

High Prevalence of Sleep Problems in School- and Preschool-aged Children in Tehran: a Population Based Study

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Abstract

Objective: Sleep problems are experienced by 25-30 percent of children and adolescents, regardless of age. The purpose of this study was to investigate if there is any relationship between gender or school entrance and sleep complaints.

Methods: From June 2008 to May 2009 children aged 2 to 12 years were selected by clustered randomization of families. The Persian version of the BEARS questionnaire (Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring) with five domains was filled out by general pediatricians. Prevalence of sleep complaints in each B-E-A-R-S category was calculated and compared for pre-school and school-age groups.

Findings: BEARS questionnaire was completed for a total of 746 children (2-12 years old); 325 in pre-school-age group (2-6 years old) (142 females [43.7%] and 183 males [56.3%]) and 421 in primary school-age group (7-12 years old) with the average age of 3.93 (± 0.16) years and 9.63 (± 0.16) years respectively. The most common screening problem in both groups was excessive daytime sleepiness (64.9% and 62.9% respectively). Bedtime problems and also regularity and duration of sleep were significantly more prevalent in pre-school-age group ($P < 0.0002$; odds ratio [OR] = 1.98; 95% confidence interval [95%CI]: 1.98-4.20; and OR=2.00; 95%CI: 1.41- 2.84 respectively). The difference between mean sleep duration between pre-school age and school-age groups was statistically significant ($P < 0.0001$).

Conclusion: The current survey shows that different types of sleep problems are relatively high especially in the form of excessive daytime sleeping domain in preschool- and school-aged children. Bedtime problems and regularity problems were significantly more prevalent in pre-school-age group. School entrance seems to play a positive role for bedtime problems, and sleep-disordered breathing.

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Key Words: Pediatric sleep; Sleep complaints; BEARS questionnaire; Children; School

Introduction

Sleep behaviors are among the most common concerns that bring parents of young children to

their physicians. A child who goes to bed unwillingly or wakes frequently during the night can be highly disruptive to a family^[1]. As a rule, the frequency of night waking starts in 100

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percent of newborns and tails off to approximately 20-30 percent in six-month-olds.

It is estimated that sleep problems are experienced by 25-30 percent of children and adolescents, regardless of age^[2]. Thus, while sleep occupies a major portion of the childhood years, childhood sleep problems constitute a major parental concern^[3]. Sleep problems, which can include inadequate, disrupted, poor quality, or non-restful sleep, are one of the most common complaints raised by parents to pediatricians and practitioners. In contrast, the relationship between insufficient or disturbed sleep and the many manifestations of daytime sleepiness, such as mood and behavior problems, although less frequently recognized by parents, has a major impact on quality of life of children and adolescents.

Although many sleep problems in infants and children are transient and self-limited in nature, certain intrinsic and extrinsic risk factors such as difficult temperament, chronic illness, and maternal depression may predispose some children to develop more chronic sleep disturbances^[4].

Despite the magnitude and clinical importance of sleep issues, several studies have documented that there is a low level of recognition of sleep disorders by primary care physicians in children^[5-6]. For example, in a survey of over 600 community pediatricians, approximately 20% of the respondents did not routinely screen for sleep problems in school-aged children in well-child visit, about 25 percent of routinely screened toddlers and pre-schoolers for snoring, and less than 40 percent questioned adolescents directly about sleep habits, despite the respondents' knowledge of the importance of sleep's impact on health, behavior, and school performance.

In another study a validated pediatric sleep questionnaire used to identify a series of children with sleep-related symptoms at two community based general pediatrics clinics and reviewed medical chart notes for the previous 2 years to determine how often sleep problems had been addressed. Fewer than 15 percent of patients had current chart notes that mentioned some of the questionnaire-defined sleep problems; diagnoses were mentioned for two of 86 patients and no treatments were discussed^[6].

The consequences of untreated sleep problems may include significant emotional, behavioral, and cognitive dysfunction^[7-11]. The impact of childhood sleep problems is further intensified by their direct effect on parents' sleep, resulting in parental daytime fatigue, mood disturbances, and a decreased level of effective parenting^[13].

