Is sleep hygiene the most neglected hygiene among adolescents? A school based comparative cross-sectional study from Kerala, India

Geethu Mathew[1], *Aby Dany Varghese[2], Sruthy C S Kumar[3], Koshy M Cherian[3], Bichu P Babu[3], Pramod Thomas[3], Anoop Ivan Benjamin[3]

Abstract

Background: Sleep hygiene is an important determinant of sleep, encompassing simple behavioural and environmental factors intended to promote healthy sleep

Objectives: To assess and compare various aspects of sleep hygiene among adolescent schoolchildren in different types of schools in an urban area of Kerala, India and assess the factors associated with sleep hygiene practices.

Method: A school based cross-sectional study was conducted among 657 adolescents in the Pathanamthitta District, Kerala, India. All adolescents in high school and higher secondary classes were included using stratified random sampling based on the type of school (government, government-aided or private). Study tool was a self-administered questionnaire which included sociodemographic data and Adolescent Sleep Hygiene Scale (ASHS) to collect information on sleep hygiene practices.

Results: In this study, 657 students were enrolled from government, government-aided and private schools. Mean age of participants was 15.09 ± 1.33 years. Mean ASHS score was 4.49 ± 0.52. Only 16.4% had good sleep hygiene. Sleep hygiene in the sleep stability (differences in sleep duration between weekdays and weekends) and bedtime routine domains were found to be poor. Nearly 85% used electronic devices one hour before sleep. Higher age (r= -0.242, p<0.0001), class (χ^2=20.39, p<0.0001), maternal education (r= -0.242, P <0.0001), family income (F=4.18, p=0.016), private school (χ^2=21.69, p<0.0001)) and chronic illness (χ^2 =7.244, p <0.0001) were associated with poor sleep hygiene. Good sleep hygiene practices were associated with good academic performance.

Conclusions: In this study only 16.4% of adolescent schoolchildren in an urban area of Kerala, India had good sleep hygiene. Sleep stability and bedtime routine domains were poor compared to other domains. Type of school, age, family income, maternal education and chronic illness were associated with sleep hygiene. Primary prevention approach aimed at promoting good sleep hygiene practices among adolescents should be encouraged.

(Key words: Sleep, School, Adolescents, Private school, Public school)

[1]*National Institute of Occupational Health - Regional Occupational Health Centre, Indian Council of Medical Research, India,* [2]*NITTE (Deemed to be University), K S Hegde Medical Academy, India,* [3]*Believers Church Medical College Hospital, Kerala, India*
Correspondence: abydany@gmail.com

https://orcid.org/0000-0002-0921-1248

Introduction

Sleep is a basic biological process and is essential for ideal physical, cognitive, emotional functioning and healthy development of a child[1,2]. Sleep patterns in adolescents need adequate attention because of the potential impact on academic performance, social behaviour and cardio-metabolic system[1,3,4]. Inadequate sleep time in adolescents is related to intrinsic and extrinsic factors. Intrinsic factors like shift in circadian rhythm during puberty and extrinsic factors like early school start times, poor sleep hygiene and using electronic devices around bedtime, adversely affect adolescent sleep time[5]. Students are frequently not aware that sleep deprivation influences their cognitive functioning and can perpetuate chronic sleep difficulties[6-8].

Sleep hygiene is an important determinant of sleep, encompassing simple behavioural and environmental factors intended to promote healthy sleep[6]. These behaviours include reduced consumption of caffeine, emphasis on regularity of sleep-wake patterns, regular exercise, duration of daytime napping, not using electronic devices in bed

and following a bedtime routine[5,7,9]. Good sleep hygiene is a predictor of sleep quality and is also recommended as a component of multimodal treatment of patients with insomnia[6,10]. Direct involvement of a clinician in sleep hygiene education is not needed. This can be disseminated as a relatively cheaper lifestyle intervention to individuals needing it[7,11]. There is scanty knowledge regarding the sleep hygiene concept in India[12].

Objectives
To assess and compare various aspects of sleep hygiene among adolescent schoolchildren in different types of schools in an urban area of Kerala, India and assess the factors associated with sleep hygiene practices.

