PREVALENCE OF POOR SLEEP QUALITY AND ITS CORRELATES AMONG HIGH SCHOOL STUDENTS IN BANGKOK, THAILAND

Nuchanad Hounnaklang[1], Somrat Lertmaharit[2, *], Vitool Lohsoonthorn[2], Thanapoom Rattananupong[2]

[1] College of Public Health Sciences, Chulalongkorn University, Bangkok, 10330, Thailand
[2] Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand

ABSTRACT:

Background: Sleep plays important roles in physical and mental development among adolescents. Prevalence of poor sleep quality and its correlates among high school students were investigated.

Methods: This study covered 1,080 high school students completing the questionnaire of Pittsburgh Sleep Quality Index (PSQI), socio-demographic characteristics, behavioral factors, and student-related factors. Multivariable logistic regression was used to calculate adjusted odds ratios (OR) and 95% Confidence intervals (CI).

Results: Prevalence of poor sleep quality was 32.0% (95% CI: 29.26, 34.91). Multivariable logistic regression showed that female students (OR=1.49; 95% CI: 1.12, 1.98), weekly allowance (OR=1.44; 95% CI: 1.10, 1.88), school activity ≥6 hrs./week (OR=1.68; 95% CI: 1.09, 2.59), smoking (OR=1.90; 95% CI: 1.28, 2.81) and caffeine consumption >1 cup/day (OR=3.14; 95% CI: 1.47, 6.71) were associated with poor sleep quality.

Conclusions: In such urban and modernized environment as the Bangkok metropolitan area, the prevalence of poor sleep quality among high school students is relatively high. Also, gender, weekly allowance, school activity, smoking and caffeine consumption are associated with poor sleep quality.

Keywords: Prevalence, Sleep quality, Poor sleep, Adolescent health, High school student, Thailand

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INTRODUCTION

Sleep is essential to human being in that it can properly maintain physical and mental health. A number of studies have found that poor sleep has associated with daytime sleepiness, exhaustion, weight gain [1], obesity [2], impaired glucose tolerance and diabetes [3], impaired memory [4], depression and anxiety [5], higher risk of motor vehicle accidents [6-8].

Over the past decades, socio-economic, cultural, and racial factors have been found to be related to sleep problems [8-11]. Age and gender have also been reported to be associated with sleep quality [12, 13]. It has been discovered that academic obligation is one of the key factors impacting the sleep patterns. The findings from Taipei, Taiwan indicated that the students in more academic challenging programs reported less sleep and lower level of alertness than those in the less challenging programs [14]; in America, the students on the academic fast track were likely to sleep less [15]. Additionally, adolescents engaging in school or community-related activities were at greater risk from sleepiness [16].

The use of stimulant like caffeine generally found in coffee, tea, chocolate, and soft drinks resulted in poor sleep and daytime drowsiness which, in turn, could lead to an increasing consumption the next day [17]. The sleep quality and sleep patterns were found to be associated with caffeine consumption among Thai college students [18].

* *Correspondence to: Somrat Lertmaharit*
E-mail: somrat.L@chula.ac.th

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Cigarette smoking was also associated with a higher chance of poor sleep owing to the fact that a stimulant substance has pharmacological effects on sleep quality [19]. Whereas sleep problems and alcohol consumption are common phenomena among college students, previous studies found that there was a strong relationship between poor sleep quality and alcohol consumption [20].

Poor sleep quality is currently a widespread issue in most urban societies. The prevalence of poor sleep quality in adolescents was reported as ranging from 48.1% to 62.4% [18, 21-24]; which reflected a wider range of poor sleep quality prevalence. In Thailand, the prevalence of poor sleep quality among college students was 48.1% [18].

Notably, studies on sleep quality and factors contributing to sleep quality among adolescents in Thailand seemed relatively limited [25]. One of those studies carried out by Lohsoonthorn et al. [18], an investigation on sleep quality and sleep patterns in relation to consumption of energy drinks, caffeinated beverages, and other stimulants among Thai college students, has shed some light on risk factors. Therefore, in carrying out this study, the researcher has set two main objectives: 1) to determine the prevalence of poor sleep quality among high school students in Bangkok, 2) to evaluate the association between socio-economic status, student-related activities, consumption behavior and poor sleep quality.

