Research Article

Relationship of Depression and Sleep Quality among North Jakarta Medical Students during the COVID-19 Pandemic

Hubungan Depresi dengan Kualitas Tidur pada Mahasiswa Kedokteran Jakarta Utara selama Pandemi COVID-19

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ABSTRACT

Medical students with high academic load have had elevated baseline rates of depression and poor sleep quality. During the COVID-19 pandemic, medical students are more susceptible to depression and poor sleep quality. This study aimed to analyze depression and sleep quality among medical students at the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia (FKIK UAJ) during the COVID-19 pandemic. A cross-sectional study was conducted among pre-clinical and clinical students of FKIK UAJ academic year 2020/2021. Respondents were selected through proportional systematic random sampling to fulfill the Patient Health Questionnaire-9 (PHQ-9) and Pittsburgh Sleep Quality Index (PSQI) for depression and sleep quality. The data were analyzed using Mann Whitney U-Test. There were 63.3% of 635 respondents with depression, in which 39.4% respondents had mild depression, 14.2% respondents with moderate depression, and 9.8% respondents with severe depression. There were 59,2% of respondents with poor sleep quality. Depression was highest in females (67.2%) and pre-clinical stage of 2020 intake year (74.6%), and among clinical level students of 2018 (56%) and 2019 (53.9%) intake year. Poor sleep quality was also highest in females (62.8%) and pre-clinical 2020 intake year (69.8%), and among clinical level students of 2018 (53%) and 2019 (51.9%) intake year. The Mann-Whitney U-test showed a significant difference between depression level and sleep quality in pre-clinical and clinical students of FKIK UAJ during the COVID-19 pandemic (p value=0.000). Depression and sleep quality among medical students of FKIK UAJ during the COVID-19 pandemic were significantly associated.

Keywords: COVID-19 pandemic, depression, medical students, sleep quality

ABSTRAK

Mahasiswa kedokteran yang memiliki beban akademis lebih berat memiliki angka depresi dan kualitas tidur buruk yang tinggi. Selama pandemi COVID-19, mahasiswa kedokteran semakin rentan terhadap depresi dan kualitas tidur buruk. Tujuan penelitian ini adalah untuk mengetahui hubungan antara depresi dengan kualitas tidur pada mahasiswa prodi kedokteran Fakultas Kedokteran dan Ilmu Kesehatan Universitas Katolik Indonesia Atma Jaya (FKIK UAJ) selama pandemi COVID-19. Studi potong lintang dilakukan terhadap mahasiswa preklinik dan klinik FKIK UAJ Tahun Ajaran 2020/2021. Responden dipilih dengan teknik *systematic random sampling* secara proporsional untuk mengisi kuesioner *Patient Health Questionnaire-9 (PHQ-9)* dan *Pittsburgh Sleep Quality Index (PSQI)* guna mengukur tingkat depresi dan kualitas tidur. Analisis data menggunakan uji *Mann Whitney U-Test*. Sebanyak 63,3% dari 635 responden mengalami depresi, diantaranya 39,4% depresi ringan, 14,2% depresi sedang, dan 9,8% depresi berat. Terdapat 59,2% responden memiliki kualitas tidur buruk. Depresi paling banyak dijumpai pada perempuan (67,2%) dan preklinik tahun angkatan 2020 (74,6%), sedangkan klinik tahun angkatan 2018 (56%) dan 2019 (53,9%). Kualitas tidur buruk juga lebih banyak dijumpai pada perempuan (62,8%) dan preklinik tahun angkatan 2020 (69,8%), sedangkan klinik tahun angkatan 2018 (53%) dan 2019 (51,9%). Uji analisis *Mann Whitney U-Test* menunjukkan bahwa terdapat perbedaan bermakna antara tingkat depresi dan kualitas tidur pada responden preklinik dan klinik FKIK UAJ selama pandemi COVID-19 (*p value*=0,000). Terdapat hubungan bermakna antara depresi dengan kualitas tidur mahasiswa preklinik dan klinik FKIK UAJ selama pandemi COVID-19.