Method
This is a cross-sectional study conducted in a district of central Kerala. Participants for the study were enrolled using multistage stratified random sampling. Stratification was based on the type of school (government, government-aided and private). Totally, there were 65 schools which fulfilled the selection criteria (urban area and high school / higher secondary students). Out of the 65 schools 10 were government, 22 were government-aided and 33 were private. From the list of these schools, two government (due to inadequate sample in one school), one government-aided and one private school were randomly selected. Permission to conduct the study was obtained from the principal / management of the schools. If the first selected school principal/ in charge refused permission to conduct the study, another school was selected randomly. Following this, class divisions were randomly selected and all the students from the selected class division were included

Sample size calculation: As there were no previous studies on this topic in Kerala, a prevalence of 75% of good sleep hygiene practices among adolescents was considered (in a study done in Indore) and 10% relative precision with 5% type 1 error and 10% non-response rate, lowest sample size was calculated and found to be 148[13]. Hence a minimum of 150 participants were selected from each category of schools.

All adolescent children studying in high schools and higher secondary classes in the selected divisions were included in the study. Adolescents who were absent on the day of data collection were excluded from the study. A team consisting of doctors (including a paediatrician), medico-social workers, and nurses, went to each school for data collection. Data were collected using a self-administered questionnaire which collected information on sociodemographic variables, morbidity and Adolescent Sleep Hygiene Scale (ASHS).

Questionnaire was also translated to local language Malayalam and back translation was done to ensure quality. After explaining objective of study, each question was explained to participants and they were instructed to fill the form. To ensure confidentiality and to minimize 'social desirability bias', questionnaire did not collect personal information like subject's name. Teachers and principal were requested not to be present during data collection as their presence might influence student's response to questions if they felt they were being watched. To avoid further bias, academic performance and attendance of students were taken using the student's roll number by an independent assessor who was not a part of the study. Their attendance and marks of examinations conducted during the study period were obtained.

ASHS: This is a 33-item instrument assessing sleep-facilitating and sleep inhibiting behaviours in adolescents in 8 conceptual domains (physiological, behaviour arousal, cognitive, sleep environment, sleep stability, daytime sleep, substance and bedtime routine). ASHS provides 8 subscale scores and an overall sleep hygiene score. Calculation of mean score was done so that total and subscale scores ranged from 1 to 6, higher scores indicating better sleep hygiene behaviours. Scores less than 4 were considered as poor, 4 to 5 as moderate and >5 as good[4,11].

Ethical issues: Study protocol was approved by the Institutional Ethics Committee of the Believer's Church Medical College (No. IEC/01/3/2017). Permission to conduct the study was obtained from the principal / management of the schools. Written consent/assent was obtained from the study participants as well as from their parents/guardians.

Statistical analysis: Data was entered in a database in Excel with help of a data entry expert. Epi Info was used for analysis. Chi square test, ANOVA, and Pearson correlation coefficient were used as appropriate. Further, linear regression analyses were conducted on outcome variable (sleep hygiene) against explanatory variables (age, class, family income, morbidity, educational status of mother, type of school) which were found to be associated in bivariate analyses. $p < 0.05$ was considered statistically significant.

Results
Mean age of the participants was 15.09 ± 1.33 years. Among them, 365 (55.9%) were males. Some socio-demographic variables of students like family income (χ^2 test $= 198.9$, $p < 0.0001$), maternal education (F $= 105.6$, $p < 0.0001$), paternal education (F $= 146.1$, $p < 0.0001$), results (F $= 27.6$, $p < 0.0001$) were significantly different in different types of schools i.e., higher values in private school. Among

the students, 91 (13.8%) reported chronic illness. Details of sociodemographic variables are given in

Table 1. Respiratory problem was the commonest illness among students.

