

Bedtime and its correlates among secondary school children in Karachi, Pakistan

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Abstract

Objectives: To determine the demographic and lifestyle predictors of bedtime among secondary school children in Karachi, Pakistan, and to assess what variables of daytime functioning correlate with bedtimes.

Methods: The cross-sectional study was conducted between September and October 2007, among secondary school students aged 10-16 years, in the socio-economically diverse city of Karachi. Data was collected using a pre-tested self-reporting questionnaire, and analysed by univariate and multivariate logistic regression analysis on SPSS version 15. A p value of <0.05 was considered significant. All odds ratio were recorded with a 95% confidence interval.

Results: Of the 539 students in the study, 102 (18.92%) were male and 437 (81.07%) were female. Of the total, 401 (74.4%) slept late (after 10pm). Homework and TV shows were more frequent reasons of bedtime among the late-sleepers, whereas parental influence was reported more by the early-sleepers. Advancing grade at school, father's profession as doctor or engineer and sleeping alone in the room were independent predictors of late bedtime on multivariate analysis ($p < 0.05$). Students who were older, did not share a bed, or slept for >3 hours during the afternoon, were more likely to sleep after 10pm on univariate analysis only ($p < 0.05$). Students sleeping late were more likely to get less daily and nocturnal sleep, wake-up later, require multiple wake up reminders in the morning, fall asleep in a morning class and feel tired during the day ($p < 0.05$). They were also 2.42 times less likely to feel that they got adequate sleep to be fresh in the morning ($p < 0.001$; 95% CI 1.58-3.72).

Conclusion: More than three-fourth of our secondary school children sleep late. Parents and teachers should foster healthy sleeping habits and early bedtimes among students to allow optimal daytime functioning.

Keywords: Bedtime, Students, Correlates. (JPMA 62: 1168; 2012)

Introduction

Sleep is an important determinant of one's health and functionality. Its effects are seen on both adult and children population. Sleep patterns and problems in children are influenced not only by a large number of biological and psychological factors, but also by cultural, social, environmental and family factors.¹⁻⁸ It is believed that environmental factors may play a more important role than biological factors, such as age, gender, and pubertal development, in the changing sleep-wake behaviour at early adolescence.²

Many factors like mother's educational level, daytime naps and watching TV at night affect the sleep duration.¹ Television-viewing habits, particularly the presence of media in a child's room, have shown to negatively affect the sleep-wake pattern of Chinese school going children.⁹ Bed-sharing has been correlated with later bedtimes, later awakening times, and a shorter duration of sleep in some studies.¹⁰ Among Korean adolescents,

advancing school grade has been found to be significantly associated with higher academic demands, sleeping late and waking up early.⁸ Increasing age also contributes to late bedtime at night and less duration of sleep among the adolescents.⁶ On the other hand, parenting style encouraging social maturity in children is linked with healthier sleep patterns.⁷

Adolescence marks a transition to evening-type sleeping pattern among many children.² Inadequate sleep imparts serious consequences and interferes with the functioning of a child in various aspects.⁵ For example, it correlates with daytime sleepiness¹¹ and poor performance at school.^{12,13} Such implications signify the need of determining modifiable factors that influence sleep duration during the critical growth phase of adolescence.

A late bedtime, accompanied by an early wake-up time on school days and oversleeping for more than two hours on weekend mornings, are clinical indicators of insufficient sleep in an adolescent.⁵ In all parts of the world,

children wake up mostly at the same time, i.e. early, as they have to go to school. Delaying school start time by even an hour has shown to increase sleep durations and improve daytime performance.¹³ However, this is beyond the control of the students or their families. Total sleep duration decreases due to later bedtime, but unchanged wake-up time as the age increases.³ Thus, factors affecting the bedtime, in turn, affect the total sleep duration.

