Demographic correlates, lifestyle habits, and health effects of poor sleep quality in Indian adolescent girls living in a second-tier city

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ABSTRACT

Background: Insufficient sleep, poor sleep quality, and sleepiness are common problems related to learning, memory, and school performance. During puberty, sleep habits change earlier among girls in parallel to their earlier pubertal maturity. The changes occur during adolescence in response to maturational changes and increased autonomy and independence. **Aims and Objectives:** This study aims to estimate the prevalence of poor sleep quality among adolescent girls in a second-tier city. **Materials and Methods:** Cross-sectional observational study conducted in 150 school-going adolescent girls from three different schools in a second-tier city. The study was conducted using the Pittsburgh Sleep Quality Index scale for assessment of the quality of sleep and an investigator designed pro forma to analyze various lifestyle habits. Kutcher Adolescent Depression Scale 6 was used to address the depressive symptoms. **Results:** Prevalence of poor sleep quality was 9.2%. Pre-bed screen time of >30 min was found in 53% of girls with poor sleep quality. Overweight girls also have poor sleep quality. Good grades (>90% marks in examinations) were associated with poor sleep quality. About 8.3% of girls with poor sleep quality have one or more symptoms pertaining to depression. **Conclusion:** The pre-bed screen time of more than 30 min in the form of any electronic screens leads to poor sleep quality and poor sleep quality is significantly associated with being overweight. Poor sleep quality is also associated with some symptoms of depression. These all are observed in the girls living in a tier two city, awareness among adolescent girls must be spread to decrease the screen time and they should also be encouraged for better sleep hygiene.

Key words: Adolescent; Sleep quality; Screen time; Adolescent girls; School

INTRODUCTION

The World Health Organization defines adolescence as a period from 10 to 19 years of age which is further classified as early (10–13), mid (14–16), and late (17–19) adolescence. This is a phase of development in many formats, from reproductive maturity to the development of analytical processes and adult identity. Sleep duration varies constantly throughout the entire childhood. Before puberty, insomnia has been found to be equally common in boys and girls. During puberty sleep unfold earlier among girls, in parallel to their pubertal development. Calhoun et al. have shown that the prevalence of insomnia symptoms peaks in girls ages 11–12 years and is associated with objective sleep disturbances.[1] Possible explanation is due to the influence of hormonal changes in the sleep-wakefulness activity.[2] The menstrual cycle of adolescents is characterized by hormonal changes, and changes in the levels of secretion of the hormones melatonin and cortisol, which are susceptible to negative influence in better quality of sleep and adversely affecting the quality of sleep.[3]

Sleep is an area that has been underrated especially in the pediatric and adolescent population. It has been known to be related to various sociodemographic factors and lifestyle and different aspects have been studied in previous

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studies. The low level of physical activity, inappropriate diet, excessive time in front of electronics, overweight/ obesity, and low aerobic activities have been associated with poor sleep quality in adolescents.[4,5] However, this study aims at identifying the factors more relatable to this era of social media, to identify any increase or decrease in prevalence or association, and also the less known factors that significantly affecting the sleep habits. We have also studied the effect of this poor sleep quality on various aspects of health. Better quality of sleep is associated with better performance in academics and various aspects of personal life. This gains significance because Curcio et al. have shown that insufficient sleep, poor sleep quality, and sleepiness are common problems related to learning, memory, and school performance.[6]

Aims and objectives

This study aims to estimate the prevalence of poor sleep quality among adolescent girls in a second-tier city. And the association of poor sleep quality with various lifestyle habits–Total and pre-bed screen time per day, duration of transport to school, dietary habits, mode of transport, physical activity per day, and menstrual irregularities. This also aims at identifying the effect of poor sleep quality on physical and psychosocial health–body mass index (BMI), menstrual abnormalities, and depressive symptoms.

