

# Sleep Hygiene in Adolescents and Factors Influencing Sleep Pattern: A Cross-sectional Study from Southern India

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## ABSTRACT

**Introduction:** Adolescence is an important period of growth and development. Sleep patterns undergo changes as the child transitions from adolescence to adulthood. A proper sleep hygiene for adolescents is important for their proper health, academic performance and prevention of adult-onset diseases.

**Aim:** To assess sleep pattern and factors influencing sleep among adolescent school-going children.

**Materials and Methods:** This cross-sectional questionnaire-based study was conducted at Saveetha Medical College Hospital, Chennai, Tamil Nadu, India (tertiary care centre), from June 2021 to December 2021. School children aged 12-19 years, studying in class 8-12 were included in the study. Adolescent Sleep Hygiene Scale (ASHS) questionnaire, was used to collect information about the sleep practices. In addition, socio-economic class, start to school time, after school activities, sharing of bed room and access to personal devices like mobile phone were also noted. Sleep was assessed with regards to different parameters like physiological factors, cognitive and emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor, bedtime routine factors. In addition, disturbance of sleep based on sharing of bed with others; use of social media, school routine preventing adequate sleep and presence or absence of outdoor activities was also assessed. The primary

data was tabulated using Microsoft excel sheet. Analysis of the independent variables with dependant variables was done using a three-way Analysis of Variance (ANOVA) was done using Sigma Plot 13 (Systat Software, USA).

**Results:** A total of 826 students were enrolled in the study. Majority of the study population was females (n=500). Mean age was 15.1±1.6 years. The mean sleep score was 118.7±14.3, out of a possible 150. Sleep stability and bedtime routine factors were the areas the children had lesser scores of 12.6 and 4.2 respectively, compared to other domains. Majority of the children (76.8%, 635) did not have a bedroom of their own and shared it with their parents, siblings or grandparents. Total 602 children did not have television inside their bedroom, likewise, access to computer was also limited (129,15.6%). Socio-economic status was found to be significantly impacting behavioural arousal factors (p-value=0.006), sleep environmental factors (p-value=0.009), sleep stability factors (p-value=0.001) and bedtime routine factors (p-value=0.004) as assessed using ASHS questionnaire.

**Conclusion:** The overall sleep quality was good in the study population. In the Indian setting, the socio-economic class and the type of family play an important role in the sleep hygiene practices of an adolescent. School based and family-based interventions will do a lot of good to adolescent sleep hygiene thereby increasing their overall health, productivity and academic performance.

**Keywords:** Adolescent sleep hygiene scale questionnaire, Bedtime routine, Day time sleep, Sleep stability

## INTRODUCTION

Time spent on sleep is one of the most important investments a person makes for his or her health. Sleep is not just about shutting the mind and body but a phase when thought is processed, restored, and strengthened. Collective memories are consolidated, and short-term memories are strengthened to long-term memory during sleep. A sound sleep is essential for the repair and restoration of body system and hormonal regulation [1].

Sleep requirement varies for different age groups, and is based on level of physical and mental activities. The Centers for Disease Control and Prevention (CDC) recommendation for hours of sleep needed by different age groups are, new born 14-17 hours, infants 12-16 hours, Children require 11-14 hours of sleep to acquire language, social and motor skills through their childhood. School children require 9-11 hours of sleep, and adolescents about 8-10 hours of sleep [2]. There is a direct relationship between development, mental alertness, and optimal duration of night sleep. It is prudent to sleep adequately, and sleep debt cannot be compensated by sleeping for hours together on a single day. Other functions like restoration and rejuvenation also occur during sleep. The muscles grow, tissues are repaired and hormone synthesis occurs during sleep.

Sleep hygiene practices are defined as behavioural practices that promote good sleep quality, adequate sleep duration, and full

daytime alertness [3]. Sleep hygiene is viewed as multidimensional with implications for the timing of sleep and wake periods, the quality of the sleep environment, and behavioural, emotional, and physiological readiness for sleep with the approach of bedtime.