MATERIAL AND METHODS

Participants

A sample size was calculated based on the prevalence of poor sleep quality with the rate of 48% from a study of Lohsoonthorn et al. [18] with 95% CI, and 3% of poor sleep quality rate for minimum error. The formula for one sample proportion estimation derived from Lemeshow et al. [26] gives rounded up minimum sample size of 1,065 participants. This research was conducted between January–March, 2014, based on simple random sampling approach, including the participants of 10 high schools in Bangkok area which are under the supervision of the Office of the Basic Education Commission, Ministry of Education. After that, the researcher randomly selected 1 classroom each from grade 10, 11 and 12, respectively; totaling 30 classrooms, covering 1,080 subjects participating in this study.

Instruments

The self-administered questionnaires collected information about socio-economic status, student-related activities, consumption behavior relating to sleep quality, i.e. gender, age, educational level, weekly allowance, part-time job, physical activities, school activities, extra-curricular knowledge. Questionnaires also included history disease related sleep problems, BMI, alcohol consumption, smoking, caffeine consumption, sleep medicine use. Body mass index (BMI) was calculated as self-reported weight (in kilograms) and height (in meters), based on WHO's criteria describing BMI-for-age (5-19 years) [27].

As for caffeine consumption, the respondents were asked how many days per week they consumed caffeinated drinks (Coke/Pepsi, tea, coffee, energy drinks); how many servings per day. The respondents were required to specify each caffeinated drink consumed separately. After calculating the caffeine content in Coke/Pepsi, tea and energy drinks, the caffeine content was then compared to the caffeine content in a cup of coffee being used as a benchmarking. The comparative formula of caffeine content estimation is described as follows: 2 colas=1 tea; 2 cups of tea=1 cup of coffee (FDA data cited in the Guardian) [28]. According to the FDA's commissioned study, the Redbull energy drink has caffeine content of approximately 80 mg. per serving; whereas classic colas has about 35 mg. of caffeine content per serving [29], the researcher, therefore, estimated 2 colas = 1 energy drink.

The Pittsburgh Sleep Quality Index (PSQI): PSQI [30] is a 19-item self-rated questionnaire assessing sleep quality over the past one-month time interval. In this instrument, 19 individual items produce seven sleep components, namely, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The score for each of these sleep components yields a score ranging from 0 to 3, whiles 3 being the greatest dysfunction. The sleep components are summed to yield a total score ranging from 0 to 21, with higher total score (referred to as global scores) representing poor sleep quality in the past month. Based on prior literature, participants with global score of greater than 5 were classified as poor sleepers. Those with score of 5 or less were classified as good sleepers [18, 29]. The researcher had obtained permission to use the PSQI by translating the menuscript from English to Thai language. To ensure the PSQI's validity, the back-translation was also executed. The internal consistency reliability of the PSQI in this study yielding a Cronbach's $\alpha = .0.77$, was conducted in high school students, rather than samples from 10 selected schools, in Bangkok, under the supervision

of the Office of the Basic Education Commission, Ministry of Education.

For poor sleep components sub-scales, specific categories were long sleep latency (≥ 30 mins. vs. <30 min.), poor sleep efficiency (<85% vs. ≥85%), daytime dysfunction due to sleep (<once per week vs. once per week or more), and use of sleep medication during the past month (<once per week vs. once per week or more), sleep duration was assessed by using the PSQI questionnaire asking participants regarding their actual sleep hours at night in the past 1-month time period. While previous study recommended that sleep time for adolescents should be between 8 – 9 hours per night [20]; another suggested that, based on the National Sleep Foundation, adolescents having less than 8 hour-sleep time are considered having insufficient sleep time [31]. In this research, we have classified sleep duration into 4 categories: ≥ 6.0, 6.1 – 7.0, 7.1 – 8.0 and ≥8.1.

