

Relationship Between Sleep Quality and Achievement of Medical Students in Indonesia

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Abstract

Sleep quality is a form of fulfilling the satisfaction of an individual who undergoes a sleep process. The quality of a person's sleep is believed to have an impact on aspects of that person's life. Medical students are no exception, who are prone to sleep with poor quality. It is suspected that one of them can have an impact on their academic performance. This literature review aims to determine whether a person's sleep quality level contributes to the academic achievement of medical students in Indonesia. Based on the eleven studies reviewed, six studies found a positive relationship between the level of sleep quality and the academic achievement of medical students in Indonesia. This is presumably because of the factors that influence it, namely mental, physical, environmental, and so on. One of them is a change in the lifestyle of medical students such as a busy schedule of activities that requires medical students to adapt to affect their sleeping hours. Not only that, the most common thing that happens is due to high stressors or pressure that occurs which affects the quality of sleep and ends up affecting their academic performance. Based on eleven literature reviews that have been conducted, it is found that currently, as many as six studies support a positive relationship while five studies do not find a relationship between sleep quality and achievement in medical students in Indonesia.

Keywords: Sleep Quality; Achievement; Academic Performance; Medical Students

1. INTRODUCTION

Sleep quality is a form of fulfilling the satisfaction of an individual who is undergoing a sleep process (1). To provide a valid standard measure, a scoring system can be implemented to measure a person's sleep quality with the Pittsburgh Sleep Quality Index (PSQI) (2). The measurement tool has been generally adapted to Indonesian and contextually based sleep quality on some components which include subjective sleep quality, sleep latency, sleep duration, daily sleep efficiency, sleep disturbances, use of sleeping pills, and daily disturbances during the day (3).

College students, especially in medical faculties, are prone to experiencing poor quality sleep (4). A systematic review and meta-analysis of 57 studies show that worldwide, poor sleep quality has a prevalence rate of 52.7% based on the value of the Pittsburgh Sleep Quality Index (PSQI) (5). A study conducted at Udayana University, Indonesia showed that 58.3% of students at the preclinical stage and 74.8% of students at the clinical stage had poor sleep quality (6). A decrease in sleep quality among medical students is associated with a high incidence of stress due to academic workload, fear of facing exams, and an irregular schedule of daily activities (7). Sleep quality is a major factor that not only determines a student's academic ability, but also determines long-term cognitive, psychosocial, and physical health effects (8–11).

The quality of one's sleep is believed to have an impact on aspects of that person's life, and a medical student is no exception. One aspect that has been widely studied is the impact of sleep quality on academic performance. A literature review and meta-analysis by Seoane et al., (12) found that medical students' poor sleep quality around the world is significantly correlated with impaired academic performance.

Conversely, several studies have also concluded that academic performance affects the quality of sleep of medical students. Research involving 212 medical students in Nepal showed that students who failed exams in the previous academic year were 3.4 times more likely to have poor sleep quality than students who graduated (11). Research on 756 medical students in Saudi Arabia shows that cumulative grade point average (GPA) is a significant predictor factor for sleep quality (13). Even so, until now there is no literature reviewing sleep quality and achievement of medical students in Indonesia.

2. METHODS

A literature search was conducted on Google Scholar and PubMed online databases using the keywords “mahasiswa”, “kedokteran”, “kualitas tidur”, and “prestasi akademik”. The arrangement of keywords is based on Boolean operations in Indonesian and English so as to produce a series (“mahasiswa” OR “college student” OR “medical student”) AND (“kedokteran” OR “medicine” OR “fakultas kedokteran” OR “faculty of medicine” OR “pendidikan dokter”) AND (“kualitas tidur” OR “sleep quality”) AND (“prestasi akademik” OR “achievement” OR “academic performance”). The Indonesian language Boolean operations are used in the Google Scholar database and translated into English before being used in the Pubmed and Google Scholar databases. that is applied to the lookup column of each database. Selection of the search results was then carried out to produce 11 original studies that met the criteria for the purpose of this literature review (Nilifda et al., 2016; Yekti and Rambe, 2021; Amelia et al., 2022; Fenny and Supriatmo, 2016; Putra and Dharmadi, 2018; Rifai et al., 2020; Stefanie and Irawaty, 2019; Asshiddiqie and Triastuti, 2020; Botoor et al., 2022; Evelyn et al., 2022; Putri et al., 2021).