Table I: *Distribution of the respondents based on socio-demographic characteristics*

Variable	Categories	Government (*n=201*) Frequency	Aided (*n=242*) Frequency	Private (*n=214*) Frequency	Total (*n=657*) Frequency (%)
Class	High school	118	107	130	355 (54.0)
	Higher secondary	83	135	84	302 (46.0)
Gender	Male	117	140	110	367 (55.9)
	Female	84	102	104	290 (44.1)
Religion	Hindu	118	80	62	260 (39.6)
	Christian	79	153	147	379 (57.7)
	Muslim	04	09	05	18 (02.7)
Family type	Nuclear	147	138	112	397 (60.4)
	Three generation	45	82	83	210 (32.0)
	Joint	09	22	19	50 (07.6)
Monthly family income	< 10,000	176	120	41	337 (51.3)
	10,000 – 30,000	17	77	92	186 (28.3)
	>30,000	08	45	81	134 (20.4)
Educational status (mother) (n=601)	Up to 10th	42	09	01	52 (08.7)
	10th to 12th	144	152	59	355 (59.1)
	>12th	13	74	107	194 (32.2)
	Mean years of schooling	9.9 ± 2.1 years	12.9± 2.9 years	13.7±2.2 years	
Educational status (father) (n=585)	Up to 10th	67	25	3	95 (16.2)
	10th to 12th	118	130	53	301 (51.5)
	>12th	8	78	103	189 (32.3)
	Mean years of schooling	9.3 ± 2.1 years	11.83±2.7 years	13.8±2.3 years	
Attendance	< 90%	47	15	32	94 (14.3)
	≥90%	154	227	182	563 (85.7)
Examination scores (n=652)	< 30%	91	96	33	220 (33.7)
	30- 49.9%	59	66	77	202 (31.0)
	≥50%	51	75	104	230 (35.3)

The mean ASHS score of the students was 4.49 ± 0.52. Students were also classified as those with poor sleep hygiene (16.7%), moderate sleep hygiene (66.8%) and good sleep hygiene (16.4%). Sleep hygiene practices in the sleep stability domain (differences in the duration of sleep between weekdays and weekends) and bedtime routine factor (which deals with following a bedtime routine) were found to be poor compared to other domains. During the weekend, 503 (76.6%) students stayed up more than 1 hour past the usual bedtime. Similarly, 569 (86.6%) of them slept in more than 1 hour past the usual wake-up time. Only 169 (25.7%) were following a bedtime routine daily. Sleep hygiene scores in the substance factor domain (which deals with substance use like alcohol and tobacco) and sleep environment domains (which deals with environment in which we sleep like brightly lit room or noise etc.) were found to be good compared to other domains. Nearly 70% of them used to have drinks with caffeine after 6 pm and 20% of students had it daily. Out of 657 students, 556 (84.6%) used electronic devices like mobile phone 1 hour before sleep; 54.6% of students used their bed for things other than sleep like using mobile phone, doing homework etc. Among students, 70% felt they got insufficient sleep and only 94 (14.3%) students routinely did activities that helped them relax (such as having a bath/shower, listening to soft music). Out of 657 students, 124 (18.9%) did some physical activity / exercise >20 minutes daily and 57 (8.7%) exercise >20 minutes for a period of 5 days/week.

Also, 20% of the students were reportedly passive smokers (Table 2).

The sleep hygiene practices were significantly different across the 3 categories of schools selected ($\chi2$ test -21.69, p<0.0001). The prevalence of poor sleep hygiene practices among private school students was 21.5% in contrast to 11.5% in public school. Similarly, students belonging to high school (8th, 9th and 10th) had good sleep hygiene compared to higher secondary class (11th and 12th) students ($\chi2$ =20.39, p<0.0001). Students who did not report any chronic illness had better sleep hygiene compared to those who reported a chronic illness ($\chi2$ =7.244, p <0.0001). Students belonging to family income category of <Rs.10,000 were found to have better sleep hygiene scores compared to other categories (F = 4.18, p= 0.016). Further post hoc analysis was conducted and it was found that the sleep hygiene scores in income category of <10, 000 were significantly different from the >Rs.30, 000 category. Factors like age (r= -0.242, p<0.0001) and maternal education (r= -0.242, p <0.0001) were found to be negatively correlated to the sleep hygiene scores. Attendance percentages of the students were found to be positively correlated to the sleep hygiene scores (r =0.174, p<0.0001). Sleep hygiene scores were also found to be positively correlated with academic performance of the students in the government school (r=0.244, p<0.0001). However, this correlation was not statistically significant in other schools (Table 3).

