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Medical Students' Vulnerability to Anxiety: Its Frequency and Associated Factors

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Abstract

Medical students are vulnerable populations at risk of mental health problems, particularly anxiety. Specifically, during COVID-19, the prevalence of anxiety among medical students increased rapidly and several factors affected its causes. This study aimed to find out the frequency of anxiety among medical students by using the TMAS questionnaire and factors that significantly contribute to anxiety levels. This cross-sectional study used simple random sampling of undergraduate medical students. The correlation between TMAS scores and several variables was analyzed with the Spearman and Kruskall-Wallis correlation test and also multiple linear regressions. Among 275 respondents, the average age is 18.81 (SD 1.18), dominated by females (62.2%), in their first year (84.4%), non-scholarship (96.7%), lived in boarding houses (57.8%), and academic problem as the dominant cause of anxiety (46.5%). Later, 40.7% were anxious, then age and the year of study were found to be negatively correlated to their anxiety. A survey regarding the preferred form of anxiety therapy by medical students showed that 27.4% of respondents chose relaxation. These results are expected to help the development of future anxiety therapy based on the specific needs of medical students.

Introduction

Medical students are prone to run into mental health problems. Anxiety among medical students has become emerging rapidly during the pandemic of COVID-19. The prevalence of anxiety among medical students was higher than in general populations with a rate of 33.8% among medical students compared to a mere 3% in the general population (Quek *et al*., 2019). That result was similar to research by (Mao *et al*., 2019) which showed the average prevalence of anxiety among medical students in China was 27.22%. Based on the study of anxiety among medical students in Peru, most of them had moderate anxiety (29.8%) and severe anxiety (28%) (Alves *et al*., 2021).

The American Psychological Association defines anxiety as the manifestations of emotions that are characterized by feeling tense, anxious thoughts, and changes in physical conditions such as changes in blood pressure (APA, 2023). Anxiety can be considered as the normal reaction of the body when facing pressure and stressful life events. Nevertheless, if left untreated, anxiety can have consequences in becoming mental health problems. These consequences can give rise to reduced productivity (Hendriks *et al*, 2016). As a result, medical students will experience decreased academic performance, and delay in completing their studies, until they are unable to finish their studies. Later, if they were a doctor, they would have less empathy, care, and interest in treating their patients (Quek *et al*.,

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Several factors affected medical students to be prone to anxiety such as year of study, gender, history of mental health disorders, history of childhood violence, loss of parents, undergoing exams, being burdened by exams, dissatisfaction with exam scores, history of chronic illness, conflict with parents, lack of social supports, and economic disadvantage stemming from low-income backgrounds (Robles-Mariños, 2022; Alves *et al*., 2021; Arisyna, *et al*., 2020). Previous research revealed that anxiety among medical students mostly occurred in their first, second, and fifth year of study (Robles-Mariños, 2022; Arisyna *et al*., 2020). Factors affected significantly medical students were age, gender, year of study, place of residence, supportive environment, type of financing, parents' income stability, and causes of stress (Bandelow & Michaelis, 2015; Yusoff *et al*., 2013; Quek *et al*., 2019; Rahmayani *et al*., 2019; Cao *et al*., 2020).

As medical students are a vulnerable population at risk of having anxiety, anxiety among medical students can be detected and must be treated early. Regarding those issues, this study was carried out as a preliminary study to find out the frequency of anxiety among medical students by using the TMAS questionnaire and factors that significantly contribute to the manifestation of anxiety. We also surveyed to find out what kinds of psychiatric interventions were intended by medical students.

Method

This research was conducted as a cross-sectional design in May – December 2021 through an online survey. The sampling technique was carried out by simple random sampling. The subject of this study was undergraduate medical students from the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada. The population of this study was determined based on the results of the Indonesian Basic Health Survey (Riskesdas) 2018. Based on Riskesdas 2018, the prevalence of Mental Emotional Disorders at the age of ≥15 years in Indonesia was 9.8%. The minimum sample was calculated with a Z score of 1.96 (confidence interval 95%), a margin of error of 0.05, and an estimated proportion of 0.098 was 136. The online survey was filled by 275 students who were studying in their first until the fourth year (batch 2016-2019).