MATERIALS AND METHODS

This is a cross-sectional school-based analytical study performed in 2021 which included 150 adolescent girls from 10 through 19 years of age from three schools, out of which two were government aided and one private school from a second-tier city in central India. Schools were selected after making a list of schools in a radius of 3 k.m from our institute and then using a table of random numbers for selecting schools. The sample size was calculated using the formulae $n = \dfrac{4\,pq}{d^2}$ with 5% significance and 3% absolute error and the 150 subjects were selected using simple randomization. Out of the 150 students analyzed, six were excluded from the analysis, because they did not respond to the question regarding the perception of the quality of sleep, resulting in 144 students. The study was approved by the ethical committee with informed and written consent from the participants and the school representatives. The dependent variable was the subjective perception of the quality of sleep, measured through the item that integrates the questionnaire "PITTSBURGH SLEEP QUALITY INDEX."[7] This is a highly valuable sleep assessment tool that can be applied in the adolescent age group. It's a 19-item self-report instrument with global score >5 indicating "poor sleeper," and it has been shown to have a diagnostic

sensitivity of 89.6% and a specificity of 86.5% and includes questions related to "sleep initiation," "sleep maintenance" and questions regarding problems during awakening.

Assessment of depressive symptoms using Kutcher adolescent depression scale (KADS) - 6 was done. The KADS is a self-report scale specifically designed to diagnosis and assesses the severity of adolescent depression, and versions include a 16-item, 11- item, and an abbreviated 6-item scale. A score above 6- possible depression while a score below 6- is probably not depressed.[8]

50 Sample collected from school A

50 Sample collected from school B

50 Sample collected from school C

$\downarrow$

PSQI, KADS and investigator designed questionnaire filled

General physical examination and anthropometric evaluation done

$\downarrow$

6 responses rejected $\longrightarrow$

144 SAMPLE

Data processed using STATA®

The lifestyle was assessed using investigator designed questionnaire requesting for age, class of study, grade in the last exam, travel distance from residence to school, mode of transport, age of menarche, menstrual irregularities, history of drug intake, duration of outdoor physical activity per day, total and pre-bed screen time per day and any known medical history. Health characteristics were assessed by measurement of anthropometry. Three measures of each anthropometric variable were taken and the average of each one was used. The variable index of (BMI = body weight in kg/height in m^2) was used to identify the nutritional status of the individual.

The values obtained were categorized and analyzed using STATA® software.

RESULTS

The average age of the study population is 14.8 (±1.8) years. Out of the total number of adolescents assessed 53.8% of the study population is from mid adolescent

age group. The mean BMI of the population is 19.8. The average duration spent outdoors by the population is >30 min with an average duration of travel from residence to school is <30 min (74.6%) of the respondents. None of the adolescent girls had any history of drug abuse although 2.3% had a history of drug intake for medical conditions. Mode of >30 min is spent in front of the screen before sleep. Approximately, three-quarters of the adolescents consume a vegetarian diet. Mean SD grade obtained in the last exam by the respondents is 84.8±7.3 (more than average).

The associations of poor sleep quality with various demographics such as age, academic performance, travel distance, and mode of transport are depicted in Table 1.

The results of the association of poor sleep quality with various lifestyle habits of the study group are demonstrated in Table 2 and the rate of association is given by odds ratio.

The prevalence of poor sleep quality as assessed by PSQI is 9.2% being equal in the early and mid-adolescent age group. Poor sleep quality is higher in adolescent girls with a BMI of overweight (P=0.001), who has obtained more than 90% grades in the last exams, and in 8.3% of individuals with menstrual irregularities. No significant sleep disturbance was noted with the difference in mode of transport. The crude analysis demonstrated that for the female adolescents, those who had pre-bed screen time of more than 30 min had poor sleep quality and those who had a vegetarian diet also had poor sleep quality. Those with low aerobics were more likely to have good-quality of sleep.

The effects of poor sleep quality on health parameters are depicted in Table 3.

