Risk Behavior and Psychological Stress on the Incidence of Hypertension among Productive Age in Urban Communities

Alifia Apriliani Prahassiwi[1], Dyah Mahendrasari Sukendra[2]
[1,2]Universitas Negeri Semarang, Indonesia
Email: alifiaapr@gmail.com

Abstract

Indonesia has an increasing trend of hypertension cases annually. The incidence of hypertension in Indonesia was 25,8% in 2013 and 34,1% in 2018, with a higher prevalence in urban areas. Although the prevalence of hypertension is higher in older age, the potential burden of disease is greater at a younger age in experiencing cardiovascular disease and kidney failure in the future. This study aims to determine the relationship between risk behavior and psychological stress on hypertension among productive age in urban Indonesia. This is analytical observational research with a cross-sectional design that uses secondary data from the fifth *Indonesian Family Life Survey* (IFLS-5). The sample size was 3193 respondents who met the inclusion and exclusion criteria. The analysis is univariate, bivariate, and multivariate. Bivariate analysis using *Chi-square* and *Fisher* test obtained factors related to hypertension incidence are age 55-64 years old (p<0,001), age 45-54 years old (p<0,001), age 35-44 years old (p<0,001), education level (p=0,004), physical activity (p=0,020), and obesity (p<0,001). There is no significant relationship in other variables, including psychological stress. While through the test of *logistic regression* in multivariate analysis, factors that affect hypertension are age (p<0,001), gender (p=0,011), and obesity (p<0,001). The study concludes that obesity is the strongest influential variable on the incidence of hypertension among productive age in urban Indonesia. After controlling for other variables, obese individuals had 3,538 times more potential to develop hypertension compared to non-obese individuals (OR=3,538; 95% CI=2,763-4,532).

Keywords: *Hypertension, Risk Factor, Productive Age, Urban Community.*

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A. INTRODUCTION

Hypertension is one of the world's major *non-communicable diseases* (NCDs) that can significantly contribute to the burden of cardiovascular diseases (CVDs), cerebrovascular, kidney disease, disability, and premature death globally (Mills et al., 2020; Stanaway et al., 2018; WHO, 2023). About 1,28 billion adults worldwide are estimated to suffer from hypertension, of which two-thirds live in low and middle-income countries (WHO, 2023). This number continues to increase every year. By 2025, it is predicted that there will be 1,5 billion people with hypertension worldwide and around 9,4 million deaths due to hypertension and its complications (Kemenkes RI, 2019)

One of the global targets for *non-communicable diseases* is to reduce the prevalence of hypertension below 33% in 2030 by preventing and taking hypertension medication regularly (WHO, 2023). Based on a study analysis of NCD *Risk Factor Collaboration*, Indonesia in 2019 ranked second with the highest prevalence of hypertension in women (44%) and third with the prevalence of

hypertension in men (35%) for the Southeast Asia Region (Zhou et al., 2021). Indonesia, as a country of *Upper-Middle-Income Countries* (UMICs), has an increasing trend of hypertension cases. Basic Health Research Data (Riskesdas) in 2018 showed that the prevalence of hypertension was 34,1%, an increase of about 8,3% from 2013 (Kemenkes RI, 2013, 2018).

Risk factors for hypertension can be grouped into two, namely modifiable and non-modifiable risk factors (WHO, 2023). Modifiable risk factors refer to unhealthy behaviors or lifestyles, i.e., lack of physical activity, obesity, smoking habits, poor sleep quality, stress, unhealthy diets such as fast-food consumption, alcohol consumption, less consumption of vegetables and fruits, and excess salt and fat consumption. At the same time, risk factors that cannot be modified are age, sex, family history of hypertension, and comorbidities such as diabetes or kidney disease (Kemenkes RI, 2018; Nawi et al., 2021; Princewel et al., 2019; WHO, 2023).