The future of a nation depends on its youth. For a developing country like Pakistan, it is of utmost importance to provide the children with an environment that fosters their mental and physical development. To our knowledge, factors that influence the sleep habits of Pakistani students and the effects of such habits on daytime functioning have not been explored. Hence, we conducted this study to assess the association of various demographic and lifestyle factors with bedtime, and to identify the aspects of daytime functioning that are influenced by bedtime among secondary school children in Karachi, Pakistan.

Subjects and Methods

The cross-sectional study on secondary school children, with ages ranging from 10-16 years, was conducted between September and October 2007.

Karachi is the largest city of Pakistan with 18 towns. We chose one town with a socio-economically diverse population for our study. Keeping alpha as 5% and confidence interval as 95%, a sample size of 423 was calculated. This assumed a 50% variance and adjusted for a 10% non-response rate. Convenience sampling was used to draw the sample. We chose seven different schools from both the public and private sectors. Inclusion criterion was secondary school students aged 10-16 years, with no known co-morbidities. Students with psychological problems, congenital anomalies, sleep apnoea or chronic illnesses were excluded from the study.

Data was collected through a self-reporting questionnaire developed by modifying a validated questionnaire used for adolescent sleep habits survey by a paediatric sleep clinic.¹⁴ It was pre-tested on an independent sample of secondary school children, aged 10-16 years, and was found to be satisfactory. After permission from school principals, the investigators explained the details of study objectives and methodology to the students, who were then given assent forms. Forms for parental consent were distributed among students who gave assent. The next day, the students who returned with signed parental consent forms were given the questionnaire. To answer any question, a teacher and one or two of the investigators were present in the classroom as students filled the forms. All forms were translated into Urdu for students of public-sector schools.

The questionnaire was anonymous, guaranteeing confidentiality of the participants. The study, which was approved by the Aga Khan University Ethics Review Committee, offered no incentives to the participants.

The questionnaire included demographic variables, lifestyle factors and variables of daytime functioning. These variables were assessed through well-phrased questions easily comprehensible by students. Most questions were followed by a few responses to choose from, as well as an option of 'others (please specify)' to identify any common responses possibly missed in the questionnaire.

Various demographic and lifestyle variables were assessed to identify predictors of bedtime. Demographic variables included participants' age, gender, grade (class) in school, father's occupation and mother's occupation. Lifestyle variables included bedtime on weekdays, reasons for going to bed at the stated time, and reasons for staying up late, bed-sharing, room-sharing, number of room-mates, frequency of afternoon naps in a week, and duration of afternoon naps in the day.

Daytime functioning was assessed using questions regarding waking-up time on weekdays, ease in waking up (one reminder/multiple reminders), frequency of missing school and being late to school, subjective satisfaction of getting enough sleep to feel fresh in the morning, the incident of falling asleep in a morning class or in an afternoon class in a two-week duration, and the frequency of feeling tired or sleepy during the day in an average two weeks.

Data entry was done using Epi-info version 3.1, and analysis was performed on SPSS version 15. Daily sleep duration was computed for each student from the bedtime, wake-up time and afternoon nap duration stated by that student. Categorical variables were analysed in terms of frequency and percentage of students, whereas means and standard deviations were calculated for continuous data. For the purpose of analysis, students were grouped according to bedtime as those sleeping early (i.e. at or before 10pm) and those sleeping late (i.e. after 10pm). The cutoff of 10pm was selected to allow an adequate 8 hours of sleep at night, as most schools in Pakistan start by 7:30-8am. Common reasons of early and late bedtime were evaluated by computing number and percentage of respondents stating a specified reason. Associations among different variables and the bedtime of students were assessed using chi-square test and independent sample t-test as applicable. A p value of <0.05 was considered significant. Variables with significant p-values were further subjected to multivariate logistic regression analysis to ascertain independent predictors of bedtime. All odds ratios were recorded with a 95% confidence interval. Demographic and lifestyle variables were analysed separately from variables of

daytime performance.