Taylor Manifest Anxiety Scale (TMAS) questionnaire was used as the instrument of this research. TMAS is a self-report questionnaire that consists of 50 questions that require either a "yes" or "no" with a cut-off point >21. TMAS is part of the Minnesota Multiphasic Personality Inventory (MMPI) that has been translated to the Indonesian version with the validity assessment of the instrument indicating sensitivity of 90%, specificity of 95%, positive predictive value (PPV) of 94.7%, and negative predictive value (NPV) of 90.4%. The reliability of the instrument was tested using Kuder-Richardson Formula 20 (KR 20) with the result of r = 0.86 (Wicaksono, 1992). Based on the literature review, factors associated with the level of anxiety symptoms among medical students such as age, gender, year of study (first until fourth year), type of financing (scholarship or non-scholarship), place of residence (living with parents, residing in boarding houses, or inhabiting dormitories/ religious-based dormitories (pesantren), and the specific types of issues that may precipitate anxiety (whether academic, non-academic, or both). We also surveyed to find out the psychiatric interventions that medical students with anxiety would prefer to receive.

Quantitative data such as respondents' demographic and TMAS score category would be analyzed as quantitative descriptive. The correlation between TMAS scores and several variables was analyzed with the correlation test. Numeric variables such as the correlation of TMAS scores with age and year of study were analyzed with Spearman's correlation test. Categorical variables such as the correlation of TMAS scores with gender, place of residence, and the specific types of issues that may precipitate anxiety were analyzed with Kruskall-Wallis' correlation test. Variables that demonstrated a significant correlation (p-value <0.05 were then analyzed using multiple linear regression tests to see the direction of the relationship between these variables and the TMAS score. Descriptive analyses were conducted on data obtained from the survey

regarding the psychiatric interventions that respondents wanted to receive. This research has received ethical approval from the UGM FK-KMK Ethics Committee. The ethical approval letter was issued on September 21 2021 with No: KE/FK/1051/EC/2021. The study participants provided online consent and the study was conducted according to the ethical principles of human studies as enshrined in the Declaration of Helsinki.

RESULT AND DISCUSSION

Respondents' demographic characteristics and TMAS survey results were analyzed descriptively and presented in Tables 1 and 2. Based on Table 1, the average age of the respondents is 18.81 years old (SD 1.18). Most of them were female (62.2%), studying in their first year of school (84.4%), studied with non-scholarship financing support (96.7%), living in boarding houses (57.8%), and academic problems were their dominant problem causing anxiety (46.5%).

Table 2. Anxiety Frequency

TMAS Categories	N	%
Not Anxious	163	59.3
Anxious	112	40.7

Table 1. Respondents' Demographic

Variables		Mean (SD)	
Age		18.81 (1.19)	
Characteristics		N	%
Gender	Female	171	62.2
	Male	104	37.8
Year of Study	First year	232	84.4
	Second year	14	5.1
	Third year	4	1.5
	Fourth year	25	9.1
Types of Financing	Scholarship	9	3.3
	Non-scholarship	266	96.7
Place of Residence	Living with parents	81	29.5
	Residing in boarding houses	159	57.8
	Inhabiting dormitories/ religious-based dormitories (pesantren)	35	12.7
Causes of Anxiety	Academic	128	46.5
	Non-academic	41	14.9
	Both	106	38.5

Table 3. Correlation of Variables with TMAS Scores

Variables (Spearman's correlation test)		Correlation Coefficient	p-value
Age		-0.210	0.000
Year of Study		-0.503	0.000
Variables (Kruskall-wallis' correlation test)		Mean Rank	p-value
Type of Financing	Scholarship	102.22	0.170
	Non-scholarship	139.21	
Causes of Anxiety	Academic	136.56	0.312
	Non-academic	123.44	
	Both	145.37	
Place of Residence	Living with parents	135.28	0.425
	Residing in boarding houses	142.50	
	Inhabiting dormitories/ religious-based dormitories (pesantren)	123.87	
Gender	Male	138.67	0.913
	Female	137.59	

Based on Table 2, the frequency of anxiety among the respondents was 40.7% with a mean TMAS score of 19.67. Based on Table 3, age and year of study are the variables that have significant correlations ($p<0.05$) with the TMAS score.

