Prevalence of Hypertension in Indonesia: 2018 Basic Health Research

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Article Info

Abstract

Hypertension is one of the main factors contributing to premature death. The nationwide prevalence rate of hypertension in Indonesia is relatively high. Understanding the factors contributing to hypertension is essential to reduce the prevalence of hypertension. This paper investigates the risk factors associated with hypertension based on the survey data of Riskesdas 2018. The risk factors related to behaviors or lifestyle include smoking every day, being less active, eating fatty or salty foods once a day, drinking caffeine once a day, and overweight status. Using multiple linear regression, this study finds that being overweight with a body mass index in range 25-27 and having a daily coffee intake habit of one cup are the most significant risk factors to the prevalence of hypertension. These findings should be used as a reference for preventative and promotional actions to reduce the prevalence of hypertension in Indonesia.

Introduction

The Many people experience non-communicable diseases (NCDs) that affect the heart and blood arteries, the main cause of health issues worldwide. According to the American Academy of Pediatrics most recent release of revised pediatric clinical practice recommendations, adults older than 13 years old are considered to have hypertension if their systolic and/or diastolic blood pressure is greater than 130 mmHg and 80 mmHg, respectively (Flynn *et al.*, 2017). There are two types of hypertension: primary hypertension, which has an unknown exact cause, and secondary hypertension, which is a complication condition that might elevate blood pressure, such as kidney illness, an endocrine disorder, etc. When left untreated, hypertension frequently goes undetected and can develop into difficulties if it persists for an extended period. This can also cause complications in other diseases, such as obesity and hypertension prevalences positively impact the prevalence of diabetes mellitus (Oktora & Butar Butar, 2022). To identify hypertension early, it is crucial to check blood pressure periodically (Sola *et al.*, 2022). In general, there are two categories of risk factors for hypertension. The first factors that cannot be modified are age, heredity, and gender. Meanwhile, the second factors can be controlled, such as following a nutritious diet, regular physical activity, maintaining one's weight, stress management, and healthy sleep habits (Valenzuela *et al.*, 2021). Only when a person experiences multiple instances of these risk factors may hypertension develop (Charchar *et al.*, 2024).

Hypertension is one of the major causes of premature death worldwide. Africa has the highest prevalence of hypertension (27%), whereas Asia has the lowest rate (18%) (WHO, 2023). The number of adults with hypertension

rose from 594 million in 1975 to 1.13 billion in 2015. These rising hypertension risk factors may affect 1.6 billion people by the year 2025 (Sackou *et al.*, 2020). The overall estimated prevalence of hypertension for the urban population in Southeast Asia is 33.82%. Among them, the community reported 33.98% of hypertension, while teenagers in schools reported 32.45% of it (Mohammed *et al.*, 2021). In Indonesia, hypertension is a serious health issue (Merita *et al.*, 2019). the Bangka Belitung Islands Province had the highest prevalence at the national level (30.9%), while Papua Province had the lowest prevalence (16.8%), according to the results of 2013 Indonesia Basic Health Research (Riskesdas) (Kemenkes RI, 2013). The 2018 Basic Health Research findings showed that, in comparison to 2013, North Sulawesi had the greatest prevalence of hypertension (13.2%) and Papua had the lowest (4.4%) (Kemenkes RI, 2018).

The rising trend of hypertension prevalence has been a concern globally as it is thought to be the most common cause of death worldwide and one of the triggers for cardiovascular disease (Mills *et al.,* 2020). Studies about hypertension prevalence in various regions have been conducted worldwide (Carlsson *et al.*, 2009; Larkins, Teixeira-Pinto & Craig, 2018; Mills *et al.,* 2020). An analysis of the prevalence and associated factors for hypertension was conducted among the 4228 population in Sweden study using univariate and multivariate logistic regression (Carlsson *et al.*, 2009). They conducted a medical, lifestyle, and socioeconomic questionnaire. They discovered that waist circumference of more than 97 cm, cardiovascular disease, lack of access to healthcare due to finances, and regular fruit consumption were separately linked to men's uncontrolled hypertension. While, living in an apartment, having a waist circumference greater than 78 cm, and having coronary heart disease continued to be independently associated factors. Another study in Australia related to hypertension is conducted to assess the Australian kids population aged 5-17 years old using Australian Health Survey data using selected predictor variables (age, sex, remoteness, socioeconomic status, body mass index) using linear regression and multiple

linear regression (Larkins *et al.,* 2018). Their study revealed that low socioeconomic class is the second most significant predictor of blood pressure, after BMI. This indicates that a wide range of factors affect the estimation of the prevalence of hypertension and multiple linear regression is a prominent tool to estimate the prevalence of hypertension.

