



Full length article

Sleep-patterns, co-sleeping and parent's perception of sleep among school children: Comparison of domicile and gender

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ABSTRACT

This study was aimed at assessment of sleep schedule, pre-sleep behavior, co-sleeping and parent's perception of sleep of school going children.

Method: Four schools each, from urban and rural area were included. Sleep patterns were assessed using the validated Hindi version of Childhood-Sleep-Habit-Questionnaire. Comparison was made between urban and rural group and between boys and girls. Interaction of gender, domicile and school-type was examined on the sleep patterns.

Results: This study included 831 school children with mean age of 8.9 years. Nearly half of the subjects were boys in this study. Urban children outnumbered those from rural area. Total sleep time on weekdays was 8.3 h that increased to 9.5 h on weekends. Rural children spent more time in sleep than urban children on weekdays and weekends. A higher proportion of urban children felt sleepy during the day. Television watching before bedtime was more common in urban settings. Room sharing was more common among rural children. Nearly 65% rural parents as compared to 77.5% urban parents reported that their child was sleeping sufficient enough. Gender did not affect sleep-schedule and parent's perception regarding their child's sleep. Interaction between gender, domicile and school-type did not have any significant effect on sleep patterns.

Conclusion: Television watching before bedtime was more common among urban school children and they had shorter total sleep time. They had signs of sleep deprivation. Room sharing was more common among rural children. Despite longer sleep time, parents of rural children felt the need for more sleep.

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1. Introduction

Sleep is an important part of the life and adults spend around one third of their life in sleep. In contrast to adults, infants spend nearly half of their day in sleep. Duration of sleep is not static and it shortens with the growing age, especially among children [1–4]. Reduction of sleep with the growing age can be ascribed to a number of factors that include not only biological but also environmental factors e.g., age related natural decline in sleep need, changes in presleep behavior such as watching TV or spending time on screens or burden of the school-work [2,5,6]. Among these, watching television or spending time with a screen before bed (screen time) is known to reduce the total sleep time and to

delay the sleep onset [2,5]. It has been found that children who have longer screen time, show difficulty in both sleeping as well as in waking up [7].

In addition to the factors mentioned above, sleep patterns of children are also influenced by the cultural practices and sleep schedule followed by family [8,9]. It has been reported that children of Asian origin had a later bed-time (around 10.30 pm) as compared to children with predominantly Caucasian origin who went to bed earlier (at 7.45 pm) [9]. Not only the sleep pattern but co-sleeping too is influenced by the cultural practices. It has been reported that co-sleeping was more common among Asians as compared to western children [4,10,11,12]. Aishworya et al. [13] found that children in Singapore had difficulty in sleeping alone and that they required some company to fall asleep. Similarly, co-sleeping was observed among 73% and 93% children in two studies from India [4,12]. Following the similar trend, 87% Japanese children were reported to share the bedroom with their parents [10].

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However, prevalence of co-sleeping was lesser in China, where approximately 38% children were found to co-sleep with their parents [14]. Thus, with the exception of China, co-sleeping is common in Asian region. On the other hand, co-sleeping is less prevalent in West, with the prevalence of around 50% during infancy which further reduces as the age advances [15]. Thus, this data suggests that culture influences the sleep pattern as well as sleep practices.

Not only the culture, but also the domicile and gender may influence sleep. Girls have been found to have longer sleep and they spend more time in motionless sleep [16]. To make the issue further complex, a study from Brazil showed that girls had a longer nighttime sleep on holidays but not on weekdays [17]. Another study from Japan showed that girls had a longer sleep onset latency as compared to boys [18]. Thus, it appears that gender influences some of the sleep parameters that but the results were inconsistent among studies [16–19].

