

## Night Time Gadget Use and Quality of Sleep among Health Science Students in Bangalore, India

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### ABSTRACT

**INTRODUCTION:** Electronic gadgets have become a necessity for modern life, and unstructured use of these devices can result in sleep disturbances among youth in the digital era. This study correlated patterns of nighttime electronic gadget use and quality of sleep among health science students.

**METHODS:** Cross-sectional research study was conducted among 243 health science students of selected colleges in Bangalore. The subjects comprised students from pharmacy 79 (32.6%), physiotherapy 79 (32.6%) and nursing 84 (34.7%). A self-administered questionnaire was used to collect demographic information on nighttime electronic gadget use. Sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI).

**RESULTS:** Watching movies (43.6%), communicating (36.1%) and academic use (20.3%) were the most reported purposes of nighttime gadget use among the students. 22.8 % of the participants were using the gadgets for 2-4 hours and 7.5 % of the students used them for more than 5 hours at night. Linear regression analysis revealed that the habit of checking one's phone at night and staying up late at night had an impact on the daytime activity of students. Subjective sleep quality, sleep latency, sleep duration and sleep efficiency were significantly affected by nighttime gadget use.

**CONCLUSION:** Unrestricted gadget use during nighttime can result in sleep-deprived individuals who may not be able to perform as efficiently. Effective measures should be initiated to structure the use of technologies.

**Keywords:** Sleep quality, Sleep latency, Digital technology, Electronics, Medical Students, Health Occupation.

### INTRODUCTION

Sleep refers to a state of rest that occurs for a sustained period, leading to reduced consciousness and providing time for repair and recovery of the body system for the next period of wakefulness.

Sleep is vital for regulating the internal environment and restoring normal brain functions [1]. Adequate sleep is essential for undergraduate students' health, academic outcomes, and daily functioning. Both the quantity and quality of sleep are vital for students' physical and mental well-being, and poor

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sleep quality is associated with lower academic performance [2].

Insufficient sleep can lead to a decline in intellectual functions, including memory, attentiveness, and responsiveness. Prolonged sleep loss and related drowsiness can be a severe hindering factor to educational achievements. A research study revealed that adolescents' academic achievement strongly influenced the quality of their sleep [3].

Several studies have reported the impact of gadget use on students' sleep quality. The term "gadget" refers to a portable electronic device, including mobile phones, MP3 players, gaming consoles, and other wireless-enabled devices. Gadgets hold an essential role in the life of modern youth. These gadgets are enabled with multifunction capabilities, including applications, internet access, and photography [4]. Enhanced internet penetration and easy availability of smartphones at an affordable price resulted in a more significant proportion of the Indian population using smartphones, especially affecting youth who have access to the internet at young ages, potentially creating a lifelong internet addiction. A recent survey conducted on college students and young professionals reported that fifty-six percent of the respondents admitted having at least one mobile phone addiction, including gaming, internet use, or social media (Facebook, Twitter, Instagram, etc.). The participants also reported having at least one behavioral problem, not limited to sleep dysfunction, aggressiveness, anxiety, and decline in concentration [5].

Since gadget use is an unstructured activity without a clear beginning and end, it may cause sleep displacement, as youth often stay up late at night with computer activities and reduce their sleep duration. The bright light emitted from the screen of electronic gadgets can suppress the secretion of melatonin at night, affecting the circadian rhythm of sleep [6]. Gadget use at night may enhance the central nervous system activity, resulting in increased alertness, physiological arousal, and difficulty falling asleep [7].

Electronic gadgets like smartphones, video games, laptops, and tablets have been widely used by students and have become a central force around which daily activity revolves, through different capabilities, including a wide variety of mobile applications for the delivery of information,

networking such as messages and email, education, and entertainment purposes [3]. Previous research studies have reported that the excessive use of these gadgets can lead to physiological and psychological health problems [8]. These problems include earache, feeling of warmth near the ear, difficulty concentrating, fatigue, memory loss, nausea, dizziness, and sleep disturbances.

