

Medical students' mental health state during pandemic COVID-19 in Indonesia



Putu Asih Primatanti^{1*}, Yuda Turana², Wawang S. Sukarya³,
Marwito Wiyanto⁴, Artha Budi Susila Duarsa⁵

ABSTRACT

Introduction: The COVID-19 pandemic has not only had an impact on health problems, but also brought many changes in other aspects of human life, including the education sector. Difficulty in adapting with the learning process can affect the mental health, especially medical students who are quite susceptible to depression and anxiety. We aimed to provide an overview of mental health problems in medical students during the COVID-19 pandemic.

Method: The method used was an online cross-sectional survey using student characteristics instruments, the GAD-7 and PHQ-2 questionnaires. Respondents were 7949 medical students from 49 medical faculties in Indonesia from February to May 2021. All data were analyzed by univariate and bivariate statistics to see the relationship between several variables using SPSS version 22.0.

Results: The majority of respondents were women (69.4%) with an average age of 20.9 ± 2.1 years and domiciled in Java (63.4%). The survey was joined by students from all years of education and the most followed by students in the second year (20.3%). Based on the GAD-7 questionnaire, 3471 respondents (43.7%) experienced symptoms of anxiety (mild, moderate, severe) and the most experienced mild anxiety (29.8%), while from the PHQ-2 questionnaire it was found that 1332 respondents (16.8%) experienced symptoms of depression. Analysis of the mean GAD-7 and PHQ-2 on several factors (gender, year of education, education phase, and place of domicile) showed a significant relationship ($p < 0.05$), except for the PHQ-2 score which was not significant for place of domicile ($p = 0.06$).

Conclusion: The results of this survey describe the mental health conditions of medical students in Indonesia during the pandemic. This study emphasizes the importance of early detection, support, and mental health services to improve the ability and resilience of medical students in dealing with various changes during the COVID-19 pandemic.

Keywords: medical student, mental health, pandemic COVID-19, Indonesia.

Cite This Article: Primatanti, P.A., Turana, Y., Sukarya, W.S., Wiyanto, M., Duarsa, A.B.S. 2023. Medical students' mental health state during pandemic COVID-19 in Indonesia. *Bali Medical Journal* 12(2): 1295-1301. DOI: 10.15562/bmj.v12i2.4104

¹Faculty of Medicine and Health Sciences, Warmadewa University, Denpasar, Indonesia;

²School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia;

³Faculty of Medicine, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta, Indonesia;

⁴Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia;

⁵Faculty of Medicine, Al-Azhar Islamic University, Mataram, Indonesia;

*Corresponding author:

Putu Asih Primatanti;
Faculty of Medicine and Health Sciences,
Universitas Warmadewa;
dr.asih@gmail.com

Received: 2023-01-11

Accepted: 2023-02-28

Published: 2023-04-25

INTRODUCTION

All education sectors, from basic education to higher education, including medical education have also been affected by the COVID-19 pandemic. Since the beginning of 2020, there have been various changes in the learning process in an effort to minimize the transmission of COVID-19. Learning becomes virtual learning; there is a change in the exam system, changes in clinical rotation, and changes in other learning methods.¹ There have been many changes during the pandemic, both in health protocols such as maintaining large social distances, as well as related to the learning process, students must adapt to these changes.²

Mental health in college students has received considerable attention in this era, seeing a significant increase in

psychopathology in this population,^{2,3} as well as a tendency for medical students to experience higher mental health problems compared to other students.^{4,5} Prior to the pandemic, problems related to mental health in medical students had been found to be quite high in experiencing distress, burnout, anxiety, depression, and suicidal ideation.⁶ Various conditions were mentioned as causes, such as factors related to academics, exams, disappointment in lectures, disinterest in medical science, length of curriculum, anxiety about the future,⁷⁻⁹ and other factors outside of academics, such as family function, social support, and coping styles.¹⁰

The number of student enthusiasts in Indonesia to study medicine is very high, so support systems from various parties are needed in order to maintain the quality of

doctor graduates.¹¹ Indonesia is a country with the largest archipelagic area in the world, consisting of 37 provinces and has 91 medical faculties spread throughout the country. In the era of pandemic, medical education must quickly adapt to the situation and take firm and clear considerations to maximize the quality of education. Medical students also need the ability to adapt in the face of conditions that demand various changes in the learning process. Difficulty in adapting can have a great impact on the mental health such as causing depression and anxiety.² Several studies on the mental health of medical students found quite big numbers of those cases, both before and during the pandemic.¹²⁻¹⁴ Not many studies have been conducted to look at the impact of the pandemic on the mental condition of

a large number of medical students from various regions in Indonesia. This study aims to provide an overview of mental health problems in medical students during the COVID-19 pandemic.

