

The relationship between anxiety and sleep quality among medical students during Covid-19 pandemic

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ABSTRACT

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Background: Coronavirus disease 2019 (COVID-19) pandemic causes individuals at risk of anxiety and sleep disorders. Anxiety can cause a person's sleep quality to be poor.

Objective: To investigate the association between anxiety and sleep quality among students in the Faculty of Medicine and Health Sciences UNIKA Atma Jaya during the COVID-19 pandemic.

Methods: This cross-sectional study involved 635 preclinical and clinical students at FKIK UNIKA Atma Jaya. Measuring instruments used were the Generalised Anxiety Disorder 7 (GAD-7) and the Pittsburgh Sleep Quality Index (PSQI). Both instruments were distributed using Google Forms. Data analysis was performed descriptively and bivariate (Mann Whitney U Test).

Results: There were 62% of respondents with anxiety; among them, 37% were mild anxiety; 16.9% were moderate anxious; 8.2% were severe anxiety. This study finds that 66.28% of women with anxiety and 62.8% with poor sleep quality. In 2020, 73.81% of preclinical respondents experienced anxiety and 69.84% experienced poor sleep quality. The bivariate analysis demonstrated a significant association between anxiety and sleep quality among preclinical and clinical students at FKIK UNIKA Atma Jaya during the COVID-19 pandemic ($p < 0.05$).

Conclusion: There is an association between anxiety and sleep quality in preclinical and clinical students in FKIK UNIKA Atma Jaya During the COVID-19 Pandemic.

Latar Belakang: Pandemi coronavirus disease 2019 (COVID-19) menyebabkan individu memiliki risiko mengalami kecemasan dan gangguan tidur. Kecemasan menyebabkan kualitas tidur seseorang menjadi buruk.

Tujuan: Mengetahui hubungan kecemasan dengan kualitas tidur pada mahasiswa program studi kedokteran Fakultas Kedokteran dan Ilmu Kesehatan Universitas Katolik Indonesia Atma Jaya (FKIK UNIKA Atma Jaya) selama pandemi COVID-19.

Metode : Penelitian ini adalah penelitian cross sectional pada 635 mahasiswa prelinik dan klinik FKIK UNIKA Atma Jaya. Alat ukur yang digunakan adalah Generalized Anxiety Disorder 7 (GAD-7) dan Pittsburgh Sleep Quality Index (PSQI) yang disebarakan menggunakan Google Forms. Analisis data dilakukan secara deskriptif dan bivariat (Mann Whitney U Test).

Hasil: Sebanyak 62% responden mengalami kecemasan, di antaranya 37% cemas ringan; 16,9% cemas sedang; 8,2% cemas berat. Sebanyak 66,28% perempuan mengalami kecemasan dan 62,82% perempuan dengan kualitas tidur buruk. Sebanyak 73,81% responden prelinik tahun 2020 mengalami kecemasan dan

69,84% mengalami kualitas tidur buruk. Analisis bivariat menunjukkan hubungan signifikan antara kecemasan dengan kualitas tidur pada mahasiswa preklinik dan klinik FKIK UNIKA Atma Jaya selama pandemi COVID-19 ($p < 0.05$).

Kesimpulan: Terdapat hubungan antara kecemasan dengan kualitas tidur pada mahasiswa preklinik dan klinik FKIK UNIKA Atma Jaya selama pandemi COVID-19.

INTRODUCTION

Anxiety is a normal emotional condition that every individual experiences daily, such as dealing with work, exams, or making important decisions. It can be considered an anxiety disorder when this anxiety occurs excessively and interferes with daily activities.¹ The Anxiety and Depression Association of America (ADAA) reported that anxiety disorders are common in America, with an estimated 40 million people over the age of 18, or as many as 18.1% of the population, experiencing anxiety disorders every year.²