One of the promising strategies to reduce the prevalence of hypertension is to comprehend and control the risk factors for the condition, the majority of which are influenced by behavior and lifestyle. However, not so many studies about the risk factors affecting hypertension have been conducted in Indonesia. Therefore, this study proposes to investigate the hypertension risk factors in Indonesia, particularly those that are closely related to the population's lifestyle and the prevalence of hypertension, using multiple linear regression. Understanding the hypertension risk factors will guide preventative and promotional actions to lower the prevalence of hypertension in Indonesia.

METHOD

The data used in this study were taken from the 2018 report of Indonesia Basic Health Research, a national survey with many goals to assess Indonesia's health state. The survey data involved 34 provinces, 416 districts, and 98 cities in Indonesia. Riskesdas is a cross-sectional, non-interventional national scale survey run by the Ministry of Health in the Republic of Indonesia, which began gathering the data in March 2018. A representative sample of 658,201 people of all ages, including 327,150 men and 331,051 women, were questioned for the 2018 Indonesia Basic Health Research to assess their hypertension status. This study examines the risk variables that affect the prevalence of hypertension in Indonesia, which includes individual behaviors endangering health at risk. The prevalence of hypertension is a measure of the proportion number of hypertension cases in a given area at a given period. It is commonly reported as a percentage value. According to Riskesdas 2018, the prevalence of hypertension value based on a doctor's diagnosis in Indonesia is 8.36, within the range of 4.39 - 13.21 on the province scale. This number estimates that

more than 8% of people in Indonesia have hypertension in general.

Six behaviors will be measured in this study. First is smoking activity, whether the respondent smokes every day or not. Of course, the smoking behavior and tobacco consumption were asked for the respondent aged older than 10 years. The second behavior will be measured from physical activities, whether the respondent is doing exercises or less active. The third and fourth behaviors correspond to eating habits, whether they eat fatty or salty foods at least once a day. Salty food is defined as food that contains a strong salty flavor or a lot of salt. In contrast, fatty foods are those that have a high-fat content, particularly saturated fat and cholesterol. The fifth behavior is about caffeine consumption, whether the respondent drinks caffeine once a day. The last behavior is about the respondent's overweight status, which is determined by the BMI metric. The Body Mass Index (BMI) is used to determine the nutritional status of persons over the age of 18 (adult nutritional status). To determine whether a person is overweight or not. Overweight is defined when the BMI value is ≥ 25.0 to < 27.0 by calculating body weight (kg) divided by the square of height (m2). To investigate the relation between the prevalence of hypertension and the six risk factors, we applied a multiple linear regression method, a statistical technique to predict an outcome based on multi-independent variables. In this study, the outcome would be the prevalence of hypertension and the six risk factors would be the independent variables. From this regression, we expect to find the important factors affecting the prevalence of hypertension.

RESULT AND DISCUSSION

According to the 2018 Basic Health Research (Riskesdas) report, the prevalence of hypertension based on a doctor's diagnosis varied substantially by province in Indonesia. The highest prevalence is 12.3 in North Sulawesi, while the lowest prevalence is 4.4 in Papua. The average prevalence of hypertension across all of Indonesia is 8.4. The hypertension prevalence in some provinces is illustrated in Figure 1. Six variables of the risk factors associated with the prevalence of hypertension have been chosen: physical activity, eating fatty food at least once per day, eating salty at least once per day, consuming caffeine at least once per day, and smoking every day. A brief overview of how many residents in a province face the risk factor of hypertension is described in Figure 2. Meanwhile, the statistics descriptive of the data are presented in Table 1.

Before implementing the multiple linear regression method to predict the prevalence of hypertension, we assess the multicollinearity of the predictor variables and a significant
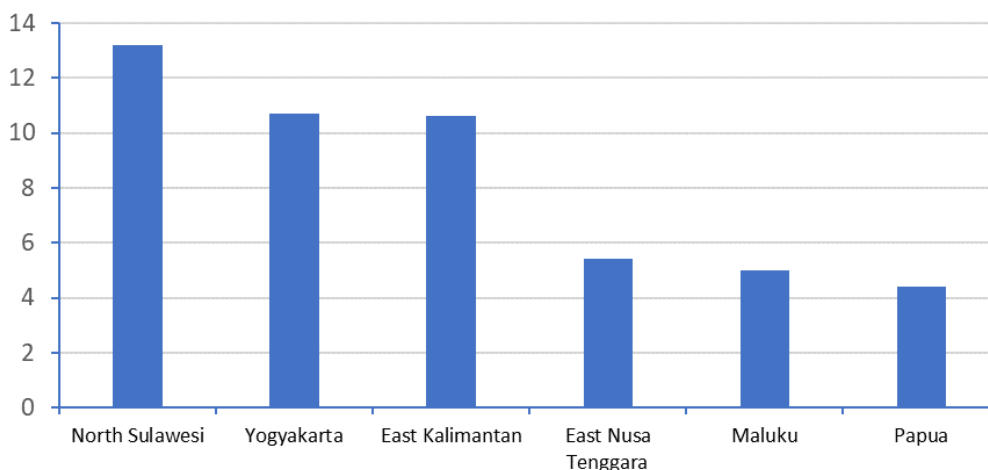