Practices that improve sleep hygiene include limiting day time nap to less than 30 minutes, avoiding stimulants such as caffeine and nicotine close to bedtime, aerobic exercise for atleast 10 minutes per day, adequate exposure to natural light both in day and night promotes a better sleep-wake cycle, regular bedtime routine like a warm bath, reading a book makes it easier to sleep. The bedroom should have a pleasant environment with an ideal temperature and warm and dark. Light from lamps, mobile phone screen, Television (TV) or any devices will cause difficulty to fall asleep [4]. A person should get the required amount of sleep per day; they cannot accumulate sleep debt and pay it off by sleeping for hours together on a single day.

The pubertal growth spurt occurs during the adolescent period, for which good sleep is essential to facilitate the accelerated physical growth. However, reset of the biological clock alters the sleep-wake cycle leads to delaying to go to bed and waking up in the morning. Studies have shown that in teenagers, the natural rise of melatonin that occurs at night happens later than in other children and adults [5,6]. Adolescents have a biological delay in sleep onset timing

which makes them to fall asleep at a later time than usual [7]. The combined effect of late onset of sleep in adolescents and increased academic activity leads to a shorter sleep duration. This factor is particularly noticeable during the school years, as the time required to rise for the school day remains constant.

A systematic review reported that bedtime use and access to hand held media devices were significantly associated with inadequate sleep quality, poor sleep quality, and excessive daytime sleepiness [8]. Studies from developed countries showed that sleep deprivation is prevalent among adolescents, with over two-thirds of American high school students getting less than the minimum recommendation of 8 hours of sleep on school nights, and nearly one-third reported excessive daytime sleepiness atleast several days per week [9,10].

Almost half (45%) of adolescents reported a sleep problem occurring atleast a few nights a week including difficulty initiating sleep, maintaining sleep, and early awakening. Insufficient sleep duration and/or poor sleep quality among adolescents is associated with problems with academic performance [11], psychosocial functioning [12], obesity [13] prehypertension [14], and motor vehicle accidents [15].

In the Indian context, Gupta R et al., did a study of sleep patterns amongst urban Indian school going adolescents from classes ninth to twelfth grade. They reported that adolescents of higher grades suffered from increasing sleep debt and lesser sleep time with increasing classes [16]. Thus, aim of the study was to assess sleep pattern and factors influencing sleep among adolescent school-going children.

## MATERIALS AND METHODS

This cross-sectional questionnaire-based study was conducted at Saveetha Medical College Hospital, Chennai, Tamil Nadu, India (tertiary care centre), from June 2021 to December 2021. The ethical clearance was obtained from the Institutional Review Board (SMC/IEC/2017/149). The study involved Adolescent Sleep Hygiene Scale (ASHS) questionnaire [3].

**Sample size calculation:** As per previous studies, prevalence of sleep disorders in Indian children ranged from 3.2% [17] to as high as 47.5% [18]. Keeping in mind the variable percentage, authors used the higher prevalence rate of 47.5% and a precision of 5%, sample size was calculated using the formula:

$$N = Z^2 pq / e^2$$

Where

N=sample size,

Z=confidence level at 95%,

pq=variance of population,

e=5% allowable error) by substituting the values

The sample size was calculated to be 385. The total number of the students after removing those who were unwilling summed upto 826.

**Inclusion and Exclusion criteria:** All children studying in 8<sup>th</sup> to 12<sup>th</sup> standard who were willing to participate in the study were included in the study. The parents of those students who were unwilling to participate were excluded from the study.

**Data collection:** Additional questions regarding socio-economic status, type of family, along with presence of separate bedroom, distance from school to home, start to school time and mode of transport to reach school were added to the questionnaire and shared with students from 8<sup>th</sup> to 12<sup>th</sup> standard, Body Mass Index (BMI). In addition, disturbance of sleep based on sharing of bed with others; use of social media, school routine preventing adequate sleep and presence or absence of outdoor activities was also assessed. The independent variables, namely; gender, socio-economic status and type of family were analysed with the seven dependant domain of the ASH score [3] i.e.,

- Physiological factors
- Behavioural and arousal factors
- Cognitive and emotional factors
- Sleep environmental factor
- Sleep stability factors
- Day time sleep factor
- Bedtime routine factors.

Due permission from the school management, consent, and assent from the parents and adolescent were obtained. Three schools were included in the study catering to different socio-economic status.

