# Descriptive Cross-Sectional Assessment of Sleep Duration and Associated Factors among Adolescent School Children 

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Abstract
Aim: The aim of the present study was to assess sleep duration and associated factors among adolescent school children.
Methods: This cross-sectional study was conducted in Gaya district of Bihar with the duration of one year. Data were obtained from 500 adolescents by a team consisting of doctors including a pediatrician, medico social workers, and nurses.
Results: The mean age was $15.09 \pm 1.33$ years. Nearly $30 \%$ of students were from government school, $36 \%$ from aided school, and $34 \%$ from private school. There was a significant difference in the sociodemographic pattern across the schools such as family income $(\chi 2$ test $=198.9, \mathrm{P}<0.0001)$, maternal education $(\mathrm{F}=105.6, \mathrm{P}<0.0001)$, paternal education ( $\mathrm{F}=146.1, \mathrm{P}<0.0001$ ), and results $(\mathrm{F}=27.6, \mathrm{P}<0.0001)$ (higher values in private school compared to government school). The mean duration of sleep as reported was $7.2 \pm$ 1.2 h . The duration was significantly different in different type of schools (government - 7.29 $\pm 1.3 \mathrm{~h}$, aided $-7.38 \pm 1.2 \mathrm{~h}$, private $-6.56 \pm 1.1 \mathrm{~h}, \mathrm{~F}=8.13, \mathrm{P}<0.0001$ ). Nearly $72 \%$ of students were having inadequate sleep in private school. The most common (mode) bedtime, both weekdays as well as weekends, was 10 pm . However, the most common (mode) wakeup time was 6 am during weekdays and 7 am during weekends. The duration was also significantly different during weekdays $(7.4 \pm 1.2 \mathrm{~h})$ and weekends $(9.03 \pm 1.4 \mathrm{~h})$ with longer duration during weekends (paired t -test $\mathrm{t}=-25.41, \mathrm{P}<0.0001$ ).
Conclusion: Inadequate sleep duration and difference in sleep schedule during weekends were observed among adolescents, especially among private school students. Primary prevention approach aimed at spreading adequate awareness regarding the importance of sleep among students, parents, and teachers should be practiced.
Keywords: Adolescent, factors, schools, sleep duration, sleep, types of school.
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## Introduction

The quality of school life (QSL) can be regarded as a crucial part of the quality of life itself. [1,2] QSL is defined as the students' sense of satisfaction at any given time period. [3] Studies suggest that good QSL is also a major goal of education, along with academic performance. The

QSL can be measured based on six domains (general affect, negative affect, opportunity, teachers, identity, and status).
[4] Good quality school life creates a healthy environment in schools, leading to better well-being and psychological health, which in turn causes more
opportunities for advancement among students. [5,6] Lifestyle and personal behavior are important factors that can affect individual efficiency. One of the most effective factors that can boost efficiency is reported to be sleep. [7] Sleeping disorders are ever-growing issues concerning all human beings all over the world. [8] These disorders are greatly affected by factors such as environment, as well as culture and behavior. [9] The prevalence of such disorders has been estimated to range from $10 \%$ to $48 \%$. [10]
Adolescence is a critical period which marks puberty and physical maturation, where there is a gradual transition between childhood and adulthood. [11] Sleep affects physical, mental, and emotional development of the adolescents, and it has a potential impact on their academic performance. [12] Adolescents should sleep $8-10 \mathrm{~h} /$ day on a regular basis to promote optimal health. Consistent sleep habits such as regular bedtime, wake-up time, and similar sleep schedules on weekends and weekdays help in better sleep outcomes. However, majority of them have inadequate sleep due to various intrinsic and extrinsic factors. [13] Poor sleep has multiple effects on adolescent health which includes depression, excessive daytime sleepiness, and metabolic dysfunctions. [14]
The aim of the present study was to assess sleep duration and associated factors among adolescent children studying in different types of schools in Bihar region.

## Materials and Methods

This cross-sectional study was conducted in Gaya district of Bihar with the duration of one year. Data were obtained from 500 adolescents by a team consisting of doctors including a pediatrician, medico social workers, and nurses.

Written consent was obtained from the study participants as well as from their parent/guardian. Participants were enrolled using multistage stratified random sampling, strata being the type of school (government, government aided, and private schools). Permission to conduct the study was obtained from the principal of the schools. In the first level of sampling, schools were selected from each category, and in the second level, class divisions were randomly selected. All the students from the selected division were included.

The questionnaire was translated into the local language and was back translated to ensure accuracy. The study tool included a structured self-administered questionnaire which collected information such as sociodemographic details, sickness, distance, and time travelled between home and school. Sleep duration (in $24-\mathrm{h}$ time period) and the usual bedtime and wakeup time were collected separately for weekdays and weekends. Their attendance and academic performance during the study period were obtained from class records. The collected data were entered in Excel, and statistical analysis was performed using EpiInfo. Chi square test, Independent t -test, ANOVA, Paired t -test, and Pearson correlation coefficient were used.

