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Association between Stress, Depression and Anxiety with Body Fat Percentage among Medical Students of Faculty of Medicine and Health Sciences of Atma Jaya Catholic University

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ABSTRACT

Background and purpose: Medical students have higher rate of stress, depression and anxiety compared to the general population of the same age and are at risk of having high level of body fat percentage. The objective of this study is to determine the association between stress, depression and anxiety with body fat percentage among medical students.

Methods: This is a cross sectional study carried out among 90 undergraduate medical students of Faculty of Medicine and Health Sciences of Atma Jaya Catholic University, North Jakarta, from January to March 2019. Sampling was performed by using the stratified proportional random sampling method. Stress, depression and anxiety were measured with Depression Anxiety Stress Scale 42 and body fat percentage was measured with Bioelectrical Impedance Analysis. Data analysis was performed by using Spearman correlation.

Results: Based on sociodemographic characteristics, the respondents were mostly 19 years old, female and 1st year students. This study shows that 34.4% of respondents had stress, 22.2% had depression and 48.9% had anxiety. This study shows that 62.1% of the male respondents and 32.8% of the female respondents had high body fat percentage. Spearman analysis showed moderate positive correlation between stress ($r=0.505$), depression ($r=0.403$) and anxiety ($r=0.485$) with body fat percentage among the respondents.

Conclusion: There is a significant association between stress, depression and anxiety with body fat percentage among medical students. This study intends to be an input for educational institutions to screen for mental health problems (stress, depression and anxiety) as well as body fat percentage in students that may affect their well-being and learning process so that they can be diagnosed and intervened as early as possible.

Keywords: medical students, stress, depression, anxiety, body fat percentage

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INTRODUCTION

Medical education is an academic education consisting of preclinical and clinical education programs. During this period, students are highly vulnerable to dietary imbalance as they experience transitioning to independent living, having new lifestyle such as making their own food choices and having irregular routines.¹ Thus, adequate nutritional intake is needed to prevent chronic diseases, such as cardiovascular disease, diabetes and osteoporosis.²

Nutritional problems are usually caused by unhealthy lifestyles, such as excessive consumption of fast food

and low activity levels. Fast food has an unbalanced nutritional content, namely high in calories, fat, sugar, sodium and low in fiber.³ A study by Linardakis (2020) among medical students showed that 30.7% were overweight and obese while 67.2% had low consumption of fruits and vegetables.⁴ Another study by Purohit (2015) found that more than 90% of medical students consumed fast food and 35% were overweight and obese. This study also found positive correlation between BMI with blood pressure and negative correlation with oxygen saturation, which may increase the risk of chronic diseases among medical students.⁵

Medical education is a challenging

environment that can have a stressful impact on students' physical and psychosocial health. Medical students have higher rates of stress, depression, and anxiety than the general population of the same age group.^{6,7} A study by Wahed (2017) shows that more than half medical students experienced stress (62.4%), depression (60.2%) and anxiety (64.3%).⁸ Stress in medical students can be caused by busy academic activities, family problems, social problems, financial problems, adaptation to new environments and competition for grades.^{6,7} These issues can cause adjustment disorders which may hamper the students to carry out their functions optimally. These disorders can

manifest in the form of sleep disturbances, concentration problems, eating disorders and emotional disorders.^{6,9}

Stress is an emotional experience that coincides with biochemical, physiological, cognitive and habitual changes associated with these events or effects.¹⁰ Depression and anxiety are two of the most common psychological disorders and usually begin in adolescence and young adulthood.^{11,12} Stress, depression, and anxiety can cause physiological changes in the body by activating the neuroendocrine system involving the hypothalamic-pituitary-adrenal (HPA) axis pathway which stimulates the release of cortisol and catecholamines.^{13,14} Excess cortisol causes excessive fat accumulation.^{9,15-17} A study by Jaaskelainen (2014) found significant association between stress and increased frequency of eating and diet changes in the form of increased consumption of high-fat foods and decreased consumption of vegetables and fruits among adolescents.¹⁸

High levels of fat in the body can cause chronic inflammatory reactions and be a risk factor for various metabolic diseases.¹⁹ Measurement of body fat percentage can be carried out safely and non-invasively with the Bioelectrical Impedance Analysis (BIA) method using a tool that evaluates body composition, including water content and fat content in the body.^{20,21}

Based on the rationale above, the researchers are interested in conducting a study to measure the association between stress, depression, anxiety and body fat percentage among medical students.

