

## Anxiety Levels of Undergraduate and Clerkship Medical Students during the COVID-19 Pandemic

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### Abstract

The COVID-19 pandemic has brought a devastating impact on the world. Medical students who belong to psychologically vulnerable groups also share more burdens due to the medical education academic demands, curriculum transition to virtually-delivered format, and the risk of being infected by the disease during clinical settings. This study aims to identify the anxiety level of undergraduate and clerkship medical students to create proper and effective strategies to build good mental status among medical students during the COVID-19 pandemic. It is a cross-sectional study. The survey

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was conducted using an online questionnaire to assess respondents' identity, demographic data, family history, perceptions about online/offline learning, and the researchers used the Taylor Manifest Anxiety Scale (TMAS) test to measure the anxiety level of the subjects. The subjects of this study were 164 medical students, divided into two groups, 94 final year undergraduate students and 70 final year clerkship students who were still doing their clinical rotations at the hospital. The findings of this study informed that the average anxiety level was 18.3 for undergraduate students and 19.6 for clerkship students. The TMAS score was higher among clerkship students than undergraduate students. However, the statistical analysis showed no difference ( $p=0.306$ ) in TMAS scores between clerkship and undergraduate students. A close approach and continuous observation are needed because the higher the TMAS score indicates the higher the anxiety level.

**Keywords:** COVID-19, anxiety, undergraduate, clerkship, medical students

## 1. Introduction

The COVID-19 pandemic that started in Wuhan, China, has spread worldwide since the end of 2019 (Nugraha et al., 2020). Coronavirus disease 2019 (COVID-19) has brought devastating impacts to the global economy and health. The detection of COVID-19 in Indonesia began on 2<sup>nd</sup> March 2020 when two patients tested positive for the virus. As of 11 August 2021, 30 625 new and 3 749 446 cumulative cases were reported nationwide. From 5 to 11 August, the average number of new cases per day was 30 983; a decrease compared to the average of 34 977 cases per day in the previous week (WHO, 2021).

Since the declaration of this disease as a pandemic, more aggressive measures against COVID-19 have been taken, including shutting down schools and other public places to reduce disease transmission. The COVID-19 pandemic increases anxiety levels within the community and in particular medical students who are already considered psychologically vulnerable groups, due to the highly competitive atmosphere of the education, academic pressure, exposure to patients, financial problem, and lack of sleep; which may already contribute to psychological problems associated with stress and anxiety. Additionally, during disease outbreaks, medical students are at a higher risk of infection because of exposure to the virus during clinical training. During previous disease outbreaks, a higher case of anxiety was reported among medical students than non-medical students (Saddik et al., 2020).

Anxiety represents a principal emotional state, which presents in men and can be defined by affective (principal emotional feelings), perceptive (realization of bodily or psychomotor sensations), and cognitive components. Besides these subjective components, behavioural and physiological characteristics can define anxiety phenomenologically. In contrast to experiencing anxiety during everyday life, anxiety as psychopathologic disturbance or anxiety disorder includes specific diagnostic criteria, neurobiological dysfunctions, and a specific genetic background and leads to social and occupational disabilities (Wiedemann, 2015).

With the demands and pressures faced by medical students, it is not surprising that mental, physical, and spiritual wellbeing can be compromised. Ironically, a field that advocates the promotion of health and wellness in patients falls behind in supporting and addressing the needs of medical students.

A cross-sectional survey comparing psychological distress and mental illness amongst the medical student population to that of post-secondary graduates carried out by Canadian researchers found that medical students had significantly higher rates of diagnosed mood disorders, suicidal ideation, and psychological distress. In addition to these higher rates, female medical students were more likely to have a mood disorder, lifetime suicidal ideation, and more severe psychological distress than their male counterparts. This is not a unique issue to Canada, and there is a plethora of evidence that medical students worldwide experience significant rates of burnout, psychological distress, and psychiatric morbidity (Maser et al., 2019; Wilkes et al., 2019).

