ORIGINAL ARTICLE

RISK FACTORS FOR HYPERTENSION INCIDENCE AMONG WOMEN IN INDONESIA

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ABSTRACT

Indonesia is one of the countries with the highest cases of hypertension, namely 34.1% of the population in Southeast Asia, This study further elaborates the hypertension prevalence in Indonesian women older than 15 years with their modifiable risk factors. This study uses data from the Indonesia Basic Health Research (Riskesdas) 2018 with a cross-sectional study design and total sampling method. The data were analysis further by chi-square test and multiple logistic regression (α = 0.05) in relation to their modifiable risk factors. The risk factors covered were age, contraception use, level of education, smoking behaviour, alcohol consumption, unhealty food consumption, underweight BMI, fat-based BMI and stress.The data processing resulted that age provides (p = <0.001; POR=1.883), contraception type (p = <0.001; POR=1.007), education (p = <0.001; POR=1.478), smoke (p = < 0.001; POR=0.867), alcohol consumption behavior (p = <0.001; POR=0.879), risky food consumption behavior (p = <0.001; POR=1.120), BMI underweight category (p = <0.001; POR=0.536), BMI category fat (p = <0.001; POR = 2.245), and stress (p = <0.001; POR = 0.942) had a significant relationship with the incidence of hypertension in Indonesian women older than 15 years.It was found that fat-based BMI factor was the significant prevalence of hypertension occuring in Indonesian women older than 15 years..

Keywords: *Risk factors, Hypertension, Women, Indonesia*

INTRODUCTION

Hypertension is known as the silent disease or the silent killer because most of people did not realise they have this disease.[1] This has caused high morbidity and mortality due to hypertension complications as they are unaware of this disease. The danger of uncontrolled hypertension has led to severe complications, such as coronary heart disease, stroke, kidney, and visual impairment. Death due to hypertension is ranked as the first cause compared to other diseases.[2] Cardiovascular disease accounts for 17.7 billion deaths annually in the world, which about 31% of all global deaths. 1.13 billion adults worldwide suffer from increased high blood pressure, while 1 in 5 people worldwide suffers from hypertension.[3] Based on AHA data in 2011, out of 59% of people with hypertension in America, only 34% are under control. It is stated that 1 in 4 adults suffers from hypertension.[4] By 2025, it is estimated that 1.56 billion adults will be living with hypertension.[5] Nearly 8 million people every year worldwide and almost 1.5 million people every year in the Southeast Asia region die from hypertension.[6]

In 2018, Indonesia became one of the countries in Southeast Asia with the highest cases of hypertension, namely 34.1% of the population. Based on gender, hypertension cases are dominated by Indonesian women (11.57%) compared to Indonesian men (6.07%). Based on age characteristics, hypertension patiens in Indonesia are 69.5% for those older than 75 years, 63.2% for aged 65-74 years, 55.2% for aged 55-64 years, 45-54 years old are 45. 3%, age 35-44 years as much as 31.6%, age 25-34 years as much as 20.1%, and age 18-24 years as much as 13.2% [7]. Hypertension in DKI Jakarta in 2018 is ranked 5th highest after North Sulawesi, Yogyakarta, East Kalimantan, and North Kalimantan.[7]

The incidence of hypertension is influenced by many factors such as nutritional status, dietary habits, work patterns, physical activity, and lifestyle.[8] In the case of hypertension, risk factors were found, which were divided into two, namely genetic factors, which are unchanged risk factors and modifiable risk factors, such as diet, consumption of foods containing addictive substances, smoking, lack of physical activity and environmental conditions that affect health.[9]

Several factors that cause hypertension, namely lifestyle such as high sodium consumption behaviour, obesity, stress, smoking, and drinking alcohol[10,11] The high prevalence of hypertension is mainly caused by unhealthy lifestyles such as lack of physical activity, smoking habits, and high fat content consumption. The secondary causes of hypertension include kidney disorders, endocrine disorders, and oral contraceptives and other contraceptives.[12,13,14]

The description above explains that the prevalence of hypertension in women are higher than in men. The high incidence of hypertension is directly proportional to the participants' users of hormonal contraceptives, which tend to increase, which is also one of the reasons for researchers to conduct this study. Based on the background of the problem described, a study was conducted on Risk Factor Analysis of Hypertension Incidence in Women Age 15 years in Indonesia (Data Analysis of Riskesdas in 2018).