A study conducted to assess the effect of electronic device use on sleep quality among health science students at Gulf Medical University reported poor sleep quality among 81.7% of students. Poor quality of sleep was associated with missing classes ( $p=0.02$ ) and related to the placement of the electronic device close to the bed ( $p=0.01$ ) [2]. A cross-sectional study on mobile phone use's impact on mental health outcomes among 4156 young adults in Sweden reported that sleep disturbances, depression, and stress were positively linked with the duration of mobile phone use among young adults [9].

The duration and quality of sleep impact students' academic performance, and decreasing parental control may result in a reduced restriction on the use of digital media among health science students [10]. Information about gadget use and quality of sleep among health science students in South India is scarce. Hence the current study aimed to correlate the pattern of gadget use and quality of sleep among health science students.

## METHODS

### Study design

The present study was a cross-sectional study involving undergraduate students in health science courses at selected colleges in Bangalore, India. The students who were unwilling to give written consent or did not possess a smartphone were excluded. Those appearing for university examination within the month of data collection or night shift in a hospital at the time of data collection, were excluded from the study. Ethical clearance was obtained from the institutional ethical committee of Krupanidhi College of Nursing (KCN/2018/05) before the commencement of the study. The participants were recruited after explaining the purpose, confidentiality of the procedure, and voluntary participation.

A self-administered tool was used to collect information on the demographic characteristics of students, the pattern of gadget use, and the impact of gadget use on their daily activities. The Pittsburgh Sleep Quality Index (PSQI) measured the quality of sleep a self-reported questionnaire to measure the quality of sleep and disturbances in sleep over a period of one month. Pittsburgh Sleep Quality Index is composed of 19 items and measures seven domains of sleep, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. The seven component scores are added together to obtain the global quality of sleep score, which ranges from 0 to 21. A global score of equal to or less than five was categorized as good, and a global score of more than five was classified as poor sleep quality.

#### Data analysis

The data were typed into an Excel spreadsheet, and SPSS software, version 20, was used to analyze the data. The demographic characteristics, the pattern of nighttime gadget use, and PSQI scores were described using frequency, mean and standard deviation. Karl Pearson correlation coefficient and linear regression were computed to identify the correlation and impact of gadget use on sleep

quality among health science students.

#### RESULTS

We included 243 students in this study. The mean age of the students was 20.85 +/- 4.73. The majority of the participants (73 %) were females, and almost equal percentages of the students were from Nursing (34.9%), Physiotherapy (32.8%), and Pharmacy (32.4%) courses. The majority of the participants (60%) stayed in the hostel.

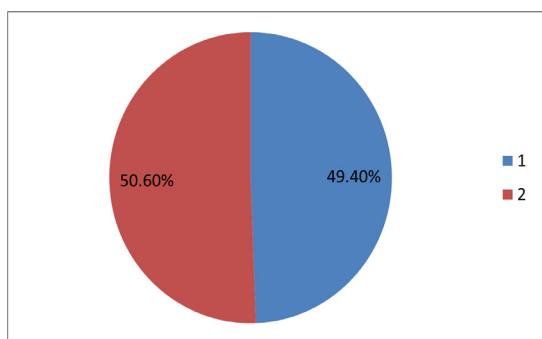
All the participants owned mobile phones, and a small percentage used laptops (3.3%) and tablets (0.4%) at night. The majority (69.7%) of the participants reported using gadgets for fewer than 2 hours at night, 22.8% of them were using the gadgets for 2-4 hours, and 7.5 % of the students were using them for more than 5 hours. The most reported purposes of nighttime gadget use among the students were watching movies (43.6%), communication (36.1), and academic use (20.3%). YouTube (35%) and WhatsApp were the applications used most commonly by the students. The majority of the students (51.9%) reported a habit of placing their cell phones at the bedside during the night most of the time, and 38.6 % of the subjects reported checking their phones at night frequently. The table also depicts that 42%