## Results

Table 1: Distribution of the respondents based on sociodemographic characteristics

| Variables | Categories | Frequency (\%) |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Government $(\mathrm{n}=150)$ | $\begin{aligned} & \text { Aided } \\ & (\mathrm{n}=180) \end{aligned}$ | $\begin{aligned} & \hline \begin{array}{l} \text { Private } \\ (\mathrm{n}=170) \end{array} \\ & \hline \end{aligned}$ |  |
| Class | High school | 100 (30.30) | 110 (33.33) | 120 (36.36) | 330 |
|  | Higher secondary | 50 (29.41) | 70 (41.17) | 50 (29.41) | 170 |
| Religion | Hindu | 110 (44) | 90 (36) | 44 (17.6) | 250 |
|  | Muslim | 40 (20) | 100 (50) | 60 (30) | 200 |

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|  | Christian | 11 (22) | 25 (50) | 24 (48) | 50 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Family type | Nuclear | 110 (36.66) | 105 (35) | 85 (28.33) | 300 |
|  | Three generation | 30 (20) | 60 (40) | 60 (40) | 150 |
|  | Joint | 9 (18) | 22 (44) | 19 (38) | 50 |
| Monthly family income | <10,000 | 130 (52) | 90 (36) | 30 (12) | 250 |
|  | 10,000-30,000 | 15 (10) | 60 (40) | 75 (50) | 150 |
|  | $>30,000$ | 6 (60 | 34 (34) | 60 (60) | 100 |
| Educational status (mother) $\mathrm{n}=450$ | Up to 10th | 40 (80) | 9 (18) | 1 (2) | 50 |
|  | 10th-12th | 110 (40.74) | 115(42.59) | 45 (16.66) | 270 |
|  | $>12$ th | 10 (7.69) | 50 (38.46) | 70 (53.84) | 130 |
|  | Mean years of schooling | $9.9 \pm 2.1$ | $12.9 \pm 2.9$ | $13.7 \pm 2.2$ |  |
| Educational status (father) n=440 | Up to 10th | 56 (70) | 20 (25) | 4 (5) | 80 |
|  | 10th-12th | 80 (40) | 86 (43) | 34 (17) | 200 |
|  | $>12$ th | 8 (5) | 64 (40) | 88 (55) | 160 |
|  | Mean years of schooling | $9.3 \pm 2.1$ | $11.83 \pm 2.7$ | $13.8 \pm 2.3$ |  |
| Exam scores $\mathrm{n}=490$ | <30\% | 68 (40) | 76 (44.70) | 26 (15.29) | 170 |
|  | 30\%-49.99\% | 47 (31.97) | 50 (34.03) | 50 (34.03) | 147 |
|  | $\geq 50 \%$ | 40 (23.12) | 60 (34.68) | 73 (42.19) | 173 |
|  | Mean examination scores | $36.8 \pm 20.9$ | $40.8 \pm 23.6$ | $52.3 \pm 21.7$ |  |

The mean age was $15.09 \pm 1.33$ years. Nearly $30 \%$ of students were from government school, $36 \%$ from aided school, and $34 \%$ from private school. There was a significant difference in the sociodemographic pattern across the
schools such as family income ( $\chi 2$ test $=$ 198.9, $\mathrm{P}<0.0001$ ), maternal education ( F $=105.6, \mathrm{P}<0.0001$ ), paternal education ( F $=146.1, \mathrm{P}<0.0001$ ), and results ( $\mathrm{F}=27.6$, $\mathrm{P}<0.0001$ ) (higher values in private school compared to government school).

Table 2: Factors associated with sleep duration

| Variables | Categories | Duration of sleep (\%) |  |  | ,\mathbf{P}}{} |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | $<\mathbf{8 ~ h}$ | $\geq \mathbf{8} \mathbf{~ h}$ | Total |  |
| Type of school | Government | $80(53.33)$ | $70(46.66)$ | 150 |  |
|  | Aided | $99(55)$ | $81(45)$ | 180 |  |
|  | Private | $119(70)$ | $51(30)$ | 170 |  |
| Gender | Males | $150(54.54)$ | $125(45.45)$ | 275 | $8.284,0.005$ |
|  | Females | $145(64.44)$ | $80(35.55)$ | 225 |  |
| Income (Rs.) | $<10,000$ | $140(56)$ | $110(44)$ | 250 | $6.940,0.031$ |
|  | $10,000-30,000$ | $100(66.66)$ | $50(33.33)$ | 150 |  |
|  | $>30,000$ | $65(65)$ | $35(35)$ | 100 |  |
| IIIness | Yes | $45(60)$ | $30(40)$ | 75 | $0.388,0.566$ |
|  | No | $255(60)$ | $170(40)$ | 425 |  |