Kata Kunci: Depresi, kualitas tidur, mahasiswa kedokteran, pandemi COVID-19

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INTRODUCTION

During the global pandemic of COVID-19, the positive cases of COVID-19 in Indonesian regions continue to rise (1). The Province of DKI Jakarta was ranked first as the province with the highest positive COVID-19 cases (73,309) in September 2020 (2). Through the Governor's Regulation of DKI Jakarta Number 33 Year 2020, the implementation of Large-Scale Social Restrictions (PSBB) on the Province of DKI Jakarta was started on April 10, 2020 and later changed to Transitional Large-Scale Social Restrictions (PSBB Transisi) on June 5, 2020 (1,2).

The implementation of PSBB has a huge impact on the continuation of living for the society, whether physically, socioeconomically, or mentally (4,5). The psychological effects of self-isolating are also present within university students, specifically the cases of depression, anxiety, and poor sleep quality (6). Online research conducted by the Indonesian Association of Psychiatrists (PDSKJI) shows that during the COVID-19 pandemic, 67% of the respondents experienced depression, 68% had an anxiety disorder, and 77% experienced psychological trauma. The research also showed that 49% of the respondents had thought of death (5).

Symptoms of depression include constant feelings of sadness, a decrease in appetite, and lack of motivation (7). Correspondingly, depression can be caused by poor sleep quality (8). The prevalence of depression and poor sleep quality tends to be high among medical students. Research conducted in the Pontifical Xavierian University Medical School, Colombia (2018) shows that 26% of medical students were depressed, and 65.7% had poor sleep quality (9). Moreover, during the COVID-19 pandemic, the prevalence of depression and the poor sleep quality of students has increased. Research in Greece shows that during self-isolation period due to the COVID-19 pandemic, there has been an increase of depressive disorder for health sciences students by 74.3% and a decrease of sleep quality by 43% (6).

Increased prevalence in mental and emotional problems during the COVID-19 pandemic is also experienced by medical students in DKI Jakarta, especially in the North Jakarta region, which became one of the regions with the highest COVID-19 cases (3). Less outdoor activities for months and the execution of PSBB during the COVID-19 pandemic have increased the prevalence of depression and poor sleep quality (10). Thus, this study aimed to identify the relationship between depression and poor sleep quality among medical students of School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia (FKIK UAJ) as the only medical school in the North Jakarta region during the period of the COVID-19 pandemic.

METHOD

A cross-sectional study was carried out with registered and active medical students of FKIK UAJ from October 2020 to January 2021 as the target population. The respondents were selected using the systematic random sampling technique proportionally to the ratio of active students for each intake year of pre-clinical (year 1-4) and clinical students (year 1-2).

The data collection was done through online questionnaires (Google Forms) covering characteristics, depression assessment, and sleep quality assessment. Depression was assessed using the Indonesian version of Patient Health Questionnaire-9 (PHQ-9) validated in 2019 with a Cronbach's alpha score of 0.718. PHQ-9 was made based on the guidelines of depression diagnosis criteria in the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV). The instruments of PHQ-9 consist of nine components with frequency scales starting from never (0), several days (1), more than a week (2), and nearly every day (3). The score interpretation for the questionnaire was as such, a score of 0-4 (not depressed), a score of 5-9 (mild depression), a score of 10-14 (moderate depression), a score of 15-19 (moderately severe depression), and a score of 20-27 (severe depression) (7). Sleep quality was scored using the Indonesian version Pittsburgh Sleep Quality Index (PSQI) questionnaire validated in 2018 with a Cronbach's alpha score of 0.81 and validity test score 0.42 (11). PSQI consists of nine questions with seven domains that are sleep duration, sleep disturbances, sleep latency, daytime dysfunction, sleep efficiency, subjective sleep quality, and use of sleep medication. Interpretations for the PSQI score were good sleep quality (score ≤5) and poor sleep quality (score >5) (12). Data processing was done through univariate analysis (Shapiro-Wilk, $p=0.000$) and bivariate Mann-Whitney U-Test. Respondents who did not fill the questionnaires completely were excluded from the data analysis.