METHODS

This quantitative study uses a cross-sectional design by analysing secondary data sourced from the 2018 Basic Health Research (Riskesdas). The implementation of the 2018 Riskesdas data collection was carried out in 34 provinces and 264 districts/cities, 400 sub-districts, 400 health centers, 1,200 census blocks, 22,795 households. The 2018 Riskesdas sample uses the 2018 Susenas sample framework which was carried out in March 2018 in 34 provinces, 416 districts and 98 cities in Indonesia. The population of this study was the 2018 Riskesdas respondents who were female with age 15 years living in Indonesia and were successfully interviewed as a sample in Riskesdas 2018, and samples that meet the research criteria are 20,320,600 respondents after weighting.

The sampling technique in this study is total sampling. The inclusion criteria in this study were the 2018 Riskesdas respondents aged 15 years who lived in Indonesia and had blood pressure, height, and weight measurements taken. Exclusion criteria include incomplete data on respondents. The dependent variable is hypertension, and the independent variable is age, contraception, residential area, education, physical activity, smoke, Alcohol Consumption, Consumption of Risky Foods, Body Mass Index (BMI), and stress. Data analysis with univariate, bivariate, and multivariate analysis with α= 0.05. Data analysis using statistical software. Bivariat analysis using chi-square test with α= 0.05. Multivariate analysis using multiple logistic regression to analyse the effect of the independent variable and the dependent variable.

RESULTS

The results of the study based on the 2018 Riskesdas secondary data, there were 20,320,600 total respondents after the weighting was carried out. The data obtained, namely the Prevalence of hypertension in women aged 15 years. Table 1 shows the total patients with hypertension in women aged 15 years based on the results of systolic and diastolic blood pressure measurements, which shows that the Prevalence of hypertension in women aged 15 years in Indonesia is 21.2% with a total of 4,298,709 respondents.

Figure 1 shows 28 provinces in Indonesia whose prevalence rates are below the national prevalence rates. In addition, six provinces in Indonesia still exceed the national hypertension prevalence rate, namely West Java, Central Java, West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan. West Papua is the province with the lowest prevalence of hypertension in women aged 15 years in Indonesia in 2018 which is 12.2%, and West Java is the province with the highest prevalence of hypertension in Indonesian women older than 15 years in 2018 which is 29.3 %.

Based on Tabel 2, this study shows that the results of the characteristics of respondents, most of whom are in the age group 31 years (59.4%), use hormonal contraceptives (68.5%), live in urban areas (54.2%), have a high level of having low education (53.6%), do physical activity (91.5%), do not smoke (97.7%), do not consume alcohol (99.6%), have a high level of consumption of high-risk foods (57, 9%), had a normal BMI (49.7%), and did not show signs of stress (89.9%).

The results of the bivariate analysis showed that the variables that had a relationship with the incidence of hypertension in women aged 15 years were age, type of contraception, education, smoking, alcohol consumption, risky food consumption, BMI, and stress with all variables having a p-value <0.001. (Tabel 3). The results of the multivariate analysis are shown in

Table 4. there are three dominant risk factors associated with hypertension in the final multiple logistic regression multivariate analysis model. These variables are BMI, aged, and education. This multivariate analysis found that the BMI variable with the fat category was the most influential variable on the incidence of hypertension in women aged 15 years with a POR = 2.245 (95% CI 2.240-2.250). While the BMI category Thin/Normal is a protective factor for hypertension (POR=0.536 95% CI 2.240-2.250)