Table 4. Direction of The Relationship between Significant Variables with the TMAS Score

Variables	Unstandardized B Coefficients	p-value
Age	-2.127	0.000
Year of Study	-4.337	0.000

Based on the results of multiple linear regressions, the R Square value was 0.276. This result means age and year of study affected 27.6% of the total TMAS score meanwhile the remaining 72.4% were affected by other variables. Based on Table 4, Unstandardized B Coefficients of the age and year of study had negative values. It means the correlations of those variables are inversely proportional (negative correlations) with the TMAS Scores. We also surveyed to find out the psychiatric interventions that were preferred by medical students who experienced anxiety. The survey results were analyzed descriptively and presented on the pie chart below (Graphic 1).

Based on Figure 1, most of the respondents wanted to get relaxation practice as their psychiatric intervention (27.4%). This study found out the frequency of anxiety among respondents was 40.7%. This amount of frequency is closely related to the prior study that found the prevalence of anxiety among medical students globally was 33.8% (Quek *et al.*, 2019) and the average anxiety among medical students in Tiongkok was 27.22% (Mao *et al.*, 2019). These findings reinforce the prior statement that medical students are at risk of having anxiety. Factors associated with causing high prevalence of anxiety among medical students were lack of time to study, high demand of academic load, and more frequent and difficult examinations than other non-medical majors (Quek *et al.*, 2019; Ma *et al.*, 2021). The COVID-19 pandemic during the study played a role in triggering anxiety among medical students. The threat and fear of being infected by the SARS-COV-2 virus and shifting learning methods to be online made it difficult for medical students to concentrate and comprehend the subject. Additionally, the implementation of social distancing protocols has further contributed to a reduction in interpersonal communication (Cao *et al.*, 2020; Sadiq *et al.*, 2019; Xiao *et al.*, 2020). Furthermore, a study conducted in Pakistan has revealed that medical students hailing from universities that employ a quantitative assessment system, such as GPA, are more prone to experience heightened levels of anxiety. This assessment system is also utilized by the university where the study was conducted (Ali *et al.*, 2015).

Based on the bivariate test, this study revealed that age has a negative correlation with TMAS scores, indicating that individuals tend to have lower TMAS scores as they get older. This finding is consistent with previous studies