The risk of hypertension increases with age (Buford, 2016; Ostchega et al., 2020). Based on age group, the prevalence of hypertension in 2018 at the age of 18-24 years old was 13,22%; age 25,34 years old was 20,13%; age 35-44 years old was 31,61%; age 45-54 years old was 45,32%; age 55-64 years old was 55,23% (Kemenkes RI, 2018). Although the prevalence of hypertension is high in the elderly group, the potential burden of disease is greater in the younger age group in experiencing cardiovascular disease and kidney failure later in life because they are not aware that they are suffering from hypertension (Hird et al., 2019; Princewel et al., 2019).

In productive age, humans are at the peak of activity and tend to be more active. Dense activity can cause a person to experience health problems due to a poor lifestyle (Marlita et al., 2022). Lifestyle that leads to risk behavior is an important factor that can affect people's lives and is strongly associated with the incidence of hypertension, especially in productive age (Marlita et al., 2022). According to the results of research conducted by Herawati et al. (2020) in the productive age population, it is shown that physical activity intake of sugar, fat, and salt are associated with the incidence of hypertension, and they advised to change lifestyles better. In the working-age population, hypertension is also associated with decreased productivity due to absenteeism and decreased efficiency at work (Benjamin et al., 2017).

Hypertension is included in the top ten diseases that cause death in the age group of 15-44 years old in urban Indonesia (Surjadi & Surja, 2019). Based on Basic Health Research Data (Riskesdas) in 2018, the prevalence of hypertension is higher in urban areas (34,43%) than in rural areas (33,72%) (Kemenkes RI, 2018). In the future, there will be a higher prevalence of hypertension in rural areas than in urban areas (Gupta et al., 2019). Due to modernization, modifiable risk factors tend to be carried out as a lifestyle of urban communities compared to those living in rural areas (Agustina, 2019).

Urban communities are shown to have overnutrition problems and a high proportion of less physical activity (Surjadi & Surja, 2019). Several studies in several countries have concluded that there is a significant relationship between obesity and

lack of physical activity and the incidence of hypertension in urban communities (Bushara et al., 2016; Kingue et al., 2015; Nawi et al., 2021; Oyeyemi & Adeyemi, 2013; Rissardi et al., 2018; Singh et al., 2017). The prevalence of obesity based on the BMI category of adults (>18 years) in urban Indonesia is 25,1%, higher than the prevalence in Indonesia (21,8%) and rural Indonesia (17.8%). The proportion of less physical activity in urban areas (37,8%) also showed higher figures than the proportion in Indonesia (33,5%) and rural Indonesia (28,4%) (Kemenkes RI, 2018)

Reflections of life in urban areas are illustrated with a *sedentary lifestyle* which is characterized by ease of access, relaxed behavior, low physical activity, the increasingly widespread fast food, smoking habits, lack of fiber foods such as fruits and vegetables, and drinking alcohol, which are risk factors on increasing blood pressure (Pradono, 2010; Surjadi & Surja, 2019). According to the research by Kingue et al. (2015), a higher prevalence of hypertension in urban communities is associated with rapid urbanization that affects low physical activity and a higher proportion of obesity.

In addition, the increasing level of competition in urban life can cause mental and emotional disorders and improve disability levels (Pradono, 2010). Psychological factors such as symptoms of stress, depression, and anxiety are thought to contribute to the development of hypertension (Nainggolan et al., 2021). High blood pressure can result from stress suffered by an individual. Stress can also encourage a person to behave badly, which can increase the risk of developing hypertension. Several research results have shown a significant relationship between stress and the incidence of hypertension in productive age (Benu et al., 2023; Janczura et al., 2021; Mayasari et al., 2019). Stress proved to be one of the important problems in a population and is a major risk factor for hypertension that can be considered in future studies to obtain better results (Singh et al., 2017).

Studies that examine risk behavior and psychological stress on the incidence of hypertension in urban Indonesia have not been widely conducted. Therefore, this study was conducted to prove whether there is a relationship between these factors and the incidence of hypertension among productive age in urban Indonesia.