- Private sector school- The Pupil saveetha school, Chennai.
- Government aided school- Christ Matriculation School, Chengalpattu
- Government school- Government Higher Secondary School, Tiruvallur

The socio-economic status was deducted based on the modified Kuppuswami scale [19].

## STATISTICAL ANALYSIS

The primary data was tabulated using Microsoft excel sheet. Analysis of the independent variables with dependant variables was done using a three-way Analysis of Variance (ANOVA) was done using Sigma Plot 13 (Systat Software, USA). The three dependant variables namely-gender, type of family and socio-economic status was compared with each domain of the ASH score using Normality Test (Shapiro-Wilk) and Equal Variance Test (Brown-Forsythe). A probability of 0.05 or less was considered statistically significant.

## RESULTS

A total of 826 students were enrolled in the study. The age and sex distribution are shown in [Table/Fig-1]. The mean age of the study population was 15.1±1.6 years with 500 girls and 326 boys. The socio-economic status, type of family and number of siblings is shown in [Table/Fig-2]. The mean BMI of the study population was 20±4.1 kg/m<sup>2</sup>. The BMI was self-reported by the participants and hence we did not include them for the analysis with respect to sleep disturbance. The distribution of the study population was almost equal between middle (n=347) and lower (n=479) socio-economic class.

Out of the 826 respondents, 191 (23%) children had a bedroom of their own and the rest (n=635) of them share it with their parents, siblings or grandparents. Disturbed sleep amongst children with shared bedrooms was self-reported; however, it was not significant (p-value=0.51). Total 224 (27.1%) of children had a television in their bedroom and 129 (15.6%) had computers in their rooms. Personal

| Age group (years) | Girls       |        |            |       |       | Boys        |        |            |       |       | Grand total (Boys+Girls) |
|-------------------|-------------|--------|------------|-------|-------|-------------|--------|------------|-------|-------|--------------------------|
|                   | Underweight | Normal | Overweight | Obese | Total | Underweight | Normal | Overweight | Obese | Total |                          |
| 11-14 years       | 11          | 68     | 40         | 7     | 126   | 10          | 117    | 48         | 35    | 210   | 336                      |
| 15-18 years       | 55          | 165    | 126        | 28    | 374   | 10          | 80     | 18         | 8     | 116   | 490                      |
| Total             | 66          | 233    | 166        | 35    | 500   | 20          | 197    | 66         | 43    | 326   | 826                      |

[Table/Fig-1]: Distribution of adolescents based on age, sex and nutritional status.

| Variables                    | Girls | Boys | Total |
|------------------------------|-------|------|-------|
| <b>Socio-economic status</b> |       |      |       |
| Lower                        | 281   | 198  | 479   |
| Middle                       | 219   | 128  | 347   |
| <b>Family type</b>           |       |      |       |
| Joint                        | 93    | 64   | 157   |
| Nuclear                      | 372   | 246  | 618   |
| Single parent                | 35    | 16   | 51    |
| <b>Siblings</b>              |       |      |       |
| Single child                 | 54    | 35   | 89    |
| 1                            | 313   | 197  | 510   |
| 2                            | 109   | 73   | 182   |
| 3                            | 20    | 15   | 35    |
| 4                            | 4     | 6    | 10    |
| Total                        | 500   | 326  | 826   |

**[Table/Fig-2]:** Socio-demographic distribution with regards to sex, socio-economic status, type of family and siblings.

mobile phone was available for 37 (4%) of the children. About 73.4% of the respondents travelled for more than 30 minutes to reach their school, irrespective of their mode of transport.

The scores and p-values obtained with respect to gender are shown in [Table/Fig-3], with respect to socio-economic status [Table/Fig-4] and type of family [Table/Fig-5]. These three variables were chosen as they had independent impact on the sleep quality. Amongst these variables, socio-economic status had the most significant impact on sleep, as it affected behavioural arousal (p-value=0.006), sleep stability (p-value=0.001), sleep environment (p-value=0.009) and bedtime routine (p-value=0.004) factors.