The Association of Indonesian Mental Medicine Specialists (PDSKJI) has conducted an online self-examination on mental health, and it was found that 64.3% of the 1,522 respondents experienced anxiety during the coronavirus disease 2019 (COVID-19) pandemic.³ A previous study in the United States among student respondents by Son C (2020) showed that 71% of respondents experienced anxiety during the COVID-19 pandemic.⁴ A study in Iran also reported a psychological impact on the general population due to COVID-19, resulting in increased anxiety.⁵

One of those who feel the impact of the COVID-19 pandemic is educational institutions. The students must experience distance learning or online from their homes. This situation causes various changes that force students to adapt to existing situations and conditions, such as reducing their freedom, being separate from beloved people who do not live at home, limiting direct social interaction, and excessive boredom. When this situation is not overcome immediately, it can cause various mental health

disorders.⁶

A study in the Philippines reported that most students showed anxiety during the lockdown period. The results showed that their anxiety was 62.64% about financial problems and 54-56% of students avoided social contact and meetings since they were worried that they or their families could be infected.⁷

Students in China involving 7,143 respondents also reported the psychological impact of the COVID-19 pandemic, resulting in 24.9% of students experiencing anxiety, including 0.9% experiencing severe, 2.7% moderate, and 21.3% mild. Factors that influence their anxiety are drastic changes with distance restrictions, inhibition of the learning process that will affect their future, the lack of interpersonal communication, excessive changes to the news, family or self-health, and family financial stability. Excessive anxiety about these things impacts the students' mental health.^{8,9}

One of the symptoms obtained due to anxiety is decreased sleep quality. Sleep quality is an accumulation of quantitative and qualitative components that can be accessed through several aspects, such as the amount of sleep time, barriers to starting sleep, waking time, sleep efficiency, and conditions that interfere the sleep. A study conducted at Udayana University, Bali, reported that 46.2% of medical students had poor sleep quality and had a significant relationship to depression, anxiety, and stress. The lecture activities and demanding assignments make medical students more susceptible to decreased sleep quality.¹⁰ In China, about a third (36.38%) of respondents had poor sleep quality during the COVID-19 pandemic.

Study on anxiety and sleep quality during the COVID-19 pandemic has been conducted abroad. However, there is still not much study on the COVID-19 pandemic in Indonesia, especially among the medical faculty. This study aims to investigate the characteristics, anxiety, and sleep quality as well as the relationship among

these variables among medical students at the FKIK UNIKA Atma Jaya during the COVID-19 pandemic.

METHODS

The study was cross-sectional with analytic-

descriptive observational. This study was conducted between July 2020 to May 2021 in Atma Jaya FKIK UNIKA. The population was all students of the medical faculty. The sample was 635 respondents with inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Active student of preclinical and clinical medical students at FKIK UNIKA Atma Jaya within the year 2020/2021.	Preclinical and clinical medical students at FKIK UNIKA Atma Jaya in 2020/2021 who are not willing to fill out informed consent (online). Preclinical and clinical medical students at FKIK UNIKA Atma Jaya in 2020/2021 who are not willing to fill out the complete answer to the questionnaire.

The data collected by the technique of sampling random systematic proportional, it is using a student proportional balance in each year of study with fill an online questionnaire containing respondent's characteristics (name, age, gender, year of study), the Generalised Anxiety Disorder 7 (GAD-7) questionnaire, and the Pittsburgh Sleep Quality Index (PSQI) questionnaire which distributed using Google Forms.

The data collection was conducted by a survey team comprising 4 persons, 2 principal investigator study and 2 study assistants. The principal investigator acts as supervisor and executor, responsible for the mechanism of study, sharing on duty, leading an evaluation meeting, and supervising data retrieval executives in collecting the data through the level commander in each preclinical and clinical year representative. The study assistant acts as an executor who helps the principal investigator collect the data through the level commander in preclinical and clinical years. Field implementation monitoring meetings are held daily to ensure the adequacy of the number of samples and the validity of the answers to the questionnaires filled out by the respondents.