Data analysis

The study of frequency distributions of participants was conducted, based on the socio-economic, student-related activities, consumption behavior in accordance with sleep quality. Then the characteristics were summarized by using mean (SD) and categorical variables using counts and percentage for univariate summaries. Later, the distribution of poor sleep quality across socio-economic status, student-related activities and consumption behavior was calculated. The distribution of PSQI scores and its components among male and female students were estimated. The odds ratio (OR) and 95% confidence intervals for the associations of sleep quality parameters with socio-economic status, student-related activities, consumption behavior were analyzed. Stepwise logistic regression modeling procedures were used to calculate odds ratio (OR). Upon completion of the univariate analyses, the variables were selected for multivariable analysis. The variables whose univariate test has a p-value <0.25 would be considered as a candidate for the multivariable model (gender, weekly allowance, history disease related sleep problems, BMI, part-time job, school activities, extra-curricular knowledge, alcohol consumption, smoking, caffeine consumption, sleep medicine and smart phone use) [18, 32]. These analyses were accomplished by using Stata 12 (Statacorp LP, College Station, TX).

Ethical consideration

Protection of participants and procedure for data collection, approved code: COA No. 016/2014, were approved by the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (ECCU).

RESULTS

Among the 1,080 participants, mean age was 16.8 (SD = .94) years, 483 (44.7%) were male and 597 (55.3 %) were female. The prevalence of poor sleep quality (PSQI >5) was 346 (32.0%). The mean of PSQI total score was 4.7 (SD = 2.22); 4.5 (SD = 2.21) for male and 4.8 (SD = 2.21) for female. The socio-economic status, student-related activities, and consumption behavior in relation to sleep quality of the samples are shown in Table 1. Differences in gender, educational level, GPA, body mass index (BMI), part-time job, and physical activity were not found, but there were significant status differences in weekly allowance, history disease related sleep problems, school activity, extra-curricular knowledge, alcohol consumption, smoking, caffeine consumption and smart phone use.

Table 2 shows the distribution of the PSQI sleep component scores across gender of students. Worth noting is that 36.4% of the samples was reported having sleep time ≤ 6 hrs. per day; whereas 24.6% of the samples was reported having sleep latency >30 mins.; whiles 17.2% of the samples reported having day time dysfunction due to sleepiness at least once a week; 9.1% reported having poor sleep efficiency; 23.7% reported having subjective poor sleep quality; 22.6% reported having poor sleep disturbance; 8.2% reported using sleep medicine. Differences in sleep duration, sleep latency, day time dysfunction, use of sleep medication, were not significant; however, there were significant status differences in sleep efficiency, subjective sleep quality, and sleep disturbance. Given the comparison of poor sleep quality and its components between male and female students, it was found that the prevalence of poor sleep quality was 32.0%: the prevalence of poor sleep quality of female students was higher than that of their male counterparts (34.5% vs. 29.0%). Notably, when looking into a component of sleep efficiency, female students reported having higher poor sleep efficiency than male students (10.9% vs. 6.8%). In terms of subjective sleep quality, female students reported having slightly poorer than male students (25.2% vs.22.0%). Lastly, regarding sleep disturbance, female students reported having higher sleep disturbance than male students (27.0% vs.17.2%).

As per Table 3, the odds ratio for poor sleep quality across characteristics achieved by using stepwise logistic regression after adjusting for