RESULTS

Characteristics of the Respondent, Depression, and Sleep Quality

This research involved 635 students of FKIK UAJ medical study program with the age range of 17-27 years old, a mean age of 20.33 years, and a deviation standard of 1.92. Most of the students were female (68.2%) and in the pre-clinical (67.9%) level. Among the respondents with depression (63.3%), 39.4% were in mild depression, 14.2% were in moderate depression, and 9.8% were in severe depression. Also, there were 59.2% of respondents with poor sleep quality (Table 1).

Table 1. Characteristics, depression, and sleep quality of medical students

Characteristics	Frequency (n)	Percentage (%)
Age (M, SD)	Range= 17.0 – 27.0, Mean= 20.33, SD= 1.92	
Gender		
- Male	202	31.8
- Female	433	68.2*
Level of Education		
- Pre-clinical	431	67.9*
- 2017 Intake	99	15.6
- 2018 Intake	104	16.4
- 2019 Intake	102	16.1
- 2020 Intake	126	19.8*
- Clinical	204	32.1
- 2018 Intake	100	15.7
- 2019 Intake	104	16.4*
Depression		
- No depression	233	36.7
- Depression	402	63.3*
- Mild	250	39.4*
- Moderate	90	14.2
- Severe	62	9.8

Table 1. Characteristics, depression, and sleep quality of medical students

Characteristics	Frequency (n)	Percentage (%)
Sleep Quality		
- Good	259	40.8
- Poor	376	59.2*

Note: *highest percentage

Depression and Sleep Quality Based on Gender and Level of Education

Most female respondents were found with depression (67.21%). According to the level of education, depression was mostly found in respondents at pre-clinical level of 2020 intake year (74.6%), and there were students with mild depression (41.27%), moderate depression (20.63%), and severe depression (12.7%). Meanwhile, among clinical respondents, the number of total depression was highest in 2018 intake year (56%) (Table 2).

Poor sleep quality was mostly found in female respondents (62.82%). Based on the level of education, poor sleep quality was mostly found among respondents at pre-clinical level of 2020 intake year (69.84%), followed by 2018 intake year (66.35%) and 2019 intake year (64.71%). Meanwhile, poor sleep quality in respondents at clinical level of 2018 and 2019 intake years did not differ much, which was 53% compared to 51.92% (Table 3).

Table 3. Distribution of sleep quality based on gender and level of education of medical students

Characteristics	Sleep Quality		Total n (%)
	Good n (%)	Poor n (%)	
Gender			
- Male	98 (48.51%)	104 (51.49%)	202 (100.00%)
- Female	161 (37.18%)	272 (62.82%)*	433 (100.00%)
Level of Education			
- Pre-clinical			
- 2017	53 (53.54%)	46 (46.46%)	99 (100.00%)
- 2018	35 (33.65%)	69 (66.35%)	104 (100.00%)
- 2019	36 (35.29%)	66 (64.71%)	102 (100.00%)
- 2020	38 (30.16%)	88 (69.84%)*	126 (100.00%)

Table 3. Distribution of sleep quality based on gender and level of education of medical students

Characteristics	Sleep Quality		Total n (%)
	Good n (%)	Poor n (%)	
- Clinical			
- 2018	47 (47.00%)	53 (53.00%)*	100 (100.00%)
- 2019	50 (48.08%)	54 (51.92%)	104 (100.00%)

Note: *highest percentage

Relationship of Depression and Sleep Quality among Medical Students during the COVID-19 Pandemic

Pre-clinical respondents with depression and poor sleep quality reached as high as 91.03%, while respondents at clinical level with depression and poor sleep quality reached 95.54%. The bivariate Mann Whitney U-Test showed significant differences in the level of depression and sleep quality in pre-clinical and clinical students (p value=0.000), with the highest mean rank in poor sleep quality (pre-clinical=286.46, clinical=149.83), and the lowest in good sleep quality (pre-clinical=99, clinical=50.29) (Table 4).

