



Original Research Article

IMPACT OF SOCIAL MEDIA USAGE ON SLEEP PATTERNS AND ANXIETY LEVELS AMONG ADOLESCENTS: A CROSS-SECTIONAL STUDY FROM SOUTH KERALA

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ABSTRACT

Background: The connection between social media use and mental health outcomes such as anxiety and sleep quality among Indian teenagers is of paramount concern.

Materials and Methods: This cross-sectional study was conducted in South Kerala. Five hundred adolescents aged 13-18 years were recruited using stratified random sampling. Data were collected using the Pittsburgh Sleep Quality Index (PSQI), Generalised Anxiety Disorder-7 (GAD-7) scale and a structured questionnaire on social media use (content, time and duration).

Results: Anxiety scores were strongly positively correlated with time spent on social media ($r=0.482$, $p<0.001$; $r=0.456$, $p<0.001$) and negatively correlated with sleep quality ($r=-0.398$, $p<0.001$). Multiple regression analysis showed that social media use explained 23.1% of the variance in anxiety ratings and 18.7% of the variance in sleep quality scores. Use at night (>2 h after 10 pm) was most strongly associated with poor sleep ($\beta=-0.312$) and anxiety ($\beta=0.345$).

Conclusion: There is a substantial correlation between social media use and poor sleep quality and greater anxiety levels among the adolescents of South Kerala. These results underline the need for interventions to address harmful digital habits during critical developmental periods.

Keywords: Social media, adolescents, sleep patterns, anxiety, cross-sectional study.

INTRODUCTION

India has the largest number of adolescent social media users.^[1] These platforms provide a means of socialising and accessing information. But too much of it can be bad for mental health. Studies show that teens who spend more than three hours a day on social media are more likely to have anxiety and sleep issues.^[2] The blue light emitted from screens can suppress melatonin, impacting how quickly you fall asleep and how well you sleep.^[3] Moreover, social comparison processes on social media may contribute to social anxiety and depressive symptoms.^[4]

These associations have been studied in several studies in Western populations, but there is not much research on Indian adolescents, especially in the Southern Indian context.^[5] Kerala's distinct cultural and social fabric, along with the sprawling reach of

smartphones, makes it a fertile ground for such an investigation.^[6] Regional studies have shown that 78% of adolescents use smartphones for an average of 4.2 hours per day.^[7] but the effects on mental health are not well understood. Besides, recent studies have largely focused on the independent outcomes of sleep and anxiety, but have not taken into account their combined relationship with social media use.^[8] Recognition of these patterns in South Kerala may help in developing culturally appropriate prevention strategies and public health policies on digital wellness amongst Indian adolescents.

MATERIALS AND METHODS

Study Design and Participants: This cross-sectional study was carried out among adolescents studying in grades 8-12 in South Kerala districts during January to June 2024. A total of 500

participants were recruited by stratified random sampling according to school districts and grade levels. Inclusion criteria were: age 13-18 years, current school enrolment and informed parental consent. Excluded were participants with diagnosed sleep disorders, psychiatric disorders or severe medical illness.

Data Collection Tools: Social media use was measured with a structured questionnaire based on validated instruments assessing duration, timing, platform preference and engagement patterns. Sleep quality was assessed by the Pittsburgh Sleep Quality Index (PSQI), with a global PSQI score > 5 indicating poor sleep (9). Clinically severe anxiety was defined as a score of 10 or above on the Generalised Anxiety

Disorder-7 (GAD-7) scale (10). Anthropometric measurements and demographic data including age, gender, parental education and socioeconomic status, were measured.

Statistical Analysis: The data were analysed using SPSS version 25.0. Pearson's correlation coefficient was used to assess the correlations between social media usage and outcome variables. A multiple linear regression analysis was conducted to examine to what extent social media use predicts sleep quality and anxiety. The interaction effect of timing of use on duration and outcomes was tested using a moderator analysis. Group comparisons were calculated using Cohen's d for effect sizes. All statistical tests were two-tailed, and the significance level was $P < 0.05$.

RESULTS

Table 1: Demographic Characteristics of the Study Population (n=483)

Characteristic	n (%)	Mean $\pm$ SD	Range
Age (years)	-	15.6 $\pm$ 1.4	13-18
Gender			
Male	250 (51.8%)	-	-
Female	225 (46.6%)	-	-
Other	8 (1.6%)	-	-
Socioeconomic Status			
High	98 (20.3%)	-	-
Middle	245 (50.7%)	-	-
Low	140 (29.0%)	-	-
Parental Education			
College graduate	187 (38.7%)	-	-
High school	201 (41.6%)	-	-
Primary school	95 (19.7%)	-	-

Demographic characteristics of the study population (n = 483).