Table 2: *Distribution of respondents based on Adolescent Sleep Hygiene Scale total and domain scores*

Domain	Mean score (SD)
Physiological Poor hygiene - 100 (15.2%) Moderate hygiene - 339 (51.9%) Good hygiene - 218 (33.2%)	4.41 (0.78)
Behavioural arousal Poor hygiene – 232 (35.3%) Moderate hygiene - 257 (39.1%) Good hygiene - 168 (25.6%)	4.15 (1.26)
Cognitive/emotional Poor hygiene - 225 (34.2%) Moderate hygiene - 303 (46.1%) Good hygiene - 129 (19.6%)	4.18 (1.00)
Sleep environment Poor hygiene - 44 (6.8%) Moderate hygiene - 215 (32.7%) Good hygiene - 398 (60.6%)	5.12 (0.75)
Sleep stability Poor hygiene - 367 (55.9%) Moderate hygiene - 209 (31.8%) Good hygiene - 81 (12.3%)	**3.54 (1.3)**
Daytime sleep factor Poor hygiene – 59 (9%) Moderate hygiene - 245 (37.3%) Good hygiene – 353 (53.7%)	5.11 (0.98)
Substance factor Poor hygiene – 13 (2%) Moderate hygiene - 22 (3.3%) Good hygiene - 622 (94.7%)	5.88 (0.53)
Bedtime routine factor Poor hygiene -379 (57.7%) Moderate hygiene - 109 (16.6%) Good hygiene- 169 (25.7%)	**3.29 (1.98)**
Total ASHS score (Mean of the domain scores) Poor hygiene – 110 (16.7%) Moderate hygiene - 439 (66.8%) Good hygiene - 108 (16.4%)	4.49 (0.52)

*SD – Standard deviation

Table 3: *Factors associated with sleep hygiene scores*

Variable	Categories	Sleep hygiene				Chi square, p value
		Poor	Moderate	Good	Total	
Type of school	Government Aided Private	23 (11.45%) 41 (16.9%) 46 (21.5%)	133 (66.2%) 155 (64.0%) 151 (70.6%)	45 (22.4%) 46 (19.0%) 17 (07.9%)	201 242 214	χ2 = 21.69 p <0.0001
Class	High school Higher secondary	39 (11.0%) 71 (23.5%)	247 (69.6%) 192 (63.6%)	69 (19.4%) 39 (12.9%)	355 302	χ2 =20.39 P <0.0001
Chronic illness	Yes No	22 (24.2%) 88 (15.5%)	61 (67.0%) 378 (66.8%)	08 (08.8%) 100 (17.7%)	91 566	χ2 =7.244 p <0.027

No association was observed between sleep hygiene and factors like gender, religion, type of family and paternal education. Further, we conducted multivariate linear regression analyses on outcome variable (sleep hygiene) against those variables which were found to be significant on bivariate analysis. We found significant association of sleep hygiene with age (beta= -0.080, p- value= 0.0001, confidence interval: -0.112 to -0.048), school type (beta=-0.127, p- value<0.0001, confidence interval: -0.180 to -0.074) and attendance (beta= 0.123, p-value= 0.041, confidence interval: 0.05 to 0.241). Multivariate analysis results showed that older students and private school students had poor sleep hygiene.

