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Understanding Hypertension Risk among Undergraduates in Ahmad Dahlan University, Indonesia.

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ABSTRACT

Background: Hypertension remains a serious public health issues globally, affecting almost all groups, including the younger population. The purpose of this study was to explore hypertension understanding among students at Ahmad Dahlan University, Indonesia. **Method:** A structured, interview-directed questionnaires, was used in this cross-sectional offline study. The study population comprised undergraduates' students of university situated in Ahmad Dahlan University. The sample of this study amounted to 394 people through the calculation of the sample size with the Slovin approach. **Results**: A total 394 participants took part in the study comprising 50 (12,69%) medical undergraduate students and 344 (87,31%) non-medical undergraduate students. The logistic regression model indicated that the logistic regression model indicated that family history (AOR = 0.190; 95% CI = 0.097 – 0.374; p-value = 0.000), alcohol consumption behaviors (AOR = 0.078; 95% CI = 0.021 – 0.287; p-value = 0.000), and stress (AOR = 0.712; 95% CI = 0.516 – 0.982; p-value = 0.038) among undergraduates are associated with hypertension. Meanwhile, age, sex, smoking, coffee drinking routines, and physical activity were indicated to have no relationship with hypertension. **Conclusion**: In this study, it was concluded that the risk factor of hypertension were family history, stress, and alcohol consumption. These finding highlight that focus surrounding hypertension prevention should shift toward individual risk profiling and should be tailored toward and individual's specific needs.

Introduction

Hypertension continues to be a public health problem globally. Hypertension is established when the systolic blood pressure exceeds 140 mmHg and the diastolic blood pressure exceeds 90 mmHg [1]. The World Health Organization (WHO) has recorded that if 1.13 billion people globally suffer from hypertension [2]. WHO estimates that by 2025 hypertension will reach 1.5 billion people and cause 9.4 million deaths per year in the world and 1.5 million deaths per year in Southeast Asia due to hypertension and its complications [3].

Hypertension is often called "the silent killer" because it is often without complaints, so the patient does not know that he has hypertension, but later finds himself already having complications or complications from hypertension. According to the 2018 Basic Health Research in Indonesia, the prevalence of hypertension among Indonesians aged 18 and up has risen to 34.11%. In Indonesia, 8.4% of adults aged 18 and up had hypertension diagnosed by a doctor [4]. Yogyakarta Province ranks fourth in terms of high hypertension cases, with 11.01% compared to the national incidence of 8.8% [4]. According to the National Basic Health Survey, the incidence of hypertension among young people (18-24 years) in Indonesia increased by 13.2% in 2018 [5]. Therefore, people throughout youth and adulthood may be at risk of acquiring hypertension [6].

Hypertension is caused by a variety of causes, including those that cannot be modified and those that can. Surya et al. (2022) evaluated 20 prior research and concluded that seven risk factors were connected with the occurrence of hypertension in adolescents: education, physical activity, obesity, smoking, nutritional status, diet, and lifestyle. Lifestyle has a significant impact on the occurrence of hypertension. Lifestyle, especially among teens, is changing and seems to worsen [7].

Students are the age group that starts to become independent individuals as they transition from adolescence to adulthood. People will go through a phase shift in their lifestyle when they start to struggle to sustain it. College students who undergo lifestyle changes are more prone to engage in unhealthy habits including smoking, eating an imbalanced diet, and not exercising. These changes in lifestyle may contribute to hypertension [8].

Higher education is an atmosphere that contributes significantly to the prevention of hypertension. Universitas Ahmad Dahlan (UAD) is a private university in Yogyakarta with a total enrollment of 26,200 students. Students are intellectuals who can aid the government by acting as change agents with the power to improve the situation, including the hypertension problem. Students are expected to lower the incidence of hypertension cases by preventing hypertension early on and implementing a healthy lifestyle in the university setting [9]. Therefore, this study aims to explore the risk factors for hypertension in students at Ahmad Dahlan University Yogyakarta, Indonesia. If hypertension triggering indicators are found in students, prevention can be done as early as possible.

