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Original Article

Sleep Loss in School Children: Fact or Myth

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Abstract

Purpose – Sleep habits play an important role in the health of young children. Sleep is often compromised either because of parents by pressuring children to study into late hours or due to sleep habits of children themselves. The aim of study was to assess the sleep habits of school going children in the capital state of Delhi, India. Methods – A total of 1457 students aged 9-17 years participated and filled validated 'School sleep habit survey' form. A performa was also developed to collect information on usual presleep habits of school children. Data was analysed using SPSS ver 20. The form was filled by parents and children together.

Results – Sleep onset latency >30 min was reported by 8.6% of the students. Mean bedtime of students was 10.49±1.14h on schooldays and 11.10±1.37 h at weekends. On weekends, students woke up later at 8.08h±1.76h than schooldays 5.46±1.41h. Older age category (>15 years) slept for lesser duration than the younger age. On weekends girls slept longer than boys. Majority of the students considered themselves to be 'good sleepers'. Lower academic grades in school were found to be associated with insufficient sleep. Number of family members played a significant role on quality of sleep. 23.7% reported to be active on electronic gadgets prior to sleep. Students reported a reduced parental influence on bedtime with increasing age during schooldays. Boys felt that parents influence the sleep time more on schooldays. Conclusion- sleep problem in the form of increased sleep onset latency was reported by 8.6% children themselves. Use of electronic gadgets, lack of parental influence on setting bed times was seen.

Introduction

In today's modern society, sleep is restricted to meet the work and social requirements. Parents, though inadvertently, make their children to try improving their performance at the cost of sleep hours. Children themselves also reduce their sleep hours by playing video or computer games at times late into night. Many a times, there is a subtle peer pressure on adolescents to stay up late and interact on social networking sites.

A recent study in USA showed an increase in use of gadgets like tablets, computers, etc. by children

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and was found to be associated with sleep problems (1). Firstly because the child tries to procrastinate his sleep, secondly just before sleeping the practise of indulging in games creates a problem in sleeping. Thirdly the blue light emitted from these devices entrains our circadian rhythm and leads to further sleep problems due to an interaction in process S and process C i.e. process Sleep and Circadian process, the principal controllers of sleep- wake interaction. The prevalence of use of these gadgets in Indian population is not known. It is also important to increase awareness about good sleep and good sleep hygiene principles in schools.

Problems in sleep are often associated with decreased attention span, memory problems, excessive daytime sleepiness, emotional stress, mood swings, irritable behaviour, aggressiveness, difficulty in relationships (children will be found having problems with teachers, friends, parents, siblings, etc.). The lapses in performance are found to increase with sleepiness. A study done by Short et al on 385 adolescents found that poor sleep is associated with sleepiness, fatigue, impairments in academic performance, poor working memory, depression, anxiety, risk taking, use o f drugs and alcohol and, diminished quality of life (2). Another study by Gruber et al studied well rested school children in the age group of 7 to 11 years and found that the longer sleep duration of children was associated with higher IQ and short sleep duration was associated with poor performance on IQ measures even in the absence of effects of sleep deprivation (3).

The investigators were involved in a symposium, conducted on ‘Importance of sleep in school children’ for school teachers. Following this many requests were received from schools to address the audience and increase awareness amongst students. It was also felt by the school teachers that probably the students do not get adequate time to sleep. There was a felt need to study the habitual sleep duration of school children and know the prevalence of sleep problems in school children of a developing country. Thus the present study was planned with the following objectives: to assess the sleep time schedule and sleep habits of school going children; to estimate prevalence of sleep problems in school children; and to estimate prevalence of using gadgets/ distracters before sleep by school children.

Material and Methods

Subjects- This cross-sectional, observation study was conducted among school children of urban capital. 1500 school children in the age group of 9 to 17 years (grades V-XII) were identified for the study. The study protocol was approved by the Institutional ethics committee of the medical school. Permission of the school principal was taken prior to conduct of the study. The participation was voluntary and informed written consent to participate in the study was obtained from both the parent and the child.