3. RESULTS

3.1. *The factors that influence the quality of sleep among medical students.*

Sleep is one of the essential activities carried out by a human being to maintain a balance of circadian rhythms and the body's physiological systems. However, sleep disturbance is a common phenomenon that

occurs in the general population (4). In 1994, a study showed that 64% of 2782 young adults reported having sleep disturbance at least once in their lifetime (14). Teenagers often struggle with sleep deprivation and excessive daytime drowsiness as they try to adjust to their campus activity schedules since the mechanism that regulates sleep homeostasis has been shown to shift postpubertal (Crowley et al., 2007; Hagenauer et al., 2009; Hagenauer et al., 2013). Certain population groups, such as university students, have a higher susceptibility to sleep disturbances (15). Evidence from a systematic review conducted by Jiang et al., (15) showed that of 16,478 college students in Iran, Egypt, China, the US, Japan, and Norway, a mean prevalence was found at 18.5%, exceeding 7.4% of the general population average prevalence. In 112,939 university students in China, a meta-analysis by Li et al., (16) showed that the prevalence of sleep disorders reached 25.7%, with 20.3% being dissatisfied with the quality of sleep they were living, and 23.6% showing symptoms of insomnia. The quality of sleep and the prevalence of sleep disorders among college students is also determined by the type of study program the student is taking. The study by Palatty et al., (17) showed that when compared to law study students, medical students tend to have less refreshing sleep, less sleep, and nightmares related to exam failure. Research in Lithuania also shows that medical students have a higher prevalence of poor-quality sleep than law and economics study program students (18).

Naturally, the differences in academic load, learning style, and sleep disturbances that were found to be different among medical students may be the basis for explaining differences in sleep quality compared to students of other study discipline programs (17,18). However, the exact cause of this difference is difficult to generalize, due to the many confounding factors involved, both internally and externally (4). In addition, the educational level of medical students is related to the quality of sleep they have on a regular basis. A study by Correa et al., (25) showed that students in their first-second year had a lower sleep quality compared to third-fourth and fifth-sixth-year students. A number of studies have linked several factors related to sleep quality, disturbance, and characteristics in medical students (Table 1).

Table 1. Factors related to sleep quality, disturbance, and characteristics in medical students based on a literature review

Study	Disturbing factor of sleep quality	Ref
Almojali <i>et al.</i> (2017)	<ul style="list-style-type: none"> • Low GPA • High level of stress 	(13)
James <i>et al.</i> (2011)	<ul style="list-style-type: none"> • Chronic illness • Childhood unpleasant trauma • Poor sleep schedule 	(19)
Siddiqui <i>et al.</i> (2016)	<ul style="list-style-type: none"> • Post-midnight sleep • Short sleep duration • Longer sleep latency period 	(20)
Rezaei <i>et al.</i> (2018)	<ul style="list-style-type: none"> • Depression • Anxiety • Stress • Daytime sleep with more than >1 hour duration • Poor sleep schedule • Caffeine-consumption 4 hours prior to sleep • Electronic devices use prior to sleep • Late night sleep post-study • Roommate disturbance • Uncomfortable rest place 	(21)
Thaipisuttikul <i>et al.</i> (2022)	<ul style="list-style-type: none"> • Academic anxiety • Starring to electronic widget during night 	(22)
Yazdi <i>et al.</i> (2016)	<ul style="list-style-type: none"> • Male gender • Final year student • Married student 	(23)
Alotaibi <i>et al.</i> (2020)	<ul style="list-style-type: none"> • High stress level • Daytime sleep 	(24)