Results

Of the 539 students in the study, 102 (18.92%) were male and 437 (81.07%) were female. The mean age of the students was 13.60±1.66 years. Most fathers (n=131; 21%) were businessmen by profession. Other common professions were government officers (n=57; 10.6%) and engineers (n=47; 8.7%). Most mothers were housewives (n=327; 61%), followed by teachers (n=54; 10%) and doctors (n=49; 9%). More than three fourth students (n=416; 77.2%) shared their room with at least one person, and 243 (45%) shared their beds also. Besides, 79 (14.6%) students slept for more than 3 hours during the day.

Out of 539 students, 401 (74.4%) students reported

sleeping after 10pm. Among the respondents, 528 (98%) explained why they sleep at their stated bedtime. The top four reasons for going to bed at night among students who slept early and those who slept late were compared (Table-1). Time fixed by parents and the routine of siblings was a more common reason for bedtime among students sleeping early and for ages less than 12 years. On the other hand, schoolwork and television shows were more common among those who slept late and for older students.

We found a direct relationship between age and sleeping late. While half of 10 year old students slept late, this percentage rose to 87.9% by 15 years of age. Most students of class 6 (55.7%) slept before 10pm, whereas among the rest of the classes (grades), majority of the students slept late. Percentage of students sleeping late

Table-1: Reasons of sleeping at the stated bedtime on weekdays among secondary school children in Karachi (n=528).

| Early Sleepers (n=127) | n (%) | Late Sleepers (n=401) | n (%) |
|--|-----------|--|------------|
| Feeling Sleepy | 47 (37.0) | Feeling Sleepy | 141 (35.2) |
| Bedtime set by parents | 39 (30.7) | Homework | 132 (32.9) |
| Siblings going to bed at the same time | 17 (13.4) | TV shows | 41 (10.2) |
| Homework | 12 (9.4) | Siblings going to bed at the same time | 28 (7) |

Only top four reasons are compared.

Table-2: Association of bedtime with demographic and lifestyle factors.

| Variables | Total Children (n) | Children Sleeping Late (%) | P values Ratio (95% CI†) | Crude Odds Ratio (95% CI†) | Adjusted Odds |
|-------------------------------|--------------------|----------------------------|--------------------------|----------------------------|--------------------|
| Gender | | | 0.500 | | |
| Female | 437 | 75.3 | | 1 | |
| Male | 102 | 78.4 | | 1.19 (0.71, 2.01) | |
| Mean Age (years) | 13.60 ± 1.66* | 13.88 ± 1.54* | <0.001 | 1.56 (1.37, 1.77) | 1.18 (0.92, 1.51) |
| Class | 8.47 ± 1.54* | 8.76 ± 1.44* | <0.001 | 1.72 (1.49, 1.99) | 1.48 (1.13, 1.95) |
| Father's Occupation | | | 0.005 | | |
| Professional ** | 96 | 86.5 | | 2.29 (1.23, 4.27) | 2.01 (1.01, 4.00) |
| Others | 443 | 73.6 | | 1 | 1 |
| Mother's Occupation | | | 0.091 | | |
| Professional ** | 58 | 84.5 | | 1.83 (0.87, 3.84) | |
| Others | 481 | 74.8 | | 1 | |
| Afternoon naps | | | 0.92 | | |
| No | 232 | 76.3 | | 1 | |
| Yes | 303 | 75.9 | | .98 (0.66, 1.46) | |
| Afternoon nap duration | | | 0.046 | | |
| <3 hours | 454 | 74.9 | | 1 | 1 |
| >3 hours | 79 | 84.8 | | 1.87 (0.98, 3.59) | 1.83 (0.91, 3.71) |
| Number of Roommates | | | <.001 | | |
| 0 | 113 | 86.7 | | 5.08 (2.44, 10.59) | 5.17 (2.16, 12.35) |
| 1 | 166 | 80.1 | | 3.14 (1.68, 5.85) | 3.66 (1.78, 7.55) |
| 2 | 104 | 76.9 | | 2.59 (1.32, 5.08) | 3.21 (1.50, 6.85) |
| 3 | 82 | 72.0 | | 2.00 (1.00, 3.98) | 2.48 (1.14, 5.40) |
| >3 | 64 | 56.3 | | 1 | 1 |
| Bed Sharing | | | 0.007 | | |
| No | 291 | 80.8 | | 1.73 (1.16, 2.59) | 1.11 (0.68, 1.82) |
| Yes | 243 | 70.8 | | 1 | 1 |

* Given in mean ± SD.