Considering the facts that pre-sleep behaviors, sleep schedule and sleep practices are influenced by cultural background and gender, and in view of a dearth of studies from India, which is culturally different from not only from other countries but also between its own urban and rural areas, present study was planned. Most of the studies addressing this issue included sample from the clinics, and findings of these studies are difficult to be extrapolated to non-clinical samples [8,9,4,20,21]. Moreover, we could not find any study comparing the influence of domicile on sleep patterns, despite the fact that at least in India, socio-economic disparity is high between urban and rural areas [22]. This disparity may influence the sleep parameters by having an impact on availability of electricity and screens.

This study was designed to assess the pre-sleep behavior and sleep schedule of school going children falling in the age group of 8–13 years. We hypothesized that total sleep time would be lesser in urban children while the co-sleeping would be more frequent among rural children. We also assumed that girls would be sleeping lesser than the boys. Thus, the objectives of the study were to compare sleep pattern on the basis of domicile, school type and gender among Indian school children.

2. Method

This study was done after obtaining permission from the Institutional Ethics Committee of Himalayan Institute of the Medical Sciences, Dehradun. We included four schools from the rural area and four schools from the urban area. Urban schools included those educational institutions, which were within the administrative area of Dehradun Municipal Corporation. Rural schools were situated in an area, which was outside the jurisdiction of city's municipal corporation, but situated in a block within the same district. Among these, in each group, two schools were the public schools, run by private trusts and the Government ran the other two. In general, there is a socioeconomic difference between the government and public schools; public schools usually cater the children with higher socio-economic strata. The names of the schools were randomly chosen from the list of the major schools in the city and that of the chosen block. All the schools were running the morning shift (8.00 am to 2.00 pm).

School authorities were approached and they were explained regarding the rationale of the study. They were requested to distribute a questionnaire (vide infra) that enquired about sleep related behaviors and sleep disorders among children aging 8–13 years, irrespective of their gender. The questionnaire was distributed to all the students by their class teachers. They encouraged the children to get it filled by their parents. Questionnaires were collected a week later from each of the student by

the class teachers who then submitted the questionnaires to the office of the school-authority. From there, all the questionnaires were collected by one of the authors. All the students who cooperated in the study, and whose form had complete information were included for final analysis.

2.1. Questionnaire

Questionnaire had two sections – first section explained the rationale of the study in detail to the parents and requested them to provide desired information regarding sleep of the child along with the written informed consent. It also had items that were directed towards demographic details and some items related to co-sleeping e.g., number of persons sharing the bedroom of the child in the house and number of persons sharing the bed with the child. It also had items to gather the medical history of the child. Second section consisted of Hindi version of Childhood Sleep Habit Questionnaire (CSHQ). All the items were responded by the parents.

2.2. Childhood sleep habit questionnaire

Childhood sleep habit questionnaire was developed by Owens et al. [23]. It has 45 items that enquire about the child's usual bedtime and usual wake-time on week days/week ends and naps during the day. It has many sub-scales that enquire about the bedtime behavior, sleep behavior, parasomnia, sleep related breathing disorder and daytime sleepiness. It has internal consistency of 0.68 for community sample and 0.78 for the clinical sample [23]. This has been translated and validated in many languages including Hindi [24–27]. A cutoff score of 41 has been proposed to differentiate between the children with and without sleep problems in the original study with 80% sensitivity and 72% specificity [23].

In the present study, Hindi version of CSHQ was used after obtaining permission from principal author of the original paper [23,24].

3. Statistical analysis

Statistical analysis was done using SPSS v 21.0 (IBM Inc., USA). Descriptive statistics was calculated. Normality of data was checked based upon visual analysis of the Q-Q plot curve. Proportion was compared using chi-square statistics and, independent sample 't' test was used to compare numerical variables. We compared the variable based upon two factors- first, depending upon domicile i.e., urban and rural children and secondly, between genders. Three way ANOVA was run to see the effect of gender*domicile*school type of sleep related continuous parameters.