Table 1 Characteristics according to sleep quality

Characteristics	All	Poor sleep quality		Good sleep quality		*p-value*
	N	n	%	n	%	
Gender						.053
Male	483	140	29.0	343	71.0	
Female	597	206	34.5	391	65.5	
Educational level						.823
Grade 10	339	107	31.6	232	68.4	
Grade 11	373	124	33.2	249	66.8	
Grade 12	368	115	31.3	253	68.7	
Grade point average (GPA)						.539
≤2.70 (25 percentiles)	261	81	31.0	180	67.9	
2.71-3.12 (26-50 percentiles)	271	94	34.7	177	65.6	
3.13-3.50 (51-75 percentiles)	250	86	34.4	164	66.7	
>3.50 (>75 percentiles)	259	77	29.7	182	70.3	
Weekly allowance (baht/month) [a]						.003
≤ 600(50 percentiles)	633	181	28.6	452	71.4	
>600 (>50 percentiles)	432	161	37.3	271	62.7	
History disease related sleep problems (depression, rhinitis, allergic, asthma...)						.044
No	1014	318	31.4	696	68.6	
Yes	66	28	42.4	38	57.6	
Body mass index (BMI)						.160
Underweight	337	120	35.6	217	64.4	
Normal	564	167	29.6	397	70.4	
Overweight/Obese	176	59	33.5	117	66.5	
Part-time job						.128
No	968	303	31.3	656	68.7	
Yes	112	43	38.4	69	61.6	
Physical activity						.538
No	569	187	32.9	382	67.1	
Yes (≥150 mins./week)	511	159	31.1	352	68.9	
School activity						.015
No	500	143	28.6	357	71.4	
1-5 hrs./week	458	152	33.2	306	66.8	
≥6 hrs./week	122	51	41.8	71	58.2	
Extra-curricular knowledge						.042
No	210	72	34.3	138	65.7	
1-5 hrs./week	449	126	28.1	323	71.9	
6-10 hrs./week	263	85	32.3	178	67.7	
>10 hrs./week	158	63	39.9	95	60.1	
Alcohol consumption						.011
Never	508	141	27.8	367	72.2	
None over last 12 months	108	37	34.3	71	65.7	
< Once a month	374	129	34.5	245	65.5	
≥ Once a month	89	39	43.8	50	56.2	
Smoking						.005
No	928	283	30.5	645	69.5	
Yes	177	61	42.4	83	57.6	
Caffeine consumption (compared to caffeine content in coffee)						.002
No	102	22	21.6	80	78.4	
< 0.5 cup per day	747	232	31.1	515	68.9	
0.5-1 cup per day	181	67	37.0	114	63.0	
> 1 cup per day	50	25	50.0	25	50.0	
Mobile/smart phone used (hrs./week)						.050
≤ 12(25 percentiles)	272	74	27.2	198	72.8	
12.10-25.0 (26-50 percentiles)	279	91	32.6	188	67.4	
25.10-30 (51-75 percentiles)	264	80	30.3	184	69.7	
>30 (>75 percentiles)	265	101	38.1	164	61.9	

P-value from Chi-square test.

[a] $1 US = 32 Baht (Approx.)

Table 2 Sleep quality and its components scores among high school students by gender

Sleep quality components	All, n=1,080		Male, n=483		Female, n=597		*p-value*
	N	%	N	%	N	%	
Sleep duration (hrs.)							.448
≤6	393	36.4	177	36.6	216	36.2	
6.1 - 7.0	386	35.7	166	34.4	220	36.9	
7.1 – 8.0	264	24.4	119	24.6	145	24.3	
≥8.1	37	3.4	21	4.3	16	2.7	
Sleep latency (min)							.665
≤15	336	31.1	159	32.9	177	29.6	
16-30	478	44.3	205	42.4	273	45.7	
31-60	224	20.7	100	20.7	124	20.8	
>60	42	3.9	19	3.9	23	3.9	
Day time dysfunction							.798
Never	582	53.9	267	55.3	315	52.8	
Less than once a week	312	28.9	138	28.6	174	29.1	
1-2 times per week	163	15.1	69	14.3	94	15.7	
≥3 times per week	23	2.1	9	1.9	14	2.3	
Sleep efficiency							.021
>85%	982	90.9	450	93.2	532	89.1	
≤84%	98	9.1	33	6.8	65	10.9	
Subjective sleep quality							.014
Very good	172	15.9	96	19.9	76	12.7	
Fairly good	652	60.4	281	58.2	371	62.1	
Fairly bad	237	21.9	97	20.1	140	23.5	
Very bad	19	1.8	9	1.9	10	1.7	
Sleep disturbance							<.001
Very good	57	5.3	31	6.4	26	4.4	
Fairly good	779	72.1	369	76.4	410	68.7	
Fairly bad/ Very bad	244	22.6	83	17.2	161	27.0	
Use of sleep medication							
Not during the past month	992	91.9	437	90.5	555	93.0	.198
Less than once a week	56	5.2	27	5.6	29	4.9	
≥Once a week	32	3.0	19	3.9	13	2.2	
Sleep quality score							.053
Good sleep(≤5)	734	68.0	343	71.0	391	65.5	
Poor sleep(>5)	346	32.0	140	29.0	206	34.5	

