

Original Research Article

Effect of screen time and physical activity on sleep quality among adolescents

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ABSTRACT

Background: India houses the largest population of adolescents globally, with an estimated 253 million individuals between the ages of 10 to 19 years. Modifiable lifestyle behaviors such as physical activity, screen time use, and sleep patterns are important components of healthy life and have an impact on behavioral outcomes, performance-based outcomes, mental and emotional well-being, and the physical health of adolescents. The purpose of this study was to assess sleep quality and to determine its association with screen time and physical activity among adolescents.

Methods: A cross-sectional study was conducted among 317 study participants in Mysuru city, Karnataka. Convenience sampling technique was used for data collection. Descriptive statistics and association were analyzed using statistical package for the social sciences (SPSS) version 22.

Results: The study found 22.1% prevalence of poor sleep quality among study participants in Mysuru city, Karnataka. The average levels of screen times were higher on weekend than weekday. Moreover, specific types of screen time, such as small screen recreation on weekends and education and social activities on weekdays, were associated with poorer sleep quality. The study also observed physical activity, particularly during leisure time and travel is significantly associated with sleep quality.

Conclusions: The prevalence of poor sleep quality among study participants was significantly higher. Maintaining healthy sleep habits, incorporating yoga, meditation, or physical activity can effectively relax the mind and should be promoted in schools, and limiting the use of electronic devices before bedtime is crucial for improving sleep quality.

Keywords: Adolescents, Sleep quality, Physical activity, Screen time

INTRODUCTION

The phase of life from the age of 10 to 19 years is known as adolescence. It is a distinct period in the development of the human being and a crucial one for building the foundations of good health.¹ India houses the largest population of adolescents globally, with an estimated 253 million individuals between the ages of 10 to 19 years. This young and dynamic segment of the population represents every fifth person in the country.² Modifiable lifestyle behaviors such as physical activity, screen time use, and sleep patterns are important components of a healthy life and have an impact on behavioral outcomes, performance-based outcomes, mental and emotional well-being, and the physical health of children and adolescents. The health

status of adolescents is improved when they get sufficient sleep, spend less time sitting in front of screens, and engage in a lot of physical activity.³ The amount of time children and adolescents spend in front of devices like televisions, laptops, tablets, gaming consoles, and cell phones continuously increases.⁴ According to a recent survey, 35% of India's population had internet connectivity in 2017, and 92.8% of households owned mobile devices. In particular, more than two-thirds (67%) of internet users were between the ages of 12 and 29; 32% of them were between 12 to 19 age group.⁵ Children and adolescents who spend more time on screens have been found to have negative body composition, increased cardiometabolic risk, adverse behavioral conduct, worse fitness, and reduced self-esteem.⁴ Sufficient sleep is essential for the

development, growth, daily functioning, and health of children and adolescents.⁶ Insufficient sleep or sleep disturbances are becoming a worldwide issue for children and adolescents. The growth, development of cognition, learning, and general health of children and adolescents are all negatively impacted by insufficient sleep.⁵ Physical activity is defined by the World Health Organization (WHO) as "any bodily movement produced by skeletal muscles that requires energy expenditure." Walking, running, swimming, gymnastics, dance, ball games, and martial arts are all examples of physical activity other than sports.⁷ The World Health Organization (WHO) recommends children and adolescents aged 5 to 17 should engage in at least an average of 60 minutes per day of moderate to vigorous physical activity across the week.⁸ Physical activity is a crucial indicator of health in children and adolescents.⁹ Regular physical activity decreases the chance of childhood and adolescent overweight and obesity, as well as associated chronic diseases in the future.¹⁰ Better physical fitness can be achieved by encouraging physical activity, restricting excessive screen time, and increasing sleep duration.⁹ High levels of screen-based sedentary behavior and insufficient physical activity are linked to a wide range of physical and psychological conditions, which can have a severe impact on one's health and well-being.¹⁰

The purpose of this study was to assess sleep quality and to determine its association with screen time and physical activity among adolescents.

METHODS

Study design

It was a cross-sectional study.

Study area

The study was conducted at private pre-university colleges (JSS PU Colleges, SJCE and Ooty road campus) of Mysuru city, Karnataka.

Study population

Study population included adolescents both boys and girls of pre-university college of Mysuru city, Karnataka.

Inclusion criteria

Adolescents both boys and girls were included.

Exclusion criteria

People who do not consent to the study were excluded.