B. METHOD

This study is analytical observational research with a *cross-sectional* design to assess the risk factors and characteristics of hypertension among the productive age population in urban Indonesia. The source of data is the fifth *Indonesian Family Life Survey* (IFLS-5), which was conducted from September 2014 to April 2015. IFLS is a longitudinal survey conducted since 1993 with a sampling framework representing 83% of Indonesia's population (RAND Corporation, 2014). The sampling scheme in IFLS is carried out in stages based on provinces and urban and rural areas, and then random sampling is carried out at the household level. The survey was conducted by direct interviews with respondents using instruments (*structured questionnaires*) and interview guides consisting of several books. This IFLS survey has collected data on 50,148 individuals from 16,204 households (Mahwati et al., 2022).

The sampling technique in this study follows the sampling scheme in IFLS, *multistage random sampling.* The sample size in this study is all data contained in the *Indonesian Family Life Survey* (IFLS-5) adjusted for researcher variables and has met the inclusion and exclusion criteria. The inclusion criteria are respondents from urban areas of Indonesia who are of productive age (15-64 years) and have complete information related to blood pressure measurement. The exclusion criteria are respondents aged <15 years and >64 years, pregnant women, were taking hypertension medicines, and did not have complete data on all research variables (*missing data*). Thus, a total of 3193 participants were analyzed in this study.

The independent variables in this study consisted of age, gender, education level, marital status, employment status, obesity (based on BMI), smoking status, physical activity, fast food consumption, quality of sleep, and psychological stress. Meanwhile, the dependent variable in this study was the incidence of hypertension.

Blood pressure measurement is carried out by trained health workers three times using *Omron Sphygmomanometer Digital* (HEM-7203) (Strauss et al., 2016). The criteria for hypertension follow the JNC-7 guidelines. Respondents are hypertension if the average measurement of systolic blood pressure is ≥ 140 mmHg and/or diastolic blood pressure is ≥ 90 mmHg (Kemenkes RI, 2018; Unger et al., 2020; Verdecchia et al., 2020; WHO, 2023)Unger et al., 2020; Verdecchia et al., 2020; WHO, 2023). Furthermore, hypertension is categorized into "yes" and "no".

Obesity variables are categorized based on Body Mass Index (BMI). The respondent's height was measured using *Stadiometer Seca model 213,* with an accuracy of 0,1 cm. Body weight was measured using a scale *Camry model EB1003* with an accuracy of 0,1 kg (Strauss et al., 2016). The calculation of Body Mass Index (BMI) is body weight (kg) divided by height squared (m^2). A person is categorized as obese if he has a BMI of ≥27 kg/m^2 (Kemenkes RI, 2018). Then, these variables are categorized into "obesity" and "not obesity".

Physical activity is measured based on the respondent's habits in carrying out heavy, moderate, and light physical activities carried out in the past week for at least 10 minutes continuously, to be further categorized into active and less active. This criterion is in accordance with the criteria used in Riskesdas: active physical activity if respondents do heavy physical activity and/or moderate physical activity, while physical activity is less active if respondents only do light physical activity, i.e., walking or not doing physical activity at all (Kemenkes RI, 2013).

The variables of smoking status and fast food consumption were grouped into "yes" and "no". Sleep quality variables were assessed based on sleep experience over the past week and then categorized into "poor" and "normal". Psychological stress variables are categorized into "yes" and "no", measured from 10 question items with *a cut-off point* of 40% multiplied by the maximum total score of all questions. So, respondents have stress if the total stress score is more than 15.

Respondent's socio-demographic variables were also measured in this study, including: age (15-24 years/25-34 years/35-44 years/45-54 years/55-64 years), gender (male/female), education level (low: kindergarten-junior high school/high: senior

high school-college), marital status (unmarried or divorced/married), and employment status (employed/unemployed).

Univariate analysis with descriptive statistics is carried out to determine the frequency distribution of the variables studied. Then, bivariate analysis with *the Chi-Square test* or *Fisher* test (alternative test if it does not meet the requirements of the *Chi-Square* test) was done to see the relationship of each independent variable to the risk of hypertension. Researchers use the degree of meaning or α = 0.05 (95% Confident Interval). Last, multivariate analysis with *a logistic regression* test was used to determine the variable with the strongest influence on the incidence of hypertension among productive age in urban Indonesia.