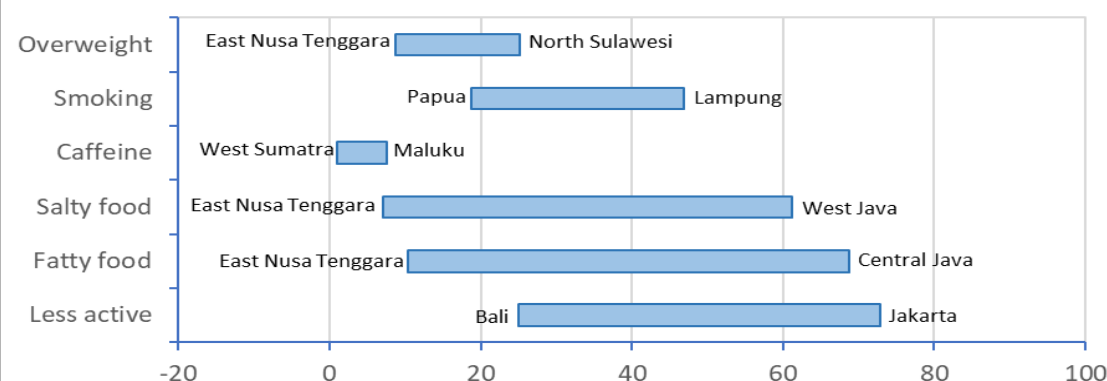Figure 1. The Prevalence of Hypertension in Some Indonesian Provinces

Figure 2. Percentage of Residents in Each Indonesian Province with the Risk Factor

Table 1. Statistic Descriptive of Variables and VIF

Variable	Mean	SD	Min	Max	VIF
Hypertension prevalence	8.2	1.9	4.4	13.2	-
Less active	34.9	5.8	25.2	47.8	1.29
Eat fatty ≥1x per day	33.3	11.1	10.3	58.4	1.69
Eat salty ≥1x per day	20.9	10.0	7	54.1	1.51
Consume caffeine ≥ 1x per day	2.3	1.4	1	6.5	1.21
Smoking every day	23.5	2.6	18.8	28.1	1.22
Overweight	13.6	1.3	8.8	16.3	1.3

Table 2. Results of Multiple Linear Regression Using Six and Three Variables

Variable	Coefficient (CI 95%)	P value	Coefficient (CI 95%)	P value
Less active	0.03213	0.48923*		
Eat fatty ≥1x per day	0.06729	0.02012	0.05308	0.017442
Eat salty ≥1x per day	-0.02588	0.37419*		
Consume caffeine ≥ 1x per day	-0.61595	0.00233	-0.54363	0.002210
Smoking every day	-0.01563	0.87598*		
Overweight	0.58929	0.00772	0.66896	0.000836

*Variables that do not meet p value < 0.25 are not continued for the next multiple regression mode

correlation between independent variables. The linear regression would give a more robust prediction when there are no multicollinear variables. Therefore, a variance inflation factor (VIF) value is used to determine whether the multicollinearity exists among the variables. VIF of variable j is formulated by $1 / (1-R2)$, with R2 as the coefficient of determination calculated by multiple regression of variable j with other variables as the predictors. If the value of VIF is 1, then multicollinearity does not exist. The value of VIF above 4 indicates a chance of multicollinearity, and further investigation is required. If a VIF value of more than 10 is attained, multicollinearity is present. In this study, all VIF values presented in Table 1 are less than 10, so there is no multicollinearity between the variables used in this study. The first multiple linear regression is conducted using six variables, and the result is described in Table 2, see the second and third columns. With a criterion of p-value less than 0.25 for pre-filter variables, the result reveals that three variables, less active, eating salty ≥1x

per day, and smoking every day have p-values larger than 0.25. As a result, these variables are eliminated for the next regression model, which will only consider three variables, eating fatty ≥1x per day, Consuming caffeine 1x per day, and being Overweight.