After the school entrance such sleep problems impact adversely on behavior, school functioning, and health-related quality of life. Surprisingly little attention has been paid to the impact of sleep problems in the vital preschool years and there have not been enough studies investigating etiologic factors of these problems^[7,12]. Preschool and School Children with habitual snoring were more likely to have sleep-related daytime and nighttime symptoms. But the studies determined no significant association between habitual snoring and poor school performance^[7,10]. A recent study from Nigeria concluded that snoring is an important health problem among preschool and school children as a significant percentage of them snore and most of whom are between third and sixth year of life^[9].

Most of the studies regarding sleep habits in children are from the West; however, a few Asian studies^[12-14] are available and these studies emphasize the effect of culture.

In a previous study in Iran, the authors first determined the reliability and validity of Persian version of the well-known Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring (BEARS) pediatric sleep questionnaire^[15] and then designed a pilot study to describe sleep patterns and sleep problems among pre-school and school-aged children in two primary care pediatric clinics in Tehran^[16].

The purpose of the Tehran's Children Sleep Study (TCSS) was to investigate the possible relationship between gender and school entrance on sleep complaints. The authors supposed that these mentioned factors might be of value for both practitioners and parents to plan for tailored and more effective interventions to combat sleep problems in boys and girls and in pre-school (2-6 years of age) versus school-age children (7-12 years of age).

Subjects and Methods

Study Design and Sampling

This study was conducted from June 2008 to May 2009 in Tehran. The subjects were pre-school-aged and school-going children between the ages 2 and 12 years who were selected by clustered randomization of families in Tehran based on their zip codes. Subjects were included randomly if their parents agreed to cooperate in filling BEARS sleep screening questionnaire (see the Procedure). A total of 746 subjects were entered in the study: 325 pre-school-aged children (2-6 years old group) and 421 primary school-aged children (7-12 years old group).

Our study protocol was approved by the Ethical Board Committee of ENT, Head and Neck Research Center of Tehran University of Medical Sciences, in Tehran.

Procedure

The BEARS is a screening tool developed by the investigators of Brown University School of Medicine, Rhode Island Hospital, USA^[4]. It was designed to address the most common sleep issues in toddlers, pre-schoolers, and school-aged children. It is an acronym and incorporates five basic sleep domains: Bedtime Problems, including difficulty going to bed and falling asleep; Excessive Daytime Sleepiness, which includes behaviors typically associated with daytime somnolence in children; Awakenings during the night; Regularity of sleep/wake cycles (bedtime, wake time) and average sleep duration; and Snoring. These domains are felt to reflect the most common presenting sleep complaints in children.

Reliability and validity of the Persian version of the BEARS questionnaire was assessed in a previous study^[15]. Children were primarily seen by two general pediatricians. On first visit, all parents were informed about the importance of sleep problems screening in children and they were asked to sign the consent to participate in the study. Then, the Persian version of the BEARS questionnaire with five domains was asked by general pediatricians. Questions for pre-school children were answered by their parents; but for school-age children, some questions were asked from the children themselves.

Statistical Analysis

Data were entered into the Statistical Package for the Social Sciences (SPSS) software version 11.5. Descriptive statistics were used to report frequency counts, percentages and means (\pm Standard Deviations).

Proportions (prevalence) of sleep complaints in each B-E-A-R-S category were calculated for pre-school and school-age groups, totally and stratified by gender. The differences in proportions were compared using independent sample proportion difference test. The same test was used to assess if there was any difference between boys and girls in each age category. Two-sided *P*-values were reported and an alpha level of 0.05 was considered as the threshold of statistical significance.

As the effect measure, the odds ratio (OR) plus its 95 percent confidence interval (95%CI) was calculated to compare the effect size of gender on sleep complaints difference in each B-E-A-R-S category. Again, the same approach was used to calculate the effects of school attendance on sleep problems.

For comparing mean sleep duration between two groups, independent samples *t*-test was used.

Findings

BEARS questionnaire was completed for a total of 746 (2-12 years old) children; 325 consisting of 142 (43.7%) females and 183 (56.3%) males were in pre-school-age group (2-6 years old) and 421 with 173 (41.1%) females and 248 (58.9%) males were in primary school-age group (7-12 years old). Male to female ratio was not different between the two age groups ($P=0.4$). The average age was 3.93 (± 0.16) years in pre-school-age group and 9.63 (± 0.16) years in primary school-age group.