3.2. The relationship between sleep quality and achievement of medical students in Indonesia

Eleven studies examine the relationship between sleep quality and achievement indicators of medical students in Indonesia. The study by Nilifda et al., (26) showed that of 177 students at the Faculty of Medicine, Andalas University, 57% of them had poor sleep quality and academic achievement. In that study, it was found that sleep quality was closely related ($p < 0.004$) to academic achievement based on block 4.2 test scores in semester VII (26). In contrast to this study, Yekti and Rambe (27) defined learning achievement based on the cumulative grade point index (GPA) from semester I to VII in students of the Faculty of Medicine at the Indonesian Christian University. The study showed that out of 119 student respondents, only 1 of them was categorized as having poor achievement and it was found that sleep quality was not related ($p = 0.508$) to academic achievement (27). In line with this research, Amelia et al., (37) who reviewed learning achievement based on semester I-IV GPA also showed that sleep quality was not significantly related to learning achievement in 148 Baiturrahmah Faculty of Medicine students ($p = 0.847$). The same thing was found in the research by Putri et al., (36) which targeted 231 first-year students to the third preclinical stage of the medical education study program at the Faculty of Medicine, University of Mataram, using the same measurement tools as the previous research, namely PSQI and GPA. The study found that there was a weak inverse correlation between sleep quality and academic achievement, ($r = -0.172$, $p < 0.01$) with the conclusion that better sleep quality indicated better achievement. In a study conducted by Fenny and Supriatmo (29), it was found that out of 300 students at the Faculty of Medicine, the University of North Sumatra, 61.7% of them had poor sleep quality based on PSQI scores, 54.3% had poor sleep quantity based on SQT scores, and 50% have poor academic achievement based on the results of semester I-IV GPA. Chi-square analysis showed a significant relationship between sleep quality and learning achievement (OR 2.75; 95% CI [1.696-4.458]; $p < 0.0001$) and multivariate analysis using logistic regression showed that the quality and quantity of sleep could affect learning achievement with the log equation $p(\text{poor learning achievement}) = -1.068 + 0.570(\text{sleep quality}) + 1.303(\text{sleep quantity})$ (29). Another study by Botoor et al., (34) also measured sleep quality with the PSQI. In contrast to previous research, they used a questionnaire to measure academic achievement. Nonetheless, the results are similar to previous research, namely that there is an influence between sleep quality on the level of academic achievement in 127 Ukrida Medical Faculty students' class of 2019 as evidenced by a partial test with a significance value of 0.220 (> 0.05). Another study targeting 256 preclinical students at levels 1, 2, and 3 at the Faculty of Medicine, Islamic University of Malang, used sleep quality and academic performance measurement tools that were different from previous studies, with interesting findings. The study measured sleep quality using the Sleep Quality Scale (SQS) and measured student academic performance with pre-remedial scores for the Cell Molecular Biology and Genetics block at grade 1 students, urinary system physiology block scores 1 & KCEAB at grade 2 students, and system pathology block scores. urinaria in grade 3 students. Interestingly, the results of statistical analysis using the ordinal logistic regression test showed that there was a significant effect of sleep quality on the academic performance of preclinical level 1 students ($p = 0.043$), while there was no significant effect of sleep quality on the academic performance of grade 2 students. ($p = 0.916$) and 3 ($p = 0.481$). These results could be due to differences in academic stressors that affect student sleep cycles (35).

Another study that shows a relationship between sleep quality and academic achievement of medical students is research conducted by Putra and Dhamardi (30) targeting Udayana Faculty of Medicine students. Learning outcomes are obtained from the categorical score of passing the block exam in that semester. Based on the analysis of the chi squared test and phi & cramér's V, the results stated that there was a relationship with $P = 0.000$, although the quality of the relationship was considered weak with a value of $\chi^2 = 0.196$. Similar to research by Rifai et al., (38) obtained the results of a significant correlation test between sleep quality and the GPA results of 168 students from the Faculty of Medicine, University of Malahayati with a p-value obtained of 0.013 based on the results of the Spearman test. Contrary to the results of previous studies,

Asshiddiqie and Triastuti (39) found no relationship between the two in the logistic regression test with $p=0.480$. Likewise, what was done by Stefanie and Irawaty (32). also stated that students who have poor sleep quality do not always get bad results either. This is supported by the absence of a relationship between sleep quality and student learning outcomes at the Faculty of Medicine, Tarumanegara University, as assessed by the results of the Biomedical block exam with $p=0.739$.