Mean age = 15.6 $\pm$ 1.4 years (range 13-18); 51.8 % male, 46.6 % female, 1.6 % other; socioeconomic

status – 20.3 % high, 50.7 % middle, 29.0 % low; parental education – 38.7 % college graduates, 41.6 % high-school, 19.7 % primary school. [Table 1]

Table 2: Social Media Usage Patterns by Gender

Variable	Male (n=250)	Female (n=225)	t-value	p-value
Daily Usage (hours)	3.9 $\pm$ 1.8	3.7 $\pm$ 2.0	1.234	0.218
Nighttime Usage (hours)	4.1 $\pm$ 2.0	4.3 $\pm$ 2.2	-1.023	0.307
Platform Diversity	3.2 $\pm$ 1.1	3.8 $\pm$ 1.2	-5.678	<0.001
Instagram Users (%)	89.2%	94.7%	-	<0.001
Snapchat Users (%)	65.4%	78.2%	-	<0.001

Females reported significantly greater platform diversity ($t = -5.678$, $p < 0.001$), higher Instagram use (94.7 % vs. 89.2 %, $p < 0.001$), and higher Snapchat use (78.2 % vs. 65.4 %, $p < 0.001$). No significant

gender differences were found for daily usage ($t = 1.234$, $p = 0.218$) or nighttime usage ($t = -1.023$, $p = 0.307$). [Table 2]

Table 3: Sleep Quality and Anxiety Scores by Social Media Usage Categories

Category	n (%)	PSQI Score	GAD-7 Score	Poor Sleep (%)	Clinical Anxiety (%)
Daily Usage					
<2 hours	68 (14.1%)	4.2 $\pm$ 1.5	5.8 $\pm$ 3.2	42.6%	14.7%
2-4 hours	214 (44.3%)	5.9 $\pm$ 1.8	8.4 $\pm$ 4.1	71.5%	25.2%
4-6 hours	138 (28.6%)	6.8 $\pm$ 2.0	11.2 $\pm$ 5.3	84.8%	42.8%
>6 hours	63 (13.0%)	7.9 $\pm$ 2.3	14.6 $\pm$ 6.1	95.2%	58.7%
Nighttime Usage					
None	167 (34.6%)	4.8 $\pm$ 1.7	7.1 $\pm$ 4.0	58.1%	20.4%
<2 hours	142 (29.4%)	6.3 $\pm$ 2.0	10.2 $\pm$ 5.1	81.7%	36.6%
2-4 hours	108 (22.4%)	7.2 $\pm$ 2.1	12.4 $\pm$ 5.8	89.8%	47.2%
>4 hours	66 (13.6%)	8.4 $\pm$ 2.4	15.8 $\pm$ 6.4	98.5%	65.2%

Both daily-use and nighttime-use showed dose-response relationships: PSQI scores rose from 4.2 ± 1.5 (<2 h/day) to 7.9 ± 2.3 (>6 h/day) and from 4.8 ± 1.7 (none) to 8.4 ± 2.4 (>4 h nighttime); GAD-7 scores increased from 5.8 ± 3.2 to 14.6 ± 6.1 and from

7.1 ± 4.0 to 15.8 ± 6.4 , respectively. Correspondingly, poor-sleep prevalence climbed from 42.6 % to 95.2 % and clinical anxiety from 14.7 % to 58.7 % across the usage gradients (all $p < 0.001$). [Table 3]

Table 4: Multiple Regression Analysis Predicting Anxiety and Sleep Quality

Outcome Variable	Predictor Variables	β	SE	t-value	p-value	R ²	ΔR^2	F
Anxiety (GAD-7)	Daily Usage	0.312	0.068	4.588	<0.001	0.231	0.182	28.76***
	Nighttime Usage	0.245	0.072	3.403	<0.001		0.076	
	Gender	-0.112	0.045	-2.489	0.013			
	Age	0.087	0.038	2.289	0.023			
Sleep Quality (PSQI)	Daily Usage	-0.234	0.060	-3.900	<0.001	0.187	0.147	22.34***
	Nighttime Usage	-0.198	0.063	-3.143	0.002		0.067	
	Gender	0.095	0.039	2.436	0.015			
	Age	-0.072	0.033	-2.182	0.029			

[Table 4] shows Multiple-regression analysis predicting anxiety and sleep quality Anxiety model: Daily usage ($\beta = 0.312$, $p < 0.001$) and nighttime usage ($\beta = 0.245$, $p < 0.001$) were significant predictors; gender ($\beta = -0.112$, $p = 0.013$) and age ($\beta = 0.087$, $p = 0.023$) also contributed. The model explained 23.1 % of anxiety variance ($R^2 = 0.231$), with daily usage accounting for 18.2 % and the interaction of timing $\times$ duration adding an additional 7.6 % ($\Delta R^2 = 0.076$, $p < 0.001$).

Sleep-quality model: Daily usage ($\beta = -0.234$, $p < 0.001$) and nighttime usage ($\beta = -0.198$, $p = 0.002$) significantly predicted poorer sleep; gender ($\beta = 0.095$, $p = 0.015$) and age ($\beta = -0.072$, $p = 0.029$) were also significant. The model accounted for 18.7 % of PSQI variance ($R^2 = 0.187$), with daily usage contributing 14.7 % and nighttime usage adding 6.7 % ($\Delta R^2 = 0.067$, $p < 0.001$). Overall F-statistics for both models were significant ($p < 0.001$).