4. Results

In this study a total of 1138 students were approached. Among these 1027 forms were returned (overall response rate 90.2%; urban=91.4%, rural=86.9%). These forms were examined for the inadequacies and 196 forms were excluded because of incomplete information e.g., missing a part of demographic data, sleep schedule, information regarding co-sleeping, pre-sleep behavior or the sleep disorders. Thus, finally the 831 (73%) forms were analyzed. Medical history was not significant in any of the children.

4.1. Demographic variables

Mean age of the subjects included in this study was 8.9+1.5

Table 1
Comparison of sleep patterns between rural and urban subjects.^a

	Rural (n=200)	Urban (n=631)	P
Age (years)	8.48 (1.8)	9.08 (1.4)	< 0.001
Bedtime schooldays (pm)	9.20 (0.9)	9.35 (0.7)	< 0.001
Sleep onset latency schooldays (min)	15.9 (12.2)	15.4 (10.0)	0.54
Wake-time schooldays (am)	6.0 (1.1)	5.9 (0.7)	0.14
Total sleep time schooldays (h)	8.7 (1.3)	8.3 (1.1)	< 0.001
Bedtime weekends (pm)	9.50 (1.1)	9.70 (1.9)	0.11
Sleep onset latency weekend (min)	17.2 (15.6)	15.6 (11)	0.12
Wake-time weekend (am)	7.50 (1.2)	7.40 (1.1)	0.31
Total sleep time weekends (h)	9.8 (1.5)	9.4 (1.2)	< 0.001

^a Values presented as mean (SD).

years (range 9–14 years). 51% subjects were boys in this study. Students from the urban schools were overrepresented in this study (631 from urban schools versus 200 from rural schools).

On the schooldays 88% children went to bed between 8 and 10 pm to wake up between 5 and 6 am (80.4%). Average sleep latency was 15.6 (SD=10.6) min. They spent around 8.3 (SD=1.2) hours in sleep on schooldays. On the weekends, there was no change in the bedtime and sleep onset latency, but the wake time was delayed by 1–3 h and most of the children had wake-times ranging between 6 and 9 am (92.2%). Thus, total sleep time was increased to 9.5 (SD=1.3) h on the weekends. A total of 82% children had to share bedroom with 2–4 family members.

4.2. Comparison of urban versus rural subjects

Comparison of sleep schedule between rural and urban children is depicted in Table 1.

4.2.1. Pre-sleep behavior

Nearly half of the subjects from each group had the habit of reading books before going to bed ($P=0.3$) and one fourth used to play with mobile phone ($P=0.4$). Television watching before bedtime was more common among urban children (76.2% among urban versus 69% in rural; $\chi^2=4.1$; $P=0.04$).

Most of the children were reported to go to bed by themselves (84% urban and 79% from rural; $\chi^2=2.6$; $P=0.1$). Two third children from each group used to follow their sibling to bed and remaining one third had to be forced to bed by their parents. No effect of domicile was observed in these parameters (follows the sibling- $\chi^2=0.07$; $P=0.7$; forced to bed- $\chi^2=1.4$; $P=0.22$). 22.5% urban children and 25% rural children required some specific object (e.g., blanket, toy) in the bed to fall asleep ($\chi^2=0.53$; $P=0.4$). 45.5% rural children and 27.7% urban children were afraid of sleeping in the dark ($\chi^2=22$; $P<0.001$) and 44% rural and 35% urban children were afraid of sleeping alone in bed ($\chi^2=5.2$; $P=0.02$).

4.2.2. Co-sleeping

Bedroom of rural children was more crowded as compared to the urban children (average=4.5; SD=1.7 persons in a bed room in rural area as compared to mean 2.6; SD=1.2 persons in child's bedroom in urban area; $P<0.001$) Nearly three-fourth (75.5% rural and 79.7% urban) children from each group shared their bed ($P=0.2$). More than half of them needed somebody in the room to fall asleep (59.5% rural vs 57.2% urban; $\chi^2=0.32$; $P=0.5$).

