

Comparing sleep disorders in urban and suburban adolescents

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Abstract

Background Sleep disturbances commonly occur in adolescents. Socioeconomic levels, lifestyle, and urban or suburban environments influence the sleep patterns of adolescents. The modernization process in urban environments is marked by the development of information technology media, and the lack of parental monitoring potentially influencing adolescent sleep disturbances. Sleep disturbances may affect children's physical growth, as well as their emotional, cognitive, and social development.

Objective To assess for sleep disorders in urban and suburban adolescents, and to determine the factors that influence the prevalence of sleep disturbances.

Methods A cross-sectional study was conducted on 12 to 15-year-old junior high school students in urban (n=350) and suburban (n=350) environments in the city of Medan, North Sumatera. The study was undertaken from May to June 2010 using the *Sleep Disorders Scale for Children (SDSC)*, a set of questionnaires. The SDSC was filled out by parents based on what they remembered about their children's sleep patterns in the prior 6 months.

Results In the urban group, there were 133 (38.0%) subjects with sleep disturbances, 182 (52.0%) were borderline, and 35 (10.0%) were normal. In the suburban group, there were 132 (37.7%) subjects with sleep disturbances, 180 (51.4%) were borderline, and 38 (10.9%) were normal. The most influential factors for sleep disturbances in urban and suburban youth were environmental noise (P=0.001) and consuming beverages that contain caffeine (P=0.001). There were three types of sleep disorders that significantly found more in urban adolescents: disorders of initiating and maintaining sleep, disorders of excessive somnolence, and sleep hyperhidrosis.

Conclusion The prevalence of sleep disturbances do not differ between urban and suburban adolescents. However, there are significant differences in the types of sleep disorders experienced. The most influential factors on sleep disturbance in both areas are environmental noise and consuming beverages that contain caffeine. [Paediatr Indones. 2014;54:299-304].

Keywords: adolescents, urban, sub-urban, sleep disorders questionnaire

Quality of sleep in adolescents tends to be reduced compared to that of younger children. In adolescents, there is a dramatic change in the pattern of sleep which includes reduced sleep duration, delayed time to sleep, and increased differences in sleep patterns on weekdays and weekends.¹ *The National Institutes of Health* concluded that adolescents are at high risk for impaired sleep.² The prevalence of sleep disorders in teenagers varies among studies. A study in Beijing (China) on children aged 2-12 years found the overall prevalence of sleep disorders was 21.2%.³ Another study on junior and high school students, reported that the prevalence of sleep disturbance varied from 15.3% to 39.2%, depending on the type of sleep disturbance experienced.⁴ In Indonesia, there have been few epidemiological studies on sleep disorders in teenagers.

Sleep disturbance is a collection of conditions characterized by disturbance in quantity, quality or time

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needed to fall asleep.⁵ Sleep disorders in teenagers are influenced by many factors, both medical and non-medical. Non-medical factors include gender, puberty, sleep habits, socioeconomic level of the family, lifestyle, and environment. Medical factors affecting sleep include a variety of neuropsychiatric disorders and chronic diseases, such as asthma and atopic dermatitis.^{4,6,7}

Diagnosis of sleep disorders in teenagers is difficult, because youths seldom complain of sleep disorders. Also, teenage sleep patterns are no longer a focus of attention for their parents. Among the various methods of sleep disorder screening, the SDSC test can be used to detect the presence and type of sleep disorder experienced by children aged 6 to 15 years.^{8,9} Families' socioeconomic levels, lifestyle, urban and suburban environments can affect sleep patterns in adolescents. The process of urban modernization, such as the the growth of social media and lack of parental monitoring, results in changes in adolescent sleep patterns, causing sleep disturbances.¹⁰ Therefore, this study was conducted to assess for sleep disorders in teenagers and examine the differences in sleep disorders in urban and suburban adolescents. We also examined subjects' sleep patterns and types of sleep disturbances experienced, as well as factors associated with sleep disorders.

Methods

We conducted a cross-sectional study from May to June 2010, in Syaffiyatul Amaliyah and Gereja Kristen Protestan Indonesia (GPKI) Junior High School, in the urban subdistrict of Medan Baru, and in Junior High School 31 Lau Cih, in the suburban subdistrict of Medan Tuntungan, North Sumatera. We included all children aged 12 to 15 years who met the inclusion criteria. Parents and children gave informed written consent and completely filled questionnaires. We excluded adolescents with clinically diagnosed psychiatric disorders or hormonal abnormalities. The minimum required sample size was calculated to be 350 subjects for each group.

