

Sleepiness and sleep characteristics in students from an urban district of Lima, Peru

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ABSTRACT

Introduction. Sleepiness in students has an impact on their learning, focus and memory. Sleepiness is caused by multiple factors. Therefore, our objective was to estimate the frequency of sleepiness in Peruvian students and assess its relation to lifestyle and sleep habits.

Methods. Cross-sectional study conducted on first through fifth year secondary students. The Spanish version of the pediatric daytime sleepiness scale (0 to 32 points) was administered and sleep and demographic characteristics and harmful habits, among others were investigated. Excessive sleepiness was considered as a score higher than 20 points, and its association was assessed using raw and adjusted odds ratios.

Results. The study included 586 students; the average score in the pediatric daytime sleepiness scale was 13.0 ± 5.5 ; 11.9% of students had excessive sleepiness. Smoking was associated with excessive sleepiness, with an adjusted OR of 6.9 (95% CI: 2.9-17.0); alcohol consumption showed an OR of 4 (95% CI: 1.5-10.5), and practicing sports showed an OR of 0.5 (95% CI: 0.3-0.9). Likewise, having a bad sleep quality (OR: 5.4; 95% CI: 3.1-9.5) and taking more than 60 minutes to fall asleep (OR: 2.5; 95% CI: 1.1-6.0) were associated with a higher probability of having sleepiness.

Conclusion. Sleepiness was observed in 12% of the studied population, and was found to be lower than the rates described in studies with different populations. Excessive sleepiness is associated with smoking and frequent alcohol consumption, a lower level of sports practice, and bad sleep habits.

Key words: adolescence, sleep habits, insomnia, daytime sleepiness, sleep disorders.

<http://dx.doi.org/10.5546/aap.2014.eng.239>

INTRODUCTION

Sleep quality in adolescents is influenced by multiple intrinsic and extrinsic factors,¹ including psychological,² hormonal, genetic,³ nutritional⁴ factors and inadequate sleep habits.⁵ An alteration in any of these factors may result in the development of sleep-related problems. For this reason, adolescents are vulnerable to developing sleep disorders, with a high prevalence ranging between 11% and 47%.⁶

The most common disorders

include sleepiness, which has a negative impact on daytime activities and is accompanied by a deterioration of academic achievement and a significant increase in the number of failed subjects at school⁷ because it reduces the students' ability to focus, their learning capacity and memory.⁵ The reasons for sleepiness include extrinsic factors, such as changes in sleeping hours due to increased nighttime activities, or symptoms of anxiety or depression, which lead to desynchronization in melatonin secretion and abnormal sleep patterns.^{2,8}

In spite of the literature cited here, studies conducted on sleepiness are heterogeneous and cannot be compared because in them, different sleep quality assessments and populations were studied, with varying age ranges or origins. Few scales are designed for the adolescent population and many of those are recent,⁹ have been validated in a language other than Spanish, and do not assess all sleep components.⁶ These include a recently Spanish validated scale called the pediatric daytime sleepiness scale (PDSS).¹⁰

Sleep disorders in Peruvian adolescents have been approached from the point of view of dreams, in an attempt to understand their meaning or to interpret them, but sleep quality has not been studied.¹¹

Conducting the first assessment on sleep quality to know the prevalence of sleepiness and potentially-related extrinsic factors will allow to establish measures to improve the academic achievement of affected students.^{1,5} Given the lack of Peruvian studies aimed at determining this population's special characteristics, sleepiness in Peruvian students and its

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Conflict of Interest:
None.

Received: 9-9-2013
Accepted: 11-20-2013

relation to lifestyle, assuming that we would find a high frequency of sleepiness.

MATERIAL AND METHODS

A cross-sectional study was conducted on secondary school students attending schools located in Villa El Salvador, an urban district in the south of Lima, Peru. According to the 2008 school census, there were 32 144 enrolled students;¹² the sample size was estimated using the Epidat software v. 3.1. Since no Peruvian publications were found and given the heterogeneity of sleepiness prevalence, it was assumed that the proportion of students with sleepiness was 50%, with a 95% confidence interval, a 5% accuracy, and a 1.5 design effect, so we required to administer the survey to 570 students.