The mean duration of sleep as reported was $7.2 \pm 1.2 \mathrm{~h}$. The duration was significantly different in different type of schools (government $-7.29 \pm 1.3 \mathrm{~h}$, aided $-7.38 \pm 1.2 \mathrm{~h}$, private $-6.56 \pm 1.1 \mathrm{~h}, \mathrm{~F}=$ $8.13, \mathrm{P}<0.0001$ ). Nearly $72 \%$ of students were having inadequate sleep in private
school. The most common (mode) bedtime, both weekdays as well as weekends, was 10 pm . However, the most common (mode) wake-up time was 6 am during weekdays and 7 am during weekends. The duration was also significantly different during weekdays
$(7.4 \pm 1.2 \mathrm{~h})$ and weekends $(9.03 \pm 1.4 \mathrm{~h})$ with longer duration during weekends (paired t -test $\mathrm{t}=-25.41, \mathrm{P}<0.0001$ ). The students of private school were found to have a late bedtime and early wake-up
time compared to other schools. Most of the students take daytime nap of more than an hour during weekends. During weekdays, they do not get time for naps since they are in school.

Table 3: Factors with Correlation coefficient

| Variables | Correlation coefficient | P |
| :--- | :--- | :--- |
| Age, duration of sleep (h) | -0.301 | $<0.0001$ |
| Paternal education (years of education), duration of <br> sleep (h) | -0.170 | $<0.0001$ |
| Maternal education (years of education), duration of <br> sleep (h) | -0.149 | $<0.0001$ |
| Distance of travel, duration of sleep (h) | -0.102 | 0.009 |
| Results (\%), duration of sleep (h) | -0.245 | $<0.0001$ |
| Attendance (\%), duration of sleep (h) | 0.077 | 0.048 |

The sleep duration was negatively correlated with factors such as age, education of parents, distance travelled to school, and academic performance and positively correlated with attendance percentage. The duration was significantly different among males ( $7.35 \pm 1.22 \mathrm{~h}$ ) and females ( $7 \pm 1.28 \mathrm{~h}$ ) with shorter sleep duration observed among female students ( $\mathrm{t}=3.954, \mathrm{P}<0.0001$ ). We have also noticed that students who reported to have chronic illness like asthma had shorter sleep duration ( $7.02 \pm 1.37 \mathrm{~h}$ ) compared to those who did not report any ( $7.24 \pm 1.24$ h). However, this association was not statistically significant. Factors such as income and class were also associated with sleep duration.

## Discussion

The transition from childhood to adulthood is marked by the onset of puberty. This is a critical phase for an adolescent where physical maturation takes place. [15] There are multiple factors which influence it and among them sleep is a major one. Sleep affects mental, emotional and physical wellbeing of an adolescent. [12] On an average for adequate development an adolescent should sleep for at-least 8 to 10 hours per day. This shall ensure an optimal health. For a better outcome they need to be consistent with their sleeping schedules.

They should go to bed regularly at a specific time, wake up at specific time and this should be followed even during weekends. [13] The sleep is influenced by various factors such as life style of the child, hormonal imbalances, emotional disturbances and relative sleep needs. Although the sleep-wake circadian rhythm is intrinsically regulated, external factors also influence it. If there is inadequate sleep for a long term then it leads to "sleep debt", which causes decrease in concentration, daytime dozing and repeated napping. [16]

The sleep duration decreased with increasing age and grades. Another study done among urban adolescents showed similar results of sleep disturbances and deprivation with increased age and grades. [12,17] We have a paradoxical finding in our study. The sleep duration was found to be negatively associated with academic performance. This is in contrast with the conventional wisdom that adequate sleep is necessary for better academic performance. It may be that students were sleeping less to put in more hours of study to achieve better results. Our finding may also be due to the fact that we have based our conclusion considering one examination test. Academic performance is influenced by other factors such as IQ.

Hence, it cannot be attributed to sleep duration only. More reliable information about this relationship can be obtained through randomized controlled trials/longitudinal studies.
Private school students had inadequate sleep duration, late bedtime, and early wake-up compared to other students. Most of the studies did not make any comparisons across different type of schools. However, a study done by Meltzer et al. showed that students of private schools had lesser sleep duration compared to home school. Different academic needs coupled with parents expectations could have contributed to this finding. [17,18] Higher income and parental education were associated with sleep deprivation among children. This is comparable with findings of the study done in Puducherry. [19] Decreasing parental supervision and academic pressure among highly educated may be a reason behind this. There is paucity of data from developing country settings to do comparisons. [13,20]

## Conclusion

Inadequate sleep duration and difference in sleep schedule during weekends were observed among adolescents, especially among private school students. Longitudinal and qualitative studies involving students, parents, and teachers would yield better results. School curriculum should emphasize on importance of sleep, and parents and teachers should be sensitized regarding the importance of adequate sleep. Sleep problems are common among adolescents. Their pre sleep activities have a major impact on their quality of sleep, hence addressing them is essential.

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