** Professionals include doctors, engineers and artists

† Confidence Interval.

Table-3: Factors affected by bedtime among the study sample.

| Variables | Total Children (n) | Children Sleeping Late (%) | P values | Odds Ratio (95% CI†) |
|---|--------------------|----------------------------|------------------|-----------------------|
| Total daily sleep | | | <0.001 | |
| <8hours | 228 | 98.7 | | 51.38 (16.08, 164.20) |
| ≥ 8hours | 305 | 59.3 | | 1 |
| Wake up time | | | 0.024 | |
| Before 6am | 160 | 69.4 | | 1 |
| After 6am | 377 | 78.5 | | 1.61 (1.06, 2.45) |
| Ease in waking up | | | 0.046 | |
| One reminder | 392 | 74 | | 1 |
| Multiple reminders | 137 | 82.5 | | 1.66 (1.01, 2.72) |
| Subjectively gets enough sleep to feel fresh in morning | | | <0.001 | |
| No | 240 | 84.6 | | 2.42 (1.58, 3.72) |
| Yes | 294 | 69.4 | | 1 |
| Tired, dragged out or sleepy during day in a 2 week duration | | | <0.001 | |
| Never | 236 | 66.5 | | 1 |
| 1-3x | 187 | 85.0 | | 2.86 (1.76, 4.64) |
| 4-6x | 37 | 89.2 | | 4.15 (1.42, 12.13) |
| Every day | 60 | 73.3 | | 1.38 (0.74, 2.61) |
| Falls asleep in morning class in a 2 week duration | | | 0.003 | |
| Yes | 48 | 91.7 | | 3.80 (1.34, 10.81) |
| No | 471 | 74.3 | | 1 |
| Falls asleep in afternoon class in a 2 week duration | | | 0.304 | |
| Yes | 50 | 82.0 | | 1.48 (0.69, 3.14) |
| No | 465 | 75.5 | | 1 |
| Absent from school | | | 0.800 | |
| < once a week | 489 | 76.7 | | 1 |
| ≥ once a week | 44 | 75.0 | | 0.91 (0.45, 1.86) |
| Late to school | | | 0.412 | |
| < once a week | 494 | 76.9 | | 1 |
| ≥ once a week | 38 | 71.1 | | 0.74 (0.35, 1.53) |

† Confidence Interval.

increased as class became higher, reaching 93.3% in class (grade) 11. There was no association between bedtime and gender of the students. The highest percentage (91.5%) of late-sleepers was seen among children of engineer fathers and the lowest (57.4%) was observed among the children of labourers. Similarly, labourer mothers had the least percentage of children with delayed bedtimes than mothers of other professions (50% vs. 76.6%; $p=0.022$). It was also found that as the number of people sleeping in the same room increased, children went to bed earlier. Among those who did not share a room, 98 (86.7%) slept after 10pm as compared to 36 (56.3%) of those who shared a room with more than 3 people.

On univariate analysis, a child's bedtime was significantly associated with age ($p<.001$), grade at school ($p<.001$), father's occupation ($p=.005$), duration of afternoon nap ($p=.046$), number of roommates ($p<.001$) and with bed-sharing ($p=.007$) (Table-2). On multivariate logistic regression analysis, it was found that sleeping late was more likely in students who were in a higher class (grade), whose fathers were doctors or engineers, and who slept alone in the room. When taken in multivariate analysis, the influence of bed-sharing on bedtime was not

significant (Adjusted OR 1.11; 95% CI 0.68-1.82). We found that students who shared a bed at night, studied in a lower class (grade) than others (8.22 vs. 8.69 respectively; $p<0.001$). These students were also significantly younger than those who did not share a bed 13.44 ± 1.67 and 13.75 ± 1.63 years respectively; ($p =0.029$).