4.2.3. Parent's perception regarding duration of sleep

31% of rural parents as compared to 21.6% of urban parents felt that their child was sleeping too little ($\chi^2=7.4$; $P=0.006$). 65.5%

rural parents as compared to 77.5% urban parents reported that their child was sleeping sufficient enough ($\chi^2=11.5$; $P=0.001$). Thus, inadequate duration of sleep was reported more commonly from rural area. 35.5% rural and 40.1% urban parents reported that their child was sleeping for same duration each day ($\chi^2=2.4$; $P=0.12$). A greater number (50.4%) of the urban children were reported to demand more sleep as compared to rural children (41.5%) after waking up in the morning ($\chi^2=4.8$; $P=0.02$). 62.9% urban children and 54.5% rural children fell asleep easily after waking up at night ($\chi^2=4.5$; $P=0.03$). A greater number of children from rural background had trouble in sleeping away from home as compared to urban children (33% rural vs 25% of urban children; $\chi^2=4.8$; $P=0.02$).

4.3. Comparison of boys and girls

Comparison of sleep schedule between genders is depicted in Table 2.

4.3.1. Pre-sleep behavior

Nearly half of the subjects from each group were reported to read book before going to bed ($P=0.3$); three fourth of them had habit of watching television before going to bed ($P=0.8$), one third liked to play games in their mobile phones ($P=0.08$). Thus, pre-sleep behavior was comparable between genders.

Most of the children were reported to go to bed by themselves (80.4% boys vs 84.5% girls; $\chi^2=3.5$; $P=0.6$). A higher number of girls (70.1%) used to follow their siblings to the bed as compared to 61.5% boys ($\chi^2=0.68$; $P=0.009$) and approximately one third from each group had to be forced to bed ($\chi^2=0.47$; $P=0.4$). A significantly greater number of girls (26.7%) demanded some specific object to fall asleep as compared to boys (19.7%) ($\chi^2=5.8$; $P=0.01$). Nearly one third of the children were afraid of sleeping in the dark from each group ($\chi^2=0.008$; $P=0.9$).

4.3.2. Co-sleeping

Both boys as well girls were reported to share their bedrooms with an average of 3 persons (boys: 3.1+ 6.7, girls 3+ 1.4; $P=0.6$) and bed sharing was reported by 80.1% boys and 77.2% girls ($\chi^2=1.0$; $P=0.3$). 58.2% boys and 57.4% girls needed someone in room to fall asleep ($\chi^2=0.05$; $P=0.8$) and nearly one third wanted somebody in bed to stay asleep ($P=0.2$). However, gender did not influence the fear of sleeping alone (35% boys and 39.5% girls; $\chi^2=1.7$; $P=0.1$).

4.3.3. Parent's perception regarding duration of sleep

Gender did not affect the perception of parents regarding the total sleep time (whether it is too little) of their child ($\chi^2=1.6$; $P=0.2$) and nearly three fourth parents from each group considered that their child was sleeping sufficient enough ($\chi^2=0.32$; $P=0.5$). Parents of 38.8% girls and 41.7% boys reported that their

Table 2
Effect of gender on the sleep patterns.^a

	Male (n=423)	Female (n=408)	P
Age (years)	8.9 (1.5)	8.8 (1.5)	0.3
Bedtime schooldays (pm)	9.30 (0.8)	9.35 (0.8)	0.6
Sleep onset latency schooldays (min)	15.2 (10.3)	15.9 (10.8)	0.3
Wake-time schooldays (am)	5.90 (0.8)	6.0 (0.8)	0.4
Total sleep time schooldays (h)	8.3 (1.0)	8.3 (1.3)	0.7
Bedtime weekends (pm)	9.60 (2.1)	9.70 (1.4)	0.5
Sleep onset latency weekend (min)	15.6 (13.1)	16.4 (11.3)	0.3
Wake-time weekends (am)	7.4 (1.2)	7.4 (1.1)	0.7
Total sleep time weekends (h)	9.4 (1.3)	9.5 (1.3)	0.4

^a Values presented as mean (SD).

child was sleeping for the same duration each day ($\chi^2=0.72$; $P=0.3$). Nearly half of the children from each gender were reported to demand more sleep after waking up in the morning ($P=0.4$). Nearly one fourth of children from either gender had difficulty in sleeping away from home ($\chi^2=0.02$; $P=0.8$). After waking up at night, greater proportion of girls used to fall back asleep easily as compared to boys (65.2% girls vs. 56.7% boys; $\chi^2=6.2$; $P=0.01$).