Table 4. Depression and sleep quality of medical students

Depression	n (%)	Sleep Quality		Mann Whitney U test
		Good n (%)	Poor n (%)	*Asymp. Sig (2-tailed)**
Pre-clinical				
No Depression	141 (32.71%)	136 (96.45%)	5 (3.55%)	0.000
Depression	290 (67.29%)	26 (8.97%)	264 (91.03%)*	
Total	431 (100.00%)			
Clinical				
No Depression	92 (45.10%)	92 (100.00%)	0 (0.00%)	0.000
Depression	112 (54.90%)	5 (4.46%)	107 (95.54%)*	
Total	204 (100.00%)			

Note: *highest percentage

DISCUSSION

Characteristics, Depression, and Sleep Quality

Table 2 Distribution of depression based on gender and level of education of medical students

Characteristics	Not Depressed n (%)	Depression				Total n (%)
		Mild n (%)	Moderate n (%)	Severe n (%)	Total Depression n (%)	
Gender						
- Male	91 (45.05%)	68 (33.66%)	28 (13.86%)	15 (7.43%)	111 (54.95%)	202 (100.00%)
- Female	142 (32.79%)	182 (42.03%)	62 (14.32%)	47 (10.85%)	291 (67.21%)*	433 (100.00%)
Level of Education						
- Pre-clinical						
- 2017	40 (40.40%)	37 (37.37%)	11 (11.11%)	11 (11.11%)	59 (59.59%)	99 (100.00%)
- 2018	35 (33.65%)	28 (26.92%)	26 (25.00%)	15 (14.42%)	69 (66.35%)	104 (100.00%)
- 2019	34 (33.33%)	43 (42.16%)	15 (14.71%)	10 (9.80%)	68 (66.67%)	102 (100.00%)
- 2020	32 (25.40%)	52 (41.27%)	26 (20.63%)	16 (12.70%)	94 (74.60%)*	126 (100.00%)
- Clinical						
- 2018	44 (44,00%)	44 (44,00%)	7 (7,00%)	5 (5,00%)	56 (56,00%)*	100 (100,00%)
- 2019	48 (46,15%)	46 (44,23%)	5 (4,81%)	5 (4,81%)	58 (53,85%)	104 (100,00%)

Note: *highest percentage

This research shows that the proportion of female respondents was higher compared to males. Muljadi and Karman's research showed that among medical students, the number of female students (64.6%) is higher than male students (35.4%) (8). Most of the medical students in this study had mild level depression. Previous studies supported that during the COVID-19 pandemic, the number of medical students who experienced depression increased with mild depression level as the highest percentage (6,13,14). The research conducted by Filho *et al.,* showed that a lot of medical students experience depression, with the highest (25,29%) at mild depression level (13). The research of Halperin *et al.,* stated that the percentage of depression in medical students increased (70%) when compared to times prior to the COVID-19 pandemic (14). It could be because pre-clinical students had to adapt to online learning, while clinical students were unable to study at hospitals and still had to prepare for the final clinical tests of medical school (14). However, the research of Bolatov *et al.,* showed a decrease in the percentage of depression (21.7%) in medical students in Iran (15).

This research shows that there were more respondents with poor sleep quality than those with good sleep quality. Muljadi and Karman's research stated that poor sleep quality in medical students reached 27.1%. It shows that there has been an increase in the percentage of poor sleep quality during the pandemic of COVID-19 (8). The research of Chandra *et al.,* found a significant drop in sleep quality (2 points) in clinical medical students in Nepal (16). Research by Kaparounaki *et al.,* stated that poor sleep quality in health sciences students had increased (43%) during the pandemic (6). The decrease in sleep quality in medical students worsens during the COVID-19 pandemic due to the lockdown period, which increases stress, depression, and anxiety, consequently contributing to poor sleep quality (16).