Table 1: Hypertension Prevalence in Women older than 15 Years

Hypertension	Number (n)	Percentage (%)
Yes	4,298,709	21.2
No	16,021,891	78.8

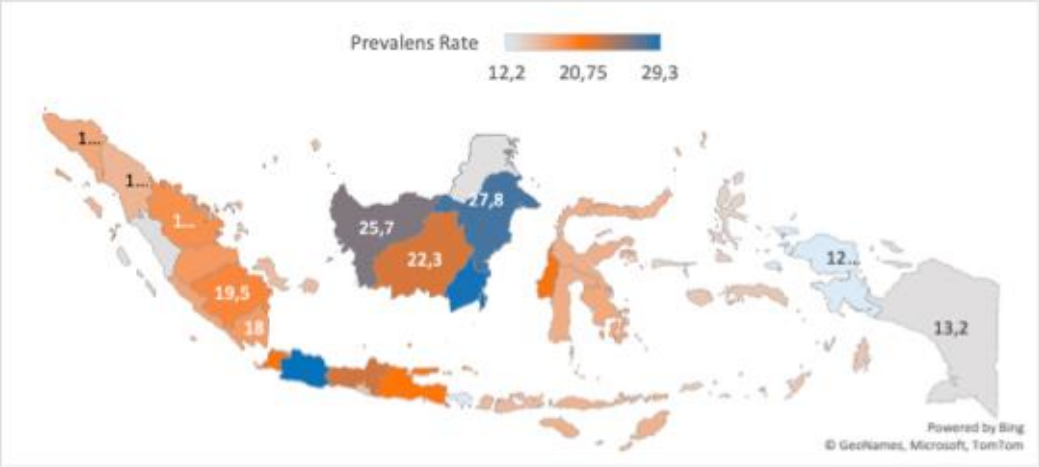

Figure 1. Hypertension Prevalence in Women older than 15 Years by Province in Indonesia

Table 2: Description of the characteristics of respondents

Variable	Number (n)	Percentage (%)
Aged		
>31 years old	8,241,388	40.6
15-31 years old	12,079,212	59.4
Contraception		
Hormonal	13,925,295	68.5
Non Hormonal	6,395,305	31.5
Residential Area		
urban	11,009,230	54.2
Rural	9,311,370	45.8
Education		
Low education	10,894,954	53.6
higher education	9,425,646	46.4
Physical Activity		
Yes	18,599,451	91.5
Not	1,721,150	8.5
Smoke		
Yes	463,281	2.3
No	19,857,319	97.7
Alcohol Consumption		
Yes	77,934	0.4
No	20,242,666	99.6
Consumption of Risky Foods		
high	11,757,366	57.9
low	8,563,234	42.1
BMI		
Fat	9,003,118	44.3
Thin	1,227,421	6.0
Normal	10,090,061	49.7
Stress		
Yes	2,050,009	10.1
Not	18,270,591	89.9

Table 3:Bivariate Analysis

Variable	Hypertension				POR (95% CI)	P-Value
	Hypertension		Not hypertension			
	n	%	n	%		
Aged						
> 31 Years old	2,385,851	28.9	5,855,537	71.1	2.166 (2.161-2.170)	<0.001
15-31 Years old	1,912,858	15.8	10,166,354	84.2		
Contraception						
Hormonal	2,966,843	21,3	10,958,452	78.7	1.029 (1.027-1.032)	<0.001
Non Hormonal	1,331,866	20.8	5,063,439	79.2	Ref	
Residential Area						
urban	2,340,288	21.3	8,668,941	78.7	1.014 (0.011-1.016)	0.100
Rural	1,958,421	21.0	7,352,950	79.0	Ref	
Education						
Low education	2,642,353	24.3	8,252,601	75.7	1.502 (1.499-1.505)	<0.001
Higher education	1,656,356	17.6	7,769,290	82.4	Ref	
Physical Activity						
Not	3,953,111	21.3	14,646,340	78.7	0.832 (0.927-1.834)	0.088
Yes	345,598	20.1	1,375,551	79.9	Ref	
Smoke						
Yes	92,369	19.9	370,913	80.1	0.927 (0.920-0.933)	<0.001
Not	4,206,340	21.2	1,650,978	78.8	Ref	
Alcohol Consumption						
Yes	13,085	16.8	64,849	83.2	0.751 (0.737-0.766)	<0.001
Not	4,285,624	21.2	15,957,042	78,8	Ref	
Consumption of Risky Foods						
high	2,580,870	22.0	9,176,495	78.0	1.121 (1.118-1.123)	<0.001
low	1,717,839	20.1	6,845,306	79.9	Ref	
BMI						
Fat	2,687,623	29.9	6,315,494	70.1	2.413 (2.407-2.418)	
Thin	98,320	8.0	1,129,101	92.0	0.494 (0.490-0.497)	<0.001
Normal	1,512,766	15.0	8,577,295	85.0	Ref	
Stress						
Yes	427,995	20.9	1,622,014	79.1	0.982 (0.978-0.985)	<0.001
Not	3,870,714	21.2	14,399,877	78.8	Ref	