Nocturnal sleep duration was considerably shortened among the late-sleepers than those who slept early (6.65 ± 1.12 and 9.28 ± 0.76 hours respectively; $p<0.001$). Similarly, late-sleepers had an average of 7.85 ± 1.62 hours of total daily sleep, which was significantly less than 10.30 ± 1.32 hours among the early-sleepers ($p<0.001$). More than half ($n=222$; 55.4%) of those sleeping late got less than 8 hours of daily sleep as compared to only 2.2% ($n=3$) of the early-sleepers ($p<0.001$). Going to bed early was also associated with subjective contentment of getting adequate sleep to be refreshed in the morning. Of the early-sleepers, 98 (71%) thought they get adequate sleep compared to only 50.1% ($n=201$) of the late-sleepers ($p<0.001$). Such students also woke up in the morning with greater ease ($p=0.04$) and were less likely to fall asleep in a morning class ($p=0.003$) (Table-3). There was no relation of bedtime with missing school, being late to school and

falling asleep in an afternoon class.

Discussion

The results gave interesting insight into the correlates of bedtime among secondary school children in Karachi, Pakistan. Predictors of delayed bedtime among American teenagers include increasing hours of social activities, computer use, TV watching, work activities and educational activities.⁴ One of the main reasons for staying up late in our study was homework and studies. This finding corroborates with other studies which have shown that doing homework is related to decreased night-time sleep.^{15,16} Bedtime television viewing and presence of TV in a child's bedroom are strong predictors of bedtime resistance and sleep onset delay in children of elementary schools.⁹ TV viewing is also related to later bedtimes and shorter sleep durations among secondary school children.¹⁷ Consistent with these studies, our study reported TV viewing at night as one of the top three reasons for late bedtime.

Among the early-sleepers, one of the main reasons of an early bedtime in our study was the setting of bedtime by parents. Similarly, a study reported that German adolescents without parental monitoring went to bed later, and parental involvement in the setting of bedtimes decreased with age to almost zero by the age of 17 years.⁶ Among American adolescents, stricter household rules have shown to be predictive of longer sleep durations.¹⁵

It has been observed for long that with advancing age and grade in school, bedtimes among adolescents become later and sleep durations decrease.^{2,3,8,12,18} The same trend was seen in our study sample. However, when taken in multivariate analysis, the significance of the effect of age was lost. This may be due to the fact that the burden of homework, a major reason of sleeping late, varies with grade in school regardless of a student's age.

We found a significant association of bedtime with father's occupation, but not with that of the mother. This is in contrast to the findings of a study done on elementary school children,¹ and may be due to the fact that most mothers in our study sample were housewives. Children of doctors, engineers and artists were twice as likely to stay up late as others. This may be a reflection of family culture in our part of the world, where family routine is set according to the time the father comes home from work, which is often late at night. Unfortunately, other similar studies are lacking for comparison. Further studies are needed to determine the possible causes behind this observation.

Afternoon naps of less than 30-minute duration are reported to be beneficial in adults. We observed naps as long as 180 minutes in our study, and such students were more likely to sleep late. Daytime napping has also shown to be significantly related to nocturnal sleep duration among