Table 2. Association between Sleep Quality and Academic Achievement in Medical Student Across Indonesian Universities.

First Author, Year	Periode Studi	Metode	Subjects	Sample Size	Sleep Quality Scale	Academic Achievement Scale	Results
Nilifda, 2016 (26)	Dec 2013 – Jan 2014	Cross Sectional	Medical Student of Universitas Andalas (2010 Batch)	177	PSQI	Block Exam Results	There is a correlation between sleep quality and academic achievement.
Yekti, 2021 (27)	Jun 2020 – Jun 2021	Cross Sectional	Medical Student of Universitas Kristen Indonesia (2017 Batch)	119	PSQI	GPA	There is no correlation between sleep quality and academic achievement.
Amelia, 2022 (28)	Mar 2021 – Nov 2021	Cross Sectional	Medical Student of Universitas Baiturrahmah (2019 Batch)	148	PSQI	GPA	There is no correlation between sleep quality and academic achievement.
Fenny, 2016 (29)	Mar 2015 – Dec 2015	Case Control	Medical Student of Universitas Sumatera Utara (2013 and 2014 Batch)	300	PSQI and STQ	GPA	There is a correlation between sleep quality and quantity with academic achievement.
Putra, 2018 (30)	2014 – 2015	Cross Sectional	Pre-Clinical Medical Student of Universitas Udayana	332	PSQI	Block Exam Results	There is a weak correlation between sleep quality and academic achievement.
Rifai, 2020 (31)	Feb 2020	Cross Sectional	Medical Student of Universitas Malahayati	168	PSQI	GPA	There is a correlation between sleep quality and academic achievement.
Stefanie, 2019 (32)	Mar 2017 – Nov 2017	Cross Sectional	Medical Student of University Tarumanegara in Biomedical Block	205	PSQI	Block Exam Results	There is no correlation between sleep quality and academic achievement.
Asshiddiqie, 2020 (33)	Oct 2019	Cross Sectional	Pre-Clinical Medical Student of Universitas Muhammadiyah Surakarta	108	PSQI	GPA	There is no correlation between sleep quality and academic achievement.
Botoor, 2022 (34)	Aug 2021	Cross Sectional	Medical Student of Universitas Kristen Krida Wacana (2019 Batch)	127	PSQI	Questionnaire	There is a correlation between sleep quality and academic achievement.

Evelyn, 2022 (35)	Nov 2021 – Dec 2021	Cross Sectional	Pre-clinical Medical Student of Universitas Islam Malang	256	Sleep Quality Scale	Block Exam Results	There is a correlation between sleep quality and academic achievement in 1 st -year students. There is no correlation between sleep quality and academic achievement on 2 nd and 3 rd -year students.
Putri, 2021 (36)	N/A	Cross Sectional	Medical Student of Universitas Mataram	231	PSQI	GPA	There is a correlation between sleep quality and quantity with academic achievement.

3.3. Efforts to improve sleep quality in medical students

Sleep is a basic human need for overall health and well-being which is influenced by several factors such as mental, physical, environmental, and so on. Correa et al. (25) conducted a study of medical students in the city of Botucatu, Brazil regarding their sleep quality. According to the results of his research, medical students appear to be more prone to sleep disturbances compared to other majors, especially first and second-year students. This is because first-year students are entering a transitional period marked by increased academic activities and irregular daily routines. These changes in habits also change lifestyle changes for example reduced time to sleep (25). In addition, not only in Indonesia, research conducted by Alsaggaf et al., (40) on medical students in Saudi also found that students with poor performance more often reported symptoms of insomnia which was defined by the inability to sleep within 30 minutes and waking up frequently at night. According to him, this is related to student psychology, such as the high-stress level of medical students or the pressure on them to maintain their grades (40). Seeing these things, in conducting sleep interventions, the influencing factors need to be considered in order to improve the quality of sleep for medical students.

