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The Relationship between Excessive Daytime Sleepiness and Cumulative Achievement Index of Medical Student in Faculty of Medicine Atma Jaya Batch 2018

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Abstract

Introduction: Excessive Daytime Sleepiness (EDS) is the inability to maintain wakefulness and alertness during the major waking episodes of the day, with sleep occurring unintentionally or at inappropriate times almost daily for at least three months. Poor concentration is commonly reported as a symptom of EDS and frequently disrupt academic performance in the learning activity. This study aims to determine the relationship between EDS and cumulative achievement index (GPA) among medical undergraduates at Atma Jaya Catholic University of Indonesia.

Methods: This research is an analytic observation research with cross-sectional data collection on 180 respondents out of the 2018 class of preclinical students at the Faculty of Medicine of the Atma Jaya Catholic University of Indonesia. The data collection methods used were the ESS (Epworth Sleepiness Scale) and cumulative achievement index (IPK) questionnaires. Demographic variables were also measured. Data were analyzed using the statistic software SPSS with a chi-square test ($\alpha \geq 0{,}05$).

Results: From 180 respondents, 52,8% had EDS, 25% of the total had mild EDS, 16,1% had moderate EDS, and 11,7% with severe EDS. The cumulative achievement index found in respondents mostly ranged from moderate (43,3%) to high (42,3%). The rest had low scores. Furthermore, 25% of respondents had a high IPK score with EDS, 22% had a moderate IPK score with EDS, 5,4% had a low IPK score with EDS, 18,5% had a high IPK score without EDS, 22% had a moderate IPK score without EDS, and the rest 7,1% had low IPK score without EDS. Analysis with chi-square showed no significant relationship between EDS and IPK (P=0,425).

Conclusions: There was no relationship between excessive daytime sleepiness and cumulative achievement index of medical students in Atma Jaya Faculty of Medicine and Health Batch 2018.

Keywords: excessive daytime sleepiness - academic achievement - cumulative achievement index - sleep duration

INTRODUCTION

Excessive daytime sleepiness (EDS) is the body's inability to maintain a state of wakefulness and is marked by a tendency to fall asleep easily at inappropriate times every day for three months or more. This symptom of drowsiness is called excessive if it interferes

the normal daily activities and a sense of well-being. Approximately 20 percent of the adult population in the United States is experiencing this symptom.[1] People with EDS have a higher risk of experiencing work and vehicle accidents and body conditions deterioration. EDS is also often reported to cause a decrease in concentration, indirectly disturbing student achievement in the learning process. One study has identified that 50 percent of college students were experiencing daytime sleepiness and 70 percent of college students had inadequate sleep.[2] In addition, it was observed that first-year students have poorer sleep patterns than third- and fourth-year students. This phenomenon is possibly due to difficulty transitioning from high school to college, in terms of academic matters.[3]

Healthy adults need 6-9 hours of sleep, while teenagers should sleep 9-10 hours daily. Sleep duration is closely related to age, physical condition, mental condition, and consumption of drugs. Various diseases can cause abnormal sleep duration, including diabetes, cardiovascular disease, and depression.[4,5] In medical students, sleep duration is usually disturbed due to the high academic burden, night shifts in the hospital (in clinical students), and the habit of studying at night. These things may cause lack of sleep and increase the risk of EDS.[6]

The prevalence of EDS is typically quite high in adolescents. Research conducted on students from health sciences schools at the University of Indonesia found that 48.6% of respondents experienced EDS.[7] There were a lot of changes in sleep patterns with many factors affecting the quality and quantity of sleep. According to a study, teens need 9 to 10 hours of sleep every night. However, adolescents' sleep time has changed due to external determinants, such as; parents who stop monitoring sleep hours of their child, changes in school hours, and additional activities in adolescents who work or participate in extracurricular activities.[8]

Students with EDS generally have lower academic achievement in comparison with non-EDS students. The relationship between sleep patterns and academic achievement is still not fully understood. However, a theory mentions that the Rapid Eye Movement phase (REM) affects procedural thinking processes. This phase occurs every 90 to 120 minutes or 4 to 5 times throughout the night, so students who have classes in the morning can miss 1 to 2 times of the REM phase which affects procedural memory. This situation can negatively impact students' academic index and leads to depression or other negative habits.[9]

Considering the various negative impacts and dangers associated with EDS, especially for students, it is important to conduct further

research on EDS and its effect on academic achievement. This paper aims to determine the relationship between excessive daytime sleepiness and academic achievement of preclinical students in Atma Jaya Catholic University of Indonesia batch 2018. The information retrieved from this paper is hoped can be useful in preventive action efforts to reduce the occurrence of EDS.