Discussion

Sleep hygiene practices and associated factors among 657 urban school going adolescents studying in 3 different types of schools are described in the study. Only 16.7% of the students were found to have good sleep hygiene practices. The results were similar to the study done in Indore where only a few students were found to have good sleep hygiene[13]. More than 50% of the students surveyed were found to have poor hygiene scores in the sleep stability domain. Weekend oversleep can contribute to the insufficient sleep during the week by circadian rhythm dysregulation and prolonging sleep onset latency during school nights[4,14-19]. Nearly 60% of the students did not follow a bedtime routine regularly. A previous study suggested that a consistent nightly bedtime routine, in and of itself, is beneficial in improving various aspects of sleep[20]. We found that

sleep hygiene practices in the environment domain and substance domain were good. Similar results were observed in the study done in Karnataka where the students reported good scores in the environment and substance abuse domain[12]. Another alarming finding is that nearly 85% of the students used electronic devices such as mobile phone before bedtime. This finding was also observed in other studies where more than 60% of adolescents and children used electronic devices before bedtime. There are studies that have shown the detrimental effect of screen-based media consumption and sleep due to factors such as time and psychological displacement, and effect of light emitted from devices[3,22]. Majority of students consumed drinks with caffeine after 6 pm which in turn can disturb their sleep cycle. Similar results were observed in other studies[3,18].

Sleep hygiene scores were found to be poor among the higher secondary and late adolescent age groups in our study. There were similar results of sleep disturbances and deprivation with increased age and grades in another study done to assess the sleep patterns among urban adolescents. As the Indian adolescents enter into a higher grade, they spend considerable time in completing school work, assignments, and projects and in addition, go for private tutoring. They also prepare for the entrance exams for getting admission to professional courses after finishing the 12th grade to further pursue their career. All these factors may be responsible for the poor sleep practices with increasing grades[4,17]. Good sleep hygiene practices were positively associated with good academic outcome among students from the government schools. This is also consistent with the existing literature as good sleep hygiene practices are a predictor of good sleep quality which in turn can help in improved memory and concentration. However, this association was not found to be significant in private and government-aided schools[3,13,15,22].

Another interesting finding was that adolescents studying in the government schools were reported to have good sleep hygiene compared to government-aided and private schools. Comparisons across different type of schools was not done in most of the studies. Poor sleep practices among private school students in our study could be due to the following factors. In Kerala, type of school is an indirect indicator of socio-economic status and most of the students belonging to the high socio-economic status attend private school. Most of the private schools here follow an early school starting time and late closing time compared to government schools. Patterns of examinations, academic pressure, peer pressure, real time parent's expectations to be a good academic performer make the circumstances more stressful for children especially in private schools. In

India, due to a lack of an adequate number of good schools to accommodate the increasing number of children, the system of selection is highly competitive. A study done in Kolkata, India among adolescents showed that more than 63% of them had academic stress and parental pressure to be a good academic performer was one of the main reasons behind that. It is also mentioned that all these stresses also affected adolescent sleep[23]. The competition among students in private schools is much more compared to that of government schools. There is tremendous pressure on their children by their parents to succeed because of their concern for the welfare of their children and their awareness of the competitiveness among students to get an admission into reputed institutions of the country so as to secure a sound future. This could have affected sleep hygiene practices of children in private school[13,18,23].

In our study higher parental education and family income were associated with low sleep hygiene scores among children. A study in Puducherry shared the same observation where sleep deprivation was more common among children belonging to high socio-economic class[19]. Both children and caregivers are unable to get adequate sleep due to our modern-day society. The ever-changing work schedules and night shifts of parents influence a child's bed time and sleep pattern. This in turn can result in decreased parental supervision especially among highly educated and may be a reason for the poor sleep practices among those children. A similar study in Pune, India explored the relationship between high socioeconomic status and adolescent sleep. It was found that the academic pressure on adolescents belonging to high socioeconomic status is higher compared to others which in turn greatly affected sleep of adolescents[24,25]. Another factor associated with poor sleep practices was the presence of chronic illness. Possible explanations are that chronic illness can affect sleep physiology and sleep patterns of children. In addition, higher rates of upper airway obstruction are observed among them which could affect their sleep. It is also possible that parental stress related to managing their child's chronic illness might contribute to poor implementation of sleep schedules[23,26]. There is a paucity of data from developing country settings to do comparisons[3,19]. In our study, gender, religion, type of family, and paternal education, were not associated with sleep hygiene practices among students.

Longitudinal and qualitative studies on this topic involving students, parents and teachers would yield better results. Similar studies for comparisons across regions should be done in rural areas. Primary prevention approach aimed at spreading adequate awareness regarding good sleep habits is required.