**Table 1: Percentage distribution of students based on the pattern of nighttime gadget use**

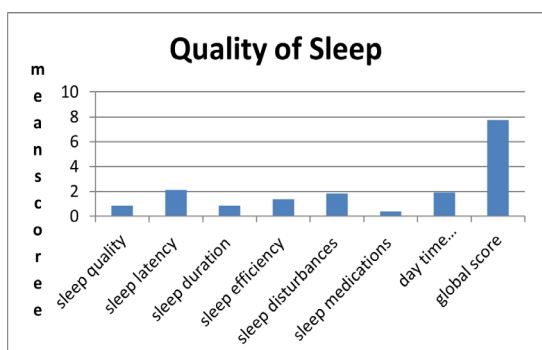
Items related to nighttime gadget use	Rarely	Occasional	Most of the times	Always
Phone placement at bedside	13 (5.3%)	43 (17.7%)	126 (51.9%)	61 (25.1%)
Phone check at night	124 (51%)	25 (10.3%)	74(30.4 %)	20 (8.3%)
Electronic device use at night time	67(27.6%)	74 (30.4%)	69 (28.4%)	33(13.6%)
Staying up late at night	100 (41.1%)	98 (40.2%)	34 (14.1%)	11(4.6%)
Silencing of the phone before sleep	51 (20.9 %)	48(19.8%)	78 (32.1 %)	66(27.2%)
Waking up by calls	130 (53.5%)	82 (33.7%)	23 (9.5%)	8 (3.3%)

of the students (28.4 and 13.6 %) were using their gadgets before going to sleep, and 12.8% reported being woken up by calls. Very few students (20.9 %) keep their phones in silent mode during the night (Table 1).

An approximately equal proportion of students were good (49.4%) and poor sleepers (50.6%) (Figure 1). The mean global score was  $7.74 \pm 3.009$ , and sleep latency ( $2.09 \pm 1.14$ ) and sleep disturbances ( $1.84 \pm 0.662$ ), and daytime dysfunctions ( $1.89 \pm 0.80$ ) were the domains with higher scores or sleep problems (Figure 2).



**Figure 1. Percentage distribution of students according to quality of sleep**



**Figure 2. Domain-wise mean scores of quality of sleep**

The results revealed that nearly an equal percentage of the students (20-30%) reported an impact of gadget use during their daytime activities, most of the time or always. The impact of nighttime gadget use included feeling sleepy in their classes (24.0%); feeling too tired to wake up (32.6%); experiencing difficulty in waking up (27.6%); having a decline in study performance (22.2%); being late for class (11.9%); having difficulty in concentration (17.7%); feeling tired at daytime

(21.0%) and missing classes (9.3%) (Table 2). Karl Pearson correlation coefficient was computed to determine the correlation between nighttime gadget use and quality of sleep among college students. The analysis revealed a significantly positive correlation between nighttime gadget use and sleep dysfunction among the students ( $r = 0.52$ ,  $p = 0.001$ ). Domain-wise analysis revealed a significant positive correlation between nighttime gadget use with sleep latency ( $r = 0.48$ ,  $p = 0.006$ ) and daytime dysfunction ( $r = 0.51$ ,  $p = 0.029$ ). The analysis also revealed a significantly positive correlation between nighttime gadget use and dysfunction in daytime activity ( $r = 0.46$ ,  $p = 0.001$ ). Linear regression was computed to determine the effect of nighttime gadget use on daytime activity. The habit of checking phones at night and staying up late at night was found to have a significant impact on day time activity of students (Table 3).

Linear regression analysis revealed that staying up late and waking up to calls significantly affected subjective sleep quality. Checking the phone at night and staying up late at night impacted sleep latency and the use of gadgets at night. Additionally, being woken up by calls significantly affected sleep duration (Table 4).

Checking a phone at night ( $p = 0.018$ ) significantly impacted daytime dysfunction. Not silencing the phone at night was associated with sleep disturbances ( $p = 0.001$ ) and the need for sleep medications ( $p = 0.04$ ). The habit of waking up by calls at night significantly impacted sleep efficiency ( $p = 0.043$ ) (Table 5).