METHODS

Study Design & Population

The design of the study used was an analytical cross-sectional study. All preclinical students from batch 2018 at Atma Jaya Catholic University of Indonesia (AJCUI) were invited to participate in this study.

Subject and Sampling Method

Sampling was done by purposive sampling method. The inclusion criteria for this study were active preclinical students from batch 2018 at AJCUI who were willing to become respondents by signing the consent form. The exclusion criteria of this study were students who used media (mobile phones, watching TV, gaming, Youtube, and other social media, etc.) more than 16 hours per day, students who consumed alcohol more than four servings a day for five days or more per months, and students who choose medical school by external enforcement or not motivated by their own.

Data Collection

We used the Epworth Sleepiness Scale (ESS) questionnaire to measure the incidence of EDS and cumulative achievement index. Demographic variables were also investigated. The Epworth Sleepiness Scale (ESS) consists of 8 questions to measure the average sleep tendency in daily life. Respondents were asked to rate the likelihood of falling asleep in eight daily activities, the ratings ranged from zero to three. With a total score ranging from 0 to 24, the ESS questionnaire classifies EDS into five levels. Normal sleepiness during the day is classified as mild normal drowsiness if the total score is between 0 and 5 and moderate normal drowsiness if the total score between 6-10. Students were considered to have mild EDS if the total score was more than 10, which further classified into mild EDS (11-12), moderate EDS (13-15), and severe EDS (16-24).

Statistical Analysis

Data analysis was carried out using SPSS software to obtain answers to research questions and prove whether the formulated hypothesis was proven correct or rejected. The statistical test that will be used to determine the relationship between EDS and the cumulative achievement index is the chi-square analysis which is divided into two types of test, namely univariate analysis to obtain an overview of each variable and

bivariate analysis to determine whether there is a relationship between two variables.

RESULTS

A total of 180 preclinical students filled out the questionnaire (115 students were female (63.9%) and 53 were male (36.1%), see Table 1 below. In terms of sleep duration, a high percentage of students (73.9%) answered < 7 hours/day, while 26.1% of students left had normal sleep duration (8-10 hours/day). Most of the students have a study duration of <3 hours/day (71.1%). rather than 3-5 hours/day (27.2%). Only three students (1.7%) with a study duration of 6 hours per day. The duration of media use in 138 students (76.7%) was 3-16 hours/day, 41 students (22.8%) were < 3 hours/day, and 1 students (0.6%) who use media for > 16 hours/day. Most of the students, as many as 164 (91.1%) answered that they did not consume alcohol, 15 students (8.3%) answered that they consumed 1-4 servings of alcohol/day less than five times/month, and one student (0.6 %) answered that they consumed the same amount of alcohol five times or more in a month. Participants mainly lived alone in a dormitory or apartment (60%), while the rest lived with their families or guardians (40%). Regarding educational motivation, almost all students stated that they chose medical school on their own (94.4%), and only ten (5.6%) chose medical school unindependently.

Table 1. Participants' demographic characteristics

Variables	n	%
Gender		
Male	65	36.1%
Female	115	63.9%
Sleep Duration		
8-10 hours/day	47	26.1%
<7 hours/day	133	73.9%
Study Duration		
< 3 hours/day	128	71.1%
3-5 hours/day	49	27.2%
≥ 6 hours/day	3	1.7%
Media Consumption Duration		
< 3 hours/day	41	22.8%
3-16 hours/day	138	76.7%
> 16 hours/day	1	0.6%
Alcohol Consumption		
Not consuming alcohol	164	91.1%
1-4 servings/day, < 5 times/month	15	8.3%
1-4 servings/day, ≥ 5 times/month	1	0.6%
Living Arrangement		
Live alone (dormitory/apartment)	108	60%
Live with family or guardian	72	40%
Educational Motivation		

Variables	n	%
Own choice	170	94.4%
Not own choice	10	5.6%

Table 2 depicts the incidence of EDS and participant's cumulative achievement index (GPA). Students with a total ESS score between 11-24 were considered to have excessive daytime sleepiness (EDS). Below that score, students are still categorized as having mild to moderate normal sleepiness.