IFLS data is open-access for the public so that any researcher can use the data for various scientific purposes. The IFLS survey and its procedures have been reviewed and approved by Institutional Review Boards (IRBs) at the RAND Corporation in the United States and in cooperation with the Survey Meter agency in Indonesia (Strauss et al., 2016).

Before this study was implemented, the research design had gone through an ethical review procedure. It was declared feasible to be carried out based on a certificate from the Health Research Ethics Committee (KEPK), Faculty of Medicine, Universitas Negeri Semarang, with Number: 370/KEPK/EC/2023.

C. RESULT AND DISCUSSION

In Table 1, the number of samples in this study was 3193 respondents, where 521 respondents (16,3%) had hypertension based on systolic blood pressure measurements (≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg). Based on its characteristics, most respondents were in the age group of 25-34 years old (41,1%), male (94%), had a high level of education (senior high school-college) (61,4%), married (56,9%), and employed (81,5%).

Table 1. Frequency Distribution of Respondents Based on Characteristics and Risk Factors of Hypertensive Events in Productive Age in Urban Indonesia (IFLS-5)

Variable	Frequency (n=3193)	Percentages (%)
Hypertension		
Yes	521	16,3
No	2672	83,7
Age		
55-64 years old	113	3,5
45-54 years old	257	8,1
35-44 years old	571	17,9
25-34 years old	1312	41,1
15-24 years old	940	29,4
Gender		
Man	3001	94,0
Woman	192	6,0

Education Level		
Low	1231	38,6
High	1962	61,4
Marital Status		
Unmarried/divorced	1376	43,1
Married	1817	56,9
Employment Status		
Employed	2603	81,5
Unemployed	590	18,5
Physical Activity		
Less Active	1088	34,1
Active	2105	65,9
Obesity Status		
Obesity (BMI ≥ 27)	382	12,0
Not obesity (BMI <27)	2811	88,0
Smoking Status		
Yes	3170	99,3
No	23	0,7
Fast Food Consumption		
Yes	478	15,0
No	2715	85,0
Sleep Quality		
Poor	1549	48,5
Normal	1644	51,5
Psychological Stress		
Yes	2542	79,6
No	651	20,4

The distribution of respondents by *Body Mass Index* (BMI) shows that 12% of respondents are obese, and 88% of others are non-obese. Furthermore, based on physical activity, 34,1% of respondents had less physical activity and 65,9% of respondents had active physical activity. Almost all respondents in this study had a smoking habit (99,3%). The proportion of respondents who consume fast food is 15% and those who do not consume fast food is 85%. Of all respondents, 48,5% had poor sleep quality, and 51,5% had normal sleep quality. Then, the prevalence of psychological stress among productive age in urban Indonesia (2014-2015) was 79,6%.

Table 2 shows the association of several significant risk factors to the incidence of hypertension among productive age in urban Indonesia. The prevalence of hypertension in the age group of 15-24 years old is 9,8%, 25-34 years old is 12%, 35-44 years old is 22,2%, 45-54 years old is 37%, and 55-64 years old is 44,2%. Based on the results of the *Chi-Square* test analysis, a *p-value* of <0,001 was obtained in the age groups of 35-44 years old, 45-54 years old, and 55-64 years old, with PR values of 2,637; 5,405; 7,315. It can be concluded that there is a significant relationship between age and the incidence of hypertension (p<0,05), followed by an increased risk in

older age groups. However, there is no significant relationship between the age group of 25-34 years old and the incidence of hypertension (p > 0,05).

