasim M, Saade M, AlBuhairan F. Sleep deprivation: prevalence and associated factors among adolescents in Saudi Arabia. *Sleep Medicine*. 2019;53:165–171. doi:10.1016/j.sleep.2018.08.031

48. Levenson JC, Shensa A, Sidani JE, Colditz JB, Primack BA. The association between social media use and sleep disturbance among young adults. *Preventive Med*. 2016;85:36–41. doi:10.1016/j.ypmed.2016.01.001

49. Ibrahim NK, Baharoon BS, Banjar WF, et al. Mobile phone addiction and its relationship to sleep quality and academic achievement of medical students at King Abdulaziz University, Jeddah, Saudi Arabia. *J Res Health Sci*. 2018;18(3):e00420.

50. Kumar VA, Chandrasekaran V, Brahadeeswari H. Prevalence of smartphone addiction and its effects on sleep quality: a cross-sectional study among medical students. *Ind Psychiatry J*. 2019;28(1):82. doi:10.4103/ipj.ipj_56_19

51. Espinoza G, Juvonen J. The pervasiveness, connectedness, and intrusiveness of social network site use among young adolescents. *Cyberpsychol Behav Soc Netw*. 2011;14(12):705–709. doi:10.1089/cyber.2010.0492

52. Garett R, Liu S, Young SD. The Relationship Between Social Media Use and Sleep Quality among Undergraduate Students. *Inform Comm Soc*. 2018;21(2):163–173. doi:10.1080/1369118X.2016.1266374

53. Gündoğmuş İ, Kul AT, Çoban DA. Investigation of the relationship between social network usage and sleep quality among university students. *Anadolu Psikiyatri Dergisi*. 2020;21(2):141–148.

54. Combertaldi SL, Ort A, Cordi M, Fahr A, Rasch B. Pre-sleep social media use does not strongly disturb sleep: a sleep laboratory study in healthy young participants. *Sleep Medicine*. 2021;87:191–202. doi:10.1016/j.sleep.2021.09.009

55. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Med Rev*. 2015;21:50–58. doi:10.1016/j.smrv.2014.07.007

56. Shelley W The Top 10 Social Media Sites & Platforms; 2023. Available from: https://www.searchenginejournal.com/social-media/social-media-platforms/. Accessed February 15, 2024.

57. Bozzola E, Spina G, Agostiniani R, et al. The use of social media in children and adolescents: scoping review on the potential risks. *Int J Environ Res Public Health*. 2022;19(16):9960. doi:10.3390/ijerph19169960

58. Chao M, Lei J, He R, Jiang Y, Yang H. TikTok use and psychosocial factors among adolescents: comparisons of non-users, moderate users, and addictive users. *Psychiatry Res*. 2023;325:115247. doi:10.1016/j.psychres.2023.115247

59. Montag C, Yang H, Elhai JD. On the psychology of TikTok use: a first glimpse from empirical findings. *Front Public Health*. 2021;9:641673. doi:10.3389/fpubh.2021.641673

60. Bergfeld NS, Van den Bulck J. It's not all about the likes: social media affordances with nighttime, problematic, and adverse use as predictors of adolescent sleep indicators. *Sleep Health*. 2021;7(5):548–555. doi:10.1016/j.sleh.2021.05.009

61. Hegazy A, Alkhail B, Awadalla N, Qadi M, Al-Ahmadi J. Mobile phone use and risk of adverse health impacts among medical students in Jeddah, Saudi Arabia. *Br J Med Med Res*. 2016;15(1):1–11. doi:10.9734/BJMMR/2016/24339

62. Stepanski EJ, Rybarczyk B. Emerging research on the treatment and etiology of secondary or comorbid insomnia. *Sleep Med Rev*. 2006;10(1):7–18. doi:10.1016/j.smrv.2005.08.002