The presence of COVID-19- related psychological distress is reported in 27% of participants with 11% exhibiting an acute stress reaction to COVID-19 on an assessment of mental health on 1442 health professional students including medical students at Sichuan University, China. Another study reported 25% self-reported anxiety on the assessment of 7143 medical students of Changzhi Medical School, China (Cao et al., 2020).

During this pandemic, the entire curriculum transforms to a virtually-delivered format. On-campus activities are removed. Exams are conducted online, even licensure or board exams are delayed, and the medical placements are cancelled. Undergraduate medical students are stressed by school added responsibilities. Student concerns related to the pandemic, paired with their desire to return to rotations despite the risks, suggest that medical students may take on emotional burdens as members of the patient care team even when not present in the clinical environment (Harries et al., 2020).

As COVID-19 gradually affects the physical, emotional, and mental well-being of clerkship medical students, they are experiencing anxiety even more. These students share more burdens because they can meet COVID-19 patients uneventfully during the clinical study. Due to limited personal protective equipment, especially respiratory protection, clinical students who must remain in contact with patients are unable to carry out clinical examinations freely, thereby reducing the comprehensiveness of their clinical experience as clinical students. With the death numbers increasing by the day and with news and social media flooded with COVID-19 discussions, it is hard to stay unaffected (Chandratre, 2020).

Medical students are known to show higher rates of depression, suicidal ideation, and stigmatization around depression and are also less likely to seek support compared to non-medical students. High rates of mental health problems, burnout, substance abuse, and mental stress in medical students were reported by a global study assessing the mental health profile of medical students from 12 different countries. It is therefore important to safeguard the mental health of medical students with an effective plan to support their wellness and education (Chandratre, 2020).

The pandemic has given an extra burden to medical students, with so much uncertainty accompanying the events unfolding globally.

This study aims to identify the level of anxiety among clerkship and undergraduate medical students to create proper and effective strategies to build good mental status among medical students.

## **2. Methodology**

This is a cross-sectional study. It involved 164 medical students of the Faculty of Medicine Universitas Muhammadiyah Surakarta. The sampling method is universal sampling. The students

were divided into two levels of medical education, the final year of clerkship students who were still on their clinical rotation at the hospital and the final year of undergraduate students who were ready to start their clinical clerkship. The researchers used an online platform to assess identity, demographic data, family history, and anxiety level using the Taylor Manifest Anxiety Scale (TMAS) that was translated to Bahasa Indonesia. The data was collected from August 31<sup>st</sup> 2020 until September 9<sup>th</sup> 2020. The TMAS questionnaire contains 50 yes or no questions related to anxiety that divided into two groups, favourable questions and unfavourable questions. For favourable questions, 1 point was added to each “yes” answer, and 0 points for each “no” answer. For unfavourable questions, 1 point was added to each “no” answer, and 0 points for each “yes” answer. The total points collected was the score of anxiety. The higher score indicated the higher the level of anxiety. The data was presented in the form of mean, standard deviation, proportion, and analysed with SPSS. This study had obtained an ethical clearance provision from the Ethical Clearance Committee of Faculty of Medicine Universitas Muhammadiyah Surakarta No. 3044/B.2/KEPK-FKUMS/IX/2020.

### 3. Results

The subjects of this study were 164 medical students, 70 of them were currently undergoing clerkship and 94 of them were final year undergraduate students. The subjects consisted of 113 women and 51 men, with the average age was 23 years old. The mean of TMAS score for all research subjects was 18.9.

Table 1: Sample characteristics and univariate analysis of variables related to anxiety level.