The collected data were analysed descriptive (univariate) that presented in the form of a

table or graph. This analysis aims to describe a student proportion with anxiety and poor sleep quality according to the characteristic (age, gender, education level). A bivariate analysis using Mann Whitney U-test was performed to know the relation between anxiety and sleep quality. All data analysis was carried out using the STATA program.

RESULTS

The study was conducted on FKIK UNIKA Atma Jaya medical students in 2020/2021. The total sample that met the study criteria was 635 students from 4 preclinical years and 2 clinical years, and none of the samples dropped out.

The results showed that respondents had an age range of 17-27 years, the average age of 20.33 years, and a standard deviation of 1.92. There were 67.9% preclinical students, 32.1% clinical students, and most respondents were female (68.2%). As many as 62% of respondents experienced anxiety, comprising 37.0% mild, 16.9% moderate, and 8.2% severe. Also, 59.2% of respondents had poor sleep quality (Table 1).

Based on gender, the most anxious respondents were female (68.2%). Female respondents (38.80%) and male respondents (33.17%) more frequent experienced mild anxiety.

Table 1. Percentage of characteristics, anxiety, and sleep quality of the medical students at FKIK UNIKA Atma Jaya

Characteristic	(N)	(%)
Age		
Range = 17-27		
Mean = 20,33		
SD = 1,92		
Gender		
Male	202	31.8
Female	433	68.2*
Education level		
Preclinical student	431	67.9
The year 2017	99	15.6
The year 2018	104	16.4
The year 2019	102	16.1
The year 2020	126	19.8*
Clinical student	204	32.1
The year 2018	100	15.7
The year 2019	104	16.4
Anxiety		
No anxiety	241	38
Anxiety	394	62
Mild	235	37.0*
Moderate	107	16.9
Severe	52	8.2
Sleep quality		
Good	259	40.8
Bad	376	59.2*

Note : * = the most percentage

Based on the education level, preclinical students year 2020 most experienced anxiety (73.81%), including mild (41.27%), moderate (23.02%), and severe (9.52%). Meanwhile, the anxiety of preclinical students in 2019 was 66.67%, the year 2018 was 65.39%, and the year 2017 was 57.57%. Clinical students year 2018 was 53% and year 2019 was 52.88%.

Based on gender, poor sleep quality was

more common in female respondents (62.82%). Poor sleep quality was more frequent in the preclinical year of 2020 (69.84%) than in other years. Meanwhile, preclinical respondents year 2018 was 66.35%, preclinical students year 2019 was 64.17%, and preclinical respondents year of 2017 was 46.46%. Poor sleep quality among clinical respondents year 2018 was 53% and year 2019 was 51.92% (Table 3).

Table 2. Distribution of anxiety based on the gender and education level of medical students FKIK UNIKA Atma Jaya

Characteristics	Total n (%)	No anxiety n (%)	Anxiety			Total of anxiety n (%)
			Mild n (%)	Moderate n (%)	Severe n (%)	
Gender						
Male	202 (100%)	95 (47,03%)	67 (33,17%)	30 (14,85%)	10 (4,95%)	107 (52,97%)
Female	433 (100%)*	146 (33,72%)	168 (38,80%)*	77 (17,78%)	42 (9,70%)	287 (66,28%)*
Education level						
Preclinic						
2017	99 (100%)	42 (42,2%)	35 (35,35%)	12 (12,12%)	10 (10,10%)	57 (57,57%)
2018	104 (100%)	36 (34,62%)	37 (35,58%)	20 (19,23%)	11 (10,58%)	68 (65,39%)
2019	102 (100%)	34 (33,33%)	43 (42,16%)*	15 (14,71%)	10 (9,80%)	68 (66,67%)
2020	126 (100%)*	33 (26,19%)	52 (41,27%)	29 (23,02%)	12 (9,52%)	93 (73,81%)*
Clinic						
2018	100 (100%)	47 (47,00%)	39 (39,00%)*	11 (11,00%)	3 (3,00%)	53 (53%)*
2019	104 (100%)	49 (47,12%)	29 (27,88%)	20 (19,23%)	6 (5,77%)	55 (52,88%)