Instruments- School Sleep habits survey form available at http://www.sleepforscience.org/contentmgr/showdetails.php/id/93(4) was used to collect the data. This survey consists of 63 questions about the demographic data of the individual and the various sleep habits. The survey also assesses sleepiness, sleep wake problem and morningness-eveningness from the questions given in the survey form (5), (6). Apart from this survey form, a performa was developed enquiring about number of family members, the usual habits of students before sleep and practice of gadgets before sleeping. Both the survey form and the Performa were filled by the students question wise by trained facilitators explaining each question. The filling of these forms was done in small groups. The forms were collected and the data was taken without any names or identity numbers making the entire data anonymous. Parameters calculated from the sleep habits survey form were bed time, wake up time, sleep duration-on both schooldays and weekends, school performance, sleepiness scale , sleep wake problem scale (SWPS), morningness/eveningness scale (ME) (7) along with their use of gadgets and family details from the performa.

Data Analysis-Data was analysed using SPSS version 20 (IBM Corp., Armonk, USA). Descriptive statistics was presented as frequencies (%) and means (SD). Chi-square tests were used for categorical variables and t-tests for continuous variables. Sleep duration during schooldays and

weekends were compared using paired t- tests .Unpaired t tests and One-way ANOVAs with multiple comparisons were performed to evaluate gender and age differences respectively for each of the dependent variables. Pearson's rank correlation assessed the relationship of school performance and sleep duration. A p value less than 0.05 was considered statistically significant.

Results

Of the total 1500 students called to report, 1457 reported and participated by filling in the survey form. Of the 1457 forms, 852 boys and 537 girls were received completed (58.5% were males and 36.9% were females). To study the effect of age, age groups of 9-11 y, 12-14 y and >15 y were used. Age distribution of the sample was: 9-11 yrs old -10%, 12-14 yrs- 50.1% and ≥15 yrs- 39.9%. Mean age of participants was 13.81 (SD - 1.74) with a median of 14 yrs.

Reasons for going to bed and Sleep onset latency (SOL) on schooldays and weekends with age, gender- Table I depicts the parental influence on setting bedtime and SOL on schooldays and weekends. On schooldays, the percentage of students for whom bedtime was set by parents decreased significantly with increasing age (p=0.000) .Genderwise, parental influence was more for boys (20.8%) than girls (13.7%) on schooldays (p=0.001). No age and gender differences were observed in reasons to go to bed during weekends. Sleep onset latency was categorized as <15 min, 16-30 min and >30 min. There was a significant difference observed in difficulty in falling asleep (SOL > 30 min) with age and gender, during schooldays and weekends as shown in Table I.

Bed time, Wake time, and total sleep duration on schooldays and weekends- Table II shows age and gender differences in bedtime, wake time and total sleep time. Bedtime of students on schooldays was earlier than weekends (p=0.000). The ANOVA showed significant difference with increasing age for bedtime during schooldays ($F2, 1341 = 70.313$, p=0.000) and weekends ($F2, 1315 = 18.432$, p=0.000). There was no gender difference seen with bedtime. On weekends, the students woke up later than schooldays (p=0.000). There was significant age difference for waketime during weekends (F2, 1324= 5.113, p=0.006) and boys woke up earlier than girls (p=0.000). Mean duration of sleep on schooldays was lesser than weekends (p=0.000). Total sleep time was lesser for ≥15 yrs on schooldays ($F2, 1242 = 5.392$, p=0.005) and weekends ($F2, 1299 = 4.497$, p=0.011). Girls slept longer than boys on weekends (p=0.004).

Bedtime time shift, wake time shift and weekend oversleep- Bed time shift significantly decreased with

TABLE I: Parental influence and Sleep onset latency (SOL) Schooldays and Weekends according to age and gender.