Table 3 Odds Ratio and 95% CI for poor sleep quality

Characteristics	Unadjusted OR (95% CI)	Adjusted[b] OR (95% CI)
Gender		
Male	Ref	
Female	1.29 (.99-1.69)	1.49 (1.12-1.98)
Educational level		
Grade 10	Ref	
Grade 11	1.08 (.78-1.50)	
Grade 12	.99 (.71-1.37)	
Weekly allowance (baht/month) [a]		
≤ 600(50 percentiles)	Ref	
>600 (>50 percentiles)	1.48 (1.13-1.94)	1.44 (1.10-1.88)
History disease related sleep problems (depression, rhinitis, allergic, asthma...)		
No	Ref	
Yes	1.61 (.93-2.75)	
Body mass index (BMI)		
Underweight	1.31 (.98-1.77)	
Normal	Ref	
Overweight/Obese	1.18 (.82-1.74)	

Table 3 Odds Ratio and 95% CI for poor sleep quality (Conts.)

Characteristics	Unadjusted OR (95% CI)	Adjusted[b] OR (95% CI)
Part-time job		
No	Ref	
Yes	1.35 (.88-2.06)	
Physical activity		
No	Ref	
Yes(≥150 mins./week)	.92 (.71-1.20)	
School activity		
No	Ref	
1-5 hrs./week	1.24 (.96-1.65)	1.35 (1.01-1.81)
≥6 hrs./week	1.80 (1.17-2.76)	1.68 (1.09-2.59)
Extra-curricular		
No	Ref	
1-5 hrs./week	.75 (.52-1.08)	
6-10 hrs./week	.92 (.61-1.37)	
>10 hrs./week	1.27 (.81-1.99)	
Alcohol consumption		
Never	Ref	
None over last 12 months	1.36 (.84-2.15)	
<Once a month	1.37 (1.02-1.85)	
≥Once a month	2.03 (1.24-3.30)	
Smoking		
No	Ref	
Yes	1.68 (1.15-2.43)	1.90 (1.28-2.81)
Caffeine consumption		
No	Ref	
<0.5 cup per day	1.64 (.98-2.83)	1.45 (.87-2.41)
0.5-1 cup per day	2.14 (1.19-3.94)	1.95 (1.09-3.47)
>1 cup per day	3.64 (1.64-8.03)	3.14 (1.47-6.71)
Mobile/smart phone used (hrs./week)		
≤12(25 percentiles)	Ref	
12.1-25.0 (26-50 percentiles)	1.30 (.88-1.90)	
25.1-30 (51-75 percentiles)	1.16 (.79-1.72)	
>30 (>75 percentiles)	1.65 (1.13-2.41)	

[b]Each odds ratio is adjusted for any variables whose univariate test has a *p-value*<0.25