4.4. Interaction of various parameters

3 way interaction between gender**domicile**school type was not significant for any of the sleep parameters. However, interaction between school-type and *domicile* was found significant for wake-time on school days, total sleep time on school days and wake-time at weekends (Table 3).

5. Discussion

This study shows some important facts about the sleep of Indian school going children. First, most of the children used to watch television before going to bed. Television watching was more common among urban children and their total sleep time was shorter as compared to rural children. Second, urban children felt a need for sleeping more as compared to rural children after waking up in the morning. Third, room sharing was more frequent among rural children. Fourth, bed sharing was seen among three fourth of the children, irrespective of the *domicile*. Fifth, parents of rural children felt that their children require more sleep. Sixth, most of children were sleeping longer on weekends. Lastly, interaction between gender and *domicile* and school type showed that it had no effect on the sleep-patterns.

In the present study we found that the usual bedtime was around 10 pm. Similar finding has been reported by the studies that haven included Asian children [9,28]. One of the study have reported that Caucasian children had an earlier bedtime as compared to the Asian children [28]. It has also been reported that delay in the bed time shortened the duration of nocturnal sleep and these children had felt sleepy during the day, an effect which was also observed in the present study when we compared the total sleep time and need for sleep after waking up between urban and rural children [28]. Further, this study showed that despite comparable bedtime between the weekdays and weekends, wake time was delayed by one hour in the weekends. This may be a surrogate marker for the sleep deprivation among Indian school-going children.

Issue of television watching and its effect on the sleep of the children has been addressed in various studies [7,2,29,5,30]. These studies have reported that television watching was associated with reduction of total time spent in sleep and that these children reported difficulty in waking up [7]. They also felt sleepy during the

day and enjoyed less in the school. This difference was observed between children who watched television for at least two hours in a day [7]. Another study reported that each one hour spent in television watching reduced the duration of sleep by seven minutes [2]. Another study reported that presence of media including television in the rooms of the children had delayed the time to bed and also reduced the total sleep time [29]. Though we did not directly examine if the television watching before bedtime had delayed the bedtime, but it is possible that sleep of urban children could be influenced by television watching before the bedtime. This becomes further substantiated by the fact that urban children had difficulty in waking up and demanded more sleep after waking up. It is an important modifiable factor that affects the children's sleep and this deserve further exploration in Indian settings.

Co-sleeping is defined as sharing of the bed and the room by some other person in addition to the index person [31]. We found that room sharing was more common among rural children as compared to urban counterparts. In addition, the number of persons sharing the bedroom was higher in the rural area. This could be influenced by the availability of the space in the house as well as the cultural practices. National Family Health Survey-III showed that overcrowding was more common in rural areas as compared to urban areas in India. In addition to the available space, cultural factors could have also played a role in co-sleeping. Available literature also suggests that co-sleeping is more common among Asian community as compared to western. One Indian study reported co-sleeping among 93% children in the age group of 3–10 years [4]. Another study from Singapore has shown the prevalence of co-sleeping among 73% children in age groups of 2–19 years and 81% in 2–6 years [12,13]. In Japan, the reported prevalence of co-sleeping was 87% [10]. The only exception to this is the China where co-sleeping was found to be less prevalent (37%) among school children with further reduction in prevalence with increasing age [11,14]. However, even in China, it was still higher than most of the Western countries. This is an important issue in view of known adverse health consequences of co-sleeping as reported in some of the studies e.g., nocturnal enuresis, parasomnia, sleep apnea, bedtime resistance, daytime sleepiness [14,32]. However, contradictory literature is also available which suggest that children who co-sleep have lesser prevalence of sleep-starts and nightmares [12]. This needs to be addressed in future studies.