Number of subjects	Mean age $\pm$ SD* (years old)		Mean TMAS Score $\pm$ SD	
	Number	Percentage	Mean TMAS Score $\pm$ SD	p value**
164	23.15 $\pm$ 1.174		18.9 $\pm$ 9.4	
Gender (n=164)				
Male	51	31.10%	17.5 $\pm$ 8,5	0.277***
Female	113	68.90%	18.8 $\pm$ 10.3	
Level of Medical Education (n=164)				
Undergraduate	94	57.30%	18.3 $\pm$ 9.7	0.306***
Clerkship	70	42.70%	19.6 $\pm$ 9.0	
Gender of Undergraduate Students (n=94)				
Male	33	35.10%	17.5 $\pm$ 8.5	0.736***
Female	61	64.90%	18.8 $\pm$ 10.3	
Gender of Clerkship Students (n=70)				
Male	18	25.70%	17.5 $\pm$ 8.4	0.253***
Female	52	74.30%	20.4 $\pm$ 9.1	
Marital status (n=164)				
				0.915***

Single	160	97.60%	18.9 ± 9.5	
Married	4	2.40%	17.3 ± 2.6	
Having children (n=164)				0.851***
Yes	2	1.20%	18.9 ± 9.4	
No	162	98.80%	18.5 ± 3.5	
Parents' job (n=164)				0.108***
Healthcare Workers	60	36.60%	17.6 ± 9.7	
Non-healthcare Workers	104	63.40%	19.6 ± 9.1	
City of residence (n=164)				0.693***
Capital city	4	2.40%	22.8 ± 16.5	
Non-capital city	160	97.60%	18.8 ± 9.2	
Isolation experience (n=164)				0.865***
Yes	9	5.50%	19.8 ± 10.6	
No	155	94.50%	18.8 ± 9.3	
Financial problem (n=164)				0.24***
Yes	54	32.90%	20.0 ± 9.5	
No	110	67.10%	18.4 ± 9.3	
Blood Type (n=164)				0.704***
A	36	22.00%	20.5 ± 11.0	
B	42	25.60%	19.3 ± 9.6	
AB	18	11.00%	19.1 ± 8.5	
O	68	41.50%	17.7 ± 8.6	
Perception of learning method during the pandemic				0.498***
Prefer Offline Learning	75	45.70%	18.5 ± 9.6	
Prefer Online Learning	89	54.30%	19.2 ± 9.3	

\*Standard Deviation

\*\*Man Whitney Test for variables with 2 groups and Kruskal Wallis Test for the variable with more than 2 groups

\*\*\*Nonsignificant differences

#### 4. Discussion

This study reveals that the COVID-19 pandemic has an impact on anxiety levels among medical students. The effect of COVID-19 on the global community has been considerably significant, causing fear, anxiety, and worry, particularly due to uncertainty of the prognosis of the disease, changes in societies' lifestyles, lockdown restrictions, and educational disruptions (Saddik et al., 2020). The COVID-19 pandemic has fundamentally transformed education at all levels - from

preschool to postgraduate. The entire curriculum is transformed to a virtually-delivered format. Medical schools also transform their lecture from offline classes to online classes, especially for undergraduate medical students. A combination of online and offline learning is also carried out for clerkship medical students.

The impact of the COVID-19 pandemic on university students is burdensome due to the effect of the virus on their studies, in particular for medical students. It could be due to the potential proximity of being exposed to the virus during their clinical studies (Saddik et al., 2020).

TMAS questionnaire is a tool that can measure anxiety levels. There are few kinds of TMAS score interpretation, one of which is with the cut-off point of 21. A score under 21 is said to have not experienced anxiety, a score above  $> 21$  is said to have experienced anxiety (Hidayah, 2010). Another TMAS score interpretation is that the higher the TMAS score indicates the higher the level of anxiety (Serudji & Machmud, 2018). Overall, scores showed that the students have adapted well during this pandemic because the average score of TMAS for all medical students is 18.9. But as the score is nearing 20, it describes the students' level of anxiety could be impacted by this pandemic.

