

Risk Factors for Hypertension Among Adults Living in A Rural Area, Minahasa

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Abstract

Hypertension is a major public health issue in Indonesia due to its high prevalence and the fact that it is a risk factor for heart disease, kidney failure, and stroke. Age, gender, family history, alcohol consumption, smoking, iodine consumption, physical activity, and obesity are all risk factors for hypertension. Adults with undiagnosed hypertension can face an increased risk of morbidity and mortality if it is left untreated. Early detection and knowledge about the risk factors for hypertension in adults are important. This cross-sectional study aimed to investigate the risk factors for hypertension in adults in Mapanget Village, North Minahasa. The sample size was 384 respondents, and the sample was obtained using convenience sampling. Data were collected using an online questionnaire and analyzed using a Chi-square test. The study found a relationship between hypertension and family history ($p = 0.01$), obesity ($p = 0.03$), smoking ($p = 0.01$), physical activity ($p = 0.01$), and alcohol consumption ($p = 0.01$). This study recommends people live a healthy lifestyle by controlling their blood pressure and weight, not drinking alcohol, not smoking, and engaging in physical activities that are appropriate given their abilities.

Keywords: adults, blood pressure, healthy lifestyle, hypertension

Abstrak

Faktor Risiko Hipertensi pada orang Dewasa yang Tinggal di Pedesaan Minahasa. Hipertensi merupakan masalah kesehatan yang utama di Indonesia karena prevalensinya yang tinggi dan menyebabkan komplikasi seperti penyakit jantung, gagal ginjal, dan stroke. Faktor risiko yang berhubungan dengan kejadian hipertensi yaitu usia, jenis kelamin, riwayat keluarga, asupan alkohol, merokok, asupan konsumsi yodium, aktivitas fisik, dan obesitas. Tujuan dari penelitian ini adalah untuk menganalisis faktor risiko yang berhubungan dengan kejadian hipertensi pada usia dewasa di Desa Mapanget, Minahasa Utara. Jenis penelitian ini adalah kuantitatif korelasional dengan desain cross sectional. Sampel dalam penelitian ini berjumlah 384 orang. Instrumen penelitian menggunakan kuesioner. Analisis data menggunakan Chi-square. Hasil penelitian didapatkan bahwa riwayat keluarga ($p = 0,001$), obesitas ($p = 0,033$), merokok ($p = 0,005$), aktivitas fisik ($p = 0,004$), dan konsumsi alkohol ($p = 0,009$) memiliki hubungan yang signifikan terhadap kejadian hipertensi di Desa Mapanget, Minahasa Utara. Sedangkan jenis kelamin ($p = 0,334$) tidak berhubungan dengan kejadian hipertensi di Desa Mapanget. Rekomendasi dari penelitian ini adalah agar masyarakat melakukan gaya hidup sehat dengan mengontrol tekanan darah dan berat badan, tidak mengonsumsi alkohol, menghindari rokok, dan melakukan aktivitas fisik sesuai dengan kemampuan fisik.

Kata Kunci: dewasa, healthy lifestyle, hipertensi, tekanan darah

Introduction

Hypertension is a major public health issue in Indonesia in that it contributes to heart disease, kidney failure, and stroke (Ministry of Health Republic of Indonesia, 2021). Hypertension is defined as a continuous increase in systolic blood pressure to 140 mmHg or more and/or an

increase in diastolic blood pressure to more than 90 mmHg (Potter et al., 2013). Hypertension was diagnosed when blood pressure measurements were taken within two days and a systolic blood pressure of 140 mmHg or more a diastolic blood pressure of 90 mmHg or more was obtained (World Health Organization [WHO], 2023).

Hypertension is usually asymptomatic until complications develop in the target organs. Headache or heaviness in the neck, dizziness, palpitations, fatigue, blurred vision, ringing in the ears (tinnitus), and nosebleeds are some of the signs and symptoms of hypertension. The number of adults with hypertension increased from 594 million in 1975 to 1.13 billion in 2015, with the majority of the increase occurring in low- and middle-income countries. An estimated 46% of adults with hypertension are unaware of their condition (WHO, 2023). In Indonesia, the prevalence of hypertension in the population aged 18 years or more has increased to 34.1%, up from 25.8% in 2013. Women have a prevalence of 36.9%, while men have a prevalence of 31.3%. The age group of 18 – 24 years has a hypertension prevalence of 13.2%, the age group of 25 – 40 years has a prevalence of 20.1%, and the age group over 75 years has a prevalence of 69.5%. North Sulawesi has the highest prevalence of hypertension, at 13.2% among people over the age of 18 (Badan Litbangkes Kementerian Kesehatan RI, 2019). In North Minahasa, there are 16,380 cases of hypertension (Badan Pusat Statistik Minahasa Utara, 2016).