elementary school children.¹

Co-sleeping of secondary school-children with family members has not been extensively studied in literature. Limited data exists on pre-adolescents, while such studies on adolescents are lacking. A high percentage of our study sample shared room or bed at night. This percentage was higher than that previously reported in Asian school children.¹⁹ Bed sharing is reportedly more prevalent in Asian countries than in the West due to cultural differences.²⁰ Similar to a study in China on children aged 7-13 years, we observed that students who shared a bed at night were significantly younger than those who did not.¹⁹ Hence, the association of bed sharing and bedtime obtained on univariate analysis may be due to the age of the students sharing a bed, and explains why the significance of this association was lost on multivariate analysis. The Chinese study also reported no significant association between bedtime and bed sharing on multivariate analysis.¹⁹ In contrast with studies on pre-adolescents, we observed that students sharing their room went to sleep at an earlier time.^{10,20} We also found that as the number of roommates increased, students went to bed earlier. These students probably shared their room/bed with older members of the family who would be going to bed early. This further signifies the influence of family members' routines on the bedtime of children, as discussed earlier. However further studies are needed to determine the reasons for these findings.

Changing sleep-wakeup habits during adolescence result in inadequate sleep durations, increased daytime sleepiness, declining academic performance, depressive mood, and risk-taking behaviour problems.⁵ In our study, there was a significant association between daytime functioning and time to bed at night. Late-sleepers had considerably less total and nocturnal sleep duration, and were less refreshed and more likely to be sleepy during the day. These results are consistent with previously published studies.^{5,11} A study conducted in Japan on school children showed that daytime sleepiness was associated significantly with reduced sleep duration, and prevalence of sleepiness did not significantly differ among groups who had 7.5 hours or more of sleep.¹¹ It found dose-response relation between sleepiness and sleep disturbances, physical activity, and media-use time. Poor grades at school are significantly associated with later bedtimes, along with other factors. This association has been discussed in depth by a clinical review article on the basis of many studies.¹³ In Hong Kong, adolescents with excellent academic performance were found to have earlier bedtimes and longer sleep durations on weekdays than those with marginal performance.¹² The fact that bedtime was not related to absence from school or being late to school in our study may be because parents wake students up on time or due to fear of punishment at school.

Many studies show that on average, adolescents obtain 7.5-8.5 hours of sleep at night.⁵ In our study, almost all students who slept after 10pm got less than 8 hours of total daily sleep. This signifies a need to counter the factors contributing to delayed bedtime by effective strategies to allow physical and cognitive growth during this critical period of adolescence.

Our study was conducted in a socio-economically diverse city, with representation of both government and private schools. The questionnaire was printed in two languages, English and Urdu, to facilitate self-reporting and to remove interviewer bias. However, the self-reported data may be influenced by recall bias and was complemented by more objective instruments like sleep diaries. Besides, some of the questions were not answered by 100% of the respondents which was a limitation in the study. However, similar self-reported questionnaires have been used by other studies and, hence, the comparisons made with them are justified. Also, representation of male and female students was not equal, which may have masked the association of gender with bedtime. Nevertheless, to the best of our knowledge, this was the first study from Pakistan that analysed the factors affecting the bedtime of secondary school children and the influence of sleeping habits on daytime functioning. It is also novel in exploring the influence of co-sleeping on bedtime of adolescents in Pakistan. Hence, this basic analysis will serve as a foundation for more extensive studies in the future in this geographic region.

Conclusions

Grade at school, father's occupation, and co-sleeping habits are independent predictors of a student's bedtime. Late bedtime shortens sleep durations to below 8 hours a day and is related to difficulty in getting up and tiredness during the day. Parental influence on early sleeping habits is undeniable and should be encouraged. A short afternoon nap of 30 minutes to 1 hour followed by completion of homework will remove the need for studying late at night. Good academic planning is needed on part of teachers to avoid extensive homework on some days of the week. With advancing classes, teachers should counsel students on coping with the increasing burden of studies in a healthy manner. Mothers should be advised to observe the bedtime of children without waiting for fathers to come home from work. Media should shift the TV shows for adolescents to an earlier timeframe. Physicians should do use their interaction for counselling of parents and children about healthy sleeping habits. Further studies should be undertaken to assess individual factors responsible for the sleeping behaviour in detail, and to determine the objective influence of such behaviour on daytime functioning.

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