| Gender          | Physiological (30) | p-value | Behavioural arousal (18) | p-value | Cognitive emotional (36) | p-value | Sleep environment (30) | p-value | Sleep stability (18) | p-value | Day time sleep factors (12) | p-value | Bed time routine (6) | p-value | Total (150) |
|-----------------|--------------------|---------|--------------------------|---------|--------------------------|---------|------------------------|---------|----------------------|---------|-----------------------------|---------|----------------------|---------|-------------|
| Girls           | 24.4               | 0.26    | 13.3                     | 0.04    | 26.4                     | 0.08    | 25.8                   | 0.68    | 12.6                 | 0.79    | 10.5                        | 0.07    | 4.2                  | 0.35    | 117.2       |
| Boys            | 25.1               |         | 14.1                     |         | 27.8                     |         | 26.2                   |         | 12.8                 |         | 11.0                        |         | 4.2                  |         | 121.4       |
| Overall average | 24.7               |         | 13.7                     |         | 26.9                     |         | 25.9                   |         | 12.6                 |         | 10.7                        |         | 4.2                  |         | 118.8       |

**[Table/Fig-3]:** Comparison of the individual ASHS domain scores as per gender.

| Socio-economic status | Physiological factors |         | Behavioural and arousal factors |         | Cognitive and emotional factors |         | Sleep environmental factors |         | Sleep stability factors |         | Day time sleep factors |         | Bedtime routine factors |         |
|-----------------------|-----------------------|---------|---------------------------------|---------|---------------------------------|---------|-----------------------------|---------|-------------------------|---------|------------------------|---------|-------------------------|---------|
|                       | Scores                | p-value | Scores                          | p-value | Scores                          | p-value | Scores                      | p-value | Scores                  | p-value | Scores                 | p-value | Scores                  | p-value |
| Lower class           | 24.7                  | 0.58    | 14.2                            | 0.006   | 26.8                            | 0.154   | 25.2                        | 0.009   | 13.4                    | 0.001   | 10.4                   | 0.110   | 4.5                     | 0.004   |
| Middle class          | 24.5                  |         | 13.1                            |         | 25.9                            |         | 26.3                        |         | 11.3                    |         | 10.7                   |         | 3.9                     |         |

**[Table/Fig-4]:** p-values and mean scores of individual ASHS domains as persocio-economic status.

| Type of family | Physiological factors |         | Behavioural and arousal factors |         | Cognitive and emotional factors |         | Sleep environmental factors |         | Sleep stability factors |         | Day time sleep factors |         | Bedtime routine factors |         |
|----------------|-----------------------|---------|---------------------------------|---------|---------------------------------|---------|-----------------------------|---------|-------------------------|---------|------------------------|---------|-------------------------|---------|
|                | Scores                | p-value | Scores                          | p-value | Scores                          | p-value | Scores                      | p-value | Scores                  | p-value | Scores                 | p-value | Scores                  | p-value |
| Nuclear        | 24.9                  | 0.164   | 13.5                            | 0.910   | 27.3                            | 0.027   | 26.2                        | 0.158   | 12.5                    | 0.895   | 10.8                   | 0.053   | 4.1                     | 0.084   |
| Joint          | 24.2                  |         | 13.6                            |         | 26.5                            |         | 25.7                        |         | 12.4                    |         | 10.7                   |         | 3.9                     |         |
| Single         | 24.8                  |         | 13.8                            |         | 25.2                            |         | 25.3                        |         | 12.2                    |         | 10.2                   |         | 4.6                     |         |

**[Table/Fig-5]:** p-values and mean scores of the individual ASHS domain scores as per type of family.

Out of the 826, 269 (32.6%) of the students attended additional tuitions/ coaching classes after school to improve their academic performance and 144 (17.4%) attended additional games/ fine arts/ language/ sports coaching after school to improve their extra-curricular performances. Upon analysis of the ASHS total scores, it was found that 50.1% of the adolescents had a score above 120 out of the possible 150. Boys (58.8%) fared better than girls (44.4%) and had a good quality sleep. Daytime sleep factors and sleep

environment factors had highest mean score out of the six domains. Bedtime routine and sleep stability had the lowest average scores.

## DISCUSSION

The study was done to assess the quality of sleep in adolescent school going children and to find factors, if any which affected the quality of sleep. Overall, the sleep pattern was good in the study population. Socio-economic status had the maximum impact on 3 domains of the ASH scoring.