Table 1 shows the prevalence of probable or definite problems in each domain of BEARS, where screening questionnaire and also the comparison of percentages between pre-school and school-aged groups is shown. The most common screening problem in both pre-school and school-aged group was excessive daytime sleepiness (64.9% and 62.9% respectively). The least common problem in both groups was sleep

Table 1: Comparison of the prevalence of sleep problems in each domain of BEARS questionnaire among pre-school and school-aged groups

Domains of BEARS questionnaire	Pre-school age (2-6 yr)	School-age (7-12 yr)	P-value	Odds Ratio*	95% CI
Bedtime problems	28.9%	12.4%	<0.001	2.89	1.98-4.20
Excessive daytime sleeping	64.9%	62.9%	0.6	1.09	0.81-1.47
Awakening during the night	27.7%	44.2%	0.5	0.48	0.36-0.66
Regularity and duration of sleep	29.2%	17.1%	<0.001	2.00	1.41-2.84
Sleep-disordered breathing	7.1%	11.9%	0.03	0.57	0.34-0.94

* Odds Ratio for the effect of school entrance; CI: Confidence interval; BEARS: Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring

disordered breathing (7.1% and 11.9% respectively). Bedtime problems and also regularity and duration of sleep were significantly more prevalent in pre-school-age group ($P<0.0002$; OR=1.98; 95% CI: 1.98-4.20; and OR=2.00; 95%CI: 1.41-2.84, respectively). However, sleep-disordered breathing was lower in pre-school children ($P=0.029$; OR=0.57; 95%CI: 0.34-0.94). Other BEARS domains - excessive daytime sleepiness and awakening during the night - did not differ significantly between the two groups.

For pre-school children, mean time for "going to bed" at night was 22:54 (SD 1.20 hrs), mean wakeup time in the morning was 08:43 (SD 1.20 hrs), and mean sleep duration was 9.81 hours (SD 1.13). For school-aged children, mean time for "going to bed" at night in school days was 22:36 (SD 1.12 hrs), mean wakeup time in the morning in school days was 07:11 (SD 1.12 hrs), and mean sleep duration was 8.59 hours (SD 1.33). The difference between mean sleep duration between pre-school age and school-age groups was statistically significant ($P<0.0001$).

Table 2 shows the comparison between boys and girls for sleep problems in both pre-school and school-aged groups. Pre-school boys showed significantly less bedtime problems than pre-

school girls ($P=0.003$; OR=0.49; 0.30-0.79). Other BEARS items showed no significant difference. However, in school-aged group all items were statistically the same between girls and boys.

Table 3 and 4 reveal the comparison of sleep problems between pre-school and school-aged boys and also between pre-school and school-aged girls. Among both genders, bedtime problems, and regularity and duration of sleep problems were significantly more prevalent in pre-school-age group ($P=0.0002$ and 0.04 respectively), ($P=0.003$ and 0.0005 respectively).

Awakening times during the night and sleep-disordered breathing were more prevalent in school-aged boys ($P=0.0003$ and 0.04 respectively).

Discussion

It seems that the prevalence of sleep problems according to BEARS questionnaire is relatively high in our study especially in excessive daytime sleeping domain. The overall findings in different BEARS domains are in agreement with authors' previous pilot study^[16]; but in excessive daytime

Table 2: Comparison of the prevalence of sleep problems in each domain of BEARS questionnaire among boys and girls in both pre-school and school-aged groups

Domains of BEARS questionnaire	Pre-school age (2-6 yr)			School-age (7-12 yr)		
	Male	Female	P value	Male	Female	P value
Bedtime problems	22.4%	37.3%	0.00	11.7%	13.3%	0.62
Excessive daytime sleeping	63.4%	66.9%	0.51	61.7%	64.7%	0.52
Awakening during the night	25.7%	30.3%	0.36	42.3%	46.8%	0.36
Regularity and duration of sleep	32.8%	24.6%	0.11	18.1%	15.6%	0.50
Sleep-disordered breathing	6.6%	7.7%	0.68	12.5%	11.0%	0.64

BEARS: Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring

Table 3: Comparison of the prevalence of sleep problems in each domain of BEARS questionnaire among pre-school and school-aged groups in boys