The first factor to note is the psychological factor. With the large demands of the academic environment, medical students tend to reduce their sleep hours to extend the time available for study. As a result, students become stressed and sleep-deprived, especially in the weeks before the exam (13). Not only stress, but even depression can interfere with sleep quality due to decreased functional serotonergic neurotransmission (41). Therefore, there is a need for the management of these psychological factors to improve sleep quality and even quality of life and reduce important factors in the occurrence of relapse, especially depression (42).

In addition, the influencing factor is a lifestyle. It is not uncommon to find medical students with the habit of drinking coffee to maintain awareness to study, especially at night. The caffeine content in it has the effect of maintaining alertness so it can disrupt the circadian cycle (43). It's the same with using gadgets. Several hypotheses explain the reasons for using gadgets two hours before going to bed affects sleep problems (44). The use of gadgets is related to exposure to light which can change sleep cycles through changes in body melatonin levels (45). Artificial light, no matter how small the intensity, as emitted by the latest technology such as LEDs, computer or television screens, cellphones and tablets can work according to the clock, can slow down melatonin secretion and delay the circadian phase, and will change a person's sleep cycle (46). Another lifestyle that affects the quality of sleep is alcohol and cigarettes. Drinking alcohol before going to bed, after the initial stimulating effect, can reduce the time it takes to fall asleep (47). Likewise, with cigarettes, Vaora et al., (48) said that smoking can increase blood pressure and heart rate, as well as increase brain activity, especially in acute addicts who are just starting to get addicted to smoking. Apart from having more difficulty falling asleep, a person may also be awakened by a strong desire to smoke after sleeping for about two hours and will find it difficult to fall back asleep due to the stimulant effect of nicotine (48). Physical activity is equally important to note in improving the sleep quality of someone who has sleep disorders (49). Evidenced in a randomized controlled trial among older adults with insomnia comparing 16 weeks of aerobic physical activity plus sleep hygiene to non-physical activity plus sleep hygiene conducted by Reid et al, (50). The results of this study indicate that the physical activity group experienced an increase in sleep quality based on the Pittsburgh Sleep Quality Index (PSQI) score so there was also a decrease in daytime sleepiness and even a decrease in depressive symptoms. Driver and Taylor (51) say that the mechanism by which physical activity positively influences sleep is most likely related to the decrease in temperature after exercise.

A factor that is no less crucial in determining the quality of sleep is the bed environment. There are many determinants that affect the bed environment, including thermal, indoor air quality (IAQ), light, and acoustic (52). Basically, the circadian cycle is closely related to the body's core temperature. This is evidenced by differences in sleep quality at certain temperatures investigated by Lan et al., (53). Research by Strøm-Tejsten et al., (54). also proved that there is an effect of bedroom air quality on improving sleep quality and feeling better the next day, as well as reduced drowsiness and increased concentration. Another determining factor is the room lighting. As explained in the discussion regarding the use of gadgets, exposure to light is key in controlling melatonin secretion which affects the circadian cycle (46). Nocturnal environmental noise is also seen as a significant cause of sleep disturbance because it triggers measurable metabolic and endocrine disturbances (increased secretion of adrenaline, noradrenaline, cortisol), increased heart rate and arterial pressure, and increased motility (55). Not only has an effect on the quality of sleep at night, but noise also often has an impact on sleepiness and fatigue during the day, disturbances and mood swings, as well as decreased well-being and cognitive performance so that one way that can be proposed to improve sleep quality is to avoid environmental noise (55).

4. CONCLUSION

Based on eleven literature reviews that have been conducted, it is found that currently, as many as six studies support a positive relationship while five studies do not find a relationship between sleep quality and achievement in medical students in Indonesia. There needs to be a more specific variable to determine the association between sleep quality and medical student achievement.

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