The sample was selected using a list of schools and randomly picking three: two public schools and a private one, since possible socio-economic differences might be found among students depending on the type of institution. The distribution of the sample was proportional and it was based on the number of enrolled students. In each school, one group per year of secondary school (first through fifth year) was selected, with an average of 35 students per group; all were surveyed. If the sample was not complete, the following section was selected.

The survey was administered during class hours in the 2008 school year. A self-administered anonymous questionnaire was used with the following items:

- Sleepiness. The Argentine validated version of the PDSS was used,¹⁰ made up of eight questions modified for oral administration (for example: addressing students using the Río de la Plata *voseo* form, see *Annex 1*). The PDSS score ranges from 0 to 32 points; "excessive sleepiness" was classified as a score of >20. This was selected as the cut-off point because it represented the 75th percentile in the preliminary studies^{10,13} and has been arbitrarily used in other studies on adolescents with excessive sleepiness.¹⁴⁻¹⁶ The Argentine validated version had a Cronbach's alpha of 0.74 and an interim correlation of 0.26.
- Demographic characteristics (sex, age), frequency of harmful habits (consumption of alcohol, tobacco, coffee, etc.), frequency of sports practice, number of failed subjects that year, and history of having repeated the previous year. Questions related to frequency referred to the past month and were classified

in two: 1) less than one time a week, and 2) one or more times a week.

- Sleep characteristics, which asked about how students described their sleep quality over the past month (good or bad quality), the time it took them to fall asleep (minutes until falling asleep), and subjective sleep time (hours of sleep).

The study was approved by the Ethics Committee of Universidad Nacional Mayor de San Marcos (project code: No. 200; approval resolution No. 0144). Firstly students were informed of the study objectives and that their participation was voluntary and anonymous, then they provided their consent to participate. After this, doubts regarding some terms were cleared. At the end of the study, overall results were delivered to each school, including recommendations based on the study.

Data obtained were analyzed using the STATA software v. 12.1. The internal consistency of the PDSS was assessed using Cronbach's alpha test. The PDSS average values were compared by school year, age, habit frequency and all sleep characteristics using Student's t tests or an analysis of variance (ANOVA). In addition, the magnitude of the association among these outcome measures and excessive sleepiness was assessed using odds ratios (OR), both raw and adjusted (by age, sex, school year, and school) in a logistic regression analysis. Comparisons are described using means and standard deviations. A value of $p < 0.05$ was considered significant.

RESULTS

A total of 620 surveys were delivered; 5 students refused to answer the survey, and 29 were excluded due to errors in filling it; therefore 586 students were included in the study. Of them, 49.6% were males; their mean age was 14.2 ± 1.6 years old. Of all, 4.1% admitted that they consumed alcohol; 3.9% indicated that they smoked; 74.9% referred to drink coffee, tea or cola drinks; and 81.6% said they practiced sports one or more times a week. *Table 1* shows the academic characteristics of the population by school year.

The average PDSS score was 13.0 ± 5.5 . The PDSS version used in this study had a Cronbach's alpha of 0.741 with an interim correlation of 0.258. Of the eight questions included in the questionnaire, seven had an item-total correlation above 0.4, except for item 3: "Are you usually alert or attentive most of the day?" which had an item-total correlation of 0.12, and eliminating such

item would allow us to increase Cronbach's alpha to 0.765.

Male students obtained 12.4 ± 5.4 points in the PDSS, while female students scored 13.6 ± 5.6 ; this was a significant difference ($p = 0.01$). Also, significant differences were found by age ($F = 1.5$; $p = 0.04$) or school year ($F = 2.7$; $p = 0.03$), as shown in Table 1. Differences in the PDSS were not significant among students who failed at least one subject or those who repeated the previous school year and those who did not ($p = 0.09$).

Students who practice sports one or more times a week obtained an average of 12.7 ± 5.4 points in the PDSS, compared to those who practiced sports less frequently, who scored 14.3 ± 5.8 ($p < 0.01$). Practicing sports had a greater influence on female students since it was observed that those who practiced sports less frequently had an average of 15.8 ± 5.5 points, compared to male students, who obtained 12.7 ± 5.9 points.

Students who smoked scored 17.3 ± 5.8 points, compared to those who did not, with 12.8 ± 5.4 points. Only 2.8% of female students indicated that they smoked one or more times a week, and their PDSS score was 20.5 ± 5.1 . Likewise, 2.1% of girls indicated that they had alcohol one or more times a week and obtained a 17.0 ± 6.6 score in the PDSS.