	Parents decide time to bed		*SOL Schooldays*			*SOL Weekends*		
	Schooldays (%)	*Weekends (%)*	*0-15 min (%)*	*16-30 min (%)*	*>30 min (%)*	*0-15 min (%)*	*16-30 min (%)*	*>30 min (%)*
All	17.9	8.8	53.9	26.8	8.6	49	31.7	9.6
Age group (yrs)								
9-11	31.6	12.5	72.6	25.8	1.6	40.3	52.5	7.2
12-14	20	9.6	64	28.9	7	61.8	29.9	8.3
≥15	11.6	7	52.5	32.4	15	48.1	37.2	14.7
P value	0.000	0.056		0.000			0.000	
Gender								
Male	20.8	8.8	63.3	27.3	9.4	56.6	34.4	9
Female	13.7	8.7	55.4	34.1	10.5	51.2	35	13.8
P value	0.001	0.195		0.016			0.018	

TABLE II : Bedtime, Wake-time and Total Sleep time according to age and gender.

	Bedtime (h)		*Wake time (h)*		*Total Sleep time (min)*	
	Schooldays Mean±SD	*Weekends Mean±SD*	*Schooldays Mean±SD*	*Weekends Mean±SD*	*Schooldays Mean±SD*	*Weekends Mean±SD*
All	10.49±1.14	11.10±1.37	5.46±1.41	8.08±1.76	421.55±104.43	526.87±146.28
P value	0.000		0.000		0.000	
Age group (yrs)						
9-11	9.71±1.10	10.66±1.49	5.55±0.75	8.42±1.57	440.54±102.30	510.73±190.19
12-14	10.30±1.18	10.95±1.24	5.44±1.82	7.93±1.72	426.25±95.96	529.28±151.22
≥15	10.87±1.07	11.34±1.46	5.45±0.74	8.15±1.86	409.43±119.57	502.05±150.41
P value	0.000[a]	0.000[b]	0.728	0.006[c]	0.005[d]	0.011[e]
Gender						
Male	10.46±1.18	11.06±1.50	5.50±1.75	7.90±1.84	422.98±106.09	507.21±154.51
Female	10.46±1.18	11.10±1.17	5.38±0.59	8.31±1.62	415.85±109.43	532.92±157.07
P value	0.962	0.604	0.051	0.000	0.258	0.004

[a] significant difference between all 3 age groups [b] between 9-11 yrs and ≥15 yrs (p=0.000) and between 12-14 yrs and ≥15 yrs (p=0.000), [c] between 9-11 yrs and 12-14 yrs (p=0.011), [d] between 9-11 yrs and ≥15 yrs (p=0.02) and 12-14 yrs and ≥15 yrs (p=0.02), [e] between 12-14 yrs and ≥15 yrs (p=0.009)

increasing age (F2, 1249 = 3.041, p= 0.048). Wake time shift (p=0.000) and weekend over sleep (p=0.000) were significantly less for boys than girls. There was no influence of gender on bedtime shift, and age on waketime shift and weekend oversleep (Table III).

Sleep habits and related aspects- 43.4% of the students said they never woke up during the night followed by 27.8% who woke up once and 10.6% who woke up 2 or 3 times. On inquiring about napping during daytime, 38.8% of the students did not nap. 37% napped sometimes on schooldays, out of these 26.4% of the 9-11 yr old, 34.2% of 12-14 yr old, and 42.8% of the 15 yr old napped, thus the numbers rose with increasing age. More than 50% of the students felt that they got enough sleep at night. Majority of the students (82.2%) considered themselves to be 'good sleepers'. Amongst the bad sleepers, more numbers with a family size > 3 reported to be bad sleepers (18.7%) than those with family size < 3 (12.6%), the difference was statistically significant (p = 0.018).

TABLE III : Bedtime shift, Wake-time shift, and Weekend oversleep according to age and gender.