METHODS

The method used was an online cross sectional survey which was attended by 7949 medical students from 49 private medical faculties in Indonesia from February to May 2021. Questionnaires were distributed using google forms through several social media groups, and various other online communication media. The questionnaire was made anonymously to ensure the confidentiality of the respondents and all respondents who filled out the questionnaire were asked to provide informed consent. Ethical approval was obtained from the ethics committee of Atma Jaya Catholic University of Indonesia.

The questionnaires used in this study were General Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-2 (PHQ-2). The GAD-7 questionnaire consists of 7 questions to assess anxiety, where respondents were asked to rate complaints experienced in the last two weeks. Each question item was scored from 0 (not at all) to 3 (almost every day).¹⁵⁻¹⁷ The PHQ-2 are the initial two questions listed in the PHQ-9 which are used as an initial screening for depressive disorders and the assessment refers to a Likert scale with a score of 0-3 similar to the GAD-7.¹⁸⁻²⁰ The questionnaire used has been adapted into Indonesian.²¹ Other questions include basic demographic data and years of education. Statistical analysis was carried out in a univariate manner to descriptively see the mental health conditions of the respondents. In addition, we performed a bivariate analysis using the chi-square test to see the relationship between mental status by gender, year of education, and place of domicile.

RESULTS

There were 7949 medical students who participated and filled out a complete survey from 49 medical faculties in Indonesia. Respondents who filled out the survey were domiciled in 34 out of 37 provinces in Indonesia. The majority

Table 1. Respondents Characteristics.

Variables (N=7949)	Frequency	Proportion (%)
Age (Mean±SD)	20.9±2.1	
Gender		
Male	2436	30.6
Female	5513	69.4
Years of study		
First year	1492	18.8
Second year	1612	20.3
Third year	1495	18.8
Fourth year	1099	13.8
Fifth year	854	10.7
Sixth year	579	7.3
Seventh years or more	818	10.3
Phase of education		
Pre Clinical (1 st -4 th year)	5698	71.7
Clinical (5 th year or more)	2251	28.3
Region of domicile		
Java	5042	63.4
Outside Java	2907	36.6

Table 2. Anxiety and Depression Characteristics.

Scoring (N=7949)	Frequency	Proportion (%)
GAD-7		
No-minimal Anxiety	4478	56.0
Mild Anxiety	2367	29.8
Moderate Anxiety	734	9.2
Severe Anxiety	370	4.7
PHQ-2		
No Depression	6617	83.2
Depression	1332	16.8

Table 3. Anxiety and Depression by Gender.

Category (N=7949)	Male (%)	Female (%)
GAD-7		
No-minimal Anxiety	1482 (60.8)	2996 (54.3)
Mild Anxiety	678 (27.8)	1689 (30.6)
Moderate Anxiety	179 (7.3)	555 (10.1)
Severe Anxiety	97 (4)	273 (5)
PHQ-2		
No Depression	2105 (86.4)	4512 (81.8)
Depression	331 (13.6)	1001 (18.2)

of respondents were women (69.4%) with an average age of 20.9±2.1 years. Students who took part in the survey varied from the first year of education to the seventh year, respectively, the most were in the first, second, and third years (18.8%, 20.3%, and 18.8%). The year of education can be divided into pre-clinical and clinical education phases, the majority of respondents from the pre-clinical education phase (71.7%), and most of the respondents from Java (63.4%) (Table 1).

On screening for anxiety disorders,

3471 people (43.7%) experienced anxiety ranging from mild to severe symptoms. The majority of respondents experienced mild anxiety (29.8%), while for symptoms of depression it was found in 1332 respondents (16.8%) (Table 2). Mild, moderate, and severe anxiety were more experienced by female students (30.6%, 10.1%, 5%) than male students (27.8%, 7.3%, 4%), as well as depression symptoms the majority were found in female students (18.2%) (Table 3). The majority of mild, moderate, and severe

anxiety symptoms were experienced by students in the first year (34%, 11.1%, 6.4%), followed by students in the second year (32.3%, 8.7%, 5.5%), respectively, and the third year (28.4%, 10.4%, 4.7%).

Similar to anxiety, the majority of students experienced depression symptoms in the first year (20.4%), followed by the third year (19.1%), and the second year (17.8%) (Table 4).

Medical students who experience symptoms of anxiety and depression are scattered in all provinces (34 provinces) in Indonesia. The proportion of anxiety and depression varies by province. Of the total

Table 4. Anxiety and depression by years of study.

