STRESS, ANXIETY, AND DEPRESSION RELATIONSHIP AMONG UNDERGRADUATE MEDICAL STUDENTS AND THEIR FINAL EXAM MARK

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Abstract

Medical students often experiencing a stressful environment in their medical school. Stress occurred in students that currently studying for examinations. Higher stressor expose leads to higher levels of anxiety and depression. High level of stress declines cognitive functioning and learning process in their medical academic process and cause mental health impairment. A prospective cross-sectional study with 26 end-stage medical students as a participant, the participant ordered to fill 3 section questionnaire that measures stress, anxiety, and depression. Final exam mark obtained from Indonesian Medical Education Institution Association (AIPKI) one month after the exam held. There is no significant relationship between stressor in all domain and anxiety, and there is a significant relationship between academic related stress,

social related stress, and depression. There is no significant difference between stress, anxiety, depression and their final exam mark. In conclusion, there is a strong relationship between stress that leads to depression in undergraduate medical students. Therefore, a good coping mechanism of stress should be well managed in medical students.

1. Introduction

Medical students often experiencing a stressful environment in their medical school that may apply a negative effect on the academic performance as well physical and mental health problems (Saipanish, 2003; Sherina, Rampal, & Kaneson, 2004). At least seven out of 10 people of United States present a stress or anxiety condition their daily activities (Beiter et al., 2015). Stress reported often occurred in students that currently studying for examinations Sherina, Rampal, & Kaneson, 2004). Medical students reported exposed to more stressor that leads to higher levels of anxiety and depression than the general population in the same group age (Saravanan et al., 2014).

High level of stress declines cognitive functioning and learning process in their medical academic process. Mental health impairment also reported on medical students that exposed high level of stress (Abdulghani et al., 2011). Medical students also reported suffering from anxiety and depression as their coping mechanism of stress. A different prevalence of depression among countries approximated at 27.1% in Malaysia, 29.1% in India and 43.8% in Pakistan. However, it tends to be lower in European countries such as Greece at 10.4% (Saravanan et al., 2014). Whilst anxiety records a higher prevalence than depression, which 54.5% in Malaysia, 56% in India, and 43.7% in Pakistan (Saravanan et al., 2014).

Depression and anxiety that suffered in a medical student can be caused by fearfulness of examination. It also may lead to interrupt how a medical student should be (Sharma & Wavare, 2013). Whilst this impaired psychological condition may cause medical student has a horrible management of time, decreasing self-confidence and self-esteem and affect academic quality such as exam mark (Beiter et al., 2015). Study on students who dropped out from medical school reveals that mostly caused by psychological issues such as anxiety, depression, and less motivated issues rather than personal academic performances itself (Rotenstein et al., 2016).

There are few studies on stress among medical students and its correlation between anxiety and depression that affect their final exam mark as well. This study aims to determine the relationship between stress, anxiety, and depression and find a significant difference between this aspect with students' exam mark.

2. Methods

2.1. Participants

In this prospective cross-sectional study, participants were 26 end-stage medical students, that will face their final exam in private university in Indonesia. A sample was chosen by simple random sampling procedure, and have met the inclusion criteria of the study.

2.2. Measures

The questionnaire package used in this study divided into three sections. A Medical Student Stressor Questionnaire (MSSQ) were used in this study to measure the students' stressor (Yusoff, Rahim, & Yaacob, 2010). To measure anxiety, we used Hamilton anxiety scale (Hamilton, 1959). Depression was measured using Patient Health Questionnaire (PHQ-9).

2.2.1. Medical Student Stressor Questionnaire (MSSQ)

The medical student stressor questionnaire contains 40 questions that differs from six different stressor domains, Academic Related Stressors (ARS), Interpersonal & Intrapersonal Related Stressor (IRS), Teaching and Learning-Related Stressor (TLRS), Social Related Stressor (SRS), Drive and Desire Related Stressor (DRS) and Group Activities Related Stressor (GARS). Each participant was told to fill the rating scales of each question between 0, which means 'causing no stress at all' to 4, means 'causing severe stress'. Every question then grouped into each domain and calculated the mean score of each domain. Score $0 - 1.00$ means a mild stress, $1.01 - 2.00$ a moderate stress, $2.01 - 3.00$ a high stress, and $3.01 - 4.00$ cause a severe stress (Yusoff et al., 2010).

2.2.2. Hamilton anxiety scale

Hamilton anxiety rating scale used to measure individual anxiety levels. The questionnaire contains 14 questions. Each item scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0-56, where <14 indicates no anxiety, 14-20 mild severity, 21-27 moderate severity, 28-41 severe anxiety and >42 very severe anxiety (Hamilton, 1959).