Materials and Method

Study design and participants

This research is a quantitative study that uses analytic observational research with a cross-sectional study design approach. The purpose of using this study design is because it wants to look for causes with effects at the same time where in this study is to determine the risk factors for hypertension screening in students at Ahmad Dahlan University Yogyakarta.

This research was located at Ahmad Dahlan University Yogyakarta with research time in August-September 2023. The sampling technique used was purposive sampling. The inclusion criteria in this study included: Students enrolled at Ahmad Dahlan University Yogyakarta; Students aged 18-25 years; Willing to be respondents in the study. Exclusion criteria in this study are: Ahmad Dahlan University Yogyakarta students who are on leave, dropped out, dropped out, graduated, and inactive. The population of this study were all students at Ahmad Dahlan University Yogyakarta totaling 26,200 people. The sample of this study amounted to 394 people through the calculation of the sample size with the Slovin approach. Samples were taken based on faculty with proportional sampling technique, namely: students with a health background as many as 30 people and non-health as many as 364 people.

Measurement

In this study, the dependent variable was the incidence of hypertension, and respondents' systolic and diastolic blood pressures were recorded with a calibrated digital sphygmomanometer. Furthermore, the blood pressure is categorized into two categories, namely: systolic blood pressure ≥ 140 mmHg and diastolic ≥ 90 mmHg is categorized as 1 (at risk of hypertension); while if systolic blood pressure < 140 mmHg and diastolic < 90 mmHg is categorized as 0 (not at risk of hypertension). Furthermore, the independent variable measured in this study is stress. The Depression Anxiety Stress Scale (DASS-21) is used as a stress measurement tool, which has been introduced by Lovibond (1995) and has been tested in Indonesia [10]. Stress is categorized into 5 categories, namely 1) normal, if the score obtained is 0-14; 2) mild, if the score obtained is 15-18; 3) moderate, if the score obtained is 19-25; 4) severe, if the score obtained is 26-33; 5) very severe, if the score obtained is >34 [11]. Lastly, demographic characteristics also observed in this study, such as physical activity, coffee consumption, alcohol consumption, smoking, family history of hypertension, sex and age.

Statistical analysis

The statistical analysis used in this study was univariate analysis, bivariate analysis, and multivariate analysis. This univariate analysis describes the distribution of dependent and independent variables using proportions and percentages. The bivariate analysis used was the Chi-square test. The prerequisites of the Chi-square test are the expected value < 5 and a maximum of 20% of all cells. The Fisher Exact test is an alternative test performed if the Chi-square test requirements are not met. Age, sex, family history, smoking, coffee consumption, physical activity, and stress using Chi-square test. Alcohol consumption using Fisher Exact test. Then the multivariate analysis performed was the Logistic Regression test. This multivariate analysis model was tested on all independent variables.

Results and Discussion

According to Table 1, the majority of respondents were between the ages of 22 and 25. The majority of responses, 240 in total, were female. There were 262 persons (66.5%) who said they had no family history. The majority of responders who did not smoke were 278 (70.6%). The majority of responders (94.9%) did not drink alcohol. Then, 341 persons (86.5%) said they drank coffee. 310 persons (78.7%) reported engaging in physical exercise. The majority of respondents with normal stress levels were 250 (63.5%).

Table 1. Frequency Distribution of Respondents Based on the Variables Studied

Variable	Frequency	%
Age		
18-21 years	98	24.9
22-25 years	296	75.1
Sex		
Male	154	39.1
Female	240	60.9
Family History		
Yes	132	33.5
No	262	66.5
Smoking		
Yes	116	29.4
No	278	70.6
Alcohol Consumption		
Yes	20	5.1
No	374	94.9
Coffee Consumption		
Yes	341	86.5
No	53	13.5
Physical Activity		
No	84	21.3
Yes	310	78.7
Stress		

Variable	Frequency	%
Normal	250	63.5
Mild	71	18.0
Moderate	55	14.0
Heavy	13	3.3
Extremely heavy	5	1.3
Hypertension		
Yes	60	15.2
No	334	84.8