Category (N=7949)	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year or more
GAD-7							
Minimal Anxiety	725 (48.6)	862 (53.5)	844 (56.5)	661 (60.1)	539 (63.1)	361 (62.3)	486 (59.4)
Mild Anxiety	507 (34)	52 (32.3)	424 (28.4)	309 (28.1)	223 (26.1)	147 (25.4)	236 (28.9)
Moderate Anxiety	165 (11.1)	141 (8.7)	156 (10.4)	82 (7.5)	69 (8.1)	54 (9.3)	67 (8.2)
Severe Anxiety	95 (6.4)	88 (5.5)	71 (4.7)	47 (4.3)	23 (2.7)	17 (2.9)	29 (3.5)
PHQ-2							
No Depression	1187 (79.6)	1325 (82.2)	1209 (80.9)	947 (86.2)	745 (87.2)	497 (85.8)	707 (86.4)
Depression	305 (20.4)	287 (17.8)	286 (19.1)	152 (13.8)	109 (12.8)	82 (14.2)	111 (13.6)

Table 5. Anxiety dan Depression Proportion.

Province (N=7949)	Anxiety		Depression	
	Without anxiety	Anxiety	Without depression	Depression
Aceh	7 (0.3)	8 (0.1)	6 (0.2)	9 (0.2)
Bali	173 (6.8)	506 (9.4)	271 (6.9)	408 (10.2)
Bangka Belitung	12 (0.5)	14 (0.3)	17 (0.4)	9 (0.2)
Banten	205 (8)	396 (7.3)	273 (6.9)	328 (8.2)
Bengkulu	7 (0.3)	14 (0.3)	8 (0.2)	13 (0.3)
Central Java	201 (7.9)	389 (7.2)	336 (8.5)	254 (6.3)
Central Kalimantan	10 (0.4)	32 (0.6)	17 (0.4)	25 (0.6)
Central Sulawesi	12 (0.5)	42 (0.8)	21 (0.5)	33 (0.8)
East Java	419 (16.4)	919 (17)	639 (16.2)	699 (17.4)
East Kalimantan	19 (0.7)	35 (0.6)	25 (0.6)	29 (0.7)
Gorontalo	4 (0.2)	9 (0.2)	7 (0.2)	6 (0.1)
DKI Jakarta	379 (14.9)	691 (12.8)	603 (15.3)	467 (11.6)
Jambi	17 (0.7)	15 (0.3)	17 (0.4)	15 (0.4)
Lampung	45 (1.8)	107 (2.0)	70 (1.8)	82 (2.0)
Maluku	1(0)	7 (0.1)	4 (0.1)	4 (0.1)
North Sulawesi	6 (0.2)	11 (0.2)	9 (0.2)	8 (0.2)
North Sumatera	80 (3.1)	267 (4.9)	158 (4.0)	189 (4.7)
Papua	9 (0.4)	15 (0.3)	16 (0.4)	8 (0.2)
Riau	28 (1.1)	100 (1.9)	55 (1.4)	73 (1.8)
Riau Islands	4 (0.2)	7 (0.1)	5 (0.1)	6 (0.1)
Southeast Sulawesi	15 (0.6)	19 (0.4)	14 (0.4)	20 (0.5)
South Kalimantan	10 (0.4)	9 (0.2)	9 (0.2)	10 (0.2)
South Sulawesi	72 (2.8)	149 (2.8)	92 (2.3)	129 (3.2)
South Sumatera	156 (61.)	314 (5.8)	205 (5.2)	265 (6.6)
West Java	354 (13.9)	852 (15.8)	574 (14.6)	632 (15.8)
West Kalimantan	19 (0.7)	24 (0.4)	25 (0.6)	18 (0.4)
West Nusa Tenggara	160 (6.3)	226 (4.2)	262 (6.7)	124 (3.1)
West Papua	3 (0.1)	12 (0.2)	6 (0.2)	9 (0.2)
West Sulawesi	4 (0.2)	8 (0.1)	7 (0.2)	5 (0.1)
West Sumatera	3 (0.1)	10 (0.2)	4 (0.1)	9 (0.2)
Yogyakarta	95 (3.7)	142 (2.6)	144 (3.7)	93 (2.3)
North Kalimantan	4 (0.2)	7 (0.1)	7 (0.2)	4 (0.1)
North Maluku	6 (0.2)	6 (0.1)	6 (0.2)	6 (0.1)
East Nusa Tenggara	11 (0.4)	31 (0.6)	24 (0.6)	18 (0.4)
Others	1 (0)	5 (0.1)	1 (0)	5 (0.1)