Parents and teachers should be sensitized regarding the importance of adequate sleep among children. School curriculum should emphasise the importance of sleep and should incorporate sessions on good sleep hygiene practices among children.

Conclusions
In this study only 16.4% of adolescent schoolchildren in an urban area of Kerala, India had good sleep hygiene. Sleep stability and bedtime routine domains were poor compared to other domains. Factors like type of school, age, family income, maternal education and chronic illness were found to be associated with sleep hygiene. Primary prevention approach aimed at promoting good sleep hygiene practices among adolescents should be encouraged.

References

1. John B. Sleep-patterns, sleep hygiene behaviours and parental monitoring among Bahrain-based Indian adolescents. *Journal of Family Medicine and Primary Care* 2015; **4**(2): 232-7.
https://doi.org/10.4103/2249-4863.154659
PMid: 25949973 PMCid: PMC4408707

2. John B, Bellipady SS, Bhat SU. Sleep promotion program for improving sleep behaviours in adolescents: A randomized controlled pilot study. *Scientifica (Cairo)* 2016; **2016**: 8013431.
https://doi.org/10.1155/2016/8013431
PMid: 27088040 PMCid: PMC4818821

3. Kaur H, Bhoday HS. Changing adolescent sleep patterns: Factors affecting them and the related problems. *Journal of the Association of Physicians of India* 2017; **65**(3): 73-7.

4. Gupta R, Bhatia MS, Chhabra V, Sharma S, Dahiya D, Semalti K, *et al.* Sleep patterns of urban school-going adolescents. *Indian Pediatrics* 2008; **45**(3): 183-9.

5. Chehri A, Khazaie H, Eskandari S, Khazaie S, Holsboer-Trachsler E, Brand S, *et al.* Validation of the Farsi version of the revised Adolescent Sleep Hygiene Scale (ASHSr): a cross-sectional study. *BMC Psychiatry* 2017; **17**(1): 408.
https://doi.org/10.1186/s12888-017-1578-6
PMid: 29282019 PMCid: PMC5745592

6. Kaur G, Singh A. Sleep hygiene, sleep quality and excessive daytime sleepiness among Indian college atudents. *Journal of Sleep Medicine and Disorders* 2017; **4**: 1076-83.
https://doi.org/10.1016/j.sleep.2016.08.020
PMid: 28153211

7. Suen LK, Tam WW, Hon KL. Association of sleep hygiene-related factors and sleep quality among university students in Hong Kong. *Hong Kong Medical Journal* 2010; **16**(3): 180-5.

8. Brown FC, Buboltz WC, Soper B. Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. *Behavioral Medicine* 2002; **28**(1): 33-8.
https://doi.org/10.1080/08964280209595996
PMid: 12244643

9. Brick CA, Seely DL, Palermo TM. Association between sleep hygiene and sleep quality in medical students. *Behavioral Sleep Medicine* 2010; **8**(2): 113-21.
https://doi.org/10.1080/15402001003622925
PMid: 20352547 PMCid: PMC3572193

10. Tan E, Healey D, Gray AR, Galland BC. Sleep hygiene intervention for youth aged 10 to 18 years with problematic sleep: A before-after pilot study. *BMC Pediatrics* 2012; **12**: 189.
https://doi.org/10.1186/1471-2431-12-189
PMid: 23216856 PMCid: PMC3538572

11. Stepanski EJ, Wyatt JK. Use of sleep hygiene in the treatment of insomnia. *Sleep Medicine Reviews* 2003; **7**(3): 215-25.
https://doi.org/10.1053/smrv.2001.0246
PMid: 12927121

12. Anbazhagan S, Johnson A, Mathew G, Reshma S, Preety S, Agrawal T. Sleep hygiene among school-going adolescents in Rural Karnataka. *Indian Journal of Youth and Adolescent Health* 2015; **2**(1&2): 20-3.

13. Dixit S, Sirohi S, Sakalle S, Rokade R, Sirohi S. A cross sectional study on sleep hygiene among morning shift school going children. *National Journal of Community Medicine* 2013; **4**(4): 584.