Murugesan G et al., did a study among 538 school-going adolescents between the ages of 10 and 17 years in Tamilnadu, and reported that 64% had atleast one form of poor sleep hygiene behaviour while 65% had daytime sleepiness [20]. This is similar to the present study where only 23% of the children had their own personal bedroom.

Deepa P et al., found that the scores were similar, to the present study, in the domains of bedtime routine, sleep environment and daytime sleep factors. However, the domain of cognitive emotional factors showed a difference, probably due to socio-economic status of the population which was not considered in their study [21].

In a study done by Galland BC et al., on a group of adolescent school going children in New Zealand reported significant sleep disturbance amongst adolescent girls with the following domains affected-behavioural arousal factors, sleep stability factors and cognitive emotional factors [22]. In the present study, the comparison of these factors of sleep with three independent variables- gender, type of family and socio-economic status was done. Amongst these, significant associations with sleep disturbance were found with socio-economic status of the family in the following areas-behavioural arousal factors, sleep environmental factors, sleep stability factors (most significant) and bedtime routine factors which

was similar to the present study. Female gender was found to have significant sleep disturbance with respect to behavioural arousal factors; type of family was found to have significant sleep disturbance association with cognitive emotional factors. This is similar to few meta-analyses [23,24], which showed more female preponderance for insomnia. Thus, in addition to gender, environmental factors like type of family and socio-economic status have an influence on the sleep health of the child.

Gellis LA et al., reported that insomnia complaints are common in adults with lower levels of education, unemployment, or those living in poverty [25]. In a study done by El-Sheikh M et al., after controlling for race, children from lower SES backgrounds have shorter sleep durations and more sleep difficulties than those living in higher SES families, and SES moderates the association between children's sleep and adjustment to their daily activities [26]. The present study also showed similar association; in fact, the socioeconomic status in the present study was found to be significantly associated with behavioural arousal factors, sleep environmental factors, sleep stability and bed time routine factors; all of which contribute to a good and efficient sleep. Owens JA et al., conducted a survey amongst adolescents belonging to different socioeconomic statuses. In their survey the major reason why kids don't go to sleep or don't get enough sleep was watching television or playing video games on TV sleep followed by involvement in social activities such as going out, partying, having fun or playing with friends and talking on the phone to friends [27]. This is slightly in contrast to this present study, wherein only a small percentage of children had access to a personal media device like a mobile phone or a computer or television in their bedroom, making their impact on sleep not very significant in this study population. In the present study, the access to TV, personal mobile or a personal computer was lesser probably due to the fact that the majority of the study population belonged to a lower socio-economic class. In a study done by Ramamoorthy S et al., prevalence of stress was high among adolescents and it negatively influenced their sleep hygiene. The authors recommend early identification and management of stress for school going late adolescents for better academic performance and wellbeing [28]. In the present study, factors like thinking in bed about what needs to be done (40.9%), replaying the events of the day in the bed (22.3%), worrying about things that happened in school and home (24.3%) probably contributed to the stress levels in this population, but did not seem to affect the overall quality of sleep. Attending additional coaching classes/ tuitions either before or after school hours could contribute to stress, however in the present study 32.6% of the population attended the same, which did not have a significant impact on the sleep quality.

Buxton OM et al., stated that children generally have better age-appropriate sleep in the presence of household rules and regular sleep-wake routines. Sufficient sleep quantity and adequate sleep quality were protected by well-established rules of sleep hygiene within the family [29]. In contrast, sleep deficiency was more likely to be present when parents and children had electronic devices on in the bedroom after bedtime. Family health intervention goals for sleep health should focus on reducing the encroachment of technology and media into time for sleep and supporting well-known sleep hygiene principles. The present study population did not have a proper bedtime routine as seen by their responses to the adolescent sleep hygiene questionnaire. However, the overall sleep quality has been good in the study population. The presence of a proper bed time routine would improve it even further. Not only measures at home, schools also have a role in making adolescent children realise the importance of sleep hygiene. In a study by Cain N et al., states that School-based interventions are promising for educating adolescents about sleep. Students within the intervention group were motivated to follow proper sleep hygiene routines. Most of the students reported gaining an increased awareness about their own sleeping pattern or habits [30].

### Limitation(s)

This was a self-administered questionnaire, hence, there is a possibility of bias when responding to questions. Though the schools catered to different socio-economic statuses, the findings presented may not be entirely representative of the whole adolescent population.