Table 3. Distribution of sleep quality based on the gender and education levels of medical students at FKIK UNIKA Atma Jaya

Characteristics	Total n (%)	Sleep Quality	
		Good n (%)	Poor n (%)
Gender			
Male	202(100%)	98(48,51%)	104(51,49%)
Female	433(100%)*	161(37,18%)	272(62,82%)*
Education level			
Preclinical			
2017	99(100%)	53(53,54%)	46(46,46%)
2018	104(100%)	35(33,65%)	69(66,35%)
2019	102(100%)	36(35,29%)	66(64,71%)
2020	126(100%)	38(30,16%)	88(69,84%)*
Clinic			
2018	100(100%)	47(47,00%)	53(53,00%)*
2019	104(100%)	50(48,08%)	54(51,92%)

The findings of this study showed that preclinical students' anxiety caused poor sleep quality (92.31%). Meanwhile, clinical students' anxiety showed poor sleep quality (98.15%). The Mann-Whitney U-Test showed a difference

between sleep quality and anxiety levels in preclinical and clinic students with a value of $p=0.000$ ($p<0.05$). The difference showed the relationship between anxiety and sleep quality in preclinical and clinic students (Tables 5 and 6).

Table 4. Anxiety and sleep quality of medical students at FKIK UNIKA Atma Jaya

Anxiety	n (%)	Sleep Quality	
		Good n (%)	Poor n (%)
Preclinical			
No anxiety	145 (100%)	140 (96.55%)	5 (3.45%)
Anxiety	286 (100%)	22 (7.69%)	264 (92.31%)
Clinic			
No anxiety	96 (100%)	96 (100%)	0 (0%)
Anxiety	108 (100%)	2 (1.85%)	106 (98.15%)

Table 5. The relationship between anxiety and sleep quality of preclinical medical students at FKIK UNIKA Atma Jaya

Preclinical		Anxiety		
		N	Mean Rank	Asymp.Sig (2-tailed)
Sleep	Good	153	82.61	0.000
Quality	Poor	278	289.41	

Table 6. The relationship between anxiety and sleep quality of clinical medical students at FKIK UNIKA Atma Jaya

Preclinical		Anxiety		
		N	Mean Rank	Asymp.Sig (2-tailed)
Sleep	Good	97	49.35	0.000
Quality	Poor	107	150.69	

DISCUSSION

The results showed that respondents had an age range of 17-27 years, the average age of 20.33 years, and a standard deviation of 1.92. Most of the study respondents were female (68.2%). The study conducted by Filho C, et al. showed that female medical students (73.80%) were more frequent than males (26.20%) with an age range of 18-30 years.¹¹ This study included preclinical respondents (67.9%) and clinic respondents (32.1%). The previous study showed more frequent preclinical (54.7%) than clinical students (45.3%). The number of preclinical education level students is more frequent than clinical because the number of years of study is more consisting of the first-year (29.6%), second-year (23.5%), third-year (23.5%), and fourth-year (14.1%).¹²

Respondents with anxiety were 62%, including 37.0% mild, 16.9% moderate, and

8.2% severe. A study by Halperin SJ, et al. showed the increase of anxiety among medical students during the COVID-19 pandemic at around 60%, comprised of mild at 35.3%, moderate at 19.5%, and severe at 11.1%.¹²

The result showed that 59.2% of respondents had more poor sleep than good sleep quality (40.8%). A study reported that 46.2% of medical students have poor sleep quality.¹⁰ This is caused by high duration, intensity, academic demands, and increased stress which can change sleep time.^{10,13} Doing an academic task late at night causes changes in sleep patterns among medical students. Another factor that can cause changes in student sleep patterns is internet use at night, with a duration of more than 1 hour before going to sleep. Changes in sleep patterns continuously cause poor sleep quality in medical students.