Table 2 indicates a statistically significant 53.5% reduction in the risk of hypertension for those between the ages of 22 and 25. It was statistically significant that men were 2.692 times more likely than women to have hypertension (OR = 2.692; 95% CI = 1.658 - 4.370; p = 0.000). It was statistically significant that the likelihood of developing hypertension in a person with a family history was 4.631 times higher than in a person without a family history. There was a statistically significant increase in the risk of hypertension among smokers compared to non-smokers, at 3.355 times. Alcohol use was statistically significantly associated with a 5.691-fold increased risk of hypertension compared to abstaining (OR = 5.691; 95% CI = 3.836 - 8.443; p-value = 0.000). Coffee drinkers were statistically significantly more likely to acquire hypertension (4.507 times higher risk) than non-drinkers. A person's risk of developing hypertension was statistically substantially higher if they did not exercise (OR = 2.137; 95% CI = 1.340 - 3.406; p-value = 0.003). The odds ratios for students with severe and moderate stress were 78.3% and 63.7% lower, respectively, for hypertension (ORHeavy = 0.217; 95% CI = 0.066 - 0.783; p-value = 0.006 and $OR_{Moderate}$ = 0.363; 95% CI = 0.180 - 0.754; p-value = 0.003).

Table 2. Bivariate Analysis Based on the Variables Studied

Variable	Hypertension				OR (95% CI)	*p-value*
	Yes		No			
	n	%	n	%		
Age						
18-21 years	8	8.2	90	91.8	Ref.	Ref.
22-25 years	52	17.6	244	82.4	0.465 (0.229 – 0.944)	0.037
Sex						
Male	38	24.7	116	75.3	Ref.	Ref.
Female	22	9.2	218	90.8	2.692 (1.658 – 4.370)	0.000
Family History						
Yes	42	31.8	90	68.2	Ref.	Ref.
No	18	6.9	244	93.1	4.631 (2.778 – 7.720)	0.000
Smoking						
Yes	35	30.2	81	69.8	Ref.	Ref.
No	25	9.0	253	91.0	3.355 (2.107 – 5.343)	0.000
Alcohol Consumption						
Yes	14	70.0	6	30.0	Ref.	Ref.
No	46	12.3	328	87.7	5.691 (3.836 – 8.443)	0.000
Coffee Consumption						
Yes	58	17.0	283	83.0	Ref.	Ref.
No	2	3.8	51	96.2	4.507 (1.134 – 17.909)	0.022
Physical Activity						
No	22	26.2	62	73.8	Ref.	Ref.
Yes	38	12.3	272	87.7	2.137 (1.340 – 3.406)	0.003
Stress						
Normal	30	12.0	220	88.0	Ref	Ref
Mild	9	12.7	62	87.3	0.929 (0.431 – 2.190)	0.877
Moderate	15	27.3	40	72.7	0.363 (0.180 – 0.754)	0.003
Heavy	5	38.5	8	61.5	0.217 (0.066 – 0.783)	0.006
Extremely heavy	1	20.0	4	80.0	0.498 (0.066 – 13.927)	0.587

Ref. = reference

Table 3 presents the results of multivariate analysis, which indicates that age did not significantly affect hypertension (AOR = 1.883; 95% CI = 0.762 - 4.652; p-value = 0.170). Sex

did not have a statistically significant effect on hypertension (AOR = 0.679; 95% CI = 0.236 - 1.955; p-value = 0.473). Family history had a statistically significant effect on hypertension (AOR = 0.190; 95% CI = 0.097-0.374; p-value = 0.000). Smoking did not have a statistically significant effect on hypertension (AOR = 0.788; 95% CI = 0.260 - 2.384; p-value = 0.673). Alcohol use was found to have a statistically significant effect on hypertension (AOR = 0.078; 95% CI = 0.021 - 0.287; p = 0.000). Coffee drinking was not linked to hypertension and was not statistically significant (AOR = 0.320; 95% CI = 0.070 - 1.455; p-value = 0.140). Physical exercise did not have a significant impact on hypertension (AOR = 0.691; 95% CI = 0.331 - 1.439; p-value = 0.323). Stress had a statistically significant impact on hypertension (AOR = 0.712; 95% CI = 0.516-0.982; p-value = 0.038). Stress (AOR = 0.712), family history (AOR = 0.190), and alcohol intake (AOR = 0.078) had the highest and lowest correlations, respectively.

