

Unhealthy Lifestyle and the Prevalence of High Blood Pressure Among Early Adults: a Cross-Sectional Study

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Abstract—Younger people with an unhealthy lifestyle have been predicted to have factors related to the risk of hypertension. To determine the factors that contribute to the risk of hypertension in early adults, a cross-sectional descriptive correlational study was conducted from 393 of eligible early adults by cluster sampling techniques. The independent variables were nutrients, sleep, smoking, and anxiety. The dependent variable was blood pressure. The nutrient was measured by BMI, sleep was assessed by the quantity of sleep in hours per day, smoking was measured by the Global Tobacco Surveillance System (GTSS), and Hamilton Rating Scale for Anxiety (HARS) was used to measure anxiety. The contributing factors were analyzed by chi square with $\alpha \leq .05$. 58.27% of participants experiencing obesity, 45.30% less sleep, 66.41% smoked in moderate levels, 56.49% of them expressed anxiety, and 60.05% showed high blood pressure. The association between all variable and blood pressure were: nutrients ($p = <.0001$, $OR = 1.299$), sleep ($p = .041$, $OR = 1.527$), smoking ($p = .025$, $OR = .622$), anxiety ($p = .026$ $OR = 1.585$). Nutrition (BMI), sleep hours, smoking, and anxiety have a significant relationship with the risk of hypertension. Nutrients, sleeping, smoking, and anxiety contributed to high blood pressure among the early adult population. A further longitudinal study is suggested to examine the trajectory associated with the prevalence of high blood pressure among early adults.

Keywords: risks of hypertension, unhealthy life-style, early-adult, blood pressure.

I. INTRODUCTION

Hypertension has been considered a cardinal criterion to determine cardiovascular function. According to the World Health Organization (WHO) global observatory data, hypertension causes more than 7.5 million deaths a year, about 12.8% of the total human mortality [1]. The percentage of hypertension evidence is currently most prevalent in developing countries and it mostly occurs in the elderly; however, it turns out the prevalence of hypertension in the early adult group tends to increase [2, 3]. Accordingly, based on the 2013 National Basic Health Research Data, Indonesia is currently experiencing triple burden diseases and hypertension was positioned on top [4].

Blood pressure (BP) is an important marker of hypertension because elevated BP in late childhood is associated with higher cardiovascular risk in later life. Therefore, understanding the risk factors associated with elevated BP may help

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to avoid cardiovascular adverse events in the future [5]. Since the trend of getting high blood pressure is changing from older to younger [6] and causing serious burdens in their future life, specific preventions are needed to be tailored to this particular age group [7].

Previous studies related to hypertension at a young age showed that other comorbid diseases such as cardiovascular, stroke, diabetes, and kidney problems are related [3, 8, 9]. However, little research has focused on determining the factors contributing to the risk of Hypertension in this particular group.

II. METHODS

Study design, setting, samples and ethical consideration

The research design used was descriptive-analytic with a cross-sectional approach. It was carried out by observing and analyzing the relationship between nutrients, nutrient intake, lifestyle, and stress and the risk of hypertension in early adults in Airlangga University Surabaya undergraduate students. The population in this study were all 21,614 undergraduate students. Determining the sample size in this study was done through probability sampling techniques with Cluster Sampling, where the sample size is obtained based on the population according to the inclusion and exclusion criteria set as follow (i) early adult age 18 to 23 (ii) understood the study procedure (iii) recent medical check-up undergraduate's requirement enrollment issued by University Airlangga's Teaching Hospital described in healthy condition physically and mentally. A total of 393 undergraduate students who were categorized into early adults joined this study. This research protocol and all research procedures were reviewed and approved by the institutional review board of Universitas Airlangga Surabaya (IRB No: 1026/KEPK).