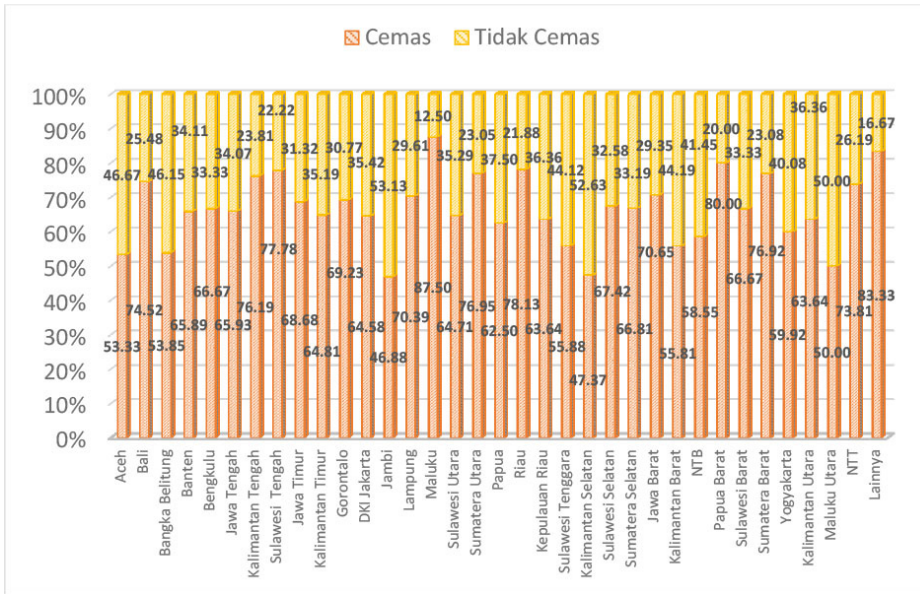


Figure 1. Anxiety Prevalence in Every Province.

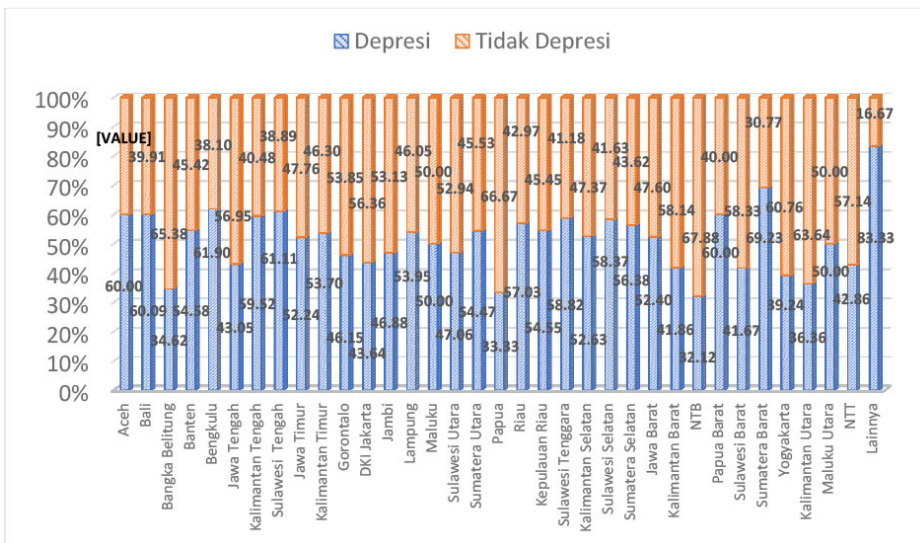


Figure 2. Depression Prevalence in Every Province.

experiencing symptoms of anxiety, 17% came from East Java and of the total who experienced depression, 17.4% also came from East Java (Table 5). Comparison of symptoms of anxiety and depression with those who do not experience anxiety and depression in each province can be seen in Figures 1 and 2. There are 6 respondents who live outside Indonesia when participating in the survey and are included in other groups.

The mean scores for GAD-7 and PHQ-2 are presented in Table 6 by category of gender, year of education (viewed annually and divided into two phases of education), and area of domicile (differentiated by province). The analysis of the means

of these factors showed a significant relationship ($p < 0.05$), except for the PHQ-2 score, which was not significant for domicile ($p = 0.06$ and $p = 0.74$).

DISCUSSION

In this study, the prevalence of anxiety disorders in medical students was experienced by 3471 respondents (43.7%) with severe anxiety symptoms experienced by 370 (4.7%) medical students. The prevalence of anxiety varies according to studies in several countries. In India, the study reported that the prevalence of medical undergraduates experiencing anxiety before the pandemic was quite

high (66.9%).²² A systematic review involving 21 articles (35160 medical students in China) published in 2000-2018 reported that the prevalence of anxiety ranged from 8.54-88.30%, with a mean of 27.22%.²³ A meta-analysis reported the global prevalence of anxiety in medical students was 33.8% (95% CI 29.2-38.7%). Anxiety has the highest prevalence in medical students from the Middle East and Asia.²⁴ From studies conducted before the COVID-19 pandemic, it can be seen that the prevalence of anxiety in medical students is quite high. A study conducted early in the COVID-19 pandemic on medical students, residents, and fellows at a medical university hospital in New York reported an anxiety prevalence of 48.1%,²⁵ in Egyptian medical students 53.6%²⁶ and in medical students at United States medical schools the prevalence is 30.6%.²⁷ Research conducted in Indonesia in July 2020, with 1027 respondents, 47.8% experienced anxiety.²⁸ Symptoms of anxiety in medical students in the period before and during the pandemic did not seem to experience much difference.