Table 3. Multivariate Analysis Based on Independent Variables

Variabel	Crude OR (95% CI)	p-value	AOR (95% CI)	p-value
Age				
18-21 years	Ref.	0.037	Ref.	0.170
22-25 years	0.465 (0.229 – 0.944)		1.883 (0.762 – 4.652)	
Sex				
Male	Ref.	0.000	Ref.	0.473
Female	2.692 (1.658 – 4.370)		0.679 (0.236 – 1.955)	
Family History				
Yes		0.000	Ref.	0.000
No	4.631 (2.778 – 7.720)		0.190 (0.097 – 0.374)	
Smoking				
Yes	Ref.	0.000	Ref.	0.673
No	3.355 (2.107 – 5.343)		0.788 (0.260 – 2.384)	
Alcohol Consumption				
Yes	Ref.	0.000	Ref.	0.000
No	5.691 (3.836 – 8.443)		0.078 (0.021 – 0.287)	
Coffee Consumption				
Yes	Ref.	0.022	Ref.	0.140
No	4.507 (1.134 – 17.909)		0.320 (0.070 – 1.455)	
Physical Activity				
No	Ref.	0.003	Ref.	0.323
Yes	2.137 (1.340 – 3.406)		0.691 (0.331 – 1.439)	
Stress				
Normal	Ref	Ref		
Mild	0.929 (0.431 – 2.190)	0.877		
Moderate	0.363 (0.180 – 0.754)	0.003	0.712 (0.516 – 0.982)	0.038
Heavy	0.217 (0.066 – 0.783)	0.006		
Extremely heavy	0.498 (0.066 – 13.927)	0.587		

Discussion

Hypertension risk factors are divided into two categories: unchangeable and adjustable. Age, sex, and family history are unchangeable risk factors. Meanwhile, risk factors that can be modified include stress, physical exercise, alcohol and coffee use, smoking, and others. According to research conducted on 394 respondents, 60 (15.2%) had the potential to develop hypertension, while 334 (84.8%) did not.

According to the findings of this study, when hypertension is assessed in students, the age range of 22-25 years reduces the likelihood of hypertension by 53.5%. Furthermore, this finding is

consistent with study by Sidenur's (2023) [11] and Hinton's (2020) [12] that found a link between age and hypertension. This is due to physiological changes in the body, such as thickening of the artery wall with age [13] which produces anomalies in the renin-angiotensin-aldosterone system [14]. Meanwhile, the cardiovascular system experiences artery narrowing, which causes a rise in blood pressure [15]. Adults over the age of 18 are more likely to acquire high blood pressure, and lifestyle factors play a significant role [16]. The age factor for hypertension can be addressed by following a healthy lifestyle [17].

Furthermore, the findings of this study demonstrate that male is a risk factor for hypertension. This study's findings are consistent with those of Roger's (2011) [18] and Colafella's (2018) [19], who found a strong link between male and the incidence of hypertension. Blood pressure (BP) is generally higher in men than in women regardless of age. During early adulthood mean systolic BP is higher in men than women, but the subsequent rate of rise in BP is steeper for women than men [20]. Possible factors contributing to this are higher levels of alcohol consumption and smoking, and less physical activity [21].

Hypertension risk is increased by a family history. This study's findings are consistent with those of Ranasinghe's (2015) [22] and Kanchan's (2023) [23] who found a strong association between family history and hypertension incidence. This has been linked to higher intracellular sodium levels and a lower potassium-to-sodium ratio [24]. If a person is genetically predisposed to essential hypertension and is not treated, hypertension can develop between the ages of 30 and 50 and increase the risk of hypertension in their offspring. Adolescents from hypertension-prone families are more likely to develop hypertension than those from hypertension-free households [25, 26]. Individuals with hypertensive parents should check their blood pressure frequently and avoid blood pressure-raising behaviors.