METHODS

This is a cross sectional study carried out among undergraduate medical students of Faculty of Medicine and Health Sciences of Atma Jaya Catholic University, North Jakarta, from January to March 2019. The sample size was calculated using the cross sectional formula with level of confidence of 95%, standard deviation of 10% and due to unknown proportion of high body fat percentage in the population, we assumed the proportion by 50% and was calculated based on the total population of 600. A minimum sample of 83 participants were required and we invited 90 participants for this study. Sampling was performed by using the stratified proportional random

sampling method. This method involves the division of the population into strata based on the education years, so the size of the sample strata is proportional to the size of the population strata. Samples were divided into three strata according to academic years, with 32 samples among the 1st academic year students, 28 samples among 2nd academic year students and 30 samples among 3rd year students.

The inclusion criteria were active medical students who were willing to take part in this study. The exclusion criteria were students undergoing a diet program, diagnosed with diabetes and thyroid dysfunction, and undergoing treatment with antiretrovirals, cancer drugs, insulin, psychotropic drugs and corticosteroids.

The dependent variable of this study is the body fat percentage. The independent variables of this study are stress, depression and anxiety. The researcher collected the data by asking selected respondents to fill out informed consent, demographic questionnaire, and the Depression Anxiety Stress Scale 42 (DASS-42) questionnaire. The demographic questionnaire identifies age, gender and academic year among the samples of this study. The DASS-42 questionnaire determines the level and presence of stress, depression and anxiety. DASS-42 consists of 3 categories (stress, depression, anxiety) each consist of 14 items. Every item was scored 0 (did not apply to me at all) to 3 (applied

to me very much, or most of the time). The cutoff score is >14 for stress, >9 for depression and >7 for anxiety. Body fat percentage was measured by Bioelectrical Impedance Analysis. Body fat percentage were classified as normal (8-19.9% in male and 21-32.9% in female) and high ($\geq 20\%$ in male and $\geq 33\%$ in female).

Data analysis included univariate and bivariate analysis using SPSS Statistics 25.

Spearman correlation was used to analyze the correlation between stress, depression, anxiety and body fat percentage among male students, female students, and all respondents. The correlation was analyzed separately among male and female groups as the cut off value for body fat percentage in the two groups was different and to measure the strength of correlation in each group. This study has been approved by the ethical committee of Faculty of Medicine and Health Sciences of Atma Jaya University (No: 05/01/KEP-FKUJ/2019) on January 7, 2019.

RESULTS

Table 1 provides an overview of the demographic characteristics, stress, depression, anxiety levels and body fat percentage of the respondents. In this study, the respondents' age range was 16-22 years, with the largest proportion aged 19 years (32.2%) and women (67.8%).

Table 1. Demographic characteristics of medical students

Variables	f (%)
Age	
16	1 (1.1)
17	1 (1.1)
18	26 (28.9)
19	29 (32.2)
20	26 (28.9)
21	6 (6.7)
22	1 (1.1)
Gender	
Male	29 (32.2)
Female	61 (67.8)
Academic Year	
1 st year	32 (35.6)
2 nd year	28 (31.1)
3 rd year	30 (33.3)

Table 2 shows that among the respondents, 25.6% experienced mild stress and 5.6% severe stress. The results also showed that 16.7% of the respondents experienced mild depression and 5.5% moderate depression. Meanwhile, 26.7% of respondents experienced moderate anxiety, followed by 2.2% respondents with severe anxiety and 1.1% with extremely severe anxiety. Almost half of

the respondents (42.2%) had high body fat percentage, while the rest are within the normal range.

Table 3 illustrates the distribution of stress, depression, anxiety and body fat percentage by demographic characteristics. Stress was identified predominantly in respondents aged 16-19 years old, female and among 1st year students. Similarly, depression was

identified predominantly in respondents aged 16-19 years old and among 1st year students, with the same proportion in both male and female. Although anxiety was also found predominantly in respondents aged 16-19 years old and female, but it was more prevalent among 3rd year students. Meanwhile, high body fat percentage was found predominantly in respondents aged 16-19 years old, female and among 1st and 3rd year students.