In this study, it was found that 1332 (16.8%) medical students experienced symptoms of depression at the initial screening with PHQ-2, which should be followed by a PHQ-9 assessment and further psychiatric examination. The symptoms listed in the PHQ-2 consist of two questions which are the main symptoms of depression, namely little interest or pleasure in doing things and feeling down, depressed or hopeless.^{29,30} A cross sectional study at 4 medical schools in Cameroon in 2015-2016 reported that third of them (618 respondents) experienced major depressive disorder (30.6%, 95% CI: 22.8-36.7).³¹ A meta-analysis study before the pandemic showed the global prevalence of depression in medical students was 28.0% (95% CI 24.2-32.1%).³² A study conducted at a medical college in South India found 59 (13.9%) of 425 participants experienced moderately severe or severe depression,³³ while in Indonesia 18.6% of medical students experienced depression during the pandemic.²⁸ Research on medical students in Morocco reported that more than 65% experienced psychological distress caused by the COVID-19 pandemic.³⁴

Table 6. Correlation of Respondents Characteristics with GAD-7 and PHQ-2 Mean.

Characteristics	Mean GAD-7	P Value	Mean PHQ 2	P Value
Gender				
Male	4.15	0.00	1.15	0.00
Female	5.00		1.39	
Years of study				
First year	5.48	0.00	1.50	0.00
Second year	5.08		1.46	
Third year	4.86		1.42	
Fourth year	4.36		1.20	
Fifth year	3.98		1.03	
Sixth year	4.05		1.10	
Seventh year or more	4.24		1.15	
Phase of education				
Pre clinical	4.99	0.00	1.41	0.00
Clinical	4.09		1.09	
Region of domicile				
Java	4.59	0.00	1.30	0.06
Outside Java	5.98		3.36	

Similar to symptoms of anxiety, symptoms of depression experienced by medical students before and during the pandemic did not change too much.

It was found that there was a significant relationship between symptoms of anxiety and depression with gender in this study. In several studies, female gender was mentioned as a risk factor for anxiety and depression in medical students,^{26,35} but the difference was not significant in several studies.^{24,32,36} A study showed that female medical students experienced fatigue and were discouraged more often than male students in facing medical training. Several reasons are mentioned because female medical students often experience negative perceptions in their social life, greater solitude,³⁷ face differences in life experiences and social expectations, which have an impact on their response to stressors.^{38,39} Biological factors may be involved, such as hormonal profile, neural circuitry, and neurotransmitter activity.³⁹

In this study, it was found that there was a significant relationship between anxiety and depression with the year and phase of education. Research in Brazil stated that anxiety symptoms were 30.8% in first year students and 9.4% in sixth year ($p < 0.001$), while there was no significant difference in symptoms of depression.⁴⁰ Research in Indonesia during the beginning of the pandemic found that there were significant differences regarding the educational stage

of medical students (p value < 0.05).²⁸ Another study stated that first-year students experienced depression more often, but it was statistically insignificant in some studies at 33.5% (95% CI 25.2–43.1%),³² as well as for anxiety.²⁴ There are several variations of conditions related to mental health problems in medical students. During the lockdown period, the prevalence of burnout among medical students at the University of Cyprus increased at the end of medical education (sixth year), while during the COVID-19 pandemic the prevalence was highest in fourth-year students who were about to start clinical practice.⁴¹ Medical students in their first year experience an increase in the incidence of anxiety and depression during the pandemic related to distance learning and social isolation.⁴² Becoming a new student at the medical faculty has the highest impact on student mentality, while changes in learning methods during the pandemic do not provide a significant additional burden. From the cohort conducted on first-year medical students in Germany, it was found that the burden experienced was more study related, so attention and monitoring related to mental health should receive attention regardless of the pandemic.⁴³