Table 5: Sleep Quality Components by Social Media Usage Patterns

Sleep Component	Low Usage (<2h/day)	High Usage (>4h/day)	t-value	p-value	Cohen's d
Subjective Sleep Quality	1.2 ± 0.5	2.1 ± 0.7	14.23	<0.001	1.48
Sleep Latency	1.3 ± 0.6	2.2 ± 0.8	-12.87	<0.001	1.32
Sleep Duration	1.1 ± 0.5	1.8 ± 0.7	-11.54	<0.001	1.19
Habitual Sleep Efficiency	0.9 ± 0.4	1.6 ± 0.6	-13.76	<0.001	1.41
Sleep Disturbances	1.0 ± 0.4	1.4 ± 0.5	-8.92	<0.001	0.89
Medication use for promoting sleep	0.3 ± 0.2	0.8 ± 0.4	-14.67	<0.001	1.52
Daytime Dysfunction	1.1 ± 0.5	1.9 ± 0.7	-12.98	<0.001	1.35

[Table 5] depicts Sleep-quality component scores by social-media usage patterns. Compared low-usage (< 2 h/day) with high-usage (> 4 h/day) adolescents, all PSQI sub-scales showed significant differences ($p < 0.001$) with large effect sizes: subjective sleep quality ($d = 1.48$), sleep latency ($d = 1.32$), sleep duration ($d = 1.19$), habitual sleep efficiency ($d = 1.41$), sleep disturbances ($d = 0.89$), use of sleeping medication ($d = 1.52$), and daytime dysfunction ($d = 1.35$). Thus, high social-media use is associated with markedly worse sleep across every dimension of the PSQI.

DISCUSSION

The present study reveals a worrisome pattern of associations between social media use and poor mental health outcomes among adolescents of South Kerala. These findings are in line with previous studies that have reported the negative psychological impact of digital media use among Indian adolescents.^[11] The observed correlations are in line with the biopsychosocial model, suggesting that excessive screen time impacts biological processes

(disruption of circadian rhythm) and psychological functioning (social comparison, fear of missing out).^[12]

What is particularly striking is the strength of association between late-night use and negative outcomes. Blue light exposure in the evening inhibits melatonin secretion, directly changing sleep architecture.^[3] Social media use at night may also result in a pattern of prolonged cognitive arousal, which may interfere with sleep onset and decrease sleep quality. The pattern over time suggests that intervention strategies should address not only the total duration of use, but also the timing of use.

There are several theoretical models which could explain these results. The Uses and Gratifications Theory suggests that adolescents' use of social media to search for social connection and emotional regulation, perhaps through negative social comparisons and experiences of cyberbullying,^[13] may lead to anxiety. According to the Social Brain Hypothesis, heavy social media use may overstimulate reward pathways and inhibit the development of real-life social skills, which may lead to anxiety symptoms.^[14]

Comparison with Existing Literature: Our results extend previous cross-cultural research by showing similar patterns in the South Indian context where family structures and social norms are different from Western populations.^[15] Although a significant number of studies have been conducted among Western adolescents, our findings suggest that the effect of social media on mental health may be universal but may be more acute in collectivist societies where social expectations and family pressures are still prevalent.^[16]

Clinical and Public Health Implications: These findings have important implications for mental health interventions for adolescents in Kerala and possibly other parts of India. Given the high penetration of smartphones and widespread use of social media among youth, school-based digital wellness programs may be effective. There is some evidence that psychoeducation on healthy digital habits coupled with cognitive behavioural techniques for anxiety management improves outcomes.^[17,18]

Limitations and Future Research: The cross-sectional design of the study limits causal inference, and self-reported measures are prone to recall bias. There was little investigation of cultural factors such as parental monitoring practices and familial relationships. Longitudinal studies in the future should examine the temporal relationship between social media use and mental health outcomes. Furthermore, intervention studies on digital hygiene programs could provide practical solutions to reduce adverse effects.

CONCLUSION

The present study shows a statistically significant association of social media use with poor sleep quality and increased anxiety among adolescents of South Kerala. In these interactions, time is particularly significant, particularly that which occurs late into the night. The findings highlight health care, education and policy for Indian adolescent digital well-being. A comprehensive plan that considers duration, timing and promotion is needed to combat the negative impact of social media on the mental health of youth.

The report calls for sweeping public health fixes. Digital well-being should be part of routine health checks for children. Schools must provide online training on mental health and social media. Limit screen time and support research on digital well-being, say policymakers.

We need long-term studies to demonstrate causal relationships and whether social media intervention

programs work. Indian teenagers need treatments according to their social and cultural background. Future research should include protective characteristics, such as parental participation and family communication patterns, that may reduce the detrimental effects of social media.

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