Table 2. Bivariate Analysis of Risk Factors of the Incidence of Hypertension among Productive Age in Urban Indonesia (IFLS-5)

Variable	Hypertension		*p-value*	PR (95% CI)
	Yes	No		
Age				
55-64 years old	50 (44,2%)	63 (55,8%)	<0,001*	7,315 (4,763-11,235)
45-54 years old	95 (37%)	162 (63%)	<0,001*	5,405 (3,877-7,536)
35-44 years old	127 (22,2%)	444 (77,8%)	<0,001*	2,637 (1,969-3,530)
25-34 years old	157 (12%)	1155 (88%)	0,119	1,253 (0,954-1,645)
15-24 years old	92 (9,8%)	848 (90,2%)		
Gender				
Man	480 (16%)	2521 (84%)	0,065	0,701 (0,490-1,004)
Woman	41 (21,4%)	151 (78,6%)		
Education Level				
Low	231 (18,8%)	1000 (81,2%)	0,004*	1,332 (1,102-1,610)
High	290 (14,8%)	1672 (85,2%)		
Marital Status				
Unmarried/divorced	215 (15,6%)	1161 (84,1%)	0,357	0,914 (0,756-1,106)
Married	306 (16,8%)	1511 (83,2%)		
Employment Status				
Employed	434 (16,7%)	2169 (83,3%)	0,279	1,157 (0,901-1,485)
Unemployed	87 (14,7%)	503 (85,3%)		
Physical Activity				
Less Active	201 (18,5%)	887 (81,5%)	0,020*	1,264 (1,041-1,535)
Active	320 (15,2%)	1785 (84,8%)		
Obesity (BMI)				
Obesity	141 (36,9%)	241 (63,1%)	<0,001*	3,743 (2,961-4,731)
Not Obesity	380 (13,5%)	2431 (86,5%)		
Smoking Status				
Yes	516 (16,3%)	2654 (83,7%)	0,408	0,700 (0,259-1,894)
No	5 (21,7%)	18 (78,3%)		
Fast Food Consumption				
Yes	63 (13,2%)	415 (86,8%)	0,052	0,748 (0,563-0,993)
No	458 (16,9%)	2257 (83,1%)		
Sleep Quality				
Poor	237 (15,3%)	1312 (84,7%)	0,144	0,865 (0,717-1,044)
Normal	284 (17,3%)	1360 (82,7%)		
Psychological stress				
Yes	400 (15,7%)	2142 (84,3%)	0,090	0,818 (0,653-1,024)
No	121 (18,6%)	530 (81,4%)		

*) *p-value* <0,05

The prevalence of hypertension among productive age in urban Indonesia obtained in this study is lower than the results of Basic Health Research (Riskesdas) in 2013, where the prevalence of hypertension in the adult population was 25,8%

(Kemenkes RI, 2013). Several factors can cause it, such as differences in sample research and differences in measuring instruments that are used. Riskesdas 2013 used *Omron Sphygmomanometers Digital* type IA1, while IFLS used *Omron Sphygmomanometers Digital* type HEM-7203. In addition, it can also caused by the high awareness of urban people to check their blood pressure in health facilities and compliance with taking hypertension medications. However, more intensive education is still needed for the public to prevent hypertension (Kemenkes RI, 2016).

The risk of hypertension is linearly related to age. In Indonesia, the trend of increasing the prevalence of hypertension has even begun in adolescents, with an increase of 4,52% at the age of 18-24, 5,43% at the age of 25-34, and 6,41% at the age of 35-44 in 5 years (Kemenkes RI, 2018). Research conducted by Gupta et al. (2019) in India has also shown that hypertension started at a young age (18-25 years) with a prevalence of 12,1% (95% CI= 11,8-12,5). This is certainly a serious concern, and a solution is needed where the global target of *non-communicable diseases* is to reduce the prevalence of hypertension by 25% in 2010-2025 (WHO, 2023).