14. Maduabuchi JC, Obu HA, Chukwu BF, Aronu AE, Manyike PC, Chinawa AT.

Sleep pattern and practice among adolescent school children in Nigerian secondary schools. *Pan African Medical Journal* 2014; **19**: 313.
https://doi.org/10.11604/pamj.2014.19.313.4603
PMid: 25883740 PMCid: PMC4394006

15. Storfer-Isser A, Lebourgeois MK, Harsh J, Tompsett CJ, Redline S. Psychometric properties of the Adolescent Sleep Hygiene Scale. *Journal of Sleep Research* 2013; **22**(6): 707-16.
https://doi.org/10.1111/jsr.12059
PMid: 23682620 PMCid: PMC3752307

16. Lima PF, Maxaranguape R. Changes in sleep habits of medical students according to class starting time: a longitudinal study. *Sleep* 2009; **2**(2): 33-6.

17. Wolfson AR, Carskadon MA. Understanding adolescent's sleep patterns and school performance: a critical appraisal. *Sleep Medicine Reviews* 2003; **7**(6): 491-506.
https://doi.org/10.1016/S10870792(03)90003-7

18. Meltzer LJ, Shaheed K, Ambler D. Start later, sleep Later: School start times and adolescent sleep in homeschool versus public/private school students. *Behavioral Sleep Medicine* 2016; **14**(2): 140-54.
https://doi.org/10.1080/15402002.2014.963584
PMid: 25315902 PMCid: PMC4397108

19. Barathy C, Prabha S, Shanthi A. Study of sleep pattern in children aged 1-12 years attending OPD at tertiary care hospital, Puducherry, India. *International Journal of Contemporary Pediatrics* 2017; **4**(6): 1980-5.
https://doi.org/10.18203/23493291.ijcp20174181

20. Mindell JA, Telofski LS, Wiegand B, Kurtz ES. A nightly bedtime routine: impact on sleep in young children and maternal mood. *Sleep* 2009; **32**(5): 599-606.
https://doi.org/10.1093/sleep/32.5.599
PMid: 19480226 PMCid: PMC2675894

21. LeBourgeois MK, Hale L, Chang AM, Akacem LD, Montgomery-Downs HE, Buxton OM. Digital media and sleep in childhood and adolescence. *Pediatrics* 2017; **140**(Suppl 2): S92-S6.

https://doi.org/10.1542/peds.2016-1758J
PMid: 29093040 PMCid: PMC5658795

22. Dewald JF, Meijer AM, Oort FJ, Kerkhof GA, Bögels SM. The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. *Sleep Medicine Reviews* 2010; **14**(3): 179-89.
https://doi.org/10.1016/j.smrv.2009.10.004
PMid: 20093054

23. Deb S, Strodl E, Sun J. Academic stress, parental pressure, anxiety and mental health among Indian high school students. *International Journal of Psychology and Behavioral Sciences* 2015; **5**(1): 26-34.

24. Bapat RS, Van Geel M, Vedder P. Socio-economic status, time spending, and sleep duration in Indian children and adolescents. *International Journal of Psychology* 2016; **51**: 635.
https://doi.org/10.1007/s10826-016-0557-8
PMid: 28111517 PMCid: PMC5219018

25. Mathew G, Varghese AD, Benjamin AI. A comparative study assessing sleep duration and associated factors among adolescents studying in different types of schools in an urban area of Kerala, India. *Indian Journal of Community Medicine* 2019; **44**(Suppl S1): 10-3
https://doi.org/10.4103/ijcm.IJCM_19_19
PMid: 31728081 PMCid: PMC6824174

26. Sivertsen B, Hysing M, Elgen I, Stormark KM, Lundervold AJ. Chronicity of sleep problems in children with chronic illness: a longitudinal population-based study. *Child and Adolescent Psychiatry and Mental Health* 2009; **3**(1): 22.
https://doi.org/10.1186/1753-2000-3-22
PMid: 19712458 PMCid: PMC2744907