Depression and Sleep Quality based on Gender and Level of Education

Based on gender, the respondents who experienced depression were mostly women. This finding is supported by previous study conducted by Essangri *et al.,* which stated there were more female medical students (77,8%) with depression rather than male medical students (65,8%) (17). Also, research by Abate et al. showed that the risk of depression in female medical students was 0.63 times higher than in males, due to differences in biological responses, self-concept, and coping mechanisms (18). Women tend to deal with stress ruminatively or by contemplating and deep thinking, while men tend to deal with stress by distracting their attention (19). Commonly, female medical students have higher depression and burnout percentages, which exacerbates during situations with high stressors, such as during the pandemic (18). On the contrary, the research of Bolatov *et al.,* stated that before and during the COVID-19 pandemic, there are no significant differences in the percentage of depression based on gender (15).

Furthermore, the result of this research shows that most female respondents had poor sleep quality. The research of Barahona-Correa *et al.,* showed that female medical students (69%) had poorer sleep quality compared to male medical students (62%) (9). Research by Xie *et al.,* showed that women were at a higher risk to experience poor sleep quality compared to men (Odds Ratio 1.00 versus 0.72). This is caused by the coping mechanism needed by women to face stressors that is the need for more social contact to gain emotional support. Therefore, a large stressor of self-isolation and psychological disorders, such as depression and anxiety during the period of the COVID-19 pandemic, influences the increase of poor sleep quality, especially for women (19). Meanwhile, research of Chandra *et al.,* stated that the difference in gender was not significant towards sleep quality during the pandemic of COVID-19 (16).

Based on the level of education, depression was mostly found in pre-clinical students of 2020 intake year (74.6%), while not much differences were found in clinical students of 2018 and 2019 intake years (56% compared to 53.85%). The research of Puthran *et al.,* showed that first-year students had the highest percentage of depression, but those in the older intake years showed a decrease in the percentage of depression (20). Research by Basnet *et al.,* stated that pre-clinical students (36.74%) had a higher percentage of depression compared to clinical students (22.22%) (21). It could be caused by the process of adaptation experienced by first-year pre-clinical students who have to face new learning situations that are more competitive and have a higher workload in the medical study program, in contrast, the older intake years of pre-clinical and clinical students have adapted better (20,21). The research of Essangri *et al.,* stated that the highest percentage of depression was found in pre-clinical students (83.5%) (17). Also, the research conducted by Halperin *et al.,* showed that the percentage of depression in medical students increased (70%) during the COVID-19 pandemic. The possible cause is the adaptation process of online courses for pre-clinical students, while clinical students are unable to practice in hospitals and must prepare for their final exams (14). Once the clinical students are allowed to start their clinical rounds in the hospital as one of the front liner medical personnel during the COVID-19 pandemic, the percentage of depression could also change due to the high levels of stress (22,23). The research of Bolatov *et al.,* showed a decrease in depression (21.7%) in medical students in Iran during the online learning period due to COVID-19 (15). This is most likely due to the fact that most of the medical students in Iran continued to try to interact with each other online with the same frequency as when they were studying offline; another research showed that online learning decreased the social interaction between medical students, which could also be one of the stressors contributing to the high levels of depression during the COVID-19 pandemic (14,15).

This research shows that poor sleep quality was mostly found in pre-clinical students of 2020 intake year, while clinical students of 2018 was similar to 2019 intake year. The research of Siddiqui *et al.,* showed that the percentage of poor sleep quality was highest in pre-clinical students of the first and second year. Pre-clinical students who are still in the early year of their studies are still adapting to balance their time when it comes to studying and resting, due to the higher burden of assignments and studies in the medical study program that often takes up their time to sleep; thus, causes stress, depression, and poor sleep quality (24). Meanwhile, the research of Barahona-Correa *et al.,* stated that the percentage of poor sleep quality was higher in clinical students (70%) (9). It is most likely due to the burden of assignments and high competition level within clinical students, late working hours, family

demands, financial burdens, as well as a more emotionally challenging workload when practicing in the hospital. Thus, they cause stress and depression and affect the sleep quality of the students (9,14). The research of Romero-Blanco *et al.,* showed that poor sleep quality in nursing students increased as much as 0.91 point during the COVID-19 pandemic compared to the times before the pandemic, and the highest number of poor sleep quality was in early years (pre-clinical students) (25). Meanwhile, the research of Xie *et al.*, stated that the percentage of poor sleep quality was highest in the fifth year (43.8%). The timing of the data collection can be the cause of the data discrepancy, if the research were done near the final exam of clinical students or when clinical students has started their clinical rounds in hospitals during the pandemic, the percentage of the poor sleep quality might increase due to their pressure (19).