The Minimum Service Standard (MSS) in the health sector at the productive age (15-59 years), health condition screening must be carried out, such as blood pressure measurement for early detection of people with hypertension (Kemenkes RI, 2019). Another indicator of MSS is that all people with hypertension should get anti-hypertension medications. This is part of the government's actions to find cases of hypertension early to be treated and educated so that it doesn't continue to be a complication with other diseases (Kemenkes RI, 2019). As part of this action, Indonesia empowers the community to participate in hypertension screening at the Pos Binaan Terpadu (Posbindu) PTM. People who actively participate in Posbindu PTM have a greater chance of realizing that they have hypertension (a*wareness*), which is 37%, compared to people who are not actively visiting the Posbindu PTM (Faisal et al., 2022). Individuals with hypertension who visit the Posbindu PTM have a greater chance of getting treatment than those who are not actively visiting the Posbindu PTM (93%) (Sujarwoto & Maharani, 2020).

The results of another study interpreted that the risk of cardiovascular disease in a person will be greater if the onset of hypertension is found at a young age. People who experience the onset of hypertension with the age under 45 years old are at risk of 2,26 times experiencing cardiovascular disease. Respondents with the onset of hypertension aged 45-54 years old risk 1,62 times, aged 55-64 years risk 1,42 times, and aged≥ 65 years risk 1,33 times for experiencing cardiovascular disease (Wang et al., 2020). Because in addition to being a health problem, hypertension is also a risk factor for the occurrence of other non-communicable diseases, such as stroke and heart disease (Whelton, 2017). So, screening actions and early detection of hypertension at a younger age will reduce the risk of cardiovascular disease in the future.

The result of bivariate analysis in Table 2 showed that 18,8% of respondents with low education levels had hypertension, while 85,2% of respondents with higher education levels tended not to experience hypertension. Based on the *Chi-square* test

analysis, it can be concluded that there is a significant relationship between the level of education and the incidence of hypertension among productive age in urban Indonesia, with a *p-value*=0,004 (p<0.05). A person with a low level of education has a 1,332 times higher risk of developing hypertension compared to people who have a high level of education (PR=1,332; 95% CI=1,102-1,610).

Level of education is a risk factor for the incidence of hypertension among productive age in urban Indonesia. In line with studies by Susanti et al. (2020), which resulted in the finding that there was a significant relationship between educational status and the incidence of hypertension (*p-value*=0,001) with POR=5,350 (95% CI=1,992-14,368). It can be interpreted that subjects with low education are 5,35 times more likely to develop hypertension than subjects of higher education.

The higher a person's education, the easier they are to receive information; in the end, they have more knowledge. Conversely, if a person's level of education is low, it will hinder the development of one's perspective toward acceptance, information, and newly introduced values. Individual knowledge influences awareness of hypertension prevention behaviors. The higher the individual's knowledge about the causes of hypertension, risk factors, signs of symptoms, and normal and abnormal blood pressure, the more the individual will tend to avoid things that can trigger hypertension (Sinuraya et al., 2017). This statement can be proven through the results of research by Khusnah Fahriah et al. (2021), which shows that there is a relationship between the level of education and the prevention of hypertension in productive age (*p-value* <0.05).

World Health Organization has predicted that prevalence of hypertension will continue to increase if prevention is not carried out. This event is due to changes in people's lifestyles that increasingly lead to *sedentary lifestyles*, especially in urban communities (Liambo et al., 2021). Not good lifestyles, such as less physical activity and dietary imbalances, make hypertension and other non-communicable diseases are now become a major burden in every country (Kemenkes, 2012).

In the physical activity variable, bivariate analysis in Table 2 showed that 18,5% of respondents with less active physical activity experienced hypertension, while respondents with active physical activity tended not to experience hypertension (84,8%). Based on the *Chi-square* test analysis, it can be concluded that there is a significant relationship between physical activity and the incidence of hypertension among productive age in urban Indonesia, with *p-value*=0,020 (p<0.05). Someone who has less active physical activity is 1,264 times more at risk for hypertension when compared to people who have active physical activity (PR=1,264; 95% CI=1,041-1,535).