Domains of BEARS questionnaire	Pre-school (2-6 yr)	School-aged (7-12 yr)	P value	Odds Ratio*	95%CI
Bedtime problems	22.4%	11.7%	0.00	2.18	1.30-3.66
Excessive daytime sleeping	63.4%	61.7%	0.72	1.08	0.73-1.59
Awakening during the night	25.7%	42.3%	0.00	0.47	0.31-0.71
Regularity and duration of sleep	32.8%	18.1%	0.00	2.20	1.41-3.43
Sleep-disordered breathing	6.6%	12.5%	0.04	0.49	0.25-0.98

* Odds Ratio for the effect of school entrance in boys; CI: Confidence interval; BEARS: Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring

sleeping domain we came to a much larger figure. The prevalence estimates of sleep problems are very diverse in multiple old and new studies and in different parts of the world and it ranges from 20.7% in a 1989-90 survey in Headington, Oxford by Ali et al^[8] to almost 40% in a 2010 study in Australian indigenous and non-indigenous children by Blunden et al^[17]. But most of these studies have not used the BEARS questionnaire as a screening tool for sleep problems assessment. Owens et al^[4] have reported the following prevalence estimates in their leading study: bedtime issues 16.3%; nighttime awakenings 18.4%; and snoring 10.7% (our relevant estimates are 28.9%, 27.7%, and 7.1% in pre-school children and 12.4%, 44.2%, and 11.9% in school-aged children respectively). The more important thing here is the regular assessment of the prevalence estimates at different times using reliable and valid tools to become able to perform trend analyses. The prevalence of sleep problems in these groups of children in our study was also nearly comparable to percentages found in other studies^[3,18].

We thought of gender and school attendance as possible factors affecting sleep problems in

children. The reason for the first one is that especially in school-aged children, boys and girls attend separate schools in most parts of our country especially in Tehran. Some studies also have evaluated the effects of gender on sleep related problems and have found interesting points. For example, Gau et al reported that girls sleep fewer hours than boys and do not show an increase in daytime sleepiness^[13]. Simola et al showed that age and gender were related to phenotype of the sleeping problems^[3] while there were no gender differences in any sleep parameters in another study conducted by Seo et al^[19]. Few studies have estimated if there is any difference between boys and girls on sleep problems, and as shown in Table 2, there is just a statistically significant difference in one BEARS domain (bedtime problems) between boys and girls. In a study by van Litsenburg et al, parents reported that girls experienced more sleep problems than boys, notably for sleep onset delay and daytime sleepiness, while for the child self-reports, no gender difference was found^[18].

Secondly, few studies guided us to consider school attendance as a possible factor affecting sleep problems^[19-23]. Because the usual starting

Table 4: Comparison of the prevalence of sleep problems in each domain of BEARS questionnaire among pre-school and school-aged groups in girls

Domains of BEARS questionnaire	Females		P-value	Odds Ratio*	95% Confidence Intervals
	Pre-school (2-6 yr)	School-age (7-12 yr)			
Bedtime problems	37.3%	13.3%	<0.00	3.88	(2.24-6.74)
Excessive daytime sleeping	66.9%	64.7%	0.69	1.10	(0.69-1.76)
Awakening during the night	30.3%	46.8%	0.00	0.49	(0.31-0.79)
Regularity and duration of sleep	24.6%	15.6%	0.04	1.77	(1.01-3.09)
Sleep-disordered breathing	7.7%	11.0%	0.33	0.68	(0.32-1.46)

* Odds Ratio for the effect of school entrance in girls; BEARS: Bedtime problems, Excessive sleepiness, Awakenings during the night, Regularity of sleep, Snoring

year for school attendance is 7 years of age, we divided the age range of our subjects to two broad categories shown in tables. Considering total subjects, bedtime problems regularity and duration of sleep, and sleep-disordered breathing had statistically significant difference between pre-school and school-aged children. The added value of calculating odds ratio as an effect measure helps us better understand the consequence of going to school on sleep. School entrance seems to exacerbate sleep problems in bedtime problems and also regularity and duration of sleep domains and plays the role of a risk factor. The opposite effect is seen for sleep-disordered breathing domain (Table 1). Considering males and females separately (Tables 3 and 4), same pattern is seen for males and females in bedtime problems and regularity and duration of sleep; but, school attendance seems to have a protective effect in awakening during the night domain in both boys and girls. School entrance plays a protective role for sleep-disordered breathing in boys but not in girls.