Figure 1 depicts the odds ratio of sleep quality with various factors. Higher the odds ratio, the greater is the association of correlates with poor sleep quality.
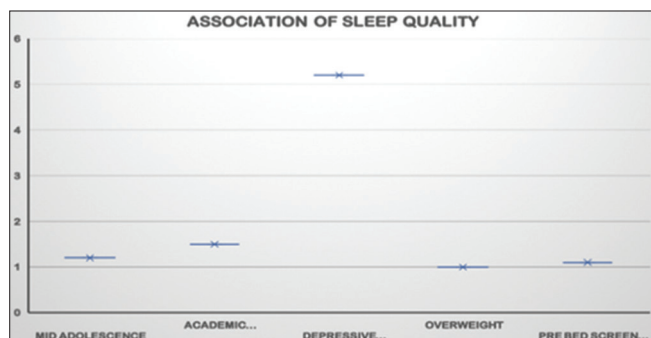

Figure 1: Odds ratio of sleep quality with various factors

DISCUSSION

The American Academy of Sleep Medicine recommends the duration of sleep must be at least 9 h/24 h for children and 8 h/24 h for adolescents optimal for school nights. The present study aimed to estimate the prevalence of poor sleep quality and to identify the association between poor sleep quality with demographic factors, lifestyle, BMI, and depressive symptoms in adolescent girls.

Table 1: Association of sleep quality with demographic factors

Characteristics	Categories	PSQI >5 (%)	P-value	Odds ratio
Age	10–13 years	50.0	0.81	1.2
	14–16 years	50.0		1
Grade	70–79 average	25.0	0.93	1
	80–89 good	33.3		1.1
	90–100 excellent	41.7		1.5
Travel distance	>30 min	8.3	0.15	<1
	<30 min			>1
Mode of transport	Walking	33.3	0.53	2.4
	Self-vehicle	25.0		
	Auto	33.3		1.8
	Others	8.3		0.6

PSQI: Pittsburgh sleep quality index

Table 2: Association of sleep quality with lifestyle habits

Characteristics	Categories	PSQI >5 (%)	P-value	ODDS ratio
Diet	Vegetarian	66.7	0.30	1.9
	Non-veg	33.3		0.8
Outdoor activity	<30 min	8.3	0.20	0.3
	>30 min	91.7		3.5
Pre-bed screen time	>30 min	58.3	0.79	1.1
	<30 min	41.7		0.09
History of drug intake	Present	0.0		1
	Absent	100.0	1.00	0.1

PSQI: Pittsburgh sleep quality index

Table 3: Effect of poor sleep quality on health parameters

Characteristics	Categories	PSQI >5 (%)	P-value
BMI	<18.5	8.3	0.001
	18.5–24.9	16.7	
	25–29.9	75.0	
	30–34.9	0	
Depressive symptoms	KADS <6	97.7	0.25
	KADS >6	3	

KADS: Kutcher adolescent depression scale, BMI: Body mass index

Association with demographics

Our study shows that with reference to age and sleep quality, it is equally affecting both early and mid-adolescent age groups. The previous studies in tier-one cities have shown that the possibility of sleep disturbances in adolescents increases with an increase in age. Other than biological variations that take place in mid-adolescence, increased autonomy or independence along with increased academic concerns may contribute to this increased prevalence starting from mid-adolescence age group. Dubey et al. conducted a study in the adolescent age group in a resettlement colony, New Delhi, India, where the adolescents of age group equal to and >15 years have higher odds of having poor sleep quality than those younger than 15 years of age.[9] In our study, on second-tier city, the difference was not observed and could be because of delay in the development of autonomy among the adolescent girls. Moreover, this delay in incidence among late adolescence could not be assessed because this was a school-based study and most of the late adolescents have entered higher education. Another possibility would be that in big cities in developing countries, the problems of noise pollution are more acute, causing discomfort and interfering negatively with the realization of basic activities and tasks, like sleep.[10]

In our study of adolescents with poor sleep quality majority of them have a travel distance from residence to school of <30 min. This is because most of the study subjects have their residency near the school premises. The delaying of school start times could extend adolescent school night sleep duration and lessen their need for catch-up sleep on weekends.[11] It has been documented that long-distance commutation not only increases the stress level.[12] but also leads to sleep deprivation.[13] among daily commuters. Similarly, students who have to daily commute a long distance from their home to school have been found to spend less time in bed leading to restricted sleep among school students pursuing their studies in morning schools.[14] This issue could gain importance, especially in areas where students have to travel longer distances to pursue quality higher education.