In this study, the proportion of the productive age population with less physical activity in urban Indonesia was 34,1%, 8% higher than the results of the Basic Health Research (Riskesdas) in 2013, which showed that the proportion of the population (aged ≥10 years old) with less physical activity was 26,1%. It is thought that differences in samples and measurement methods in this study could cause the proportion of the population with physical activity to be overestimated. This

proportion is also higher than the proportion of less physical activity in the global adult population in 2016 (28%) (WHO, 2022).

Physical activity is a risk factor for the incidence of hypertension among productive age in urban Indonesia. Linear with the retrospective studies conducted by Halim & Sutriyawan (2022) with *p-value* <0,001 and OR=5.723, which can be concluded that there is a relationship between physical activity and the incidence of hypertension in productive age in Bandung City, where individuals with less physical activity have a risk of 5,723 times developing hypertension when compared to individuals with sufficient physical activity. A person who has less physical activity tends about 20%-50% to develop hypertension compared to those who are active (Anggraini et al., 2018).

Less physical activity can increase the risk of high blood pressure because of the raised risk of becoming obese. Inactive individuals tend to have faster heart rates, and their heart muscles have to work harder with each contraction. The more complicated and frequent the heart pumps, the greater the force pressing on the artery (Marlita et al., 2022). World Health Organization (WHO) states that less physical activity is mainly due to the non-utilization of free time for activities and sedentary behavior at the workplace and home. In addition, the increased use of "*passive*" modes of transportation contributes to less physical activity in urban communities (WHO, 2019). Increasing the intensity of physical activity by 30-45 minutes per day is important as a strategy for the prevention and management of hypertension so that will reduce the risk of suffering from hypertension in the future (Halim & Sutriyawan, 2022; Juraschek et al., 2014; Wijaya et al., 2020).

Based on Table 2, respondents with obesity tended to experience hypertension (36,9%), while respondents who were not obese tended not to experience hypertension (86,5%). *Chi-square* test analysis shows a significant relationship between obesity and the incidence of hypertension among productive age in urban Indonesia, with p-value <0,001 (p<0,05). Individuals who are obese have a 3,743 times higher risk of developing hypertension compared to people who are not obese (PR=3,743; 95% CI=2,961-4,731).

Obesity is a risk factor for the incidence of hypertension among productive age in urban Indonesia. These findings are linear with previous studies; a *cross-sectional study* in Ambon City and *a case-control study* in Kupang City show a relationship between obesity and the incidence of hypertension in productive age (*p-value* <0.05). The results of the analysis from both studies showed that individuals with obesity had a five times greater risk of developing hypertension when compared to individuals who were not obese (Lawalata et al., 2023; Rini et al., 2022). In addition, studies conducted by Joseph et al. (2018) also indicate that obesity is the dominant hypertension risk factor in Southeast Asia, especially central obesity.

The greater the body mass, the more blood is needed to supply oxygen and food to body tissues. It causes an increase in the volume of blood circulating through the blood vessels, so it can put more pressure on the artery walls (Arum, 2019; Khasanah, 2022). Framingham's study shows that the increase in blood pressure in

men and women are directly proportional to weight gain, where systole blood pressure will rise 4 mmHg for every 4,5 kg weight gain. Contrarily, when there is weight loss in obese people, there is a decrease in blood pressure. A meta-analysis of 18 studies found that 3-9% weight loss reduced systole blood pressure by 3 mmHg and diastol by 3 mmHg (Aronow, 2017).

Routine physical activity helps lose weight and lowers systolic and diastolic blood pressure. In adults, physical activity is known to reduce the risk of premature death as a result of degenerative diseases such as hypertension (Liambo et al., 2021). Doing routine physical activity (aerobic physical activity for 30-45 minutes/day) effectively reduces the risk of hypertension to 19%-30% (Hardati & Ahmad, 2017). Aerobic physical activity in adult men and women at all blood pressure levels, including those with hypertension, can lower systolic and diastolic blood pressure by 2-5 mmHg and 1-4 mmHg on average. With 12 weeks duration, 3-4 sessions per week, 40 minutes/session, and involves moderate to active intensity physical activity, without any combination of other interventions such as diet or weight loss (Eckel et al., 2014).