The results obtained in this study found a significant relationship between anxiety symptoms and place of domicile (on the

island of Java or outside Java), but this was not the case with symptoms of depression. During the pandemic, most of the students who migrated returned to their respective areas of origin and lived with their families. Good family relationships also provide benefits for the mental health of students who have to adapt to stressful situations during the pandemic.⁴⁴ For information, currently the island of Java is the center of government and the center of the economy in Indonesia, and has the most medical faculties compared to other islands in Indonesia. In the general population in Indonesia, there is a significant relationship between the incidence of anxiety and place of domicile. Those living on Java island (OR 0.657, 95% CI 0.491-0.878) were more likely to have severe anxiety, but those living outside Java island (OR 1.354 95% CI 1.015-1.806) were 1.3 times more likely to have severe depression. During the pandemic, the high number of COVID-19 cases on the island of Java is likely to cause higher anxiety.⁴⁵

Mental health in students is a worldwide concern, where an international survey involving students in 21 countries showed that about 20.3% of respondents met the criteria for a disorder according to the DSM-IV.⁴⁶ A meta-analysis states that one in three medical students experience higher anxiety than the general population.²⁴ Depression is experienced by almost one-third of medical students globally, but treatment rates tend to be low.³² Several studies have stated that medical students who experience mental problems have more barriers to accessing health services, prefer informal consultations and self-diagnosis, because they consider confidentiality.^{33,39,47} Medical faculties are expected to have early detection and prevention programs, as well as to provide treatment interventions before students graduate, so that students have resilience in the face of various changes in the world of education and health services.^{48,49} Providing skills to manage stress and reduce stressors that are not important by improving the academic environment is needed as long as students attend medical education.⁵⁰ Further research is needed to identify risk factors for mental problems in medical students.^{24,32,35,51,52}

CONCLUSION

This study shows that mental health problems, especially anxiety and depression, are quite common among medical students. Gender, year, and educational phase of medical students have an influence on the mental health condition of students. Students in the early years of education and the pre-clinical phase seem to have a higher risk of experiencing mental problems related to the several adaptations required to be a burden for these students. Problems related to mental health of medical students were quite high before the COVID-19 pandemic. Responding to various forms of mental problems in medical students, medical faculties are expected to have early detection and prevention programs, assistance when students experience difficult times, and provide intervention for handling before students graduate. This study can be used as a basis for the importance of preparing the resilience of medical students in the early to late stages of education to face various kinds of changes in the world of education and health services.

AUTHORS' CONTRIBUTION

All authors of this manuscript have contributed equally in the process of the study until the finishing of the manuscript.

CONFLICT OF INTEREST

We declared no conflict of interest was involved in this study.

FUNDING

This research was partly funded by the Yayasan Kesejahteraan Korpri.