Study duration

The duration of the study was for 6 months (December 2023 to June 2024).

Sample size

Assuming the prevalence of adequate physical activity in adolescents as 29.7% from a previous study with a confidence interval of 95% and at an alpha level of 5%, it was determined that 317 adolescents need to be studied.

Sampling method

Convenience sampling method was used to complete the data collection. Face to face interview technique was used to collect information from the participants.

Data collection tool

Data collection tools consist four parts: basic socio-demographic details, Pittsburgh sleep quality questionnaire was used to assess the sleep pattern which has seven components and the seven components score were added to yield one global score, with a range of 0-21 points, "0" indicating no difficulty and "21" indicating severe difficulties. Adolescent sedentary activity questionnaire was used to assess the screen time, and global physical activity questionnaire was used to assess physical activity.

Data collection

The study was taking after conducting ethical clearance from the institutional ethics committee, JSS Medical College, Mysuru, Karnataka, India. After taking informed written consent from study participants the data was collected from those who were willing to participate in the study by face-to-face interview technique.

Data analysis

The data collected in this study was recorded and organized in Microsoft excel 2016 for storage and management. Subsequently, the data underwent statistical analysis using statistical package for the social sciences (SPSS) version 25. Descriptive statistical measures have been applied. Correlation and Chi-square test were performed to check the association.

Operational definitions

Physical activity

Any bodily movement produced by skeletal muscles that requires energy expenditure. Walking, running, swimming, gymnastics, dance, ball games, and martial arts are all examples of physical activity other than sports.⁷

Screen time

The time spent on viewing of TV/video, computer, electronic games, hand-held devices or other visual devices.¹¹

Substance abuse

Substance uses such as alcohol, tobacco products, drugs, inhalants that can be consumed, inhaled, and injected.¹²

RESULTS

Socio-demographic factors of the participants

The study surveyed 317 participants, 73.2% were between the age group of 16-18 years. The gender distribution was 57.7% male and 42.3% female. Most participants were Hindu (95.9%), with smaller percentages of Muslims (3.5%) and Christians (0.6%). The majority came from nuclear families (70.7%) and had at least one sibling (83.3%). Using the modified BG Prasad classification, most participants were classified as upper middle class (34.1%). Most parents had completed high school. Regarding BMI, 53.6% of participants had a normal BMI, 30% were underweight, 12.9% were overweight, and 3.5% were obese. Substance use was reported by 9.5% of participants (Table 1).

Assessment of sleep quality

Based on responses to PSQI questionnaire, the pattern of sleep assessment showed that about 15.7% of adolescents rated their subjective sleep quality to be “fairly bad or vary bad”. 62.1% had a sleep duration of 6-7 hours per day. 37.2% participants reported sleep disturbance due to factors like waking up at night, using the bathroom, breathing difficulties, snoring, temperature discomfort, bad dreams, pain or other reasons. About 12.6% reported using sleep medications. 53.6% participants experienced daytime dysfunction due to sleep disturbances and inadequate sleep. About 47.3% participants had a sleep latency of less than 15 minutes. 1.6% had a sleep efficiency of less than 75%. Mean global PSQI score was 3.74 ± 2.55 , with a median and mode of three and two respectively, and a maximum score of 14 (Table 2).

The calculation of global PSQI scores revealed that 22.1% of participants had poor sleep quality (Figure 1).

Assessment of physical activity

Regarding the intensity of activities, 25.6% of participants engaged in vigorous activities and 64% in moderate activities during work or school, with both intensities averaging four days per week. However, vigorous activities had a longer average duration of 2.5 ± 6.5 hours per day. 86.8% of participants walked or cycled for travel purposes, averaging 5.1 ± 1.9 days per week and 0.74 ± 0.58 hours per day. During leisure time, 57.7% participated in vigorous activities and 80.4% in moderate activities, with averages of 4.2 ± 1.8 and 5.3 ± 1.9 days per week, respectively, and similar durations of 1 ± 0.67 and 0.92 ± 0.56 hours per day (Table 3).

Table 1: Socio-demographic characteristics of the study participants.