	Bedtime shift (min) Mean±SD	*Wake-time shift (min) Mean±SD*	*Weekend oversleep (min) Mean±SD*
All	40.55±87.51	139.74±128.95	107.33±192.82
Age group (yrs)			
9-11	59.40±112.40	163.75±98.36	127.59±142.93
12-14	40.46±83.20	135.50±143.22	106.75±155.16
≥15	36.48±86.67	139.60±114.98	103.90±242.36
P value	0.048[a]	0.068	0.543
Gender			
Male	42.15±93.23	129±143.61	89.77±167.04
Female	38.04±77.38	164.88±98.26	136.61±228.61
P value	0.422	0.000	0.000

[a] between 9-11 yrs and ≥15 yrs (p=0.037)

We tried to dwell on the pre-sleep activities of the students and the time they spent on them prior to sleeping. 30.2% liked to read a book, 26% listened to music while 23.7% were active on gadgets (mobile phones, videos and i-pads). Near to two-thirds of these students (62.3%) spent more than half an hour on the above activities.

Morningness eveningness scores for Sleepiness scale was 14.47±4.52 and Sleep wake problem scale was 32.32±10.69. Correlation analysis showed a positive correlation of age with ME score and sleep-wake

problem behaviour scale. No significant relation was found of age with sleepiness scale (Table IV).

TABLE IV: Correlation analysis of age with ME score, sleepiness scale and SWPS.

	Pearson's correlation	*P value*
Age with ME score	.211	.000
Age with Sleepiness scale	.047	.158
Age with SWBPS	.109	.001

A significant correlation was observed between sleep duration weekdays and grades in school for age groups 9-11 yrs (r=-.341, p=0.001) and 12-14 yrs (r=-.351, p=0.001). No Correlation was observed for sleep duration weekends with each of age groups.

Discussion

In our study population we found that students tended to sleep later on weekends and the bedtimes increased with age significantly. A delay in night time is anticipated in adolescence primarily due to delayed build-up of sleep pressure in adolescents (8). Though there was no difference in bedtimes compared on the basis of gender in our study, but girls tended to sleep longer on weekends as compared to boys. Similar results were seen by Russo et al which may be because of earlier onset of puberty or may be due to gender differences in sleep requirements as it is (7). Another reason may be because of a subjective criteria for determining sleep has been used by us though studies report that sleep habits survey form correlates well (9).

Sleep habits are affected by different cultures and ethnicity (10). Ultra-orthodox males had early bed time and wake up time with longer sleep duration and less sleepiness (11). This indicates that there is an important role played by culture.

A study to understand the effect of school start time was done by Owens et al in which both school time delay and advance was studied by its impact on adolescents sleep. A 50 minute delay in the start time for high school and secondary school was studied. A 30 minute advance for middle school also was done. Differences in self-reported duration of sleep and daytime sleepiness were analysed. The results showed that both an advance and a delay in school time had an impact on night sleep duration and daytime sleepiness. An advance in school time produced reduced night sleep with increased daytime sleepiness contrary to the delay in school time which was just the opposite (12). In our study, 42.8% of those more than 15 years napped during daytime. Though napping improves performance of sleep deprived students and reduces sleepiness after the nap but is likely to cause delayed bed time further. Since in adolescence as it is there is a delay in build-up of sleep pressure and napping during the day further reducing the pressure (8). Later school start time is associated with reduced daytime sleepiness and reduced tardiness to school (13), however confirmed conclusions of the various benefits cannot be drawn primarily due to limited number of studies and mixed results (14).

While school times are implicated as one of the important factor for sleep problems, poorer sleep quality is associated with reduced healthy diet habits (15). Schweizer et al had reported that children who had smart phones slept significantly lesser than non-owners (16). The role played by family members was also important due to cultural changes.

Lower academic performance at school was found to be associated with less sleep time, erratic sleep wake schedules and poor sleep quality (17). Eveningness showed poorer executive skills (18), and extension of sleep improved performance (19), (20). In our study we found majority of students of morning type but still the sleep wake problem scale was relatively higher. This may be primarily related to reduced sleep durations. Sleep duration in our study was significantly lesser on schooldays and a tendency to recover sleep debt occurred on weekends. More than 8 hours of sleep and better grades in school are less likely to be associated with injuries (21) Need for awareness regarding good quantity of sleep in school children is important because of the benefits of good sleep and also in avoiding the harmful effects of reduced sleep. In a study done by Wang et al in China, an inverse association was found between longer sleep duration

and BMI. Later bed times were associated with higher BMI (22). Shorter sleep duration was associated with obesity (23).