Clerkship students showed higher TMAS scores compared to undergraduate students, although the difference is not significant. This is not surprising, because clerkship students who undergo clinical rotation in the hospital will definitely meet patients directly and they may meet COVID-19 patients accidentally. Among the fears reported in the study of Chandratre (2020) are that the majority of students reported being worried about catching the virus themselves, worried about transmitting COVID-19 to one of their family members or friends, and worried about transmitting COVID-19 to other people. Besides, they also have to face the fact that they cannot do the clinical training at the hospital without constraints, due to the rules in place in hospitals during the pandemic, which limits the number of clinical students. Students have to come to the hospital in turns, in addition, they are also prohibited from entering several units with red zones in hospitals such as emergency units. Therefore, they have to adapt to online study to set up some skills they have missed during the hospital learning.

During this pandemic, the final year medical students discussed herein only needed to adapt with online lectures to complete some unfinished preclinical course material. Their clinical education or known as hospital clerkship was postponed temporarily, while waiting for the hospital's readiness to admit new clinical students during the pandemic situation. Online learning is not burdensome compared to clinical attachment in hospitals but students are not able to meet patients directly and practice clinical skills. However, anxiety certainly increases due to the unpredictable pandemic situation. The lack of clinical practice and preparing for clinical studies in a pandemic certainly presents a challenge for the students.

In this study, generally, female medical students have higher TMAS scores than male medical students although the difference was not significant. The score is 18.8 for female medical students and 17.5 for male medical students. From the TMAS score data viewed from gender and level of education, female undergraduate students have a higher score than male undergraduate students. Similarly, female clerkship students show higher TMAS score compared to male clerkship students. But when the two groups of female students are compared, female clerkship students have a higher TMAS score.

Sex differences in anxiety disorders are influenced by several factors including genetic, neurodevelopmental, environmental, and neurobiological. Significant differences in brain structures and functions between men and women exist in areas relevant to anxiety, including the prefrontal cortex, hippocampus, and extended amygdala complex. The female gender is more vulnerable to anxiety. Women are said to be more affected by environmental conditions than men, with more sensitive feelings and feminine traits. Many studies say women are more susceptible to anxiety and other psychological disorders. Female reproductive hormones, especially estrogen and progesterone, have been hypothesized to exert a critical modulation effect in the central nervous system that could influence the presentation of anxiety disorders in women. Periodic fluctuations in estrogen and progesterone levels throughout a woman's life are likely to contribute to the changes in the severity of anxiety symptoms observed during various reproductive phases in women. In males, the main reproductive hormone, testosterone, is known to have anxiolytic effects by reducing responsiveness to stress and suppressing Hypothalamic-Pituitary-Adrenal axis activity (Jalnapurkar et al., 2018).

Marital status is yet given less TMAS score, 17.3 for married students, and 18.9 for single medical students. Marriage is associated with better mental health compared to all other marital statuses. The effect of marriage on mental health is mostly due to the support provided within the marital relationship. The social, psychological, and financial supports reduce suicidal ideation, depressing effect, anxiety, and substance abuse (Spiker, 2014). Marriage makes individuals more mature, with increased responsibilities but also the existence of a spouse where they share stories and bear the burdens of life makes anxiety scores lower, although this figure is not significant. The possession of children did not significantly influence anxiety levels in this study because the number of medical students who are married and having children are few.

Another characteristic that contributes to a lower TMAS score are medical students whose parents are healthcare workers (17.6 compared to 19.6). The factors that protect the mental health of healthcare workers are clear communication and support from the organization, social support, and a sense of control and coping ability (Brier et al., 2020). Over time, along with a decrease in anxiety in healthcare workers, their families have also adapted to the pandemic, thereby reducing the level of anxiety in their families. It is possible that this population have access to clear and unambiguous information on the epidemic, thus protecting them from feelings of uncertainty, which is a risk factor for depression during an infectious epidemic (Huang & Zhao, 2020). Thus, the medical students who come from families with a medical background are easier to adapt to the pandemic situation. It is interesting to note that, compared to healthcare workers, non-medical workers especially enterprise workers tend to develop depressive symptoms. Most enterprise workers have no medical background and have insufficient knowledge about the COVID-19 outbreak. They develop depressive symptoms because of the poor psychological endurance necessary for a pandemic. In addition, many non-healthcare workers were experiencing financial problems as the COVID 19 pandemic affecting their job resulting in the loss of income. This financial problem acts as a predictive factor for depression and anxiety (Ying et al., 2020).