The result of the second multiple linear regression remains three variables with p value less than 0.05. Then, this regression model was the final model occupying three variables associated with the prevalence of hypertension. Even though the p-value of all variables is small enough, the variable related to salty food has a very small coefficient regression. So, eating salty food habits only contributes a little to the prevalence of hypertension. In contrast, the largest value of the regression coefficient is the overweight variable with the value of 0.66896, indicating that this variable has a significant influence on the prevalence of hypertension in Indonesia. The heavier a person is, the higher their risk of developing hypertension. The variable Consume caffeine ≥ 1x per day has a coefficient value of -0.54363, indicating that it has a negative relationship with the prevalence of hypertension. As this study does not consider how much caffeine is consumed by the respondents, we cannot summarize that the more frequently you consume caffeinated beverages, the lower your risk of developing hypertension.

There are many factors, categorized into two conditions that can trigger hypertension. The first condition which cannot be controlled is the physics such as gender, age, and heredity. While, the second condition that still can be controlled is the individual life's behavior such as nutritional status, stress, food, physical activity, and so on. This study investigates the second condition. Based on the multiple regression results, we found that there are three important factors related to daily behaviors influencing the prevalence of hypertension, namely caffeine consumption, eating fatty food habits, and overweight status. The coffee substances help boost energy, reduce exhaustion, and keep people awake because the polyphenols and caffeine in coffee can change blood pressure, either decreasing it or raising it (Barrea *et al.*, 2023). These advantages would drive the habit of consuming caffeine every day.

Different from the studies (Steffen *et al.*, 2012; Surma & Oparil, 2021), that consuming habits do not significantly affect blood pressure or hypertension, our study reveals that according to Table 2, the consumption of caffeinated beverages once per day is already associated with the prevalence of hypertension. This finding agrees with the previous study by Palatini *et al.*, (2007) which also found a relationship between coffee consumption and blood pressure in hypertension sufferers (Palatini *et al.*, 2007). The study by Miranda *et al.*, (2021) also showed that there is a strong relationship between coffee consumption habits and hypertension levels (Miranda *et al.*, 2021).

Fatty diets (whether they are high in fat, saturated fat, or cholesterol) can raise blood pressure and increase the risk of cardiovascular system disorders (Guasch-Ferré *et al.*, 2015). Based on the results, consumption of fatty foods at least once per day was related to the prevalence of hypertension. This is in line with the study of Wang et al. (2010) that the risk factor for consuming fatty meals is connected to a high prevalence of hypertension (Wang *et al.*, 2010). This finding is further supported by (Qin *et al.*, 2022), which demonstrated a link between fatty food consumption and the prevalence of hypertension. Other research also demonstrates this link to be positive, demonstrating that individuals who regularly consume fatty foods are more likely to develop hypertension (Reddy & Katan, 2004).

Being overweight is more frequently linked to a higher risk of cardiovascular illness, including hypertension. Our research finds that being overweight may increase the prevalence of hypertension. This is in line with a study by (Jayedi *et al.*, 2018), which shows that the risk of developing hypertension increases continuously followed by increasing anthropometric measurements including weight gain. Compared to their body weight, obese and overweight people are twice as likely to develop hypertension (Mohammed *et al.*, 2021). According to another study, the risk of high blood pressure can rise significantly as BMI approaches 25.0 and waist circumference approaches 88 cm. Since the blood flow in the body must work harder to carry nutrients and oxygen to all parts of the body, the risk

of developing hypertension or elevated blood pressure is higher in those with high BMIs (Gelber *et al.*, 2007). This is because the blood volume in the blood vessels also rises.

CONCLUSION

This paper studies six life behaviors from the survey data of Riskesdas 2018 that are believed to be associated with the prevalence of hypertension, namely smoking every day, being less active, eating fatty or salty foods once a day, drinking caffeine once a day, and overweight status. Based on the variance inflation factors, these six factors are independent variables that are not correlated with each other. Thus, we applied a multiple linear regression method to analyze which variable dominantly contributes to the prevalence of hypertension. Our study reveals that three life behaviors, drinking caffeine, eating fatty food, and being overweight, were associated with the prevalence of hypertension. Quantitatively, eating fatty food once a day only slightly contributes to the prevalence. Meanwhile, being overweight and having a daily one cup of coffee mainly contribute to the risk of hypertension. Therefore, preventative and promotional actions to reduce the prevalence of hypertension should consider this study's findings. Except for the BMI to measure the overweight status, the intensity of each factor in this study still needs to be measurable clearly. Further study should consider how much activity/ smoke/ caffeine/ fatty food/ salty food is consumed that would be associated with hypertension prevalence.

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