Measurement/Instruments

The demographics included age, gender and faculty. The independent variables are nutrition status, physical activity, the quantity of sleep, smoking habits, coffee consumption, stress and the dependent variable is blood pressure level. According to the Centers of Disease control 2011, nutrition status is measured by body mass index (BMI). BMI is categorized into 4 categories: Underweight (<18.5 kg/m²), Normal (18.5 – 24.9), Overweight (25.0-29.9), Obese (> 30.0). Body weight is measured by 'Camry' analog body weight tools in Kg and body height by 'OneMed' stature meter in Cm. An open-ended instrument was used to measure physical activity, quantity of sleep. The normal sleep hours for early adults were 7-9 per day [10], smoking was measured by the number of cigarettes smoked per day. WHO categorized smokers into 3 levels as heavy (more than 20), moderate (11-20) and mild (1-10) [10]. Coffee consumption was measured by the number of cups of coffee per day [11]. In subjects who were not coffee drinkers it raised systolic pressure on average by 3-15 mm Hg and diastolic pressures by 4-13 mm Hg [12]. The anxiety level was assessed by Hamilton Rating Scale For Anxiety (HARS) and the score was categorized as follows; less than 14 = no stress, 14 - 20 = mild, 21-27 = moderate, 28 - 41 = high, 42 - 56 = very high [13].

Blood pressure measurements was examined by 'Dynamap Pro 200 BP Monitor' digital blood pressure tools. The results are categorized based on Joint of National Committee on Prevention, Detection and Treatment of High Blood Pressure JNC VII, into 4 as follow: Normal systolic <120 mmHg and diastolic <80 mmHg, systolic prehypertension 120 - 139 mmHg and diastolic 80 - 89 mmHg, hypertension systolic 140 - 159 mmHg and diastolic 90 - 99 mmHg, systolic 2 and hypertension ≥ 160 mmHg and diastolic ≥ 100 mmHg[14].

A sequence of questionnaires consisting of demographic factors, body weight, height and 26 questions that had 5 sub-categories of lifestyle behavior (questions number 9-16), quantity of sleep (questions number 21-24), smoking habits

(questions number 25-26), coffee consumption (question number 17-20). The instruments have been classified according to categories, questions in this subcategory are physical activity (questions number 1 - 8) and validity tests using Anova are $0.371 - 0.541 >$ from r table 0.361 and reliability tests using Cronbach alpha are 0.874. This questionnaire uses the Gutman scale which has 2 choices of answers where the answer score for yes is 2 and the answer score for no is 1. This study produces one value determined by $>$ mean, positive, and $<$ mean, negative. The analyses were carried out using SPSS Inc. Statistical analysis version 19.0 (SPSS Inc. Chicago, IL. USA). The results were considered statistically significant at $P \leq 0.05$.

III. RESULTS

Based on Table 1 a total of 258 early adult males (65.65%) joined this study, age of 21 years dominated, with 124 (31.55%) and most were early adult students from Faculties of Economics and Business, with 89 (22.64%) (Table 1).

Table 1. Distribution of Respondents' Demographic Characteristics (n=393)

Respondents' characteristics	f	%
Gender		
Male	258	65.65
Female	135	34.35
Age (Years)		
18	11	2.80
19	39	9.67
20	106	26.97
21	124	31.55
22	93	23.66
23	21	5.34
Faculty		
Medicine	17	4.32
Dentistry	9	2.30
Law	17	4.32
Economics and Business	89	22.64
Pharmacy	17	4.32
Veterinary	24	6.10
Social and Politic	57	14.50
Science and Technology	47	12.00
Public Health	25	6.36
Psychology	19	4.83
Humanistic	39	9.92
Nursing	10	2.54
Fishing and Oceanography	23	5.85

Table 2. Factors contributing to the risk of hypertension (n=393)

Variables	f	%
Nutrient status		
Obesity	229	58.27
Normal	164	41.73
Physical exercise		
Mild	232	59.00
Moderate	161	41.00
Quantity of sleep		
Adequate	215	54.70
Inadequate	178	45.30
Smoking		
Moderate	261	66.41
Low	132	33.59
Coffee Consumption		
High	203	51.66
Low	190	48.34
Stress		
High	222	56.49
Moderate	171	43.51
Hypertension		
High risk	236	60.05

Variables	f	%
Low risk	157	39.95

Table 2 shows the highest presentation of nutritional status variables was obesity. There were 229 respondents (58.27%) with obesity, 232 respondents (59.00%) reported mild activities, 215 (54.70%) had less sleep, 261 (66.41%) were active smokers, 203 (51.66%) had high coffee consumption, and 222 (56.49%) reported high levels of stress. Related to blood pressure measurements, 236 respondents (60.05%) were at risk of hypertension. The relationship between nutritional status (BMI) and the risk of hypertension is shown in Table 3. The majority of respondents were obese (71.2%).