Likewise, medical students who have financial problems and have undergone independent isolation have a higher TMAS score. Financial concerns are associated with greater depressive and anxiety symptoms (Wilson et al., 2020). A study from China, found that those in quarantine experienced monotony, loneliness, irritation, worsening anxiety, and mental distress (Sundarasan et al., 2020). Students who have experienced isolation may feel loneliness. Loneliness is often described as the state of being without any company or in isolation from the community or society (Banerjee & Rai,

2020). It is considered a dark and miserable feeling, a risk factor for many mental disorders like depression, anxiety, adjustment disorder, chronic stress, insomnia, or even late-life dementia. It has been well-documented that long periods of isolation in quarantine for illness have detrimental effects on mental well-being (Banerjee & Rai, 2020). This group of medical students should be further observed because their TMAS score reaches 20. A support system must be provided to facilitate these groups.

Place of living affects anxiety. Medical students living in capital cities have a TMAS score > 21 (22.8), compared to those living in non-capital cities with a score of 18.8. It seems that living in a big city provides different levels of anxiety, information flow, and lifestyles are alleged to be the background for this. Considering DKI Jakarta had the highest number of confirmed cases per one million population (WHO, 2021), one possible explanation is that the rapid transmission of COVID-19 in the capital city of Indonesia may have exacerbated the risk of mental health problems and worsened existing psychiatric symptoms among people living in the capital city.

The blood group difference factor does not appear to have a significant contribution to the level of anxiety, although the survey results showed that medical students with blood type A had the highest mean of TMAS score of 20.5. The study by Cattell et al. (1964), showed that respondents with blood group A are more tender-minded than those with blood group AB, B, O. However, the number of participants have not been reported and the frequency of blood groups is unequal. It is also found that blood groups O and A are significantly different from each other in anxiety (A was higher) and both blood groups are significantly different from the other two groups.

Individuals of different blood types have different ways to respond to stress management. The surface of the membrane of RBCs contain a variety of genetic material (antigen). The blood group A, AB, and B contain H antigen. The N-acetylgalactosamine (sugar) is present on H antigen in blood group A, while, galactose is included in blood group B. Surprisingly, AB group has both terminal sugars. On the other hand, blood group O has no surface antigen. Nitric oxide (NO) is a factor in blood group B persons that may cause to develop mental illness, amnesia, hypertension, etc. It is the hypothesis that blood group B, as well as AB, secrete more. NO also acts as a neurotransmitter in the immune, CVS, reproductive and nervous systems, and its support for recovery from stress situations is much faster than the B and O blood group. Blood group A mostly represents high levels of cortisol which is a stress hormone, so the person is more prone to develop hypertension, hyper cholesterol, Alzheimer's, etc. Therefore, they are more predisposed to develop obsessional neurosis, depression, and stress in personality. Another study informed that people with blood type A had the most emotional sensitivity and stable emotions. But few conducted studies on blood groups and various personality dimensions provide a fragile concept and there is no scientific consensus on these facts. In another study, the author demonstrated that no huge contrast exists among various blood classifications in regards to their character qualities (Iqbal et al., 2019).