gender, weekly allowance, history disease related sleep problems, BMI, part-time job, school activities, extra-curricular knowledge, alcohol consumption, smoking, caffeine consumption, sleep medicine and smart phone use, found that female students having higher odds of poor sleep quality than male students (OR=1.49; 95% CI: 1.12, 1.98); weekly allowance ≥600 baht/month reported having poorer sleep quality than those having weekly allowance <600 baht/month (OR=1.44; 95% CI: 1.10, 1.88). When compared to students not participating in school activities, it was discovered that those participating for 1-5 hrs. (OR=1.35; 95% CI: 1.01, 1.81) and ≥6 hrs. (OR=1.68; 95% CI: 1.09, 2.59) per week, had slightly poorer sleep quality, respectively. Likewise, students with smoking behavior were likely to have higher odds of poor sleep quality when compared to those with non-smoking behavior (OR=1.90; 95% CI: 1.28, 2.81). In terms of caffeine consumption (see details in Instrument section on how caffeine content derived vs. caffeine in coffee) when comparing to non-consuming caffeine students; those consuming 0.5-1 cup per day were reported having 2 folds of poorer sleep quality (OR=1.95; 95% CI: 1.09, 3.47); while those consuming more than 1 cup per day were reported having approximately 3 folds of poorer sleep quality (OR=3.14; 95% CI: 1.47, 6.71).

DISCUSSION

The prevalence of poor sleep quality among high school students, based on this study, is 32.0% when comparing with other studies using the PSQI to evaluate. However, evidences from previous studies on poor sleep quality among students in colleges showed that the prevalence of poor sleep quality was between 48.1% to 62.4% [18, 21-23]. As far as the study on the prevalence of poor sleep

quality conducted in Thailand, the result of this study is found to be consistent with the research findings of Lohsoonthorn et al. [18] derived from a survey conducted among college students in Thailand (32.0% vs. 48.1%). Nevertheless, for results discovered so far in other Asian countries, particularly in Hong Kong and Korea, it was found that the prevalence of poor sleep quality among college students are likely to be higher than that of college students in Thailand.

Given this study's gender differences in poor sleep quality; it has been found that there is no significant difference in sleep quality by gender, and this corresponds with a study by Lohsoonthorn et al.[18]. Nonetheless, according to earlier studies, it was discovered that females reported having poorer sleep quality than males, reflecting a significant association between poor sleep quality and gender [21, 33]. The study also indicated that adolescents receiving higher weekly allowance tend to be at greater risk of having poor sleep quality, which corresponds with the evidence showing that highly family income is strongly associated with insufficient sleep [34].

Besides, evidence on adolescents' use of social network applications and devices discovered that, based on the National Statistical Office, Thai adolescents' use of approximately 3.1 hrs. per day was ranked the highest, comparing to other Asian adolescents [35]. It is, therefore, possible that adolescents with high weekly allowance, living in Bangkok, were likely to get over-indulged in modern gadgets and applications which could lead to their poor sleep quality. In terms of school activity, this study discovered that those involved in school activities have poor sleep quality. The findings are consistent with Carskadon [36] that such school sport activities as music band, choir, badminton and tennis can be sources of insufficient sleep.

The findings of this study was found to be consistent with previous studies [12, 18] in that, students consuming caffeine were likely to have poor sleep quality than non-caffeine consuming students: the more caffeine they consumed, the higher chance of having poor sleep quality. This is due to the fact that caffeine consumers could not easily fall asleep since it would block the effects of adenosine, a neurotransmitter thought to promote sleep. Furthermore, caffeine can also interrupt sleep by increasing the need to urinate at night [37]. This study also suggested that students with smoking habit would have poorer sleep quality than those non- smoking students, because nicotine is a central nervous system stimulant causing insomnia and, thus, making it more difficult to fall asleep. Also, it would speed heart rate, raising blood pressure and stimulating brain-wave activity that indicates wakefulness [37].

LIMITATIONS

As a cross-sectional study, the findings can simply reveal the associations but cannot elaborate the causal relationship. Also, the use of self-administered questionnaire depending on subjective measures of sleep quality and other covariates may generate some extent of error in reporting. Information on weekly allowance and GPA was regarded as sensitive information, generally based on self-report. However, the researcher believes that this issue can be partly reduced by using anonymous questionnaires and validated instruments. Worth pointing out is that, the calculation of caffeine consumption varies depending on the size of caffeinated drinks container, caffeine extracting method and brands of caffeine-related products.