With regard to the association of poor sleep quality with academic performance, there are many studies supporting multiple facts. With concern to our study, the odds ratio of poor sleep quality with excellent academic performance is >1. Students who are more concerned with their academic performance could end up compromising their sleep.

Association with life-style habits

Regarding screen time, our analysis demonstrated that for the female adolescents, those who had pre-bed screen time of more than 30 min had poor sleep quality. There is a direct relationship between exposure to the screen and low quality of sleep because such exposure to artificial light on the screen affects the circadian cycle and negatively influences the quality of sleep.[5] The American Academy of Pediatrics recommends no more than 2 h of screen time for children and adolescents and no screen time for children <2 years of age. In this era of COVID and the increasing trend of digital education, limiting screen time to a certain duration per day is not possible. However, students should be constantly under parental supervision regarding the information they are exposed to. The Indian Academy of Pediatrics recommends parents to balance screen time with other activities that are required for overall development.

In consistent with the previous studies, 79.7% of the vegetarian adolescent girls had good sleep quality as assessed with PSQI. One of the possible reasons for that is the high isoflavone content in plant protein. A few studies[15] have shown that a high intake of that element is related to a lower risk of excessively long sleep (longer than 9 h) and a lower risk of falling asleep during the day among women. Another substance that may exert a positive impact on sleep is tryptophan.

Effect on physical and mental health

Overweight and obesity are a major issue on a rising trend in this century, especially among children and adolescents in developing countries like India. Study on obesity prevention behaviors in Asian Indian adolescent girls: A pilot study reveals that poor sleep quality assessed by PSQI was associated with higher diastolic blood pressure and greater BMI.[16] This is in accordance with our study where overweight is significantly associated with poor sleep quality. Identifying this problem is important because it is a modifiable risk factor that may contribute to a better quality of lifestyle when intervened at this point. The outdoor physical activity of the child especially a female child starts to decrease at this point of life. School health programs should also include awareness of parents regarding the importance of physical activity and its effect on various aspects of health including sleep.

Given the well-established relation between sleep and many psychiatric disorders such as depression or anxiety,[17] the side effects of adolescent sleep debt on mental health are not surprising. Our study describes that 8.3% of individuals with poor sleep quality have depressive symptoms as assessed by KADS. Minor differences could be because of the tools used in the assessment of depressive symptoms in various studies. The debating part is that whether sleep disturbances lead

to depressive symptoms or depressive symptoms lead to inadequate sleep. Our study is limited to the development of depressive symptoms secondary to sleep issues. Besides depressive symptoms, mental health issues such as anxiety were also common. This could reflect in the child's academic performance and social life. In the study conducted on school-going adolescent girls of Gujarat by Mangal et al., it's been observed that out of 93 adolescent girls with abnormal sleep patterns 65 of them (69%) have been found to have mental health issues.[18]

The limitation of this study was that reporting of the quality of sleep was done subjectively by the respondents. The poor quality of sleep can be caused by inadequate duration of sleep (that could have been assessed by polysomnography), sleep disorders, environmental factors, and parenting habits were not investigated.

To conclude, this research presents an important contribution to the health area, since it identified susceptible groups with low quality of sleep and modifiable factors associated with this condition in adolescent girls. Interventions in the school environment, and home environment such as the increase in sports practices for these students, parents and guardians counseling, restriction of screen time per day fostering the importance of maintaining habits that promote the quality of sleep, as regularity in the sleep time and restriction of activities that promote great attention and service in periods that precede the sleeping moment, would possibly improve the quality of sleep.

CONCLUSION

The poor sleep quality in adolescent girls of tier 2 city is now identified and it is seen that poor sleep quality is associated with screen time. Steps to be taken by parents to decrease the screen time before sleep time so it can improve the sleep quality in adolescent girls. Physical activities in the form of exercise and regular sport activity can help in improving the sleep quality in adolescent girls.

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