2.2.3. Patient Health Questionnaire (PHQ-9)

PHQ-9 is an instrument for screening, diagnosing, monitoring and measuring the severity of depression that incorporates with DSM-IV depression criteria. The instrument contains 9 questions. Each item scored on a scale of 0 (not present at all) to 3 (nearly every day). Total score range of this instrument vary from 5-9 with minimal symptoms, 10-14 a minor depression, 15-19 moderate to severe depression, and >20 with severe depression (McNicholas et al., 2012).

2.3. Procedure

Following the granting of ethical approval from the University ethics committee, medical students who enrolled for this study were ordered to fill the three sections questionnaire two weeks before their final exam starts. Final exam mark was obtained from Indonesian Medical Education Institution Association (AIPKI) one month after the exam held.

2.4. Analysis

Data obtained from the questionnaire and final exam marks were collected into the table. To analyze the correlation between stress and anxiety and depression, Fisher's exact test were used in this study. One way AovaNOVA used to analyze the correlation between stress, anxiety, depression and final exam mark. All data were analyzed using SPSS version 23.0 (SPSS Inc.)

3. Results

3.1. Prevalence of Stress, Anxiety, and Depression

The prevalence level of stress, depression, and anxiety among the sample is shown in Table 1. Most of the sample (34.6%) present a minimal level of depression and most of them (42.3%) are not seen any sign of anxiety. 53.8% sample suffer a moderate level of academic stress caused by the final exam.

Table 1: *Prevalence of Stress, Anxiety, and Depression*

		n (%)
Academic-related stress	Mild	3 (11.5)
	Moderate	14 (53.8)
	Severe	8 (30.8)
	Very severe	1 (3.8)
Interpersonal & Intrapersonal Related Stressor	Mild	8 (30.8)
	Moderate	12 (46.2)

	Severe	5 (19.2)
	Very severe	1 (3.8)
Teaching and Learning-Related Stressor	Mild	5 (19.2)
	Moderate	16 (61.5)
	Severe	3 (11.5)
	Very severe	2 (7.7)
Social Related Stressor	Mild	12 (46.2)
	Moderate	10 (38.5)
	Severe	2 (7.7)
	Very severe	2 (7.7)
Drive and Desire Related Stressor	Mild	10 (38.5)
	Moderate	9 (34.6)
	Severe	5 (19.2)
	Very severe	2 (7.7)
Group Activities Related Stressor	Mild	6 (23.1)
	Moderate	15 (57.7)
	Severe	4 (15.4)
	Very severe	1 (3.8)
Anxiety	Not seen	11 (42.3)
	Mild	7 (26.9)
	Moderate	4 (15.4)
	Severe	2 (7.7)
	Very severe	2 (7.7)
Depression	Not Seen	7 (26.9)
	Minimal	9 (34.6)
	Mild	3 (11.5)
	Moderate-severe	5 (19.2)
	Severe	2 (7.7)

3.2. The Relationship between Gender, Stress, and Anxiety

Table 2 indicates no significant relationship between gender and anxiety as well stress in six different domain and anxiety.

Table 2: *Relationship between Gender, Stress, and Anxiety*

	Anxiety		Sig
	No anxiety	**Mild to Severe Anxiety**	
Gender			
• **Male**	8	7	
• **Female**	3	8	0.246
Stress			
ARS			
• **No stress**	3	0	
• **Stress**	8	15	0.63
IRS			
• **No stress**	4	4	
• **Stress**	7	11	0.683
TLRS			
• **No Stress**	4	1	
• **Stress**	7	14	0.128
SRS			
• **No stress**	6	6	
• **Stress**	5	9	0.692
DRS			
• **No stress**	5	5	
• **Stress**	6	10	0.689
GARS			
• **No stress**	3	3	
• **Stress**	8	12	1.000

3.3. The Relationship between Gender, Stress, and Depression

Table 3 indicates no significant relationship between gender and depression sign and symptoms. Meanwhile, there is a significant relationship between stress and depression, especially in academic related stressor ($p = 0.013$) and social related stressor ($p = 0.026$).