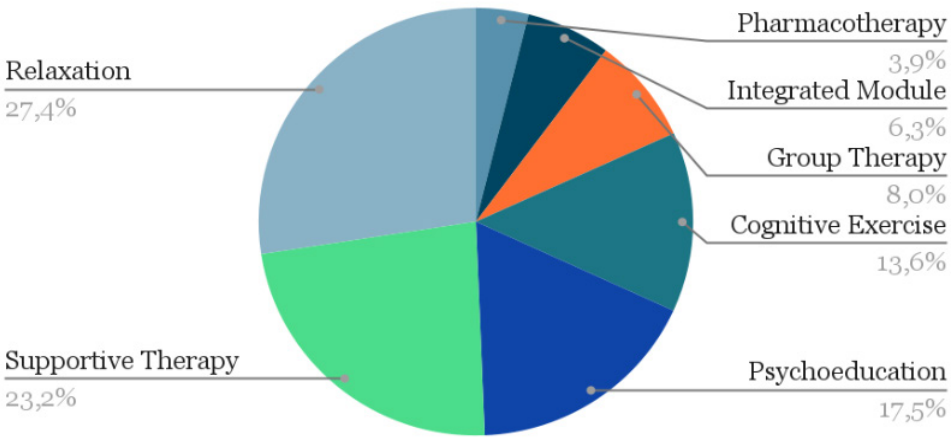

Figure 1. Graph of the Choice of Therapy Methods Preferred by the Respondents

that suggest young people are more susceptible to experiencing anxiety. The average age of the respondents in this study is 18.81 (SD ± 1.19), categorized into the adolescent age group. The adolescent age group is an important period that is marked by emotional changes related to stress management (Rahmayani *et al*., 2019). Older individuals or those who have reached maturity have superior emotional regulation as they have low reactivity to stress and adaptive coping mechanisms (Losada-Baltar, 2021). Previous studies stated that age is related to personality maturity in dealing with stress and their coping mechanism to adapt to anxious conditions (Zouharová *et al*., 2019). An epidemiological study conducted in Germany showed that anxiety disorders are most prevalent among individuals aged 18 to 34 years, with a decline observed as age increases. The lowest prevalence of anxiety disorders was recorded among individuals aged 65 to 79 years (Bandelow & Michaelis, 2015).

The present study has identified that, in addition to age, the college year also exhibits a significant association with TMAS scores. As evidenced by the negative correlation, it is anticipated that a medical student's TMAS score will be higher in the earlier years of study and lower in the subsequent years. It is suitable with previous studies that revealed the ability of individual emotional management affected by their education level. Specifically, the higher the education level, the greater the capacity for rational thinking and assimilating new information. Furthermore, better analytical skills enable individuals to effectively address novel challenges (Bölükbaş *et al*., 2010). Several studies conducted in Malaysia, Indonesia, and Hong Kong have demonstrated that anxiety disorders are more prevalent among medical students in the first and second semesters or the first year of education, compared to the second and third years. However, the prevalence of anxiety disorders increases again in the fourth year. This phenomenon can be attributed to the transition from adolescence to adulthood in their first year of medical school, as well as the shift in educational institutions from high school to university, where social environmental conditions and academic systems differ significantly (Yusoff *et al*., 2013; Chandratika & Purnawati, 2014; Rahmayani *et al*., 2019).

A meta-analysis study, with a specific focus on the global medical student population, discovered that anxiety is more prevalent among female medical students (38.0%, 95% CI: 27.6-49.5%) compared to their male counterparts (27.6%, 95% CI: 19.3-37.8%). However, similar to the result of this current study, the mean difference observed between the genders in this study was also statistically insignificant (Quek *et al*., 2019). Another study, specifically observing anxiety among medical students in the early phase of clinical rotation, revealed that there are insignificant correlations between genders and anxiety levels, but female students exhibited more concern for those around them (Shah *et al*., 2013). Previous studies revealed that gender significantly affected the anxiety level. Female medical students are 2.3 - 11.8 times more susceptible to stress than male medical students due to various psychosocial and biological differences (Ruzhenkova *et al*., 2018; Farhane-Medina *et al*., 2022). It explains that female sexual hormones will reduce the sympathoadrenal and HPA axis response leading to a decrease in cortisol's negative feedback to the brain, resulting in an increased vulnerability to stress (Manuaba *et al*., 2023; Rincón-Cortés *et al*., 2019). Psychologically, females have a higher sensitivity to stress or threats (Burani & Nelson, 2020). An experimental study conducted in animals demonstrated that adult men's testosterone has the potential to have an anxiolytic effect (Domonkos *et al*., 2018).

This study revealed that there is an insignificant correlation between TMAS Score and place of medical students' residence. This result is different from the prior study that revealed place of residence as one of the stress factors associated with anxiety. A lot of medical students are coming from different cities and separating from their parents to study for the first time in their lives. Meanwhile, living with parents and the presence of parents during childhood and adolescence will affect the maturity of individual mental conditions, particularly their ability to manage stress (Rahmayani *et al*., 2019; Cao *et al*., 2020). Another study revealed that an individual who

is in a foreign environment that necessitates a social adaptation process, particularly new sociocultural and habits will be more prone to experience anxiety than an individual who is in a familiar environment. The presence of an unsupportive environment can inhibit the development of an adaptable personality, leading to feelings of boredom, loneliness, stress, and anxiety (Lin *et al*., 2015; Çaksen, 2021; Shao *et al*., 2020; Mehmood *et al*., 2021).