## DISCUSSION

Gadgets have become an integral part of the life of students. India has emerged with the second-largest number of mobile phone users globally [11]. The present study found that all the students were using mobile phones. 7.5% of the students used gadgets at night for more than 5 hours, and 22.8% used them for 2-4 hours at night. Most of the students used the gadgets for non-academic purposes, such as watching movies (43.6%) and chatting with friends (36.1%). YouTube and WhatsApp were the most common applications used by health science students. Similar findings were reported in a study in which 39% of the students used their cell phones at night [7]. A

**Table 2: The frequency and percentage distribution of college students based on the impact of gadget use on daytime activity.**

Items related to daytime activity	Rarely	Some times	Most of the times	Always
Feeling sleepy in the class	62 (25.5%)	123 (50.6%)	39 (16.2%)	19 (7.8)
Feeling too tired to wake up	62 (25.5%)	102 (41.9%)	53 (21.8%)	26(10.8%)
Difficulty in waking up	79 (32.4%)	97 (39.9%)	46 (18.9%)	21( 8.7%)
Decline in study performance	66 (27.2%)	123 (50.6%)	42 (17.3%)	12 (4.9%)
Late for class	144 (59.3%)	70 (28.8%)	24 (9.9%)	5(2.0%)
Difficulty in concentration	77(31.7%)	123 (50.6%)	34 (14%)	9 (3.7%)
Feeling tired at day time	74 (30.4%)	118 (48.6%)	44 (18.1%)	7 (2.9%)
Missed class	138 (56.8%)	82 (33.7%)	20 (8.3%)	3 (1.2%)

**Table 3: Regression between the pattern of gadget use and impact on daytime activity**

Variables	Coefficient Beta	p-value
Phone placed at the bedside	0.139	0.027
Checking phone at night	0.129	0.04*
An electronic device used at nighttime before sleep	0.073	0.274
Silencing phone at night	-0.006	0.922
Staying up late at night	0.316	0.000*
Waking up to calls	0.04	0.525

study conducted on medical students in Andaman Nicobar Islands reported that 85.4% were heavy smartphone users [12]. Another study conducted in Karnataka among undergraduate students reported 55% of moderate gadget dependency and 45 % of high gadget dependency. The majority of them used social networking sites on their gadgets [13].

The mean age of the students was  $20.85 \pm 4.73$ . In students of this age, an increased vulnerability characterizes the period between 18- 20.4 years, driven by a desire to develop online friendships and an urge to use the latest technologies [14]. Since most of the students were hostellers, lack of parental control and monitoring could be another reason for this long-term use of gadgets at night [15]. In the present study, a significant proportion of students used their devices to watch a movie or entertainment, followed by communication

purposes and a lesser proportion for educational use. Similar findings have been reported by a study conducted on medical students in Punjab. Social interaction was the primary purpose of cell phone use among students [8].

The majority of the students reported a habit of keeping their phones at the bedside. A similar finding was reported by a previous study [8]. Thirty-five percent of the students admitted checking their phones during sleep, which indicates that habitual smartphone users may find it difficult to shut off their phones during the night. As reported by a previous study, most of the students used the gadgets before going to sleep, and they tended to stay up late at night using the devices [8].

The present study conveys that almost 50% of the students were poor sleepers (PSQI > 5), and the students had a problem with sleep latency, sleep

**Table 4: Regression between gadget use at night and subjective sleep quality, sleep latency, and sleep duration**

Items related to gadget use	Subjective sleep quality		Sleep latency		Sleep duration	
	Co-efficient Beta	p-value	Co-efficient Beta	p-value	Co-efficient Beta	p-value
Phone placement at bedside	0.016	0.82	0.016	0.124	0.107	0.78
Checking phone at night	0.039	0.604	0.039	0.014*	0.182	0.979
Electronic device used at night time before sleep	0.007	0.928	0.007	0.123	-0.113	0.044*
Silencing phone at night	-0.082	0.206	-0.082	0.167	-0.087	0.418
Staying up late at night	0.222	0.005**	0.222	0.003*	0.228	0.701
Waking up by calls	-0.032	0.04*	-0.032	0.161	0.196	0.044*

disturbances, and daytime dysfunction. Regression analysis revealed that staying up late at night and being awoken by calls and messages during sleep significantly impacted subjective sleep quality. A study conducted on university students also reported that increased use of technology at night resulted in more poor sleep quality. The study predicted that those students who could not set restrictions for their gadget use at night could ultimately be at high risk for psychological problems [16].