Table 4 shows the association between stress, depression, anxiety and body fat percentage among medical students. Spearman Correlation analysis shows a significant relationship and positive correlation between stress and body fat percentage among male ($p < 0.001$; $r = 0.566$) and female ($p < 0.001$; $r = 0.596$) medical students. There is also a significant relationship and moderate positive correlation between stress and body fat percentage among all respondents ($p < 0.001$; $r = 0.505$). The Spearman analysis between depression and body fat percentage showed a significant relationship and a positive correlation among male ($p = 0.010$; $r = 0.473$) and female ($p < 0.001$; $r = 0.505$) medical students. While the Spearman analysis among all the respondents also showed significant relationship and moderate positive correlation ($p < 0.001$; $r = 0.405$) between depression and body fat percentage. It is also shown that Spearman analysis between anxiety and body fat percentage showed a significant relationship and

Table 2. Levels of stress, depression, anxiety and body fat percentage among medical students

Variables	Total (%)
Stress level	
No stress	59 (65.6)
Mild stress	23 (25.6)
Moderate stress	3 (3.3)
Severe stress	5 (5.6)
Extremely severe stress	0 (0)
Depression	
No depression	70 (77.8)
Mild depression	15 (16.7)
Moderate depression	5 (5.5)
Severe depression	0 (0)
Extremely severe depression	0 (0)
Anxiety	
No anxiety	46 (51.1)
Mild anxiety	17 (18.9)
Moderate anxiety	24 (26.7)
Severe anxiety	2 (2.2)
Extremely severe anxiety	1 (1.1)
Body fat percentage	
Normal	52 (57.8)
High	38 (42.2)

Table 3. Distribution of stress, depression, anxiety and body fat percentage by demographic characteristics

Variables	Stress		Depression		Anxiety		Body Fat Percentage	
	No	Yes	No	Yes	No	Yes	Normal	High
Age (years)								
16-19	35 (59.3%)	22 (70.1%)	14 (73.7%)	42 (60%)	35 (70%)	22 (55%)	32 (61.5%)	25 (65.8%)
20-22	24 (40.7%)	9 (29.9%)	5 (26.3%)	28 (40%)	15 (30%)	18 (45%)	20 (38.5%)	13 (34.2%)
Gender								
Male	16 (27.1%)	13 (41.9%)	19 (27.1%)	10 (50%)	12 (26.1%)	17 (38.6%)	11 (21.2%)	18 (47.4%)
Female	43 (72.9%)	18 (58.1%)	51 (72.9%)	10 (50%)	34 (73.9%)	27 (61.4%)	41 (78.8%)	20 (52.6%)
Academic Year								
1 st year	19 (32.2%)	13 (41.8%)	7 (35%)	25 (35.7%)	19 (38%)	13 (32.5%)	19 (36.5%)	13 (34.2%)
2 nd year	19 (32.2%)	9 (29.1%)	4 (20%)	24 (34.3%)	17 (34%)	11 (27.5%)	16 (30.8%)	12 (31.6%)
3 rd year	21 (35.5%)	9 (29.1%)	9 (45%)	21 (30%)	14 (28%)	16 (40%)	17 (32.7%)	13 (34.2%)

Table 4. Association between stress, depression, anxiety and body fat percentage among medical students

	Body Fat Percentage					
	Male		Female		Total	
	p	r	p	r	p	r
Stress	<0.001	0,566**	<0.001	0,596**	<0.001	0,505**
Depression	0,010	0,473**	<0.001	0,505**	<0.001	0,405**
Anxiety	<0.001	0,694**	<0.001	0,494**	<0.001	0,485**

**Correlation is significant

a positive correlation among male ($p<0.001$; $r=0.694$) and female ($p<0.001$; $r=0.494$) medical students. Among all the respondents, Spearman analysis also showed a significant relationship and a moderate positive correlation between anxiety and body fat percentage ($p<0.001$; $r=0.485$)

DISCUSSION

This study is conducted to see the association between stress, depression, anxiety and body fat percentage among medical students. We found that 48.9% of medical students had anxiety, 34.4% had stress and 22.2% had depression. This result is in accordance with studies by Chris (2018) and Wahed (2017), which state that the most prevalent mental health problems among medical students is anxiety followed by stress and depression.^{8,22} Stress, depression, and anxiety in medical students can be caused by packed academic schedule, family problems, social relations, financial problems, adaptation to new environments and competition for grades.^{6,7} This high-pressure environment can lead to chronic stress and interfere with students' performance, leading to anxiety, depression, sleep or eating disorders.^{23,24}

We found 62.1% of male and 32.8% of female had high body fat percentage or classified as obese. This result was similar to a study conducted by Sasongko (2018)²⁵ that showed that most male students have high body fat percentage and Utami (2016)²⁶ that showed that most female students have a body fat percentage within the normal range. In this study, proportion of male students experiencing stress, depression and anxiety was higher than

male students without stress, depression, and anxiety which may lead to changes in body fat percentage accounting for the higher proportion of male students with high body fat percentage.