Socio-demographic factors	Frequency	Percentage
Age group (years)		
13-15	85	26.8
16-18	232	73.2
Gender		
Male	183	57.7
Female	134	42.3
Religion		
Hindu	304	95.9
Muslim	11	3.5
Christian	2	0.6
Area of living		
Mysuru (urban)	317	100
Types of family		
Nuclear family	224	70.7
Joint family	93	29.3
Number of sibling		
No sibling	53	16.7
≥ 1	264	83.3
Socio-economic status		
Lower class	28	8.8
Lower middle class	69	21.8
Middle class	54	17
Upper middle class	108	34.1
Upper class	58	18.3
Father education level		
Illiterate	27	8.5
Primary school	29	9.1
Middle school	20	6.3
High school	124	39.1
Intermediate	41	12.9
Undergraduate and above	76	24
Mother education level		
Illiterate	27	8.5
Primary school	34	10.7
Middle school	30	9.5
High school	122	38.5
Intermediate	51	16.1
Undergraduate and above	53	16.7
Father occupation		
Government employee	32	10.1
Private employee	282	89
Father death	3	0.9
BMI		
Underweight	95	30
Normal	170	53.6
Overweight	41	12.9
Obesity	11	3.5
Substance use		
Yes	30	9.5
No	287	90.5

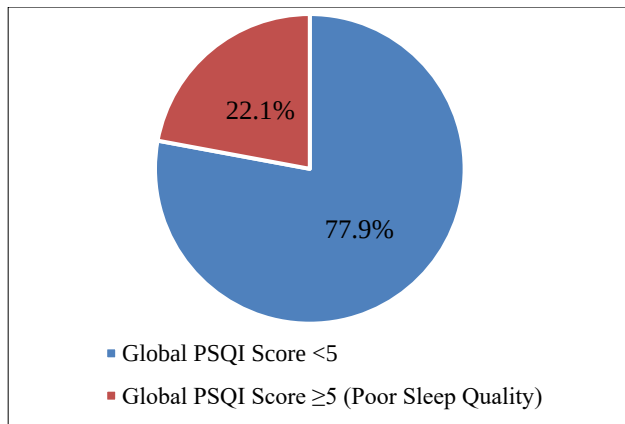


Figure 1: Prevalence of sleep quality based on PSQI scores.

Assessment of screen time

Based on responses to ASAQ questionnaire, the assessment of screen time showed variation across different categories and between weekdays and weekends. Small screen recreation and education account for the most screen time, while travel takes up least screen time. Most activities show an increase in screen time during weekends, except for education and travel (Table 4).

Correlation between screen time and sleep quality

The table present correlation between different categories of screen time and sleep quality, as measured by the PSQI, on both weekend and weekdays. On weekends, small screen recreation shows a significant positive correlation with PSQI ($r=0.149$, $p=0.008$), indicating poorer sleep quality, while education, travel, cultural activities, and social activities do not show significant correlation. On weekdays, education ($r=0.142$, $p=0.012$) and social activities ($r=0.167$, $p=0.003$) have significant positive correlation with PSQI, suggesting poorer sleep quality, whereas small screen recreation, travel, and cultural activities do not show significant correlations. These results suggest that certain types of screen time, particularly small screen recreation on weekends and education and social activities on weekdays, are associated with poorer sleep quality (Table 5).

Table 2: Distribution of sleep quality based on Pittsburgh sleep quality index (PSQI).

Components of PSQI	Frequency	Percentage
Subjective sleep quality		
Very good	155	48.9
Fairly good	112	35.3
Fairly bad	34	10.7
Very bad	16	5
Sleep duration (hours)		
>7	112	35.3
6-7	197	62.1
5-6	5	1.6
<5	3	0.9
Sleep disturbance		
Not during the past month	199	62.8
Less than once a week	59	18.6
Once or twice a week	40	12.6
Three or more time a week	19	6
Sleep medications		
Not during the past month	277	87.4
Less than once a week	25	7.9
Once or twice a week	12	3.8
Three or more time a week	3	0.9
Daytime dysfunctions		
Not during the past month	147	46.4
Less than once a week	118	37.2
Once or twice a week	43	13.6
Three or more time a week	9	2.8
Sleep latency (minutes)		
<15	150	47.3
16-30	122	38.5
31-60	26	8.2
>60	19	6
Habitual sleep efficiency (%)		
>85	298	94
75-84	14	4.4
65-74	5	1.6

Table 3: Distribution of physical activity based on global physical activity questionnaire (GPAQ).

Activity	Response	Percentage	Number of days	Duration (hours)
Vigorous intensity activity during work	Yes	25.6	4±1.9	2.5±6.5
	No	74.4		
Moderate intensity activity during work	Yes	64	4±1.7	0.9±0.6
	No	36		
Activity during travel	Yes	86.8	5.1±1.9	0.74±0.58
	No	13.2		
Vigorous intensity activity during leisure	Yes	57.7	4.2±1.8	1±0.67
	No	42.3		

Continued.