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REFERENCES

1. Colten HR, Altevogt BM. Sleep disorders and sleep deprivation: anunmet public health problem. Washington, D.C.: Institute of Medicine, Committee on Sleep Medicine and Research, 2006.
2. Lucassen EA, Zhao X, Rother KI, Mattingly MS, Courville AB, de Jonge L, et al. Evening chronotype is associated with changes in eating behavior, more sleep apnea, and increased stress hormones in short sleeping obese individuals. PLoS One. 2013; 8(3): e56519. doi: 10.1371/journal.pone.0056519.
3. Chaput JP, Despres JP, Bouchard C, Tremblay A. Short sleep duration is associated with reduced leptin levels and increased adiposity: Results from the Quebec family study. Obesity (Silver Spring). 2007 Jan; 15(1): 253-61. doi: 10.1038/oby.2007.512.
4. Malhotra S, Kushida CA. Primary hypersomnias of central origin. Continuum (Minneap Minn). 2013 Feb; 19(1): 67-85. doi: 10.1212/01.CON.0000427212.05930.c4.
5. Moo-Estrella J, Perez-Benitez H, Solis-Rodriguez F, Arankowsky-Sandoval G. Evaluation of depressive symptoms and sleep alterations in college students. Arch Med Res. 2005 Jul-Aug; 36(4): 393-8. doi: 10.1016/ j.arcmed.2005.03.018.
6. Giannotti F, Cortesi F. Family and cultural influences on sleep development. Child Adolesc Psychiatr Clin N Am. 2009 Oct; 18(4): 849-61. doi: 10.1016/j.chc.2009.04.003.
7. Léger D, Guilleminault C, Bader G, Levy E, Paillard M. Medical and socio-professional impact of insomnia.

Sleep. 2002 Sep 15; 25(6): 625-9.