The variables of gender, marital status, employment status, smoking status, fast food consumption, sleep quality, and psychological stress did not show a significant relationship with the incidence of hypertension among productive age in urban Indonesia (*p-value* >0,05). It could happen because hypertension is a non-communicable disease with many causes (*multi-factor*). A person with hypertension is associated with people's lifestyles, such as excess salt consumption, alcohol consumption, tobacco consumption, fat consumption, caffeine consumption, or other variables that were not examined in this study. This disease is also strongly influenced by hereditary factors (family history of hypertension) and comorbidities such as diabetes or kidney disease (Ulumuddin & Yhuwono, 2018). A person who has one or more risk factors has a greater probability of developing degenerative diseases than ordinary people at some point during life if these risk factors are not controlled (Muslimah et al., 2023).

Table 3. Multivariate Analysis of the Incidence of Hypertension among Productive Age in Urban Indonesia (IFLS-5)

Variable	B	Wald	*p-value*	OR	95% CI
Age					
55-64 years old	2,035	80,683	<0,001	7,650	4,908-11,926
45-54 years	1,632	84,807	<0,001	5,116	3,615-7,242
35-44 years	0,897	34,767	<0,001	2,452	1,820-3,304
25-34 years	0,141	0,997	0,318	1,151	0,873-1,518
Gender	0,522	6,476	0,011	1,686	1,128-2,521
Obesity	1,264	100,153	<0,001	3,538	2,763-4,532
Constant	-2,869	151,949	<0,001	0,057	

Furthermore, a multivariate analysis using *logistic regression* tests was carried out to determine the variables that have the strongest contribution in influencing the risk of the incidence of hypertension among productive age in urban Indonesia. The

final results of the multivariate analysis in Table 3 showed that three variables significantly affect the incidence of hypertension are age 55-64, 45-54, 35-44, 25-34 years old (OR 7,650; 5,116; 2,452; 1,151), gender (OR=1,686), and obesity (OR=3,538). It is known that obesity is the variable that has the strongest contribution to affect the incidence of hypertension among productive age in urban Indonesia because it has the smallest *p-value* (p<0,001) and the largest *Wald* (100,153). After controlling for other variables, individuals with obesity had a 3,538 times higher risk of developing hypertension compared to non-obese individuals.

Below is a model of the regression equation for the incidence of hypertension in this study. In this equation, the comparison used in the age variable is the age of 15-24 years old.

y = -2,869 + 2,035 (age 55-64 years old) + 1,632 (age 45-54 years old) + 0,897 (age 35-44 years old) + 0,141 (age 25-34 years old) + 0,522 (gender) + 1,264 (obesity)

D. CONCLUSION

Based on the results of the study, it can be concluded that age, education level, physical activity, and obesity are risk factors that are significantly associated with the incidence of hypertension among productive age in urban Indonesia. While other factors such as gender, marital status, employment status, smoking status, fast food consumption, sleep quality, and psychological stress were not significantly associated with the incidence of hypertension. The most dominant factor influencing the incidence of hypertension is obesity.

It is recommended to the community, especially urban Indonesia, to adopt a healthy lifestyle by always controlling weight and maintaining a healthy diet. Screening health conditions from a young age with routine blood pressure checking needs to be done to detect hypertension early. In addition, physical activity of at least 30 minutes per day is crucial because it has significant health benefits and contributes to preventing non-communicable diseases, especially hypertension. People with hypertension should remain consistent in carrying out eating arrangements, one of which is DASH (*Dietary Approach to Stop Hypertension*).

This study is a secondary data analysis from IFLS-5 conducted in 2014-2015. Transformations in social, cultural, economic, and lifestyle make this study's results less capable of describing society's current situation. Suggestions for future research can be carried out in a risk factors study with the same variables or other variables that have a significant impact on the incidence of hypertension among productive age in urban Indonesia using *a case-control* research design to obtain more detailed research results and find out more real comparisons between case populations and control populations.

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