Table 3. Correlation between Factors contributing to the Risk of hypertension and the risk of hypertension (n=393)

Contributing Factors	Risk of Hypertension				Odd Ratio	CI	chi square p
	High f	%	Low f	%			
Nutrient Status (IMT)							
Obesity	163	71.2	66	28.8	3.079	2.022 – 4.687	0.000
Normal	73	44.5	91	55.5			
Physical exercise							
Mild	129	55.6	103	44.4	1.582	1.042 – 2.401	0.031
Moderate	107	66.5	54	33.5			
Quantity of sleep							
Inadequate	139	64.7	76	35.3	1.527	1.017 – 2.293	0.041
Adequate	97	54.5	81	45.5			
Smoking							
Moderate	167	64.0	94	36.0	0.622	0.434 – 0.989	0.025
Low	69	52.3	63	47.7			
Coffee consumption							
High	132	65.0	71	35.0	1.537	1.024 – 2.304	0.037
Low	104	54.7	86	45.3			
Stress							
High	144	64.9	78	35.1	1.585	1.054 – 2.384	0.026
Low	92	53.8	79	46.2			

Based on the results of statistical tests a p value of 0,000 was obtained and it was lower compared to the level of $\alpha = 0.05$. Then it can be concluded there is a relationship between nutrients (BMI) and the risk of hypertension. Within Odd Ratio = 3.079 (CI = 2.022 - 4.687) which means that early adults with obesity were more at risk of experiencing hypertension 3 times higher than whom with normal BMI. Table 3 shows 129 respondents (55.6%) at high risk of hypertension due to mild physical exercise. The statistical tests obtained a p value of 0.031 smaller than the level of $\alpha = 0.05$ and can be concluded that physical activity and the risk of hypertension are related with an Odd Ratio = 1.582 (CI = 1.042 - 2.401). Early adults with mild physical activity are 1.5 times more at risk of experiencing hypertension than those who are doing moderate or regular activities. The result shows that are 139 respondents (64.7%) with a high risk of hypertension. The statistical tests obtained p value of 0.041, smaller than the level of $\alpha = 0.05$. It shows that there is a relationship between the quantity of sleep and the risk of hypertension, and the Odd Ratio = 1.527 (CI = 1.017 - 2.293), which means that early adults who have an inadequate quantity of sleep are 1.5 times more at risk of experiencing hypertension. 167 respondents (64.0%) respondents were in the category of moderate smokers, they are at high risk of hypertension. P value of 0.025 of these two variables is smaller than the level of $\alpha = 0.05$ and it means moderate smoking

is related to the risk of hypertension. Odd Ratio = 0.622 (CI = 0.434 - 0.989) shows that moderate smoker students are 0.6 times more at risk of having hypertension than passive smokers.

132 respondents (65.0%) have high coffee consumption. The statistical tests obtained p value = 0.037 and it can be concluded that there is a relationship between coffee consumption and the risk of hypertension, and the Odd Ratio = 1.537 (CI = 1.024 - 2.304) means that early adults with high coffee consumption are 1.5 times more at risk of experiencing hypertension than those who have a low level of coffee consumption.

There are 144 respondents (64.9%) with a high risk of hypertension and the statistical tests obtained p value = 0.026. It shows that anxiety has a relationship with the risk of hypertension. The Odd Ratio = 1.585 (CI = 1.054 - 2.384) shows that early adults who experience high anxiety are 1.5 times more at risk of experiencing hypertension compared to those with low-level anxiety.

IV. DISCUSSION

The relation between nutritional status (BMI) and the risk of hypertension

The majority of respondents are overweight and in the obese body index categories; one of the factors causing an increase in body mass index is food or nutrient intake that enters the body due to an irregular and uncontrolled diet. Some of the respondents prefer to have a big serving of rice three times per day to feel full. A high intake of carbohydrates may increase body weight faster. Early adults who have a body index in the overweight and obese category trigger the risk of hypertension. This fact is evidenced from the results of the research according to which there is a significant relationship between nutrition (BMI) and the risk of hypertension, Students who fall into the category of obese BMI are more than 3 times more at risk than early adults with normal BMI. This result was in line with Hall et al. [15] (2012), who reported the greater the body mass index, the more blood needed to supply oxygen to the body's tissues and the higher the pressure to enable the blood reach the destinations. Besides that, being overweight increases heart rate and blood insulin levels [9]. Being overweight which is characterized by an increase in fat tissue is commonly followed by an increase in the level of blood fat [16]. As a result, blood viscosity is thicker and transporting to the body's tissues needs higher blood pressure.