Table 4a. Multivariate Analysis

Variabel	P-Value	POR (95% CI)
Aged	<0.001	1.883 (1.879 – 1.888)
Contraception	<0.001	1.007 (1.004 – 1.009)
Residential Area	0.090	1.019 (0.017 – 1.022)
Education	<0.001	1.478 (1.475 – 1.481)
Physical Activity	<0.001	0.987 (0.983 – 1.992)
Smoke	<0.001	0.867 (0.861 – 0.874)
Alcohol Consumption	<0.001	0.879 (0.862 – 0.896)
Consumption of Risky Foods	<0.001	1.120 (1.117- 1.122)

Table 4b. Multivariate Analysis

BMI		
Thin/Normal	<0.001	0.536 (0.533 - 0.540)
Fat/Normal	<0.001	2.245 (2.240 - 2.250)
Stress	<0.001	0.942 (0.938 – 0.945)

DISCUSSION

Aged

Respondents aged >31 years had a 2.166 times risk of experiencing hypertension compared to respondents aged 31 years. This shows that as age increases. the risk and possibility of hypertension also increase. The results of Riskesdas 2013 also showed that at the age of 35-44 years. the incidence of hypertension increased to 24.8% and increased at the age of 45-54 years to 35.6%.[15] With increasing age. the risk of developing hypertension becomes greater. Changes in the structure of the blood vessels become narrower. and the walls of the blood vessels become stiffer, causing an increase in systolic blood pressure. In general, hypertension in women occurs after the age of 45 years. The structural changes in the great arteries observed in systolic hypertension are similar to those resulting from the ageing process. This makes it difficult to differentiate between arterial changes due to disease and those caused by ageing.[16] Other pathophysiological influencing factors that contribute to increased BP with ageing include decreased baroreceptor sensitivity, increased response to sympathetic nervous system stimulation, altered renal and sodium metabolism and altered renin-aldosterone relationships.[17, 18]

Contraception

This study indicates a relationship between the use of contraceptives and hypertension, where respondents who use hormonal contraceptives have a 1.029 times higher risk of developing hypertension than respondents who use non-hormonal contraceptives. Women with chronic medical conditions are of particular concern because of the significantly increased risk for morbidity, mortality, and adverse pregnancy outcomes associated with pregnancy.[19] This has made future pregnancy planning mandatory for these patients. Women over 25 years of age are more likely to use contraception than their younger counterparts. This may be because younger married women have a greater desire for more children and therefore do not use contraception.[20,21] Research shows several of hormonal contraceptives increase blood pressure and, in those with established hypertension, increase the risk of stroke and myocardial infarction.[22] This interpretation is consistent with the findings in this study that the desire to have more children was the second most frequent reason for not using contraception.