Changes in body fat composition can be caused by various factors, including diet, physical activity, physical and mental illness, hormonal disorders and stress.²⁷ Stress can lead to eating disorders, namely excessive eating behavior such as binge eating or under-eating. In stressful situations, an increase of glucocorticoid hormones can increase appetite and activate the sympathetic nervous system which can also reduce appetite.²⁸ Glucocorticoid hormones can also affect the choice of food types into foods high in fat and sugar, thus leading to increased body weight and visceral fat.¹⁵ Mirza (2018) states that 92% of medical students consume junk food more than once a week. Excessive consumption of junk food can increase body fat levels and increase the risk of developing metabolic syndrome.²⁹

The Spearman analysis showed a significant relationship and moderate positive correlation ($r=0.505$) between stress and body fat percentage among medical students. Study by Jaaskelainen (2014) showed an association between stress and increased eating frequency, increased consumption of high-fat foods and decreased consumption of vegetables and fruit among adolescents.¹⁸ Pool (2015) stated that in stressful situations, people tend to choose a diet high in calories and fat as a way to reduce stress symptoms.³⁰ In stressful situations, the HPA axis activates, resulting in increased cortisol release. Cortisol stimulates gluconeogenesis and fat relocation to visceral fat cells.¹³⁻¹⁵ Study by Purwanti (2017) shows that there is a

significant association and a positive correlation between stress and obesity among medical students.³¹ Sinha (2013) also found an association between chronic stress and fat accumulation in the body.³²

We also found moderate positive correlation ($r=0.405$) between depression and the body fat percentage among medical students. Study by Lassere et al (2014) and Khotibuddin (2017) showed a significant relationship and a positive correlation between depression and obesity among medical students.^{33,34} Faith et al (2011) stated that depression can cause obesity through several mechanisms such as hyperphagia, insomnia and physical inactivity.³⁵ Meanwhile, study by Wahed (2017) shows no association between depression and obesity among medical students. This study stated that obesity is associated with recurrent major depressive episodes in adults but does not occur in a single depressive episode.⁸

Meanwhile, there was also a significant relationship and moderate positive correlation ($r=0.485$) between anxiety and body fat percentage. Study by Wahed (2017) shows a significant association and positive correlation between anxiety and obesity.⁸ In contrast, study by Masdar (2016) shows no association between anxiety and obesity. This can be caused by other factors contributing to individuals' nutritional status.³⁶

Hopefully this study can provide an input for educational institutions to screen for mental health problems (stress, depression and anxiety) as well as body fat percentage in students that may affect their well-being and learning process so that they can be diagnosed and intervened as early as possible. Mental health problems among medical students should be screened by questionnaires every semester and should be addressed by facilitating consultations. Limitations of this study include the presence of other confounding factors, such as physical activity, nutritional intake, socio-economic status, and other illnesses that may affect the body fat percentage that were not explored in the study. Future study should take into account these factors to gain a better understanding about the issues.

CONCLUSION

This study reports the correlation between stress, depression and anxiety among students of Faculty of Medicine and Health Sciences of Atma Jaya University, North Jakarta. There were 34.4% respondents with stress, 22.2% with depression and 42.2% with anxiety. Meanwhile 42% of all respondents had high body fat percentage, in which 62.1% of male and 32.8% of female had high body fat percentage.

There is a significant association between stress, depression, anxiety and body fat percentage among male and female medical students. Stress, depression and anxiety symptoms may disrupt learning process among students and may also lead to body fat increase. High levels of fat in the body can cause chronic inflammatory reactions and be a risk factor for various metabolic diseases. Screening on mental health problems, counseling and supports should be provided by the medical school to enhance their students' wellbeing. Future study is expected to be able to explore more factors with a larger sample size.

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AUTHOR CONTRIBUTION

SD, RT, and SH designed and conceptualized the study. SD collected and analyzed the data. SD, RT and SH edited the manuscript and reviewed the study proposal.

CONFLICT OF INTEREST

No conflict of interest declared by the authors.

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