The results obtained in this study show early adults with overweight and obesity are at risk of hypertension. High carbohydrate intake commonly experienced by early adults in this study causes an imbalanced diet. It resulted in being overweight and increased risk factors of hypertension. Due to this condition, a change in dietary patterns is needed to reach an ideal body mass index and to reduce the risk of hypertension.

Relationship between physical activity and the risk of hypertension

The study shows mild physical activity tends to increase the risk of hypertension. One of the factors that cause physical activity not to be carried out regularly is being busy with college activities which require sitting rather than moving for long hours. Most students understand the benefits of doing regular physical activity but have no impulse to do so. Early adults with mild physical activity experience a risk of hypertension. This fact is supported by the results of the research stating that there is a significant relationship between physical activity and the risk of hypertension; students who have mild physical activity have 1.582 times greater risk of hypertension compared to students who do physical activities on a regular basis.

This finding is consistent with a study conducted by Choi et al., that found a significant relationship between mild physical activity and 4.69 times more risk of having hypertension compared to someone who has moderate activity [17]. The effect of physical activity on the incidence of hypertension proves that people with mild physical activity are 3 times more likely to experience hypertension compared to someone who has heavy physical activity [18].

Accordingly, physical activity has been studied greatly influences to normal blood pressure [18, 19]. Less physical activities tend to cause higher heart rate frequency, which results in the heart muscle working harder on each contraction. The harder the heart muscle attempts to pump blood, the greater the blood pressure that is charged to the arterial wall so that peripheral resistance causes an increase in blood pressure [20]. Lack of physical activity can also increase the risk of being overweight which will increase the risk of hypertension [19]. From this study, it seems that early adults tend to have sedentary behavior. This is the result of less physical activity which, however, helps improve overall heart efficiency and cardio-vascular contractility. These conditions directly influence normal blood pressure.

The relationship between the quantity of sleep and the risk of hypertension

Inadequate sleep quantity, 2-4 hours a day increases the risk of hypertension. Early adults expressed lack of sleep due to academic pressure such as mid and final exams, individual and group works and other projects in the University societies. To enable them to keep alert, they smoke and drink coffee. Lack of sleep triggers the risk of hypertension. This fact is evidenced from the results of the research stating that there is a significant relationship between the quantity of sleep and the risk of hypertension, as early adults with inadequate sleep are 1.527 times more likely to experience hypertension compared to students who have adequate sleep.

A habitual short sleep duration recorded in the previous 7 days was independently associated with elevated ambulatory blood pressure in normal-weight adolescents. An average of 1 hour of reduced sleep duration was associated with an increase of 2 mm Hg in SBP and 1 mm Hg in diastolic blood pressure [5]. An adequate sleep alters autonomic nervous system function and other physiologic events that influence blood pressure [21]. Thus, a poor quantity of sleep has 1.84 more risk of hypertension than adults who do not there is a disturbance in sleep, a short amount of sleep or a poor quantity of sleep [22].

An adequate sleep quantity in this study is a created condition to keep alert. For this reason, early adults smoke more cigarettes and drink more coffee as well. When they do not need to keep alert, smoking and drinking coffee still continue but in a lower quantity. In one semester, they will spend a maximum of 2 weeks for each mid and final exam. During 2 weeks, they experienced inadequate sleep. This condition seems to extend, due to another individual and group work and social activities out of the University societies. The risk factors for hypertension are due to inadequate sleep caused by another two factors that are smoking and coffee consumption.

Relationship between smoking habits and the risk of hypertension

The majority of respondents are moderate smokers. They smoke a minimum of 12 cigarettes per day and higher when they get bored, stress or need to stay alert for a minimum of 20 hours per day. Most students know the negative effects of smoking on their health. However, effortless to quit this smoking habit. Early adults who smoke are 1.622 times more likely to experience hypertension than non-smokers.