The time until falling asleep was 20.0 ± 16.6 min; 6.4% pointed out that it took them more than 60 min to fall asleep. The subjective duration of sleep was, in average, 7.9 ± 1.6 h; 15.9% indicated that they sleep less than 6 hours.

Excessive sleepiness was observed in 11.9% (95% CI: 9.3%-14.6%) of the studied population.

Outcome measures with a significant association with sleepiness were classifying sleep as bad quality, sleeping less than 8 hours, consuming alcohol or smoking; on the

contrary, practicing sports was associated with a lower chance of developing sleepiness. Such associations remained once adjustments for age, sex, school year and school were made (Table 2).

DISCUSSION

The prevalence of sleepiness was 12%, lower to what has been described in other studies. For example, in the study conducted on Canadian students using the Epworth scale, 42% of students had excessive sleepiness;¹⁷ in the United States and using the same scale, 26% reported excessive sleepiness;¹⁸ while in Spain 27% of adolescents had sleepiness.¹⁹ The differences with these studies lie in the instrument applied, the socio-economic stratum of the population and the nighttime activities described by them. These components could condition a higher level of sleepiness, but they have not been assessed in our study.

In addition, we found that sleepiness is related to a greater smoking habit, alcohol consumption and a lower level of sports practice. In relation to smoking and alcohol consumption, both habits have been independently associated with developing sleep disorders, including sleepiness.^{20,21} The causative mechanisms vary, including interaction with genetic variations susceptible to developing sleepiness,²² desynchronization of sleep stages and insomnia due to the resulting excitement or anxiety.^{20,21}

What is important in relation to such factors is that they have the potential to be corrected, thus allowing adolescents to recover their condition for daytime activities.⁵

The effect of practicing sports has not been thoroughly studied in adolescents, who tend to have a lower prevalence of obesity or sleep respiratory disorders compared to the adult population, who benefit greatly from practicing sports and its reducing effect on sleep

TABLE 1. Demographic distribution by school year of the participating population

School year	Total (%)	Male students (%)	Age	Failed subjects*	Repeated year**	PDSS	Excessive sleepiness
First	112 (19.1)	(49.1)	12.2 ± 0.9	1.2 ± 1.4	7.1%	12.9 ± 6.2	13.3%
Second	100 (17.2)	(61.0)	13.2 ± 0.8	0.9 ± 1.4	4.0%	11.8 ± 4.7	4.0%
Third	144 (24.4)	(45.8)	14.2 ± 0.7	0.8 ± 1.0	5.7%	12.8 ± 5.8	13.9%
Fourth	101 (17.2)	(42.6)	15.0 ± 0.5	1.0 ± 1.3	4.0%	13.2 ± 5.1	10.9%
Fifth	129 (22.0)	(47.3)	16.2 ± 0.9	1.2 ± 1.7	2.4%	14.1 ± 5.3	15.5%
Total	586 (100)	(49.6)	14.2 ± 1.6	1.0 ± 1.4	4.5%	13.0 ± 5.5	11.9%

* Average of failed subjects out of the total number of subjects taken in the past academic semester.

** Average of students who indicated to have repeated the previous year.

PDSS: pediatric daytime sleepiness scale (mean \pm standard deviation).

apnea syndrome.⁴ Its protective effect on sleep disorders could be due to an anxiolytic effect and improved sleep patterns, thus facilitating the synchronization of sleep stages, usually altered upon becoming an adolescent.²³

Sleep habits are also a factor associated with sleepiness. Several reviews have described that adolescents should sleep for approximately 8 to 10 hours.¹ In this study, 32% met such target; in addition, those who sleep less than 6 hours have three times more chances of suffering sleepiness.

In relation to students' academic achievement and the level of sleepiness, in our study no differences were observed in terms of the assessed academic characteristics, possibly due to how they were measured. However, several studies have referred a negative impact on academic achievement, even if measured differently.^{7,10,24}

The internal consistency index of the PDSS is similar to that of the Argentine validated

version.¹⁰ Notwithstanding, Drake, et al.¹³ only included the items with an item-total correlation above 0.4, while we identified that item 3 has an item-total correlation below the accepted level, a fact that had not been pointed out in the Argentine validated version. Such low correlation could be due to how the question is phrased; while the other questions are related to "How tired are you?," item 3 asks "How alert are you?". In this regard, we recommend to check that this item is clearly understood at the time of administering the questionnaire in Spanish.