Based on gender, anxiety was more prevalent in female respondents (66.28). ADAA reported

that females have twice the risk factors for anxiety disorders than males.¹⁴ Females are more anxious about their inability than males. Males are more active and exploratory, but females are more sensitive.¹⁵

Based on the education level, preclinical students in 2020 were more anxious (73.81%). Meanwhile, the clinical students in 2018 (53%) and 2019 (52.88%) were not much different. A study by Ramadhan AF reported that first-year students had higher mean anxiety scores. The biggest stressors for first-year students are adapting to the new learning curriculum, maintaining self-competence, living away from home, lecture schedules, and more crowded practicums.¹⁵ However, it differs from other studies that demonstrated that the proportion of anxiety disorders in clinical students is higher than in preclinical students. Clinical students are 1.84 times more at risk of experiencing anxiety disorders than preclinical students.

The implementation of large-scale social restrictions caused preclinical and clinical students are experiencing a change in the online learning format. In preclinical students, this change reduces interaction, especially for first-year students, the schedule is getting tighter, and the schedule uncertainty and experiences are less anxiety-provoking. While for clinical students, online learning keeps students from being in the hospital, does not have a guard schedule, and reduces the routine activities of the crowded clinical clerkships such as morning reports, ward rounds, tutors, and others.

According to Harries AJ, et al., the COVID-19 pandemic caused 84.1% of clinical students to experience anxiety. This situation makes learning activities hampered and disrupted because clinical students have to temporarily stop the clinical rotation they are supposed to be doing. Consequently, the emotional burden increased because they were worried about not getting enough skills and experience to become doctors in the future. In addition, clinical students are concerned that disruption to learning activities could hinder their ability to develop the skills needed to prepare for residency.¹⁶

Based on gender, poor sleep quality was more frequent in female respondents (42.83%). A study by Viona (2014) reported that females medical students (77.3%) more frequently experienced poor sleep quality than males (68.9%). Poor sleep quality in women is because they tend to be more prone to mental problems such as anxiety and depression that contribute to sleep disorders. Women also experience menstrual cycles that cause a decrease in estrogen and progesterone hormones. These decreases are associated with difficulty falling asleep, increased frequency of waking, and decreased total hours of sleep, leading to poor sleep quality.¹⁷ There were significant differences in sleep quality between females and males during the COVID-19 pandemic. A female with poor sleep quality was more frequent than a male nursing student.¹⁸

The difference in learning styles from home and face-to-face at school causes daily routines to become irregular. This situation affects sleep habits such as lack of sleep which worsens sleep quality.⁶ However, another study demonstrated that medical students with higher levels of education had poorer sleep quality due to higher academic pressure.⁷ This is due to the increasing pressure of exams and concerns about the impact of COVID-19 on education and work, which are risk factors for poor sleep quality. The COVID-19 pandemic has made final-year students worried that finding jobs and continuing their education will be difficult.⁸

The study revealed anxiety in preclinical students (92.31%) and clinical students (98.15%) who showed poor sleep quality. A study by Viona showed that students with anxiety symptoms had poor sleep quality 84.8%.¹⁷ This finding demonstrated that anxious students have poorer sleep quality than non-anxious students.⁹

Statistical analysis using Mann Whitney U-Test showed a difference between sleep quality and anxiety levels in preclinical and clinical students with a p-value of 0.000 ($p < 0.05$). The difference shows a relationship between anxiety and sleeps quality in preclinical and clinical students. This finding is in line with a previous study by Viona, which reported a

relationship between anxiety levels and sleep quality ($p=0.038$). The students with mild to severe anxiety symptoms had a 2.2 times higher risk of experiencing poor sleep quality than those who were not anxious. A person with anxiety symptoms experiences an increase in cortisol, serotonin, and norepinephrine hormones as well as a decrease in gamma-aminobutyric acid (GABA).¹⁷

Cortisol, serotonin, and norepinephrine are active in a waking state. Meanwhile, GABA hormones are the main inhibitory hormone in the central nervous system to initiate and maintain sleep.¹⁷ The previous study demonstrated a relationship between anxiety and sleep quality ($p=0.038$). The student with higher anxiety levels has 2.492 times the chance to experience poor sleep quality than the student who does not experience anxiety.¹⁹

