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Prevalence of Hypertension and Its Relationship with Stress Levels among Medical Students in Jakarta, Indonesia

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Abstract

Background: Stress can occur in all groups, including late adolescents and university students. Repetitive and persistent exposure to stress can induce many other conditions, one of which is hypertension. The presence of risk factors could increase the prevalence of hypertension. This study aimed to determine the relationship between stress levels and the prevalence of hypertension in pre-clinical medical students.

Methods: This study used an analytical observational design with a cross-sectional approach and simple random sampling of 212 pre-clinical medical students at the Atma Jaya Catholic University of Indonesia. The measuring instrument was the K10 questionnaire, followed by blood pressure screening. The Kruskal-Wallis test using SPSS facilitated the univariate and bivariate data analysis.

Results: The majority of the 212 respondents were female (61.8%), aged ranging from 18–21 years. Stress was identified in 49.1% of respondents, with mild stress (20.3%), moderate stress (15.6%), and severe stress (13.2%). Hypertension was detected in 11.8% of respondents, with 9.4% and 2.4% as grade 1 and 2 hypertension, respectively. High-normal blood pressure was detected in 20%. There was no significant relationship between stress levels and the prevalence of hypertension among these pre-medical students (p-value for systolic pressure= 0.1318 and p-value for diastolic pressure= 0.8314).

Conclusions: Although there is no relationship between stress levels and hypertension in medical students, however, concerns need to be emphasized regarding the prevalence of hypertension. Further thorough evaluation and intervention are needed to prevent future complications in future medical doctors. Therefore, a healthy lifestyle is encouraged.

Keywords: Medical students, prevalence of hypertension, stress level

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Introduction

According to the World Health Organization (WHO), the age of 17–25 years is classified as late adolescence,[1] which is a productive period and a transition period from adolescence to adulthood. During this period, late adolescents usually enter college or can be referred to as students. Students, especially medical students, have high levels of stress, as evidenced in several countries such as Pakistan (60%), Thailand (61%), and Malaysia (42%).[2] The prevalence of young people experiencing stress worldwide is 38–71%, meanwhile in Asia it is 29.6–61.3%.[3] The WHO defines stress as any change that causes emotional, psychological, and physical strain.[4]

Stress can affect social, academic, and work life. Stress in students often has an impact on the educational environment. They must complete their education along with the obstacles that occur during the learning

process, such as piling up assignments, repeating years, and other obstacles that can worsen the state of stress in students. Research from Spain found that 34.5% of students in the study population experienced stress.[5] Stress has three levels, namely mild, moderate, and severe. Mild stress is short-term and can be felt by everyone in general. Moderate stress occurs for several days, while severe stress occurs within a few weeks to several years.[6] Stress can cause many other conditions, one of which is hypertension.[4] Continuous and repeated exposure to stress can provide a sympathetic nervous system response that will cause overactivity of the sympathetic nervous system and the hypothalamic-pituitary-adrenocortical axis. Furthermore, there will be activation of the adrenal glands and the release of catecholamines. This will lead to an increase in blood pressure and hypertension.[7–9]

Hypertension is an epidemic disease that occurs worldwide and is now starting to occur at a younger age. Based on the International Society of Hypertension Global Hypertension Practice Guidelines 2020, hypertension can be classified into several levels, which are normal, high-normal, grade 1 hypertension, and grade 2 hypertension.[10] Hypertension in late adolescence was found to be 18.9% in Indonesia and was more common in male than female.[11] According to data from the National Health and Nutrition Examination Survey (NHANES) in 2017–2020, hypertension increases with age.[12] However, it does not rule out the possibility of hypertension at younger age. This study aimed to determine the relationship between stress levels and the prevalence of hypertension in pre-clinical medical students.

Methods

This study was a descriptive observational study with a cross-sectional design conducted in July–September 2023 involving first-, second-, and third-year medical students (admittance of 2020, 2021, and 2022) at the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. A systematic random sampling method was used. All respondents have signed informed consent. Ethical clearance has been obtained from the Research Ethics Committees of School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia number 12/06/KEP-FKIKUAJ/2023.