Sleep assessment instruments have limitations because they are subjective, as a result, their reliability is altered with age and recall and understanding biases; therefore, it is difficult to administer these instruments to poorly educated people.^{25,26}

Regarding the cut-off point to determine if the participant has excessive sleepiness, based on the

TABLE 2. Sleepiness and sleep characteristics in students. Lima, Peru, 2008

	Sleepiness %	Raw OR	95% CI	Adjusted OR	95% CI
Sex					
Male students	9.4	1	-	1	-
Female students	14.6	1.6	1.0-2.7	1.6	0.9-2.7
Age					
13 years old or younger	9.9	1	-	1	-
14 to 16 years old	12.5	1.3	0.7-2.3	1.1	0.5-2.8
17 years old or more	17.5	1.9	0.8-4.9	1.5	0.4-6.1
Self-qualification of sleep quality over the past month					
Good	7.6	1	-	1	-
Bad	33.0	5.9	3.5-10.2	5.4	3.1-9.5
Time to fall asleep					
Less than 30 min	9.4	1	-	1	-
30-60 min	17.9	2.1	1.2-3.5	2.1	1.2-3.7
More than 60 min	28.6	3.8	0.7-20.5	2.5	1.1-6.0
Sleep hours referred by students					
More than 8 hours	8.9	1	-	1	-
6-8 hours	10.9	1.3	0.7-2.3	2.2	1.3-3.7
Less than 6 hours	21.5	2.8	1.4-5.7	3.9	0.7-22.0
Alcohol consumption					
Less than one time a week	11.2	1	-	1	-
One or more times a week	29.2	3.3	1.3-8.2	4.0	1.5-10.5
Smoking					
Less than one time a week	10.7	1	-	1	-
One or more times a week	43.5	6.4	2.7-15.3	6.9	2.9-17.0
Coffee, tea or cola drink consumption					
Less than one time a week	11.6	1	-	1	-
One or more times a week	12.1	1.0	0.6-1.9	1.1	0.6-1.9
Sports practice					
Less than one time a week	18.7	1	-	1	-
One or more times a week	10.5	0.5	0.3-0.9	0.5	0.3-0.9

OR: odds ratios; OR adjusted by age, sex, school year and school.

PDSS value distribution in the population, it has been suggested that a score >20 is indicative of excessive sleepiness,^{15,16,24} and in this study, such score was obtained by 11.9% of the population. Such cut-off point is not based on the validation of the test sensitivity to distinguish between persons with or without excessive sleepiness; however, it accounts for the 75th percentile of the original study conducted by Drake, et al.¹³ and should therefore be cautiously considered.

Such aspects as correcting or extending the validated Spanish version of the PDSS and establishing a cut-off point to determine who has excessive sleepiness should be the subject of other studies specifically designed to this end. Besides, our study was not representative of each school year assessed, so implications are only representative at a population level. These are the limitations of the study interpretation.

Lastly, our study is one of the few studies conducted in Peru to assess sleepiness particularly in adolescents, including a large sample of students, who showed significant associations between sleepiness and certain habits that can be prevented or corrected so as to reduce the risk of this condition. These are the main strengths of our study.

CONCLUSIONS

In our sample of students, 12% had excessive sleepiness, which may be related to certain lifestyle habits, such as smoking or frequent alcohol consumption, a lower level of sports practice, an inadequate subjective sleep quality, and fewer hours of sleep. It is recommended to improve the sleepiness assessment instrument and conduct future studies to identify risk populations. ■

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Annex 1

Pediatric daytime sleepiness scale, modified for its administration in Peru

	Always	Often	Sometimes	Seldom	Never
a. How often do you fall asleep or feel drowsy during class periods?					
b. How often do you fall asleep or feel drowsy while doing your homework?					
c. Are you usually alert or attentive most of the day?					
d. How often do you feel tired and grumpy during the day?					
e. How often do you have trouble getting out of bed in the morning?					
f. How often do you fall back asleep after being awakened in the morning?					
g. How often do you need someone to awaken you in the morning?					
h. How often do you think you need more sleep?					

Item "c" has a reverse score.

The bold format shows the modifications made to the questionnaire originally published in Spanish by Perez-Chada, et al. using the voseo, which does not apply to the English language.¹⁰