## CONCLUSION(S)

In conclusion, the study population overall had good sleep quality. This could be further improved by talking about the need of proper sleep to school children, having a proper bedtime routine and benefits of sleep hygiene on their overall health and school performance. In all, parents, caregivers, close family members, friends, teachers as a whole have various roles ensuring the value of a proper sleep hygiene during the adolescent age to ensure a healthy younger generation. Studies describing sleep hygiene from Indian population needs to take into account the socio-economic status of the family.

## REFERENCES

- [1] Theories of the Reasons Why We Sleep. Accessed May 24, 2021. <https://www.verywellmind.com/theories-of-sleep-2795929>.
- [2] CDC - How Much Sleep Do I Need? - Sleep and Sleep Disorders. Published March 5, 2019. Accessed May 24, 2021. [https://www.cdc.gov/sleep/about\\_sleep/how\\_much\\_sleep.html](https://www.cdc.gov/sleep/about_sleep/how_much_sleep.html).
- [3] Storfer-Isser A, Lebourgeois MK, Harsh J, Tompsett CJ, Redline S. Psychometric properties of the adolescent sleep hygiene scale. *J Sleep Res*. 2013;22(6):707-16. Doi:10.1111/jsr.12059. PMID: 23682620.
- [4] Sleep Hygiene Tips - Research & Treatments | American Sleep Assoc. American Sleep Association. Accessed May 24, 2021. <https://www.sleepassociation.org/about-sleep/sleep-hygiene-tips/>.
- [5] Carskadon MA. Sleep in adolescents: The perfect storm. *Pediatr Clin North Am*. 2011;58(3):637-47. Doi:10.1016/j.pcl.2011.03.003. PMID: 21600346.
- [6] Teenagers and sleep - Better Health Channel. Accessed May 7, 2021. <https://www.betterhealth.vic.gov.au/health/HealthyLiving/teenagers-and-sleep>.
- [7] Bruce ES, Lunt L, McDonagh JE. Sleep in adolescents and young adults. *Clin Med (Lond)*. 2017;17(5):424-28. Doi: 10.7861/clinmedicine.17-5-424. PMID: 2897459.
- [8] Carter B, Rees P, Hale L, Bhattacharjee D, Paradkar MS. Association between portable screen-based media device access or use and sleep outcomes: A systematic review and meta-analysis. *JAMA Pediatr*. 2016;170(12):1202. Doi: 10.1001/jamapediatrics.2016.2341. PMID: 27802500.
- [9] Hershner SD, Chervin RD. Causes and consequences of sleepiness among college students. *Nat Sci Sleep*. 2014;6:73-84. Doi:10.2147/NSS.S62907.
- [10] Paiva T, Gaspar T, Matos MG. Sleep deprivation in adolescents: Correlations with health complaints and health-related quality of life. *Sleep Medicine*. 2015;16(4):521-27. Doi:10.1016/j.sleep.2014.10.010. PMID: 25754385.
- [11] 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 Med Rev*. 2010;14(3):179-89. Doi:10.1016/j.smrv.2009.10.004. PMID: 20093054.
- [12] Dahl RE, Lewin DS. Pathways to adolescent health sleep regulation and behavior. *J Adolesc Health*. 2002;31(6 Suppl):175-84. Doi: 10.1016/s1054-139x(02)00506-2.
- [13] Cappuccio FP, Taggart FM, Kandala NB, Currie A, Peile E, Stranges S, et al. Meta-analysis of short sleep duration and obesity in children and adults. *Sleep*. 2008;31(5):619-26. Doi: 10.1093/sleep/31.5.619. PMID: 18517032.
- [14] Javaheri S, Storfer-Isser A, Rosen C, Redline S. Sleep quality and elevated blood pressure in adolescents. *Circulation*. 2008;118:1034-1040. Doi: 10.1161/CIRCULATIONAHA.108.766410. PMID: 18711015.
- [15] Pizza F, Contardi S, Antognini AB, Zagoraiou M, Borrotti M, Mostacci B, et al. Sleep quality and motor vehicle crashes in adolescents. *J Clin Sleep Med*. 2010;6(1):41-45. Doi: <https://doi.org/10.5664/jcs.m.27708>. PMID: 20191936.
- [16] Gupta R, Bhatia MS, Chhabra V, Sharma S, Dahiya D, Semalti K, et al. Sleep patterns of urban school-going adolescents. *Indian Pediatr*. 2008;45(3):183-89.
- [17] Gupta R, Goel D, Kandpal SD, Mittal N, Dhyani M, Mittal M. Prevalence of sleep disorders among primary school children. *Indian J Pediatr*. 2016;83(11):1232-36. Doi: 10.1007/s12098-016-2138-7. PMID: 27165476.
- [18] Suri J, Sen M, Adhikari T. Epidemiology of sleep disorders in school children of delhi: A questionnaire based study. *Indian Journal of Sleep Medicine*. 2008;3:42-50. Doi: <https://doi.org/10.5005/ijsm-3-2-42>.
- [19] Bairwa M, Rajput M, Sachdeva S. Modified Kuppuswamy's socioeconomic scale: Social researcher should include updated income criteria, 2012. *Indian J Community Med*. 2013;38(3):185-86. Doi: 10.4103/0970-0218.116358.
- [20] Murugesan G, Karthigeyan L, Selvagandhi P, Gopichandran V. Sleep patterns, hygiene and daytime sleepiness among adolescent school-goers in three districts of Tamil Nadu: A descriptive study. *Natl Med J India*. 2018;31(4):196. Doi: 10.4103/0970-258X.258216.
- [21] Deepa P. Sleep characteristics and body mass index of adolescents. *Indian Journal of Research*. 2018;7(3):231-32.
- [22] Galland BC, Gray AR, Penno J, Smith C, Lobb C, Taylor RW. Gender differences in sleep hygiene practices and sleep quality in New Zealand adolescents aged 15 to 17 years. *Sleep Health*. 2017;3(2):77-83. Doi:10.1016/j.sleh.2017.02.001. PMID: 28346161.
- [23] Johnson EO, Roth T, Schultz L, Breslau N. Epidemiology of DSM-IV insomnia in adolescence: Lifetime prevalence, chronicity, and an emergent gender difference. *Pediatrics*. 2006;117(2):e247-e256. Doi: 10.1542/peds.2004-2629. PMID: 16452333.