Exposure to uncontrollable or unexpected stressors, such as hurricanes, earthquakes, tsunamis, and others, can decrease sleep quality which is associated with increased anxiety. The COVID-19 pandemic is a stressor of anxiety. High anxiety is a risk factor for low sleep quality.²⁰ Previous studies demonstrated that anxiety due to the COVID-19 pandemic could cause changes in individual sleep patterns associated with decreased sleep quality. During the COVID-19 pandemic, there has been an increase in bedtime, sleep latency, and wake time compared to before the pandemic, which can adversely affect sleep quality. In addition, the feeling of loneliness and limitations in activities also increases anxiety by increasing cortisol levels in the body, reducing melatonin synthesis, and changes in circadian rhythms that cause poor sleep quality.²¹

CONCLUSION

The COVID-19 pandemic has had a strong impact on daily life. This pandemic has put psychological stress on the general population, such as nervousness, worry of infection, anxiety, depression, and sleep problems. The results showed that anxiety is more frequent among women. There is a significant difference between anxiety levels and sleep quality in preclinical

and clinical students, indicating a relationship between anxiety levels and sleep quality in preclinical and clinical respondents.

CONFLICT OF INTEREST

All authors declare there is no conflict of interest in the manuscript.

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REFERENCES

1. Anxiety Disorders [Internet]. Natl. Inst. Ment. Heal.2020;Available from: <https://www.nimh.nih.gov/health/topics/anxiety-disorders/index.shtml>
2. Facts and Statistics [Internet]. Anxiety Depress. Assoc. Am.2020;Available from: <https://adaa.org/understanding-anxiety/facts-statistics>
3. Masalah Psikologis Terkait COVID-19 di Indonesia [Internet]. PDSKJI (Indonesian Psychiatr. Assoc.2020;Available from: <http://www.pdskji.org/home>
4. Son C, Hegde S, Smith A, Wang X, Sasangohar F. Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. J Med Internet Res [Internet] 2020;22(9):e21279. Available from: <https://www.jmir.org/2020/9/e21279>
5. Fardin MA. COVID-19 and Anxiety: A Review of Psychological Impacts of Infectious Disease Outbreaks. Arch Clin Infect Dis [Internet] 2020;15(COVID-19). Available from: <https://brief.land/archcid/articles/102779.html>
6. Corrêa C de C, Oliveira FK de, Pizzamiglio DS, Ortolan EVP, Weber SAT. Sleep quality in medical students: a comparison across the various phases of the medical course. J Bras Pneumol [Internet] 2017;43(4):285–9. Available from: <http://>