The study identified a significant positive correlation between the students' nighttime

gadget use and sleep dysfunction. Nighttime gadget use significantly affected sleep latency and daytime dysfunctions. The habit of checking one's phone at night and the late-night use of gadgets had a significant impact on sleep latency. The use of the devices at night and the practice of being woken up by calls had a considerable effect on the duration of sleep.

The habit of not silencing one's phone was significantly associated with sleep disturbances and the need for sleep medications. Checking one's phone at night contributed significantly to daytime dysfunctions ( $p = 0.01$ ). Staying up

**Table 5: Regression between gadget use at night and sleep disturbances, sleep medications, daytime dysfunctions and sleep efficiency**

Items related to gadget use	Sleep disturbances		Sleep medications		Daytime dysfunctions		Sleep efficiency	
	Coefficient Beta	p-value	Coefficient Beta	p-value	Coefficient Beta	p-value	Coefficient Beta	p-value
	Phone placement at bedside	0.05	0.472	0.004	0.951	0.003	0.968	-0.034
Checking phone at night	0.058	0.327	0.108	0.161	0.18	0.018*	0.092	0.233
Electronic device used at night time before sleep	-0.027	0.715	-0.077	0.31	-0.111	0.14	0.004	0.962
Silencing phone at night	-0.215	0.001**	-0.135	0.040*	-0.052	0.42	0.074	0.266
Staying up late at night	0.007	0.928	0.1	0.202	0.178	0.022*	0.026	0.023*
Waking up by calls	0.069	0.318	-0.026	0.713	-0.006	0.928	-0.102	0.043*

late at night significantly impacted both daytime dysfunction ( $p = 0.02$ ) and sleep efficiency ( $p = 0.023$ ). The habit of waking up to calls at night was associated with decreased sleep efficiency ( $p = 0.041$ ). Similar findings were reported by a study in which bedtime and daytime gadget use were associated with increased sleep latency, shorter sleep duration, and amplified sleep insufficiency [17]. These findings suggest that excessive gadget use during night hours will emerge as a significant causative factor of sleep disturbance and related problems among youth in the twenty-first century.

In the present study, 9.5% to 30.9% of the students reported nighttime gadget use affecting daytime activities most of the time or always. Nighttime gadget use was significantly positively correlated with daytime dysfunctions. Linear regression analysis revealed that checking the phone at night ( $p = 0.04$ ) and staying up late at night ( $p = 0.000$ ) significantly impacted daytime activity. A study conducted on medical students reported that late-night use of mobile phones had a significant association with difficulty in waking up, waking-time tiredness, a decline in study habits, difficulty in concentration, increase in the number of missed classes and more tardiness for classes [8]. A study on university students reported that more time spent on digital media at night was associated with reduced sleeping time [10]. Waking up in during the night to check their phones was reported to impact the quality of sleep among university students. This periodic checking of phones at night negatively impacts one's sleep cycle and can lead to daytime drowsiness [18].

Late-night use of phones decreases the ability of students to stay attentive during the daytime. The absence of sufficient sleep quality over a prolonged period of time can cause more sleep liability. This can result in negative consequences such as a decline in concentration, absenteeism, reduced attention, cognitive abilities, decreased interactive capabilities, trouble making a judgment, and low retention of short-term memory [19].

## CONCLUSION

The study indicated that unstructured use of electronic gadgets during nighttime is positively correlated with sleep dysfunction and significantly impacted health science students' daytime

activities. This could result in a cohort of sleep-deprived individuals who may not be able to perform up to their total capacity. Hence, effective measures are to be initiated to structure the use of technologies and channel the students' digital skills.

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