Residential Area

Urban areas have a high level of community activity, including transportation. This increases environmental changes, such as noise in the environment that triggers hypertension. As a result, it can increase levels of stress hormones, such as epinephrine, nonepinephrine and cortisol in the body, which can lead to hypertension.[23] But it turns out that the findings in this study residential area are not associated with hypertension in women. This is because the characteristics of the environment in rural and urban areas are not much different. Rural Area has also begun to have development and changes in the environment and lifestyle (sedentariness, high dietary salt, sugar and fat intake) and increase in overweight and obesity.[24]

Education

Based on the results of the research that has been carried out, it is found that there is a significant relationship between the level of education with the incidence of hypertension. The OR value indicates that respondents with a low level of education have a risk of 1,502 times experiencing hypertension compared to respondents with a high level of education.

In this study, there is a relationship between the variables of education level because most respondents with low levels of education cause hypertension. This is because education is an indicator of the human ability to access information. It is also related to awareness in accessing health information. The higher a person's education level, the easier it is for them to get information, and finally, the more knowledge they acquire.[21]

Pre-hypertension and hypertension are widely prevalent risk factors for cardiovascular disease (CVD) and mortality. Previous research has shown that educational status is inversely related to blood pressure and hypertension risk, even after adjusting for income and other measures of socioeconomic status. However, education is usually characterised only by years of schooling or degree attainment, but not both. Years of schooling and degree attainment differ in their conceptualisation of the underlying mechanisms linking education to health.[25,18]

Physical Activity
Lack of physical activity is a risk factor for hypertension. Adequate physical activity reduces the risk of hypertension by reducing vascular resistance and suppressing the activity of the sympathetic nervous system and the renin-angiotensin system. Inactive people tend to have a higher heart rate. The higher the heart rate, the harder the heart works with each contraction and the stronger the pressure on the arterial walls.[26,27,28] Although the findings of physical activity are not significantly related, hypertension sufferers tend to have less physical activity than those who have good physical activity.

Smoke
The results of the analysis of the relationship between smoking and the incidence of hypertension found a significant relationship between smoking and the incidence of hypertension. Women who smoke have a 1.029 times higher risk of developing hypertension than women who do not smoke, and blood circulation can be disrupted due to the nicotine contained in cigarettes. Nicotine can change the structure of small arteries and strengthen the work of the heart. Quitting smoking is a good behaviour change to prevent cardiovascular disease in people with hypertension.[29]

Cigarette smoking acts synergistically with hypertension and hyperlipidemia to increase the risk of acute myocardial infarction and sudden death. In hypertensive patients, smoking also accelerates the progression of kidney disease and increases the likelihood of progression to malignant hypertension. Smokers with hypertension must be required to quit smoking.[30]

Alcohol Consumption
The risk of women suffering from hypertension increases with alcohol consumption behaviour, but this study shows women who consume alcohol have a 0.927 times risk of suffering from hypertension. Excessive alcohol consumption can interfere with and damage the function of several organs, one of which is the liver. Disrupted liver function will affect the performance and function of the heart as well. Impaired heart function that occurs eventually causes hypertension.[31] However, the OR value indicates that respondents who consume alcohol have a 2.017 times higher risk of developing hypertension than respondents who do not consume alcohol. According to the literature review, alcohol use can increase blood pressure, and it is proven that hypertension is difficult to control in patients who consume more than two alcoholic drinks.[11,32] Research states that cigarettes have an OR of 2.45, which means that smoking increases the risk of 2.45 times hypertension. Thus, smoking is a significant risk factor for hypertension.[32,33]

Consumption of Risky Foods
The results showed a relationship between the consumption of risky foods and the incidence of hypertension. Other studies also suggest a relationship between the consumption of risky foods and the incidence of hypertension.[34,35] Endogenous Ouabrain (EO) is thought to have an important role in regulating sodium in the blood and sympathetic activity in the central nervous system. However, the results of this study are difficult to assume because the consumption of risky foods from a variety of foods is difficult to estimate and cannot be proven significantly, but the average intake of risky foods in the respondent group with hypertension shows a higher number.[36]

BMI
Obesity can lead to serious, potentially life-threatening health problems, including hypertension, type II diabetes mellitus, increased risk of heart disease, unexplained increased heart failure, hyperlipidemia, infertility, higher Prevalence of colon, prostate, endometrial, and breast cancer. Women who have an obese BMI have a 2.4 times risk of developing hypertension compared to women who have a normal BMI. Meanwhile, BMI is specifically a protective factor against the risk of hypertension, where someone who has a particular BMI reduces the risk of developing hypertension by 0.49 times.