Our findings are consistent with Larson et al. (2012) who reported that smokers have twice as high a risk as non-smokers [23]. The nicotine contained in cigarettes constricts blood vessels and causes blood pressure to go up. Furthermore, nicotine and carbon monoxide damage endothelial cells which results in progressing arteriosclerosis [24]. The longer poisoned particles contained in one single cigarette injure the endothelial, the more ischemic tissues caused off and as a reaction to the increase in nicotine the response of sympathetic activity on cardiovascular that is responsible with maintaining a normal blood pressure increases [25, 26].

In this study, we found that the more reasons related to smoking are that male early adults need to keep alert, concentrate and be connected to their social life. Almost all of them have been informed that smoking in the University area is prohibited. However, since this regulation is not strictly accompanied by academic punishment, it seems that sometimes smoking is tolerated for some reason. In addition, nature and nurture also play a crucial role in these early adults' smoking habits. They mostly smoke because they live with family members and actively interact with peers who smoke. Due to this relegated smoking-environment, smoking seems normal to this age group.

Relationship between coffee consumption and the risk of hypertension

Early adults drink coffee as an energy booster when working with deadlines. They need to feel dizzy and feverish. However, high coffee consumption increases the risk of hypertension. The relationship between high coffee consumption and the risk of hypertension shows early adults with this particular habit are 1.537 times more likely to have hypertension than students who consume coffee lightly.

A daily intake of ~2 to 3 cups of coffee appears to be safe and is associated with neutral to beneficial effects for most of the studied health outcomes [27, 28]. However, a study of 15 volunteers, including 6 habitual and 9 non habitual coffee drinkers, demonstrated that intravenous caffeine infusion induced similar increases in muscle sympathetic activity and blood pressure in the 2 groups. Coffee increased blood pressure in non habitual drinkers but not in the habitual coffee drinkers, despite comparable increases of muscle sympathetic activity and plasma caffeine levels in the 2 groups after coffee ingestion [29].

Additionally, a small dose of caffeine has a low adaptation to blood pressure [30]. But since early adults need to stay alert for long hours, the need to drink more cups of coffee rises. In this study, it can be seen that early adults tend to have more coffee to experience caffeine and avoid feeling sleepy. During exam seasons, the demand for high coffee intake is higher. However, there is also another reason that they drink coffee, social life. Due to this, the authors concluded that caffeine is not solely responsible for the risk of hypertension associated with short- and long-term coffee consumption.

Relationship between anxiety and the risk of hypertension

The majority of early adults in this study experienced a high level of anxiety. One of the major reasons is that the demand to get a high-grade point average every semester creates a competitive atmosphere and results in pressure. A high level of anxiety means 1.585 times more risk for early adults to have hypertension.

Anxiety can present barriers to accurate diagnosis of hypertension. On the other hand, to the extent that anxiety contributes to hypertension [31]. Having an anxiety disorder was associated with a 4-fold increase in the risk of developing hypertension [32]. This is because anxiety is related to the work of the autonomic nervous system that plays an important role in blood pressure regulation and in the development of hypertension. Blood pressure and heart rate are regulated in the short term by the baroreflex, which is part of the autonomic nervous system [33, 34]. Those previous literature data suggested that increased sympathetic outflow is evident in borderline hypertension, however, in long-standing hypertension, the absolute sympathetic tone is not increased and may even be decreased [19, 32].

The results obtained from this study show that early adults tend to have higher blood pressure when they face challenges and have less ability to manage their own anxiety due to the pressure caused by academic demands and non-academic life. This anxiety level is possibly severe as they should deal with those challenges responsibly both in their personal life such as relationships with peers and family, and academics goals required by University. In order to successfully adapt to those challenges, supportive services should be provided by the University to let them focus on their best achievement and strong coping mechanisms to adapt to stress.

V. CONCLUSION

Nutrients, physical activity, quantity of sleep, smoking, coffee consumption and anxiety have a relationship with the risk of hypertension. Nutritional status (IMT) puts on the highest factor relationship while smoking is the lowest. Importantly, this study was taken in the university setting where smoking is prohibited and less physical activity determined sedentary behavior is common in early adults. Larger multi-site studies are essential to corroborate these findings. Prevention strategies are strongly recommended. University and health care providers treating hypertension should consider the early adult population with a high risk of hypertension. Future research is required to examine the effectiveness of nutrition and sedentary behavior management in early adults with a high risk of hypertension.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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