Activity	Response	Percentage	Number of days	Duration (hours)
Moderate intensity activity during leisure	Yes	80.4	5.3±1.9	0.92±0.56
	No	19.6		

Table 4: Distribution of screen time based on adolescent sedentary activity questionnaire (ASAQ).

Categories	Week days	Weekend days
Small screen recreation	2.4±1.2	2.8±1.5
Education	2±0.4	1.8±0.9
Travel	0.3±0.25	0.2±0.5
Cultural activities	0.9±1.7	1.3±0.4
Social activities	0.9±0.7	1.7±0.83

Association between physical activity and sleep quality

The table present association between various types of physical activity and sleep quality. Vigorous intensity activity during work/school shows a near-significant association with sleep quality ($p=0.058$), while moderate intensity activity during work/school does not show a significant association ($p=0.100$). Activity during travel is significantly associated with better sleep quality ($p=0.000$). Vigorous intensity activity during leisure also shows a significant association with sleep quality

($p=0.042$), as does moderate intensity activity during leisure ($p=0.000$). These results suggest that physical activity, particularly during leisure time and travel is related to better sleep quality (Table 6).

Table 5: Correlation between screen time and sleep quality.

Categories of screen time	PSQI	
Weekend day's	r	P
Small screen recreation	0.149	0.008
Education	0.32	0.568
Travel	-0.058	0.305
Cultural activities	-0.007	0.897
Social activities	0.116	0.39
Week day's		
Small screen recreation	0.011	0.851
Education	0.142	0.012
Travel	0.009	0.878
Cultural activities	-0.021	0.714
Social activities	0.167	0.003

Table 6: Association between physical activity and sleep quality.

Physical activity	Response	PSQI		Chi-square value	P value
		<5	≥5		
Vigorous intensity activity during work/school	Yes	57	24	3.60	0.058
	No	190	46		
Moderate intensity activity during work/school	Yes	164	39	2.70	0.100
	No	83	31		
Activity during travel	Yes	230	45	39.44	0.000
	No	17	25		
Vigorous intensity activity during leisure	Yes	150	33	4.12	0.042
	No	97	37		
Moderate intensity activity during leisure	Yes	219	36	48.06	0.000
	No	28	34		

DISCUSSION

This is the first study of its kind conducted in the Mysuru city and addresses an important issue of quality of sleep, physical activity, and screen time among adolescents. This study investigated the relationship between physical activity, screen time, and sleep quality among adolescents. Findings revealed that both physical activity and screen time significantly influence sleep quality, emphasizing the need to promote physical activity and reduce screen time to enhance adolescents sleep quality. In this study, the prevalence of poor sleep quality among the study participants in Mysuru city was found to be 22.1% (by using PSQI). This prevalence rate was lower than the prevalence estimated by Kumari et al in Uttarakhand (66%).¹³ The mean global PSQI scores in the present study

(3.74±2.55) were also reported to be lower than most of the other studies such as by Kaur et al (4.77±2.51), Xianchen et al (5.26±2.38), Kumari et al (5.78±2.55), and Shad et al (6.45±2.85).¹³⁻¹⁶ The present study found that the average levels of screen time are higher on weekend than weekday. Similar finding was reported by Sanz-Martin et al and Kjellenberg et al.¹⁷ Moreover, specific types of screen time, such as small screen recreation on weekends and education and social activities on weekdays, were associated with poorer sleep quality. Some studies have either found that physical activity was positively associated with sleep quality or that there was no significant association.¹⁸ The current study observed physical activity, particularly during leisure time and travel is significantly associated with sleep quality.

Adolescents are advised to maintain healthy sleep habits by adopting strategies to manage daily stress. Incorporating yoga, meditation, or physical activity can effectively relax the mind and should be promoted in schools. Additionally, limiting the use of electronic devices before bedtime is crucial for improving sleep quality.

CONCLUSION

The findings of this study revealed that the prevalence of poor sleep quality among study participant was 22.1%. The study found average levels of screen time are higher on weekend than weekday and specific types of screen time, such as small screen recreation on weekends and education and social activities on weekdays, were associated with poorer sleep quality. Additionally, the study observed physical activity, particularly during leisure time and travel is significantly associated with sleep quality.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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