Students who preferred online learning during the pandemic had higher anxiety than those who preferred offline learning (19.2 compared to 18.5) although the difference was not significant. One thing that might be the reason is that they were still worried about the transmission of COVID-19 in offline meetings. Students that prefer offline learning experienced difficulties during online learning. We should make further approaches and observations to help them in online learning since it is one of the efforts to reduce the transmission of COVID-19. But the number of students that preferred online learning was higher than those who preferred offline learning during this pandemic. It can be concluded that the online learning method is quite well received by students, even so, there

were almost half of the students preferred offline learning so that we need to make continuous improvements to improve the online learning system we have developed.

Medical schools should take efforts to prevent medical students' exposure to COVID-19. Limitation of contact between medical students and patients must be done to reduce the likelihood of exposure to COVID-19 and overcome the limitations of the provision of PPE. Students undergoing clinical education must be equipped with adequate PPE and the proper use of PPE. Students who have a history of contact or exposure to a positive patient with COVID-19 must be quarantined to prevent the spread of the disease. Medical schools should maintain ongoing follow-up of students who have been exposed and monitor the development of symptoms as they arise. The medical school must also provide medical services for further assistance. Students with an underlying medical condition should be recommended to consult with their physician. For students who have financial problems, schools are expected to help provide the primary and health needs (Chandratre, 2020).

During this pandemic era, medical schools should maintain a virtual connection with students. Online classes held weekly will allow students to connect to one another to share thoughts and struggles. Weekly communication sharing is a proper way to decrease student anxiety. Providing supports through mental health visits with the ability to maintain anonymity will encourage medical students to seek help and receive professional assistance to battle through their negative emotions (Chandratre, 2020).

To this end, early, targeted interventions should be considered and done. Our students started their clinical rotation with extra precautionary actions. We created a certain entrance to and out of the hospital, far from the isolation area and red zone area. They were taught about PPE how to wear and off PPE at the proper place before the clinical rotation began. We designed a comfortable dressing room and restroom with a suitable sterilization method every day. Daily activities in the hospital and working hours were also adjusted to reduce prolonged exposure to the patient. We evaluated the implementation of clinical rotation during the pandemic in the first month, second month, and so on. For medical students who come into contact with COVID-19 patients accidentally, we gave them enough time for self-isolation with online learning so that they did not lose study time. Additional examinations required for tracing patient contacts had been facilitated according to the hospital rules. The academic atmosphere was still alive by actively participating in virtual scientific competitions both nationally and internationally as well as organizing virtual international scientific conferences. We also provided psychiatry consultation if necessary.

Many countries used immediate interventions to enhance psychological resilience and strengthen the healthcare systems' capacity (Bao et al., 2020). Clear communication, limitation of shift hours, provision of rest areas as well as broad access and detailed rules on the use and management of protective equipment could reduce anxiety coming from the perceived unfamiliarity and uncontrollability of the hazards involved. Providing timely and appropriately tailored mental health support through hotline teams, media, or multidisciplinary teams, including mental health professionals is also vital (Chen et al., 2020).

The anxiety level among undergraduate and clerkship students in this study does not show any statistical difference, this arises from those groups having almost same demographic factors and the number of subjects is limited.

This study has several limitations. First, since the data and relevant analyses presented were derived from a cross-sectional design, it is difficult to make causal inferences. Second, the study was limited to the COVID-19 outbreak, and we used a web-based survey method to avoid possible infections, causing the sampling of the study was voluntary and conducted by an online system. Therefore, the possibility of selection bias should be considered. Third, this study cannot explain the heterogeneity between other studies, and caution should be taken when interpreting the results. Another limitation is due to the sudden occurrence of the disaster, we do not have baseline data about anxiety levels of medical students of Universitas Muhammadiyah Surakarta before the COVID-19 pandemic, as a comparison.

## 5. Conclusion

There is no difference in TMAS score between clerkship students and undergraduate students during this pandemic. It seemed that the medical students had a good coping ability during the COVID-19 pandemic indicated by the overall TMAS score that is mostly under 21. Although overall TMAS score is predominantly under 21, those who had financial problems and self-isolation experience should receive more attention. Further evaluation and observation are needed to make sure their psychological conditions.

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