Regarding the type of financing, this study revealed that there is an insignificant correlation between the source of financing and medical students' TMAS scores. The type of financing is typically related to socio-economic ability. As mentioned in a previous study, parents' income stability specifically during COVID-19 was related to psychological pressure and is one of the important factors in anxiety conditions among medical students (Cao *et al*., 2020). Individuals with low socio-economic status and financial difficulties are prone to experience anxiety (Ridley *et al*., 2020). Research conducted in Canada showed that most of the medical students had higher socio-economic status than other populations (Manstead, 2018). Another research conducted in Arab showed that most medical students were supported by high-income parents (Shukri, 2019). People with high socio-economic status had a tendency not to seek or receive scholarships (Dragun, 2020). Nevertheless, in the present study, it remains indeterminate whether the students who were granted scholarships were from underprivileged cohorts, and conversely.

This study revealed that stress among medical students was dominated by academic stress (46.5%) and followed by stress caused by academic and non-academic (38.5%). This result is in line with a previous study by Rahmayani *et al*. (2019) that showed most medical students experienced a high level of academic stress (51.5%) that was measured by the Medical Student Stressor Questionnaire. Stress and anxiety often occur in their first 3 years of study. Academic stress that is associated with anxiety includes being in the period of lectures and examinations, heavy academic load, numerous lecture materials that must be prepared, and lack of sleep (<6 hours a day). The heavy academic workload, which serves as a source of stress and anxiety, encompasses numerous factors, including the extensive volume of material to be mastered, an intensified study load leading up to examinations, a densely packed schedule, engagement in cadaver-related laboratory work or lecture-based learning, pressures exerted by instructors and family, and competition among students. This academic burden is further compounded by internal factors within individual students, such as a deficiency in time management skills, an inability to establish priorities, and disillusionment regarding their chosen profession. Collectively, these factors culminate in a scarcity of time for self-evaluation, a decline in academic performance, and a failure to attain anticipated grades. Consequently, this can lead to feelings of life dissatisfaction, despair, and contemplation of self-harm (Ruzhenkova *et al*., 2018; Yusoff *et al*., 2014).

Currently, various therapeutic methods are available for anxiety, including pharmacotherapy, supportive therapy, group therapy, psychoeducation, cognitive therapy, relaxation techniques, and others. However, previous studies have indicated that the management of mental health issues among medical students and healthcare professionals has not been optimal due to their busy schedules, time limitations, and the presence of intrapersonal, interpersonal, and structural stigmas that limit their access to mental health services (Knaak *et al*., 2017). Therefore, we surveyed to determine the preferred form of anxiety therapy among medical students. In this study, it was found that 27.4% of respondents chose relaxation therapy. Relaxation techniques are known to assist in managing anxiety by activating a "bottom-up" emotional regulation mechanism, involving the reactivation of the amygdala as an emotional region. Additionally, relaxation techniques are capable of inducing alpha brainwave states, which stimulate the release of endorphins. The release of endorphins can induce feelings of comfort and tranquility (Ibrahim *et al*., 2013). Nevertheless, further research with more in-depth methods is needed to explore and develop therapies that are suitable for the needs, preferences, and characteristics of medical students, to enhance their coverage and effectiveness.

Conclusion

From this study, it can be concluded that the frequency of anxiety among medical students is relatively high, and several factors significantly correlated with this anxiety level including age and the year of their current academic enrollment. Despite some limitations in this research, such as the restricted geographical scope to a single university, a predominance of first-year students among the respondents, the self-report form of the questionnaire, and the absence of in-depth qualitative data exploration, the findings of this study are expected to be valuable for future research, particularly in the purpose of addressing and developing anxiety therapies for medical students.

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