- [24] Zhang B, Wing YK. Sex differences in insomnia: S meta-analysis. *Sleep*. 2006;29(1):85-93. Doi: 10.1093/sleep/29.1.85. PMID: 16453985.
- [25] Gellis LA, Park A, Stotsky MT, Taylor DJ. Associations between sleep hygiene and insomnia severity in college students: Cross-sectional and prospective analyses. *Behav Ther*. 2014;45(6):806-16. Doi: 10.1016/j.beth.2014.05.002. PMID: 25311289.
- [26] El-Sheikh M, Kelly RJ, Buckhalt JA, Benjamin Hinnant J. Children's sleep and adjustment over time: The role of socioeconomic context. *Child Dev*. 2010;81(3):870-83. Doi: 10.1111/j.1467-8624.2010.01439.x. PMID: 20573110.
- [27] Owens JA, Stahl J, Patton A, Reddy U, Crouch M. Sleep practices, attitudes, and beliefs in inner city middle school children: A mixed-methods study. *Behav Sleep Med*. 2006;4(2):114-34. Doi: 10.1207/s15402010bsm0402\_4. PMID: 16579720.
- [28] Ramamoorthy S, Kamaldeen D, Ravichandran L, Sundaramahalingam M. Effect of stress on sleep hygiene among school going adolescents in Chennai. *J Family Med Prim Care*. 2019;8(9):2917-20. Doi:10.4103/jfmprc.jfmprc\_564\_19. PMID: 31681667.
- [29] Buxton OM, Chang AM, Spilsbury JC, Bos T, Emsellem H, Knutson KL. Sleep in the modern family: Protective family routines for child and adolescent sleep. *Sleep Health*. 2015;1(1):15-27. Doi: 10.1016/j.sleh.2014.12.002. PMID: 26779564.
- [30] Cain N, Gradisar M, Moseley L. A motivational school-based intervention for adolescent sleep problems. *Sleep Med*. 2011;12(3):246-51. Doi: 10.1016/j.sleep.2010.06.008. PMID: 21292553.

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