Table 2. EDS occurence distribution and cumulative achievement index (GPA)

Variables	n	%
NON EDS	**85**	**47.8%**
Mild normal drowsiness	17	9.4%
Moderate normal drowsiness	68	37.8%
EDS	**95**	**52.8%**
Mild EDS	45	25%
Moderate EDS	29	16.1%
Severe EDS	21	11.7%
GPA	**180**	**100%**
High	77	42.8%
Medium	78	43.3%
Low	25	13.9%

This study found that there were 45 students (25%) who experienced mild EDS, 29 students (16.1%) with moderate EDS, and 21 students (11.7%) with severe EDS. The majority of students (43.3%) had a moderate GPA (3.25 > n 2.75), followed by 42.8% of students who had a high GPA (≥ 3.25), and the rest (13.9%) had a low GPA (<2.75).

As shown in Table 3, we also analyzed the relationship between students' characteristics factors and the incidence of excessive daytime sleepiness. The statistical test For the sex factor, the p-value was 0.598 (p≥0.05). The factor of sleep duration and learning duration sequentially obtained a p-value of 0.947; 0.752 (p≥0.05). The duration factor of the use of electronic media obtained a p-value of 0.550 (p≥0.05), and the alcohol consumption factor with a p-value of 0.159 (p≥0.05). Thus, the results indicated no significant relationship between these five kinds of students' characteristics factors and excessive daytime sleepiness in preclinical students. Details can be seen in Table 3.

From 180 students participating in this study, 168 students met the inclusion criteria for analysis of the relationship between EDS and GPA. The data were analyzed using statistical software with the chi-square test and obtained a p-value of 0.425 (p≥0.05), so Ho was accepted. Thus, there is no relationship between excessive daytime sleepiness (EDS) and cumulative achievement index (GPA) of

preclinical students at AJCUI. The results can be seen in Table 4 below.

Table 3. The relationship of risk factors and excessive daytime sleepiness

Variables		Excessive Daytime Sleepiness		P Value
		EDS	Non EDS	
Gender	Laki-laki	36 (20%)	29 (16.1%)	0.598
	Perempuan	59 (32.8%)	56 (31.1%)	
Sleep Duration	8-10 hours/day	25 (13.9%)	22 (12.2%)	0.947
	< 7 hours/day	70 (38.9%)	63 (35%)	
Study Duration	< 3 hours/day	67 (37.2%	61 (33.9%	0.752
	3-5 hours/day	27 (15%)	22 (12.2%)	
	≥ 6 hours/day	1 (0.6%)	2 (1.1%)	
Media Consumption Duration	< 3 hours/day	20 (11.1%)	21 (11.7%)	0.550
	3-16 hours/day	74 (41.1%)	64 (35.6%)	
	> 16 hours/day	1 (0.6%)	-	
Alcohol Consumption	Not consuming alcohol	90 (50%)	74 (41.1%)	0.159
	1-4 servings/day, < 5 times/month	5 (2.8%)	10 (5.6%)	
	1-4 servings/day, ≥ 5 times/month	-	1 (0.6%)	

Table 4. The relationship between cumulative achievement index (GPA) and excessive daytime sleepiness

Variables		GPA (%)			P Value
		High ≥ 3.25	Medium 3.25 > n ≥ 2.75	Low <2.75	
	EDS	42 (25%)	37 (22%)	9 (5.4%)	0.425

Excessive Daytime Sleepiness	Non-EDS	31 (18.5%)	37 (22%)	12 (7.1%)	

DISCUSSION

In the present study, we categorize the results into non-EDS and EDS. Each of them was further subcategorized. Non-EDS has two groups: mild normal drowsiness and moderate normal drowsiness, while EDS was divided into three levels: mild, moderate, and severe EDS. It was found that 9.4% of students did not experience EDS and only experienced normal light sleepiness during the day, and 37.8% experienced moderate sleepiness, which was still within normal limits. A high prevalence of EDS was found among participants, whether it was mild (25%), moderate (16.1%), or severe EDS (11.7%). The incidence of EDS in this study is quite different from the previous study in Hunan province, China, where only 24.6% of medical students experienced EDS.[10] Another study from Kerala, India also found a relatively low figure of 25.5% of students who experienced EDS.[11] The reason for the differences might be attributed to the variations in the sample size, which was much higher than this study and involved students from different years of education, with a balanced proportion of the gender of the respondents.