- www.scielo.br/scielo.php?script=sci_arttext&pid=S1806-37132017000400285&lng=en&tlng=en
7. Khero M, Fatima M, Shah MAA, Tahir A. Comparison of the Status of Sleep Quality in Basic and Clinical Medical Students. *Cureus* [Internet] 2019; Available from: <https://www.cureus.com/articles/18768-comparison-of-the-status-of-sleep-quality-in-basic-and-clinical-medical-students>
 8. Xie J, Li X, Luo H, He L, Bai Y, Zheng F, et al. Depressive Symptoms, Sleep Quality and Diet During the 2019 Novel Coronavirus Epidemic in China: A Survey of Medical Students. *Front Public Heal* [Internet] 2021;8. Available from: <https://www.frontiersin.org/articles/10.3389/fpubh.2020.588578/full>
 9. Ratnaningtyas TO, Fitriani D. Hubungan Stres Dengan Kualitas Tidur Pada Mahasiswa Tingkat Akhir. *Edu Masda J* [Internet] 2019;3(2):181. Available from: <http://openjournal.masda.ac.id/index.php/edumasda/article/view/40>
 10. Hendi Aryadi IP, Andra Yusari IGAA, Dewi Dhyani IA, Eka Kusmadana IP, Sudira PG. KORELASI KUALITAS TIDUR TERHADAP TINGKAT DEPRESI, CEMAS, DAN STRES MAHASISWA KEDOKTERAN UNIVERSITAS UDAYANA BALI. *Callosum Neurol* [Internet] 2018;1(1):20–31. Available from: <http://callosumneurology.org/index.php/callosumneurology/article/view/4>
 11. C. I. S. Filho et al. Impact Of Covid-19 Pandemic On Mental Health Of Medical Students: A Cross-Sectional Study Using GAD-7 And PHQ-9 Questionnaires [Internet]. WHO (World Heal. Organ.2020; Available from: <https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-n-cov/?lang=en&q=au:%22Wilson Conti de Las Villas Rodrigues%22>
 12. Halperin SJ, Henderson MN, Prenner S, Grauer JN. Prevalence of Anxiety and Depression Among Medical Students During the Covid-19 Pandemic: A Cross-Sectional Study. *J Med Educ Curric Dev* [Internet] 2021;8:238212052199115. Available from: <http://journals.sagepub.com/doi/10.1177/2382120521991150>
 13. Rao W-W, Li W, Qi H, Hong L, Chen C, Li C-Y, et al. Sleep quality in medical students: a comprehensive meta-analysis of observational studies. *Sleep Breath* [Internet] 2020;24(3):1151–65. Available from: <http://link.springer.com/10.1007/s11325-020-02020-5>
 14. Maulana I, S S, Sriati A, Sutini T, Widianti E, Rafiah I, et al. Penyuluhan Kesehatan Jiwa untuk Meningkatkan Pengetahuan Masyarakat tentang Masalah Kesehatan Jiwa di Lingkungan Sekitarnya. *Media Karya Kesehatan* [Internet] 2019;2(2). Available from: <http://jurnal.unpad.ac.id/mkk/article/view/22175>
 15. Ramadhan AF, Sukohar A, Saftarina F. Perbedaan Derajat Kecemasan Antara Mahasiswa Tahap Akademik Tingkat Awal dengan Tingkat Akhir di Fakultas Kedokteran Universitas Lampung. *Medula* 2019;9(1):78–82.
 16. Harries AJ, Lee C, Jones L, Rodriguez RM, Davis JA, Boysen-Osborn M, et al. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. *BMC Med Educ* [Internet] 2021;21(1):14. Available from: <https://bmcmmededuc.biomedcentral.com/articles/10.1186/s12909-020-02462-1>
 17. Viona JPS, M. Handini. Hubungan Antara Karakteristik Mahasiswa dengan Kualitas Tidur pada Mahasiswa Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Tanjungpura. 2013;
 18. Romero-Blanco C, Rodríguez-Almagro J, Onieva-Zafra MD, Parra-Fernández ML, Prado-Laguna M del C, Hernández-Martínez A. Sleep Pattern Changes in Nursing Students during the COVID-19 Lockdown. *Int J Environ Res Public Health* [Internet] 2020;17(14):5222. Available from: <https://www.mdpi.com/1660-4601/17/14/5222>
 19. Julianto Laia J. THE RELATIONSHIP BETWEEN ANXIETY LEVELS THROUGH SLEEP QUALITY OF WIJAYA HUSADA NURSING STUDENTS. *J Ilm Wijaya* [Internet] 2020;11(1):55–65. Available from:

<https://jurnalwijaya.com/index.php/jurnal/article/view/pv11n1p55>

20. Zhao X, Lan M, Li H, Yang J. Perceived stress and sleep quality among the non-diseased general public in China during the 2019 coronavirus disease: a moderated mediation model. *Sleep Med* [Internet] 2021;77:339–45. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1389945720302240>
21. Marelli S, Castelnuovo A, Somma A, Castonovo V, Mombelli S, Bottoni D, et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol* [Internet] 2021;268(1):8–15. Available from: <https://link.springer.com/10.1007/s00415-020-10056-6>