REFERENCES

- Chandratre S, Knight C and Dodson L. Supporting Medical Student Mental Health during COVID-19: Strategies Implemented for an Accelerated Curriculum Medical Campus. *Journal of medical education and curricular development*. 2021;8:23821205211006390.
- Deng J, Zhou F, Hou W, Silver Z, Wong CY, Chang O, Drakos A, Zuo QK, Huang E. The prevalence of depressive symptoms, anxiety symptoms and sleep disturbance in higher education students during the COVID-19 pandemic: A systematic review and meta-analysis. *Psychiatry research*. 2021;301:113863.
- Martínez-Rubio D, Navarrete J and Montero-Marin J. Feasibility, Effectiveness, and Mechanisms of a Brief Mindfulness- and Compassion-Based Program to Reduce Stress in University Students: A Pilot Randomized Controlled Trial. *International journal of environmental research and public health*. 2021;19(1):154.
- Schwenk TL, Davis L, Wimsatt LA. Depression, stigma, and suicidal ideation in medical students. *Jama*. 2010;304(11):1181-90.
- Molodynski A. Cultural variations in wellbeing, burnout and substance use amongst medical students in twelve countries. *International review of psychiatry (Abingdon, England)*. 2021;33(1-2):37-42.
- MacLean L, Booza J, Balon R. The impact of medical school on student mental health. *Academic Psychiatry*. 2016;40:89-91.
- Gazzaz ZJ, Baig M, Al Alhendhi BS, Al Suliman MM, Al Alhendhi AS, Al-Grad MS, Qurayshah MA. Perceived stress, reasons for and sources of stress among medical students at Rabigh Medical College, King Abdulaziz University, Jeddah, Saudi Arabia. *BMC medical education*. 2018;18(1):1-9.
- Kumar B, Shah MA, Kumari R, Kumar A, Kumar J, Tahir A, Siddiqui A. Depression, anxiety, and stress among final-year medical students. *Cureus*. 2019;11(3).
- Abouammah N. Stress among medical students and its consequences on health : A qualitative study. *Biomedical Research*. 2020;31(1):1-8.
- Shao R, He P, Ling B, Tan L, Xu L, Hou Y, Kong L, Yang Y. Prevalence of depression and anxiety and correlations between depression, anxiety, family functioning, social support and coping styles among Chinese medical students. *BMC psychology*. 2020;8(1):1-9.
- Lestari TR. Kebijakan pendidikan kedokteran di Indonesia. *Info Singkat Kesejahteraan Sosial*. 2012;4(8):9-12.
- Ardan M, Rahman FF, Geroda GB. The influence of physical distance to student anxiety on COVID-19, Indonesia. *Journal of Critical Reviews*. 2020;7(17):1126-32.
- Natalia D, Syakurah RA. Mental health state in medical students during COVID-19 pandemic. *Journal of education and health promotion*. 2021;10.
- Ramadianto AS, Kusumadewi I, Agiananda F, Raharjanti NW. Symptoms of depression and anxiety in Indonesian medical students: association with coping strategy and resilience. *BMC psychiatry*. 2022;22(1):1-1.
- Choo K, Spitzer RL, Williams JB. The phq-9. *Journal of General Internal Medicine*. 2001;16(9):606-13.
- Budikayanti A, Larasari A, Malik K, Syeban Z, Indrawati LA, Octaviana F. Screening of generalized anxiety disorder in patients with epilepsy: Using a valid and reliable Indonesian version of generalized anxiety disorder-7 (GAD-7). *Neurology research international*. 2019.
- Nazari N, Safitri S, Usak M, Arabmarkadeh A, Griffiths MD. Psychometric validation of the Indonesian version of the Fear of COVID-19 Scale: Personality traits predict the fear of COVID-19. *International journal of mental health and addiction*. 2021;23:1-7.
- Kroenke K and Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. *Psychiatric Annals*. 2002;32(9):509-515.
- Caneo C, Toro P, Ferreccio C, Mauco Research Team Claudia Bambs Sandra Cortés Fabio Paredes Andrea Huidobro Pia Venegas Johanna Acevedo. Validity and performance of the patient health questionnaire (PHQ-2) for screening of depression in a rural Chilean cohort. *Community Mental Health Journal*. 2020;56:1284-91.
- Levis B, Sun Y, He C, Wu Y, Krishnan A, Bhandari PM, Neupane D, Imran M, Brehaut E, Negeri Z, Fischer FH. Depression Screening Data (DEPRESSD) PHQ Collaboration. 2020.
- Onie S, Kirana AC, Mustika NP, Adesla V, Ibrahim R. Assessing the Predictive Validity and Reliability of the DASS-21, PHQ-9 and GAD-7 in an Indonesian Sample. 2020.
- Iqbal S, Gupta S, Venkatarao E. Stress, anxiety & depression among medical undergraduate students & their socio-demographic correlates. *The Indian journal of medical research*. 2015;141(3):354.
- Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety in medical students in China. *BMC medical education*. 2019;19(1):1-3.
- Tian-Ci Quek T, Tam WS. X. Tran B, Zhang M, Zhang Z, Su-Hui Ho C, Chun-Man Ho R. 2019. The global prevalence of anxiety among medical students: a meta-analysis. *International Journal of Environmental Research and Public Health*. 2019;16(15):2735.
- Gupta P, BK A, Ramakrishna K. Prevalence of depression and anxiety among medical students and house staff during the COVID-19 health-care crisis. *Academic Psychiatry*. 2021;45(5):575-80.
- Ghazawy ER, Ewis AA, Mahfouz EM, Khalil DM, Arafa A, Mohammed Z, Mohammed EN, Hassan EE, Abdel Hamid S, Ewis SA, Mohammed AE. Psychological impacts of COVID-19 pandemic on the university students in Egypt. *Health Promotion International*. 2021;36(4):1116-25.
- 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. *Journal of medical education and curricular development*. 2021;8:2382120521991150.
- Natalia D, Syakurah RA. Mental health state in medical students during COVID-19 pandemic. *Journal of education and health promotion*. 2021;10.
- Manea L, Gilbody S, Hewitt C, North A, Plummer F, Richardson R, Thombs BD, Williams B, McMillan D. Identifying depression with the PHQ-2: A diagnostic meta-analysis. *Journal of Affective Disorders*. 2016;203:382-95.
- Anand P, Bhurji N, Williams N, Desai N. Comparison of PHQ-9 and PHQ-2 as screening tools for depression and school related stress in inner city adolescents. *Journal*