Table 3: *Relationship between Gender, Stress, and Depression*

	Depression		Sig
	No depression	**Mild to Severe Depression**	
Gender			
• **Male**	4	11	
• **Female**	3	8	1.000
Stress			
ARS			
• **No stress**	3	0	
• **Stress**	4	19	0.013*
IRS			
• **No stress**	4	4	
• **Stress**	3	15	0.149
TLRS			
• **No stress**	3	2	
• **Stress**	4	17	0.101
SRS			
• **No stress**	6	6	
• **Stress**	1	13	0.026*
DRS			
• **No stress**	2	8	
• **Stress**	5	11	0.668
GARS			
• **No stress**	1	5	
• **Stress**	6	14	1.000

*P value less than 0.05 indicate as significant

3.4. Final Exam Mark and Difference between Stress, Anxiety, and Depression

The medical students' final exam was 200 multiple choice questions at 200 minutes with a computerized based test. Of all 26 samples, mean of final exam mark were at 73.69 ± 5.07. We try to look forward every chance to see if there is any significant difference between stress, anxiety, depression and their final exam mark. As it looks in Table 4, there is no significant difference between stress, anxiety, depression and final exam mark.

Table 4: *Difference between Stress, Anxiety, Depression, and Final Exam Mark by One-Way ANOVA Analysis*

	Sig
Academic-related stress	0.216
Interpersonal & Intrapersonal Related Stressor	0.615
Teaching and Learning-Related Stressor	0.100
Social Related Stressor	0.123
Drive and Desire Related Stressor	0.335
Group Activities Related Stressor	0.455
Anxiety	0.310
Depression	0.179

4. Discussion

The stability of human internal behavior is built from complex factors, including intrinsic or extrinsic strength and physical or psychological stimuli, known as stressors. Coordinated physiological processes that maintain most of the stable state in organisms are called homeostasis (Chrousos & Gold, 1992; Tafet & Bernardini, 2003). Homeostasis cannot by itself ensure the stability of the body system under stress. Stress is defined as the body's response to all types of exposure (Fink, 2010). Therefore, adaptation is needed as a flexible process by the Central Nervous System (CNS), which involves the processing of sensory information, integration with prior experience, neural endocrine and neuroendocrine adjustments, and planning of behavioral responses to facilitate the functioning of adaptive nerve pathways (Tafet & Bernardini, 2003).

Many areas of the brain are very large for glucocorticoid targets, especially hippocampus (McEwen et al., 2012a). Thus, nerve injury on the hippo campus, which is produced by excessive and continuous exposure to cortisol, and successive damage to control feedback at the supra

hypothalamic level, can cause cortisol to fail to control its own production during chronic stress (Gold, Goodwin, & Chrousos, 1988; McEwen, 1998). In addition, these limbic organs are controlled by several neural pathways, which involve a serotonergic response from the raphe nucleus, most of the median raphe nuclei, which innervate several fore brain organs, especially the hippocampus (Herrero, Sandi, & Venero, 2006; Hunter et al., 2007; Munhoz et al., 2010). This system has a strong relationship in tolerance for negative stimuli and negative emotional involvement (Smelik, 1987). In addition, the miscarriage of the serotonergic pathway is related to the powerlessness of learning which is triggered by stress and continuous depression as well (Pawlak et al., 2003).

Simultaneously, glucocorticoid mediated the occurrence of chronic stress induced transcripts are controlled by cocaine-amphetamine (CART) in the hippocampus (Hunter et al., 2007). In the hippocampus, CART's arrangement-up was associated with a form of resistance to the anxiety-generating effects of stress (McEwen et al., 2012b). The subtlety and complexity of the adrenal steroid actions expressed by this and others (Joëls, 2006; Joëls et al., 2006), reminds them of their role in the modulation of the immune system (Sapolsky, Romero, & Munck, 2000), including pro-inflammatory and anti -inflammatory (Munhoz et al., 2010). It is said that there is a correlation between levels of serotonin with adaptability of individuals experiencing anxiety disorders and locomotor behaviour (Antoniou et al., 2008; Pawlak et al., 2003), corticosteroid receptor concentrations (Herrero et al., 2006), CART peptide expression (McEwen et al., 2012a), and cytokine expression (Pawlak et al., 2003). The author argued that it should be a more comprehensive understanding is needed to explain about systems that play a role in creating variations of individual behavior so that it can help explain about the existence of some individuals who experience anxiety and mood disorders while others seem not to experience it.

Limitation of this study, we use a little amount of sample; 26; since only 31 students in that period took the final exam. A larger amount of sample in a larger population would give a better understanding of these correlations. We suggest in the next study, a larger scope of a population from a various university can be used in a whole prospective year, to result in a better data.

5. Conclusion

In conclusion, there is a strong relationship between stress that leads to depression in undergraduate medical students that will face their final examination. Therefore, a good coping

mechanism of stress should be well managed by medical students to maintain a good academic performance and to avoid mental health impairment.

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