Offsprings of bipolar mood disorders showed poor sleep category to be associated with an increased likelihood of developing psychopathology and increased blood pressure (24).

A study done by Arrona-Palacios et al showed that adolescents from morning shift reported daytime sleepiness with use of MP3 player and afternoon shift with use of computers, TV and MP3 players. There was a tendency towards eveningness with use of computers, smart phones and MP3 in the students following the afternoon shift (25). We had all students of morning shift schools and our results showed relatively less sleepiness but increased sleep wake problems. Considering sleep onset latency was found to be more than 15 minutes of a considerably large number of students both on schooldays and on weekends, the question which arises is, though we have morning type children, they had increased sleep onset latency with increased sleep wake problems. One of the possible explanation may be the use of electronic devises (23.7%) and other pre sleep activities for more than half an hour in 62.3%. In a study done on 727 adolescents of 7^{th} to 8^{th} graders for their internet usage habits, internet was used for social media and playing games and was found that the internet usage was associated with sleep alterations, daytime sleepiness (26), and obesity (27). Short sleepers were more likely amongst adolescents who had TV in their bed rooms and had disorganised family with poor family relationships (28). Smart phones/ internet usage was found to be associated with sleep problems (29) and obesity (27) and on mental health (30).

Do Parent's play an important role?

Parents often have different rules for weekdays and weekends for child's sleep time. This was reported recently in a study done in Ontario, Canada by Pyper et al. Parents of 1622 children between age group of 5 to 17 years were interviewed on phone and it was found that the parents often enforced rules of sleep times on weekdays resulting in achieving good sleep time for the child on weekdays but the same was lacking on weekends (31).

In our study we found reduced parental influence in deciding the bed time on weekends with the increasing age of the child. It has been documented that the role of parents in emphasising the importance of good sleep to adolescents is vital to reduce the ill effects of short sleep which the adolescents often indulge in, due to later bed times (32). The relatively reduced parental influence on weekends in 9-11 yr old seems to hint towards a casual approach of bedtime setting by parents. This is probably the first step towards bad sleep hygiene principles which become habit as they become 15 years and older. Parents are an important part of strategy towards prevention of illnesses (31), (33), and hence their education along with the child should be of utmost priority.

Short sleeping adolescents when slept for longer were found to benefit emotionally. When asked by parents, they were of the opinion that they would recommend this intervention for short sleeping adolescents to other families (34).

Engaging school children in good sleep habits is important for the kids. An educational game mediated intervention showed acceptance of these techniques by both parents and children. It not only instilled basic sleep hygiene habits in a fun way but also made parents more aware about the importance of good sleep in health and well being of high school students (35).

Toddlers who had shorter sleep duration were found to have higher risk for obesity, (36) hence interventions at that early an age help in the improvement of future health of the child. Here lies an important role played by parents where good sleep hygiene habits can be maintained for the child and some strictness about it may be emphasised.

Parents play an important role in formulating rules for media usage (37), control on smartphone usage (38) making children follow sleep hygiene principles (18), (1), (39), (40). The number of family members was also found to play a significant role on the sleep

of the child in our study. Was it the control of parents which looses focus with number of increased family members or the socio economic status, education of the parent, or is it that the number alone played an important role are further questions which require possible mechanism and further solutions. A better picture may also be seen by objectively analysing sleep in school children.

Sleep as an intervention will be needed and public policies and advertising to parents regarding ill effects of sleep deprivation (2). Good sleep enforcement in the population with counselling to parents and awareness about health benefits to children can play an important role in a healthy nation tomorrow.

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