- of Primary Care & Community Health. 2021;12:21501327211053750.
31. Ngasa SN, Sama CB, Dzekem BS, Nforchu KN, Tindong M, Aroke D, Dimala CA. Prevalence and factors associated with depression among medical students in Cameroon: a cross-sectional study. *BMC psychiatry*. 2017;17(1):1-7.
 32. Puthran R, Zhang MW, Tam WW, Ho RC. Prevalence of depression amongst medical students: A meta-analysis. *Medical education*. 2016;50(4):456-68.
 33. Arun P, Ramamurthy P, Thilakan P. Indian medical students with depression, anxiety, and suicidal behavior: why do they not seek treatment?. *Indian journal of psychological medicine*. 2022;44(1):10-6.
 34. Essangri H. Predictive Factors for Impaired Mental Health among Medical Students during the Early Stage of the COVID-19 Pandemic in Morocco. *The American journal of tropical medicine and hygiene*. 2021;104(1):95-102.
 35. Pacheco JP, Giacomini HT, Tam WW, Ribeiro TB, Arab C, Bezerra IM et al. Mental health problems among medical students in Brazil: a systematic review and meta-analysis. *Rev Bras Psiquiatr*. 2017;39:369-78.
 36. Zeng W, Chen R, Wang X, Zhang Q, Deng W. Prevalence of mental health problems among medical students in China: A meta-analysis. *Medicine*. 2019;98(18).
 37. Enns SC, Perotta B, Paro HB, Gannam S, Peleias M, Mayer FB, Santos IS, Menezes M, Senger MH, Barelli C, Silveira PS. Medical students' perception of their educational environment and quality of life: is there a positive association?. *Academic Medicine*. 2016;91(3):409-17.
 38. Donner NC, Lowry CA. Sex differences in anxiety and emotional behavior. *Pflügers Archiv-European Journal of Physiology*. 2013;465:601-26.
 39. Altemus M, Sarvaiya N and Neill Epperson C. Sex differences in anxiety and depression clinical perspectives. *Frontiers in neuroendocrinology*. 2014;35(3):320-330.
 40. Bassols AM, Okabayashi LS, Silva AB, Carneiro BB, Feijó F, Guimarães GC, Cortes GN, Rohde LA, Eizirik CL. First-and last-year medical students: is there a difference in the prevalence and intensity of anxiety and depressive symptoms?. *Brazilian Journal of Psychiatry*. 2014;36:233-40.
 41. Zis P. Medical Studies during the COVID-19 Pandemic: The Impact of Digital Learning on Medical Students' Burnout and Mental Health. *International journal of environmental research and public health*. 2021;18(1):349.
 42. Fruehwirth JC, Biswas S and Perreira KM. The Covid-19 pandemic and mental health of first-year college students: Examining the effect of Covid-19 stressors using longitudinal data. *PloS one*. 2021;16(3):e0247999.
 43. Schindler AK, Polujanski S, Rothhoff T. A longitudinal investigation of mental health, perceived learning environment and burdens in a cohort of first-year German medical students' before and during the COVID-19 'new normal'. *BMC Medical Education*. 2021;21:1-1.
 44. Sujarwoto, Saputri RAM, Yumarni T. Social Media Addiction and Mental Health Among University Students During the COVID-19 Pandemic in Indonesia. *International journal of mental health and addiction*. 2021;1-15.
 45. Argo TM, Kurniawan A, Liem JA, Sugianto JO, Michael RJ, Tanuwijaya NV, Agatha L, Wonsono B, Rivami DS. Profile and factors associated with depression, anxiety, and stress in Indonesian people during Covid-19 pandemic. *Medicus*. 2021;8(3):131-40.
 46. Auerbach RP, Alonso J, Axinn WG, Cuijpers P, Ebert DD, Green JG, Hwang I, Kessler RC, Liu H, Mortier P, Nock MK. Mental disorders among college students in the World Health Organization world mental health surveys. *Psychological medicine*. 2016;46(14):2955-70.
 47. Schwenk TL, Davis L, Wimsatt LA. Depression, stigma, and suicidal ideation in medical students. *Jama*. 2010;304(11):1181-90.
 48. Nishimura Y, Ochi K, Tokumasu K, Obika M, Hagiya H, Kataoka H, Otsuka F. Impact of the COVID-19 pandemic on the psychological distress of medical students in Japan: cross-sectional survey study. *Journal of medical Internet research*. 2021;23(2):e25232.
 49. O'Byrne L, Gavin B, Adamis D, Lim YX, McNicholas F. Levels of stress in medical students due to COVID-19. *Journal of Medical Ethics*. 2021;47(6):383-8.
 50. Slavin S. Medical student mental health: Challenges and opportunities. *Medical Science Educator*. 2018;28(Suppl 1):13-5.
 51. Zis P, Artemiadis A, Bargiotas P, Nteveros A, Hadjigeorgiou GM. Medical studies during the COVID-19 pandemic: the impact of digital learning on burnout and mental health. 2020.
 52. Abubakar A, Ma'ruf MF, Mizfaruddin M, Yusuf F, Maghfirah D, Muhsin M. Anxiety to COVID-19 pandemic amongst university students is related with gastrointestinal symptoms. *Bali Medical Journal*. 2021;10(2):847-50.



This work is licensed under a Creative Commons Attribution