However, the incidence of EDS in this study is similar to another study from the University of Indonesia which involved nursing students as the respondents. They found a fairly high incidence of EDS (48.6%).[7] The study design used was also pretty similar to this study where they also used an ESS questionnaire and the respondents were first-year students. Female respondents also dominated the gender proportion of respondents, so the characteristics of the data are similar to this study.

The majority of the first-year students were found to have a medium to high GPA, with a percentage of 42.8%. This finding was supported by the research of Abdulghani et al. which explained that first-year students tend to have higher GPA scores compared to other years.[12]

Of the 168 students who met the criteria to be respondents in this study, the prevalence of EDS reached 52.4%, and the majority were women. Among them, 47.7% have a high GPA, followed by students with a medium GPA as much as 42.1%, and 10.2% with a low GPA. The chi-square analysis showed no relationship between excessive daytime sleepiness (EDS) and the cumulative achievement index (GPA). The result was in line with research conducted at Prince Sattam

Bin Abdulaziz University, Saudi Arabia in 2016.[13]

Sleep is important for maintaining physical and mental health, especially in neurocognitive activities that play a vital role when humans store memory and conduct information processing activities.[14] Lack of sleep and psychological stress are therefore closely related to academic achievement. This statement was supported by Hangouche et al. in Morocco who found that 86.4% of students with high psychological stress tended to experienced sleep disorders, which were significantly related to decreased academic achievement.[6]

A study conducted on pharmacy students in Nigeria suggested that there is a relationship between sleep quality and academic achievement. This finding could be just due to reduced sleep duration and quality, thereby reducing students' concentration and memory ability, and thus disrupting student learning processes, especially during the day in class. In addition, this study also examined the relationship between academic achievement and EDS but did not find any significant relationship.[15]

Another study that discussed the relationship between EDS and academic achievement also obtained similar results: there was no significant relationship between the two variables. However, the results of this study might be influenced by the relatively small number of samples. According to that study, EDS is only one factor, so other factors that significantly impact students' academic achievement also need to be identified.[16] Other factors such as stress also need to be considered. Stress in medical students may be associated with heavy academic burdens. Sujatha et al.[17] found that the prevalence of students experiencing severe stress reached 88.6% through their research in India. However, this factor has not been analyzed in this study.

Most of the studies found no relationship between EDS and GPA, whereas other studies found a contradictory report. Mirghani et al. [18] found a significant relationship between academic achievement and EDS, sleep deprivation, sleep duration of fewer than six hours, and a tendency to fall asleep while reading in 106 medical students at the University of Ondurman. Another study by Abdulghani et al. [19] also got a significant result that EDS had a negative effect on student's academic achievement and learning motivation. A previous study by Veldi et al.[21] also found the opposite result, which stated that students with sleep problems got lower scores at the end of the semester. These different results might be arised from the type of questionnaires used where those studies used the Sleep and Daytime Questionnaire (S&DHQ). Also, the respondents in those

studies were 19-33 years old with different years of college.

There are several limitations of this study. First, there is a risk of recall bias and calculation error because the questionnaire was self-administered by the respondents. A further limitation of this study is that female respondents dominated the study population. Indeed, this could happen because the proportion of women in medical school is relatively higher than that of males. In addition, this research only involved one batch of preclinical students at AJCUI, and therefore the results cannot be extrapolated to the general population.

CONCLUSION

There is no relationship between excessive daytime sleepiness (EDS) and the cumulative achievement index (GPA) of preclinical students batch 2018 at Atma Jaya Catholic University of Indonesia. Future research should avoid self-report instruments to prevent response bias and obtain more objective results. Other factors that affect academic achievement should also be given more attention. We believe that our findings not only provide data on EDS but also increase public awareness, especially among medical students about the high incidence of EDS.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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