Data on gender, history of hypertension, comorbidities, psychiatric history, and stress level were obtained by filling in personal data and questionnaires online via Google Forms. Respondents' stress levels were assessed using the Kessler Psychological Distress Scale (K10) questionnaire (Table 1) and then classified into four levels, namely well/normal (score <20), mild (score 20–24), moderate (score 25–29), and severe (score ≥30). Respondent's blood pressure (BP) was measured using a sphygmomanometer twice on different days. Hypertension was classified into normal BP (systolic blood pressure (SBP) <130 mmHg and diastolic blood pressure (DBP) <85 mmHg, high-normal BP (SBP 130–139 mmHg and/or DBP 85–89 mmHg), grade 1 hypertension (SBP 140–159 and/or DBP 90–99 mmHg), and grade 2 hypertension (SBP ≥160 and/or DBP ≥100).

Data were analysed using the Statistical Package for Social Science (SPSS) software version 23.0. Univariate analysis was

Table 1 Kessler Psychological Distress Scale (K10) Questionnaire

Questions	Answer Options and Score				
For the last 30 days do you ever feel?					
Tired out for no good reason	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Nervous	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
So nervous that nothing could calm you down	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Hopeless	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Fidgety	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
So restless that you could not sit still	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Depressed	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Feel that everything was an effort	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Feel so bad that nothing could cheer you up	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Worthless	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)

Note: Score 1 for never, 2 for rarely, 3 for sometimes, 4 for often, and 5 for always

Table 2 Distribution of Stress Levels and Hypertension By Gender (n=212)

Variable	Gender		Total n (%)
	Male (n=81) n (%)	Female (n=131) n (%)	
Stress levels*			
Normal	47 (58)	61 (46.6)	108 (50.9)
Mild	14 (17.3)	29 (2.1)	43 (20.3)
Moderate	12 (14.8)	21 (16.0)	33 (15.6)
Severe	8 (9.9)	20 (15.3)	28 (13.2)
Hypertension classification			
Normal blood pressure	41 (50.6)	103 (78.6)	144 (67.9)
High-normal blood pressure	24 (29.6)	19 (14.5)	43 (20.3)
Grade 1 hypertension	15 (18.5)	5 (3.8)	20 (9.4)
Grade 2 hypertension	1 (1.3)	4 (3.1)	5 (13.2)

Note: *Stress levels based on the Kessler Psychological Distress Scale, normal blood pressure= systolic blood pressure (SBP) <130 mmHg and diastolic blood pressure (DBP) <85 mmHg, high-normal blood pressure= SBP 130–139 mmHg and/or DBP 85–89 mmHg), grade 1 hypertension= SBP 140–159 and/or DBP 90–99 mmHg, grade 2 hypertension= SBP ≥160 and/or DBP ≥100

Table 3 Relationship between Stress and Prevalence of Hypertension in Medical Students

		n (%)	Blood Pressure	
			p-value SBP	p-value DBP
Stress levels	Normal	108 (50.9)	0.1318	0.8314
	Mild	43 (20.3)		
	Moderate	33 (15.6)		
	Severe	28 (13.2)		

Note: * the Kruskal-Wallis test, significant at p<0.05, SBP= systolic blood pressure, DBP= diastolic blood pressure

conducted to assess the distribution of data on age, gender, academic year, stress level by gender, and prevalence of hypertension by gender which were then presented in tabular form. Bivariate analysis was conducted to assess the relationship between stress level and prevalence of hypertension in students, which in this study used the Kruskal-Wallis test.

Results

Of the 212 respondents, the majority of respondents were female (61.8%), with the mean age was 19.55 years (ranging from 18–21 years). Stress was identified in 49.1% of respondents, with mild stress (20.3%), moderate stress (15.6%), and severe stress (13.2%). Meanwhile, respondents with a normal stress level were 50.9% (Table 2).