In addition, smoking was substantially associated with hypertension. This study's findings supported those of Ranasinghe's (2015) [22] and Gao's (2023) [27] who discovered a relationship between smoking and hypertension. Smoking increased the heart's oxygen requirement and rate [28, 29]. Cigarettes included nicotine, which has been linked to health issues. Nicotine elevates blood pressure [30]. Within seconds, the blood vessels in the brain absorb nicotine and tell the adrenal glands to release adrenaline, constricting the arteries and causing the heart to work harder [31]. Smoking only raises blood pressure for 30 minutes; but, if you smoke consistently, your blood pressure will continue to rise [29].

Another finding from this study revealed that alcohol use was a risk factor for hypertension. This study is similar to those of Zhao's (2020) [32] and Hwang's (2023) [33] who found a substantial link between alcohol use and hypertension. Alcohol has been shown to raise blood acidity and impair metabolism [34]. Alcohol is produced when bacteria digest carbohydrates under anaerobic conditions [34]. Large and continuous alcohol consumption raises cortisol levels in the blood, which increases renin-angiotensin-aldosterone system activity [35]. When a person takes alcohol, his or her body produces a large number of erythrocytes. This causes an increase in blood viscosity, which raises blood pressure [36]. Excessive alcohol use can result in a deterioration in health status that can damage and delay the role of organ components, including the liver, so that it inhibits the function and performance of the heart [37].

Additionally, coffee intake habits are a risk factor for hypertension. This assertion is consistent with Minjung's (2022) [38] and Miranda's (2021) [39] studies which found a link between coffee consumption patterns and hypertension. This is because too much coffee can increase blood flow to the brain [40]. Caffeine is an ingredient found in coffee [41]. Caffeine is antagonistic (bad), which might cause an increase in blood pressure. Caffeine removes adenosine from nerve cells, converting it into adrenaline and epinephrine, then elevated blood pressure [42].

The piece then describes how physical exercise increases the risk of hypertension [43, 44]. This is because theoretically, physical activity has a significant impact on blood pressure stability [44]. The risk of developing hypertension is reduced if a person does physical activity more often [43]. If you do regular physical activity, it can increase lung and heart endurance, decrease blood vessel stiffness, and decrease blood pressure [45]. Lack of physical activity results in the risk of obesity

which contributes to an increased risk of hypertension [46]. Another impact is an increased risk of complications from several chronic diseases including heart disease, kidney disease, and stroke [46].

Finally, this study demonstrates that severe and moderate stress can minimize the likelihood of developing hypertension by 78.3% and 63.7%, respectively. Furthermore, these findings are consistent with previous studies by Kasumayanti's (2021) [47] and Sukma's (2019) [34] that found a link between stress and hypertension incidence. This is because as you get older, there are more problems so that you can experience stress, such as stress due to college assignments and others [48]. The existence of stress is based on hormones, namely adrenaline, thyroxine, and cortisol [49]. In situations of stress or anxiety, the kidney gland can release the hormone adrenaline, which makes the heart beat stronger and faster [50]. Excessive stress can lead to high blood pressure [47]. In addition, stress is related to changes that include physical changes, mental conditions, and pressures that come from the environment [34]. It is well understood that disease onset is caused by an individual's own harmful behavior. As a result, it is predicted that people will be more health-conscious, checking their blood pressure on a regular basis, taking appropriate and frequent medicine, engaging in regular physical activity, avoiding cigarette smoke, alcohol, stress, and other factors. This is believed to result in better health.

This study has weaknesses the first of which is memory bias in the cross-sectional research design, in which data on alcohol, coffee, and physical activity use are derived from respondents' responses in addition to the diagnosis of hypertension at one point in time. This is so because the respondent's memory is the source of the answer. The data collection period fell during the semester breaks on campus; however the response rate of respondents was nevertheless high.

Conclusion

There were several risk factors of hypertension associated with hypertension incidence, such as young age, sex, family history, smoking, alcohol consumption, drinking coffee, physical activity, and stress. In addition, variables that are highly likely to influence hypertension are stress, family history, and alcohol consumption. Regular blood pressure tests and leading a healthy lifestyle—such as quitting smoking, working out regularly, and managing stress—are strongly advised from a young age. Early hypertension screening is supposed to stop more serious illness.

Declaration

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Conflicts of Interest: None.

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