We explained the study methods, as well as the effect and treatment of sleep disorders, to subjects and their parents. This study used the SDSC questionnaire to measure and assess for factors which affect sleep disorders. The SDSC is a useful tool to evaluate

sleep disturbances of school-aged children in clinical and non-clinical populations, during the 6 months prior to assessment. The questionnaire consists of two sections. The first section is used to obtain demographic, behavioral and clinical data, information about previous illnesses and present medical status, along with specific questions on pathology that could affect sleep. The second section comprises 26 items in a Likert-type scale of values 1 to 5, with the wording arranged so that higher numerical values reflect greater clinical symptom severity representing the six groups of sleep disorders. Subjects were classified into three clinical categories based on the total score obtained: significant (score > 70), borderline (score 50-70), or not significant/normal (score <50). Sleep disorders were further classified into 6 groups from the SDSC results: sleep breathing disorders, disorders of initiating and maintaining sleep, disorders of arousal, sleep-wake transition disorders, disorders of excessive somnolence, and sleep hyperhidrosis. Scores for each group of sleep disorders were calculated by the sum of scores on questions related to that group.⁸

This study was approved by the Medical Ethics Committee of the University of North Sumatera Medical School. We used SPSS version 15.0 and Microsoft Excel 2007 for data processing. Chi square and independent T-tests were used to evaluate the differences in sleep disturbances between the urban and suburban adolescents. Differences were considered to be significant for P values < 0.05.

Results

Seven hundred adolescents participated in this study, consisted of 350 urban and 350 suburban adolescents. The questionnaires completed by adolescents and their parents or caregivers at home to determine the existence of an adolescent sleep disorder, based on the child's sleep pattern for the 6 months prior to the study. Questionnaires were returned 3-7 days later.

The baseline characteristics were similar in both groups. Most subjects were female in both groups. The most common parental education level was senior high school (Table 1).

The clinical categories of sleep in urban and suburban adolescents are shown in Table 2. There were no significant differences found between the

Table 1. Baseline characteristics of subjects

Characteristics	Urban adolescents n=350	Suburban adolescents n=350
Mean age (SD), years	12.9 (0.98)	13.2 (0.76)
Gender, n (%)		
Male	167 (47.7)	166 (47.4)
Female	183 (52.3)	184 (52.6)
Highest level of parental education attained, n (%)		
Elementary	9 (2.6)	16 (4.6)
Junior high school	28 (8.0)	36 (10.3)
Senior high school	152 (43.4)	210 (60.0)
Undergraduate	122 (34.9)	82 (23.4)
Master degree	35 (10.0)	6 (1.7)
Doctoral degree	4 (1.1)	0

Table 2. Clinical categories of sleep

Clinical categories	Urban adolescents n=350	Suburban adolescents n=350	P value
Sleep disturbance, n (%)	133 (38.0)	132 (37.7)	0.195
Borderline, n (%)	182 (52.0)	180 (51.4)	
Normal, n (%)	35 (10.0)	38 (10.9)	

Table 3. Types of sleep disorders

Types of sleep disorders	Urban adolescents n=133	Suburban adolescents n=132	P value
Initiating and maintaining sleep disorder, n (%)	65 (48.9)	47 (35.6)	0.014
Sleep breathing disorder, n (%)	26 (19.5)	18 (13.6)	0.130
Arousal disorder, n (%)	45 (33.8)	29 (22.0)	0.685
Sleep wake transition disorder, n (%)	98 (73.7)	81 (61.4)	0.062
Excessive somnolence, n (%)	89 (66.9)	19 (14.4)	0.001
Sleep hyperhidrosis, n (%)	16 (12.0)	12 (9.1)	0.041

Table 4. Factors affecting sleep disorders

Factors observed	Urban adolescents n =133	Suburban adolescents n = 132	P value
Long duration of sleep on a school day, n(%)	88 (66.2)	62 (47.0)	0.178
Long duration of sleep on a holiday, n(%)	46 (34.5)	44 (33.3)	0.778
Waking hours on a school day, n(%)	92 (69.2)	101 (76.5)	0.175
Waking hours on a holiday, n(%)	43 (32.3)	34 (26.0)	0.250
Hours of sleep on school days, n(%)	96 (72.2)	100 (75.8)	0.494
Hours of sleep on days off, n(%)	90 (67.7)	80 (60.6)	0.218
Activity 30-40 minutes before bedtime, n(%)	86 (64.7)	98 (74.2)	0.103
Activities in bed, n(%)	58 (43.6)	98 (74.2)	0.205
Consumption of caffeinated beverages, n(%)	46 (34.6)	18 (13.6)	0.001
Smoking one hour before bedtime, n(%)	8 (6.0)	1 (0.8)	0.128
One alcoholic beverage per day, n(%)	2 (1.5)	1(0.8)	0.566
Noise, n(%)	74 (55.6)	68 (51.5)	0.001
Turn off the lights, n(%)	50 (37.6)	37 (28.0)	0.091
Sleeping in the bedroom, n(%)	112 (84.2)	114 (86.4)	0.725
Sleeping accompanied by an adult, n(%)	99 (74.9)	85 (64.6)	0.066
TV in the room, n(%)	57 (42.9)	45 (34.1)	0.091

urban and suburban groups.