8. Ohayon MM, Smirne S. Prevalence and consequences of insomnia disorders in the general population of Italy. Sleep Med. 2002 Mar; 3(2): 115-20.
9. Grandner MA, Kripke DF. Self-reported sleep complaints with long and short sleep: a nationally representative sample. Psychosom Med. 2004 Mar-Apr; 66(2): 239-41.
10. Gureje O, Makanjuola VA, Kola L. Insomnia and role impairment in the community : results from the Nigerian survey of mental health and wellbeing. Soc Psychiatry Psychiatr Epidemiol. 2007 Jun; 42(6): 495-501. doi: 10.1007/s00127-007-0183-2.
11. Heslop P, Smith GD, Metcalfe C, Macleod J, Hart C. Sleep duration and mortality: The effect of short or long sleep duration on cardiovascular and all-cause mortality in working men and women. Sleep Med. 2002 Jul; 3(4): 305-14.
12. Lemma S, Gelaye B, Berhane Y, Worku A, Williams MA. Sleep quality and its psychological correlates among university students in Ethiopia: a cross-sectional study. BMC Psychiatry. 2012; 12: 237. doi: 10.1186/1471-244x-12-237.
13. Thomee S, Harenstam A, Hagberg M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults--a prospective cohort study. BMC Public Health. 2011; 11: 66. doi: 10.1186/1471-2458-11-66.
14. Gau SF, Soong WT. Sleep problems of junior high school students in Taipei. Sleep. 1995 Oct; 18(8): 667-73.
15. Carskadon MA. Factors influencing sleep patterns of adolescents. In: Adolescent sleep patterns: biological, social, and psychological influences. Cambridge: Cambridge University Press; 2002. p. 4-26.
16. Carskadon MA. Patterns of sleep and sleepiness in adolescents. Pediatrician. 1990; 17(1): 5-12.
17. Millman RP, Working Group on Sleepiness in Adolescents/Young Adults, AAP Committee on Adolescence. Excessive sleepiness in adolescents and young adults: causes, consequences, and treatment strategies. Pediatrics. 2005 Jun; 115(6): 1774-86. doi: 10.1542/peds.2005-0772.
18. Lohsoonthorn V, Khidir H, Casillas G, Lertmaharit S, Tadesse MG, Pensuksan WC, et al. Sleep quality and sleep patterns in relation to consumption of energy drinks, caffeinated beverages, and other stimulants among Thai college students. Sleep Breath. 2013 Sep; 17(3): 1017-28. doi: 10.1007/s11325-012-0792-1.
19. Phillips BA, Danner FJ. Cigarette smoking and sleep disturbance. Arch Intern Med. 1995 Apr; 155(7): 734-7.
20. Feinberg I, Campbell IG. Sleep Recommendations for children: a need for more data. Pediatrics. 2012 May; 129(5): 989. doi: 10.1542/peds.2012-0755C.
21. Cheng SH, Shih CC, Lee IH, Hou YW, Chen KC, Chen KT, et al. A study on the sleep quality of incoming university students. Psychiatry Res. 2012 May; 197(3): 270-4. doi: 10.1016/j.psychres.2011.08.011.
22. Lashkaripour K, Bakhshani NM, Mafi S. Sleep quality assessment of medicine students and physician (Medical) assistants. Interdisciplinary Journal of Contemporary Research in Business. 2012 Dec; 4(8): 443-50.
23. Rocha CR, Rossini S, Reimao R. Sleep disorders in high school and pre-university students. Arq Neuropsiquiatr. 2010 Dec; 68(6): 903-7.
24. Suen LK, Hon KL, Tam WW. Association between sleep behavior and sleep-related factors among university students in Hong Kong. Chronobiol Int. 2008 Sep; 25(5): 760-75. doi: 10.1080/07420520802397186.
25. Chanamanee P, Taboonpong S, Intanon T. Sleep quality and related factors among university students in southern Thailand. Songkla Med J. 2006; 24(3): 163-73.
26. Lemeshow S, Hosmer DW, Klar J, Lwanga SK, World Health Organization. Adequacy of sample size in health studies. Chichester : Wiley; 1990.
27. World Health Organization [WHO]. Multicentre Growth Reference Study Group. WHO child growth standards based on length/height, weight and age. Acta Paediatr Suppl. 2006 Apr; 450: 76-85. doi: 10.1080/08035320500495548.
28. Caffeine compared: from coke and coffee to aspirin and chocolate 2015. [Cited 2015 April 29]. Available from: http://www.theguardian.com/news/2013/nov/27/caffeine-compared-coke-coffee-aspirin-chocolate-tea.
29. New caffeine report shows no measurable change in consumption trends of the U.S. population. [Cited 2015 April 29]. Available from: http://www.fda.gov/downloads/AboutFDA/CentersOffices/OfficeofFoods/CFSAN/CFSANFOIAElectronicReadingRoom/UCM333191.pdf
30. Buysse DJ, Reynolds CF, 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989 May; 28(2): 193-213.
31. National Sleep Foundation. Sleep in America Poll 2006. [Cited 2012 November 20]. Available from: http://www.sleepfoundation.org
32. Bendel RB, Afifi AA. Comparison of stopping rules in forward "Stepwise" regression. Journal of the American Statistical Association. 1977; 72(357): 46-53. doi: 10.2307/2286904.
33. Snel J, Lorist MM. Effects of caffeine on sleep and cognition. Prog Brain Res. 2011; 190: 105-17. doi: 10.1016/B978-0-444-53817-8.00006-2.
34. Hoefelmann LP, Lopes Ada S, da Silva KS, Moritz P, Nahas MV. Sociodemographic factors associated with sleep quality and sleep duration in adolescents from Santa Catarina, Brazil: what changed between 2001 and 2011? Sleep Med. 2013 Oct; 14(10): 1017-23. doi: 10.1016/j.sleep.2013.05.015.
35. Adolescent: internet: game online. [Cited 2015 April 15]. Available from: http://service.nso.go.th/nso/nsopublish/citizen/news/news_internet_teen.jsp.
36. Carskadon MA. Adolescent sleep patterns: biological, social, and psychological influences. Cambridge: Cambridge University Press; 2002.
37. Corliss J. A harvard medical school special health report on improving sleep: a guide to a good night's rest. Boston, MA.: Harvard Health Publications; 2013.