Parents from the rural background reported that their children were sleeping lesser than desired duration in this study. It was observed despite the fact that the rural children spent a longer time in sleep as compared to the urban children and the "need for more sleep" was more prevalent among urban children. To best of our knowledge, this fact has never been examined before and it may be related to the cultural effect on sleep practices [33]. Our clinical experience suggests that people in the rural areas go to bed soon after the sunset to wake up just before the dawn. Thus, they spend around 10–12 h in bed in addition to the 1–2 h of siesta. This

Table 3

Interaction of different variables on the sleep related parameters (3 way ANOVA: *P* values are shown).

Variable	Gender* <i>school type</i> ^a	Gender* <i>domicile</i>	School type ^a * <i>domicile</i>	Gender* <i>domicile</i> * <i>school type</i> ^a
Bedtime schooldays (pm)	0.77	0.58	0.08	0.33
Sleep onset latency schooldays (min)	0.56	0.45	0.41	0.45
Waketime schooldays (am)	0.64	0.90	< 0.001	0.92
Total sleep time schooldays (h)	0.27	0.27	< 0.001	0.23
Bedtime weekends (pm)	0.24	0.28	0.05	0.41
Sleep onset latency weekends (min)	0.42	0.41	0.06	0.83
Waketime weekends (am)	0.42	0.26	0.03	0.25
Total sleep time weekends (h.)	0.91	0.09	0.94	0.15

^a School type: public vs government.

could be one reason that the parents from the rural areas felt that their children had required more sleep. During past few years, India has witnessed a major lifestyle and cultural change with availability of electricity and television in many of the rural areas. It is possible that these factors might have curtailed the total time spent in sleep among rural children, resulting in parent's perception that their children required more sleep. This could also be the reason that interaction of gender, domicile and school type did not find any difference in the total sleep time. However, these issues need to be further verified through a large scale research.

One surprising finding of this study was the absence of effect of gender on the pre-sleep behaviors; sleep schedules, co-sleeping and parent's perception of sleep. Though we could not find any comparative literature, one of the earlier studies had failed to find the effect of gender on co-sleeping, a finding that was confirmed in present study [14].

Like any other study, this study also had some limitations. First, this was a questionnaire-based study and we have conflicting literature regarding the validity of measurement of sleep patterns using questionnaires. While some studies suggest that questionnaires provide authentic information, others contradict it [34]. However, it must be remembered that CSHQ is a validated questionnaire and has been used in a number of studies across the globe, as already mentioned. Moreover, gathering objective data is a bit difficult in such a large population. Hence, we relied on gathering the information through questionnaire. Second, the parents provided the information rather than the child himself. This is important because parents have been reported to overestimate their children's sleep [35]. Third, size of the urban and rural groups was dissimilar. However, distribution of normality of data has been checked. Fourth, we did not enquire for socio-economic status. Fifth, gender difference might have been influenced by the age and could be present only among adolescents.

In conclusion, this study found that children were sleeping less on the weekdays as compared to weekends and urban children were sleeping less than rural children. This had reflected as their "need for the sleep" during the day and resulted in napping. Most of the children had a habit of watching television before going to bed and this could be one factor for the delayed bedtime among children. Considering the health impact of sleep deprivation, there is a need for urgent measures to be taken to improve the sleep patterns among children.

Conflict of interest

There is no conflict of interest to disclose.

Contribution details

Ravi Gupta and Sunil Dutt Kandpal designed the study. Nidhi Mittal worked towards data collection and data entry. Deepak Goel, Mohan Dhyani and Manish Mittal helped Ravi Gupta in data analysis. Ravi Gupta prepared the first draft of the manuscript and other authors provided their critical intellectual content. All authors approved the final manuscript and take responsibility for its content.

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