Seo et al^[19] demonstrated that extracurricular academic activities, is related to the children's sleep duration and that the older children sleep less than younger children. They thought that the main reason is late bedtimes due to socio-cultural factors, high levels of nighttime and recreational activities, and/or excessive academic activities. Quach et al showed that sleep problems during school transition are common and associated with poorer child outcomes^[21]. They conducted the first study, to their knowledge, to examine the natural history of sleep problems in children over the transition from preschool to school. Liu et al believed that unique school schedules and sleep practices may contribute to the differences in the sleep patterns and sleep problems of children from the United States and China^[12]. Gau et al hypothesized that little sleep at night made the students feel sleepy in the daytime and tired, drowsy, moody and difficult at arising in the morning^[13].

Compared with our study showing no significant difference of sleep-quality between girls and boys, Japanese findings support the hypothesis that during the junior high school period, the majority of sleep-quality indicators in Japanese schoolchildren were better for girls than for boys. Boys' sleep was less efficient and more

fragmented during the entire week in comparison to that of the girls^[22].

Few studies such as the one conducted by Kahn et al^[11], have assessed the effect of poor sleeping on school performance and have found interesting results such as the point that among the "poor sleepers," 21% had failed 1 or more years at school. School achievement difficulties were encountered significantly more often among the poor sleepers than among the children without sleep problems ($P=.001$). Although this point of view has not been considered as our hypothesis of research, there seems to be diverse effects from school attendance on different sleep patterns and behaviors that need specific and more rigorous exploration.

No study (including ours) has assessed the possibility of correlation between the results of answers to five BEARS domains; the same fact is also true for correlation between parent-answered questions and child-answered ones. Although van Litsenburg et al^[18] used different questionnaires to study sleep habits and sleep disturbances in Dutch children, they were concerned that correlations between parental and self-assessments were low to moderate and this fact may have an effect on BEARS questionnaire too. Maybe the work done by Iwasaki et al^[22] should be repeated for BEARS as well. They studied the utility of subjective sleep assessment tools for healthy preschool children and compared sleep logs, questionnaires, and actigraphy; their results showed that sleep schedule variables in the parental reports generally correlated well with actigraphic assessment of sleep patterns and although the daily sleep log was better correlated with actigraphy, the brief questionnaire showed a good correlation with sleep pattern on weekday actigraphic assessments.

We hypothesized that high prevalence of sleep problems in school aged and pre-school aged children of Tehran is due to bad sleep time that we think is caused by our culture and loss of enough family attention and related ignorance on the harmfulness of poor sleep of children. Moreover, the poor sleep quality of Iranian preschool children is probably due to cultural characteristics, climate differences, or harmful sleep habits.

The difference between mean sleep duration between pre-school age and school-age groups is

important (as it is statistically significant in our study) because it affects the risk of becoming overweight in later years. Ochiai et al reported that short sleep duration increases the risk of becoming overweight and this relationship differs between the two sexes^[24]. Newer population-based researches may elucidate this kind of relationship in Iranian children.

Against this strength, our study had some limitations. Cross sectional design limited our causative assessment for sleep problems, moreover we did not include some familial factors such as socioeconomic factors and psychological problems in the families. We have categorized the subjects to two groups according to their age and took the whole 2-6 years as one group and the 7-12 years as another. This type of unification may have an effect on the final results, but we have tried to conduct a comparable scenario to the work of Owens et al^[4], and also to our previous pilot study^[16].

The other fact is that socioeconomic status (SES) of families was not assessed in our study. Higher SES might have negative impact on total sleep duration, sleep hygiene and also on children's psychological well-being^[25].

Conclusion

The present survey shows that the prevalence of sleep problems is relatively high especially in excessive daytime sleeping domain of preschool-aged and school children. We demonstrated that there is a significant relationship between school entrance and lower bedtime as well as regularity problems. School entrance seems to have significant association with awakening during the night. Our findings suggest a development of a more tailored sleep-related health service to help both preschool and school children and also assist parents to know and tackle sleep troubles more effectively and thoroughly. The authors recommend using results of regularly conducted sleep studies to design, implement, and evaluate effective interventions to downsize the harmful effects of bad sleep habits.

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Conflict of Interest: None

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