Hypertension was detected in 11.8% of respondents, with 9.4% and 2.4% as grade 1 and 2 hypertension, respectively. High-normal blood pressure was found in 20.3% of respondents. Hypertension was found more in male than female (19.8%) (Table 2).

There was no significant relationship between stress levels and the prevalence of hypertension among these pre-medical students (p-value for SBP= 0.1318 and p-value for DBP= 0.8314) (Table 3).

Discussion

The age range of respondents in this study was 18–21 years. This age range is categorized as late adolescence. Although late adolescence is a productive age, onset of diseases could begin in this age.[13]

The results of the study showed that 49.1% of students experienced stress with varying levels of stress. Another study supports this finding that stress can occur among students, especially medical students, due to various factors, one of which is related to their studies, including learning materials, exams, and other factors.[14] Apart from that, stress can also occur due to the course load experienced by students, such as many assignments and exams when preparing their thesis and other things. A lack

of self-confidence and an unhealthy lifestyle can also cause stress.[14] In addition to these factors, stress is also influenced by gender. Stress is usually more common in female than male, which aligns with the results of other studies conducted on medical students in Indonesia. This can occur due to the hormones estrogen and progesterone which can make it easier for them to feel anxiety, feelings of guilt, sleep disorders, and eating disorders.[14]

This study shows a fairly high prevalence of hypertension among students. This result is in line with another research on the level of hypertension in students which shows that several students experience hypertension and begin with pre-hypertension, which worsens into hypertension.[13] Many factors support the occurrence of hypertension among students, one of which is an insufficient daily lifestyle. In general, hypertension occurs in old age, but it does not rule out the possibility that hypertension can occur in late adolescence and is usually primary essential hypertension. This finding is supported by another study which state that about 70% of the incidence of hypertension among adolescents are primary hypertension.[15] Although the exact cause is unknown, several things can affect it, such as adolescents' lack of interest in having health checks and managing a good lifestyle.[16] Gender also affects the occurrence of hypertension. Based on the results, male have more hypertension than female. This may be influenced by the estrogen hormone in female, which can increase high-density lipoprotein (HDL) cholesterol levels and protect women from increased blood pressure and its complications, such as thickening of blood vessel walls or atherosclerosis. In addition, estrogen can also affect the elasticity of blood vessels, thus affecting blood pressure in female.[16,17]

Bivariate analysis using Kruskal-Wallis shows no relationship between stress levels and the prevalence of hypertension. This study is in line with other research, which also found no association between stress levels and the incidence of hypertension.[18,19] These results can be caused by several factors, for an example, when the data was collected, respondents were not experiencing stress or serious problems that could cause prolonged stress. Stress is one of the risk factors for hypertension, and individuals who experience stress are more at risk of developing hypertension than those who are not stressed. A person who is under stress will experience an increase in the main stress hormones (adrenaline, thyroxine and cortisol), which can significantly affect homeostasis. Adrenaline acting on the sympathetic nervous system will cause vasoconstriction.[7–9,20] This will affect the increase in heart rate and blood pressure.[21] Nevertheless, the percentage of stress and hypertension among pre-clinical students is relatively high, indicating a need for interventions promoting healthy lifestyles to help prevent stress-related hypertension.

The limitation of this study lies in one of its data collection methods, which relies on the use of questionnaires. This approach opens up the possibility for respondents to misunderstand the intended statements or be dishonest when filling out the questionnaire sheets, which could potentially lead to different outcomes. To mitigate the issue, several measures are suggested, such as incorporating follow-up interviews to verify and expand responses.

In conclusion, hypertension is found in almost 12% of young pre-medical students. There is no significant relationship between stress levels and the prevalence of hypertension. However, concerns need to be emphasized regarding the prevalence of high-normal blood pressure and hypertension at a young age, especially among pre-medical students. High-normal blood pressure could progress to hypertension over time. Therefore, implementing a healthy lifestyle is crucial in preventing hypertension. Further thorough evaluation and intervention are needed to prevent future complications in these medical professionals.

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