Endothelin-1 is thought to play a role in obesity-associated hypertension. However, this is still controversial, so further research is needed on the relationship between Endothelin-1 and hypertension and obesity.[37,38] Research states that people with overweight and obese nutritional status have a risk of suffering from hypertension 2.15-2.79 times compared to thin people and ordinary people. Thus, obesity is a significant risk factor for hypertension.[9,39]

Obesity ultimately results from an imbalance between energy intake and energy expenditure. Genetic predisposition can be a determinant of weight gain; However, previous findings have shown that genetic predisposition does not automatically lead to the development of obesity, as eating habits and physical activity patterns may play a more significant role in the amount of weight gain.[40]

Stress
In general, women are more likely than men to suffer from emotional disorders. In certain human research, the HPA axis appears to be more activated, which may be related to women's higher levels of corticotropin-releasing factor (CRF). A study discovered that psychological stress raised the risk of hypertension by roughly 9%.[41] Stress is generally thought of as an imbalance between environmental demands and a person's ability to meet them. Stress is not just an ecological

condition but the interaction of a particular external environment and a particular person; thus, not everyone will evaluate and react to a situation in the same way. Stress conditions can increase blood pressure levels.[30]

The Most Influential Factors with the Incidence of Hypertension

The multivariate analysis results showed that obese BMI was statistically associated with the incidence of hypertension. In this study, most respondents with a fat BMI affected the incidence of hypertension. Respondents with a fat BMI level tend to have 2,245 times the incidence of hypertension compared to respondents with a higher education level. The results of this study support previous research, which stated that there was a relationship between BMI factors and the incidence of hypertension with an POR = 2.245, meaning that respondents with obese BMI have a 2.245 times higher risk of developing hypertension than women who are not obese. While the BMI category Thin/Normal is a protective factor for hypertension.

Several studies suggest a direct relationship between body weight and hypertension. Biomedical studies suggest that the reninangiotensin system is primarily involved in the development of hypertension through two systems including tissue and circulation. Obesity causes excessive distribution of visceral fat accompanied by several changes in hormonal, inflammatory and endothelial levels. These changes stimulate several other mechanisms that contribute to the hypertensive state. [42,43]

BMI at risk for hypertension, namely overweight and obesity, women who have a BMI at risk can do prevention as early as possible with Discharge management by increasing good nutrition, carrying out a healthy lifestyle and physical activity to normalize BMI. Women with a BMI at risk should immediately receive treatment and prevention. In that case, there is a possibility that the environment will encourage hypertension to develop in the future, starting with the appearance of signs and symptoms of hypertension with various complications.

The second most related risk factor is education. Higher education levels were associated with greater opportunities to learn about hypertension and adopt a healthier lifestyle as a result. They were also more likely to engage in moderate drinking, exercise, and obtain preventative they received medical attention and smoked less, which potentially prevent or postpone the onset of hypertension. Second, those with advanced degrees frequently could wages, healthcare, and working conditions. The educated possess sociopsychological assets, such as a strong feeling of social support and individual autonomy, which have been shown to be a protective factor against hypertension.[44] Some of the weaknesses in this study were that it did not analyze the modifying effect of several risk factors related to hypertension. Another limitation is the use of secondary data so that we cannot explore other risk factors for hypertension.

CONCLUSION

Based on the results of this study, it was found that the Prevalence of hypertension in women aged 15 years in Indonesia in 2018 was 21.2%, and the province with the highest Prevalence of hypertension in women aged 15 years in Indonesia in 2018 was West Java Province, which was 29.3 %. The analysis indicates the most significant risk related to hypertension with BMI factors due to fat conditions followed by age, and education in Indonesian women older than 15 years, respectively.

Conflict of interests

The authors declare no potential conflict of interest.

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