Based on the SDSC questionnaires, we found several types of sleep disorders in our subjects as shown in **Table 3**. Three types of sleep disorders were found to be significantly more common in the urban than in the suburban group: initiating and maintaining sleep, excessive somnolence, and sleep hyperhidrosis.

There were two factors that influenced the occurrence of sleep disorders in urban and suburban adolescents: environmental noise ($P=0.001$) and consumption of caffeinated beverages ($P=0.001$), as shown in **Table 4**.

Discussion

Sleep disturbances are experienced by many teenagers. In our study, 133 (38.0%) urban adolescents and 133 (37.7%) suburban adolescents experienced sleep disorders. This figure is quite high. Sleep disorders may interfere with children's physical growth, as well as their emotional, cognitive, and social development,¹⁰ although these effects were not investigated in this study. As such, improving the quantity and quality of sleep in adolescents may prevent or have positive effects on academic and behavioral problems, as well as emotional and physical health.

Adolescent sleep pattern is not much different from that of children. An average adolescent needs 8.5 to 9.5 hours of sleep each night. Most adolescents do not get enough sleep, based on these needs.^{1,2} Non-medical factors affecting sleep include gender, puberty, sleep habits, socioeconomic status of family, lifestyle, and environment. Socioeconomic levels and lifestyles in urban and suburban environments have different effects on adolescent sleep patterns. Medical factors affecting sleep include a variety of neuropsychiatric disorders and chronic diseases, such as asthma or atopic dermatitis.^{4,6,7} Sleep disturbances caused by nocturnal asthma symptoms have been a neglected area, and only recently has the extensive problem of night waking in people with asthma been highlighted.¹¹

We found that 38% of urban adolescents experienced sleep disturbances. Similarly, 37.7% of suburban subjects, experienced sleep disturbances. A systematic review reported the prevalence of sleep disorders in Singapore to be 25%, and that of

respiratory disorders such as obstructive sleep apnea to be 1-3%.¹² Another study reports the prevalence of sleep disorders was 25-40%, with 41.3% in urban adolescents and 29% in rural adolescents.¹³ A study in China showed a link between sleep disorders in school children with an accident in rural China, due to their short duration of sleep, causing daytime sleepiness.¹⁴

Road traffic noise is a major problem in urban communities which can cause health problems such as sleep disorders in teenagers.¹⁵ In our study, environmental noise affected sleep significantly more in urban subjects compared to suburban subjects. Noise emanates from the many motor vehicles in a large city. Other factors causing insomnia include television, especially if it is located in bed room, overeating or overdrinking, alcohol, caffeine and cigarettes. Caffeine is a stimulant that activates the central nervous system, causing alertness and wakefulness in the average person. North Americans on average consume two and a half cups of caffeinated beverages per day, in the form of coffee, tea, and *Coca Cola*.¹⁶ More concentrated tea or coffee typically has higher levels of caffeine. Caffeine interferes with sleep by increasing the amount of time to needed to fall asleep and reducing the duration of sleep.¹⁶

We found several factors which influenced the occurrence of sleep disorders in both urban and suburban areas. In the suburban area, 52.2% of adolescents who experienced sleep disturbances consumed caffeine-containing beverages such as tea, coffee, and *Coca Cola*. Caffeine is a natural alkaloid found in common beverages such as coffee, tea, and medicine. A study in North America shows that consuming coffee and tea are the main source of caffeine in food.¹⁷ Children with headaches may experience sleep disorders, such as lack of sleep, needing accompaniment by an adult in order to sleep, difficulty falling asleep, restlessness, waking often or nightmares.^{18,19} There is a strong relationship between headache and sleep disorders, such as parasomnias, insomnia, and drowsiness in children.²⁰ There is growing evidence that sleep is essential for optimal physical and mental health. Sleep deprivation in adolescents under certain conditions may negatively affect health, productivity, and security, and safety.²¹

We found no significant difference in the prevalence of sleep disorders in urban and suburban

areas, at 38% and 37.7%, respectively. Borderline sleep disorder status was found to be similar in urban and suburban adolescents. Several types of sleep disorders were found higher in urban compared to suburban adolescents, those were initiating and maintaining sleep, excessive somnolence, and sleep hyperhidrosis. But in general, there were no significant differences in types of sleep disorders between the urban and suburban groups.

A limitation of our study was the the cross-sectional study design. Further studies are needed to assess a direct relationship between academic achievement in adolescents with sleep disorders or between accidents and sleep disorders in adolescents. In this study which was conducted in the junior high schools located in urban and suburban areas, but not all students of urban schools lived in urban areas, and the same holds true for suburban students, thus creating a potential bias. Also, sleep patterns were subjectively evaluated, based on the testimony of parents and only a single assessment.

In conclusion, there are no differences in the prevalence of sleep disturbances between urban and suburban adolescents. However, there are significant differences in the types of sleep disorders. Urban adolescents experience more sleeping disorders of types initiating and maintaining sleep, excessive somnolence, and sleep hyperhidrosis. Two factors most influenced are environmental noise and consuming caffeinated beverages.

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