Relationship of Depression and Sleep Quality among Medical Students during the COVID-19 Pandemic

The result of this research shows a significant increase in depression and poor sleep quality in pre-clinical students during the COVID-19 pandemic (8). The research of Halperin et al. showed that during the COVID-19 pandemic, the number of medical students with depression was 70% higher (14). Research by Kaparounaki *et al.*, also stated an increase in poor sleep quality (43%) in health sciences students (6). It is due to high concern regarding the impacts of the pandemic that could increase negative emotions, such as stress, depression, and anxiety, and directly affects sleep quality (14,16).

The Mann Whitney U-Test in this study showed that there was a significant difference in the depression levels and sleep quality in pre-clinical and clinical students (p value=0,000), indicating the association between depression and sleep quality in pre-clinical and clinical students of FKIK UAJ. The research of Barahona-Correa et al. showed that poor sleep quality in medical students could be associated with depression (9). The research conducted by Siddiqui et al. stated that medical students with depression have a five times higher risk to suffer from poor sleep quality compared to students without depression (24). It is due to stressors, such as academic burden, competitiveness, family burden, financial burden, irregular working hours, and exposure to patient's suffering during practicing at the hospital (14). The experience of stress will send signals to the cerebral cortex and amygdala, and it stimulates the hypothalamus to release corticotropin-releasing hormone (CRH) that will activate the pituitary to release the cortisol hormone. The higher the stressor, the higher the level of the cortisol hormone produced. Hyperexcretion of cortisol has a neurotoxic effect on the hippocampus, which can interfere with the cortical and limbic systems in regulating cognitive and emotional functions. This can increase susceptibility towards mental disorders, such as depression and anxiety. In addition, the decrease of 5-dihydroxytryptamine (serotonin) composed of tryptophan amino acids can cause depression. Serotonin has an important role in regulating moods, sleeping conditions, and appetites. A condition of low serotonin levels is often found in people with depression and poor sleep quality (7). Depression can cause poor sleep quality by interfering with melatonin synthesis, which plays a role in helping circadian rhythms. Depression can interfere with one's sleep quality through the change of sleeping duration as well as daytime sleepiness and lead to poor sleep quality (24,26).

The research of Xie *et al.*, showed that medical students with higher levels of concern regarding the negative impacts of COVID-19 are 1.12 times higher at risk to experience depression (19). During the COVID-19 pandemic, medical students had to adapt to new social environments, especially while implementing social distancing. Pre-clinical students had to adapt to the change of location and ways in implementing all their activities. These changes also created a gap between medical students and their communities, both physically and mentally, while continuing their learning activities as usual in the medical study program. Meanwhile, clinical students must continue their activities in environments with a high risk of COVID-19 exposure while also preparing for the final exams and post-graduation work plans (14). Lethargy, abnormal diet, and less motivation to do tasks due to the depression and poor sleep quality have a negative impact on the academic performance and lifestyle of medical students (19). Depression, poor sleep quality, and other mental disorders in medical students that are already high prior to COVID-19 have increased due to the stressors emerging during the pandemic of COVID-19 (9,14,19). The strong bidirectional relation between depression and poor sleep quality increases the risk of both affecting each other, like a cycle, especially during the COVID-19 pandemic (8,9,19,24).

The results of this study indicate the increase of depression among medical students during the COVID-19 pandemic era, which is associated with a decrease in sleep quality due to changes in the online activities. The most dominant level is mild depression, and female students and students in the pre-clinical level were often found with depression. Medical education institutions need to screen students for depression, poor sleep, and the risk of both aspects to develop early preventive measures, including the development of counseling modules for further treatment. Research with a wider population needs to be done because there are differences in the learning characteristics between educational institutions and environmental factors.

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