Age, gender, and genetics are among the modifiable risk factors for hypertension. Other risk factors that can be modified include smoking, a low-fiber diet, dyslipidemia, excessive salt consumption, a sedentary lifestyle, stress, and being overweight or obese (Ministry of Health Republic of Indonesia, 2021). A study found that having a BMI of 25 increased the risk of experiencing hypertension by 3.05-fold, having a family member with hypertension increased the risk by nearly 3-fold, and not drinking alcohol reduced the risk of hypertension by 70% (Ondimu et al., 2019). Other studies have found that smoking and drinking alcohol are related to hypertension, whereas someone who engages in sufficient exercise typically has normal blood pressure. Patients with diabetes, individuals with a history of cardiovascular disease, and postmenopausal women are at risk for hypertension (Dhungana et al., 2016). Obesity, poor diet, physical activity, stress, smoking, poor sleep,

and alcohol use are all risk factors for hypertension in young adults (Susiani, 2019).

Hypertension can lead to issues such as atherosclerosis, heart attack, stroke, an enlarged heart, and kidney damage. Adults with undiagnosed hypertension can face an increased risk of morbidity and mortality. Because hypertension is a chronic disease that can lead to death if left untreated, early detection and knowledge about hypertension risk factors in adults are important. The goal of hypertension treatment is to reduce the risk factors for hypertension. However, it is unclear which risk factors contribute to hypertension in adults in Minahasa. Thus, this study aimed to investigate the factors that contribute to hypertension in adults in Mapanget Village, North Minahasa.

Methods

The method employed in this study is cross-sectional. The target population of this study was adults in Mapanget Village, North Minahasa. The researcher used an estimation formula with an unknown population size (N), a 95% confidence level ($Z = 1.96$), and an 80% research power ($Z = 0.842$) to determine the sample size. In this study, the estimated minimum sample size is 308. The sampling technique employed is convenience sampling, which involves taking samples at random and wherever possible. Adults aged 19 to 44 years old were considered eligible (Ministry of Health Republic of Indonesia, 2016). Individuals who refused to participate in the study were excluded. This study was conducted in Mapanget Village, North Minahasa, from March to April 2021.

The dependent variable was the incidence of hypertension in adults, and the independent variables were gender, family history, smoking, obesity, physical activity, and alcohol consumption. The researchers define hypertension as a continuous increase in systolic blood pressure to 140 mmHg or higher and/or an increase in diastolic blood pressure to more than 90 mmHg that has been diagnosed by a doctor and treated

with antihypertensive medications. The research instrument was a questionnaire taken from the Ministry of Health Republic of Indonesia (2011), number KOHORTPTM.2011.IND, and the Global Physical Activity Questionnaire (GPAQ). The KOHORT PTM scale is a self-report tool for use in assessing risk factors for noncommunicable diseases. The KOHORTPTM instrument has 16 domains, but only two are included in this study: smoking habits and alcohol consumption. Each question is answered dichotomously. Smoking habits are removed as “current smoker” or “never a smoker.” A current smoker is defined as an adult who has smoked 100 cigarettes in his or her lifetime and continues to do so. Never smokers are adults who have never smoked or have smoked less than 100 cigarettes in their lifetimes. Alcohol consumption refers to the consumption of alcoholic beverages. Women should limit their alcohol consumption to one drink per day, while men should limit their consumption to two drinks per day.

The GPAQ is a tool developed by the Ministry of Health Republic of Indonesia to assess physical activity. The GPAQ records the amount of

time spent each week performing various types of physical activity and consists of 16 questions. The QPAQ classifies physical activity as moderate if the total metabolic equivalents (METs) are 600 or more or as low if the total METs per week are less than 600.

The researchers developed a web-based survey and distributed it to a professional network of research members in the research area. This is considered the best way to access the target population given the social distancing restrictions in place. Data analysis is performed using the Chi-square test to determine how independent variables such as gender, family history, obesity, smoking, physical activity, and alcohol consumption are related to the risk of hypertension in rural residents of Minahasa.

The study was approved by the Research Ethics Committee of the Faculty of Nursing Universitas Pelita Harapan (No: 053/RCTC-EC/R/I/2021). The researcher considered several factors in this regard, including informed consent, anonymity, confidentiality, beneficence, and non-maleficence. Each subject was informed of the

Table 1. Respondent characteristics (n = 308)

Characteristics	Total	Percentage (%)
Hypertension		
Yes	28	9.1
No	280	90.9
Gender		
Male	117	38
Female	191	62
Family history		
Yes	202	65.6
No	106	34.4
Obesity		
Yes (BMI ≥ 30)	11	3.6
No (BMI < 30)	297	96.4
Smoking		
Current smoking	76	24.7
Never smoking	232	95.7
Physical Activity		
Less activity (Metabolic Equivalent/ week < 600)	74	24
Vigorous activity (Metabolic Equivalent/ week ≥ 600)	234	76
Alcohol consumption		
Yes	127	41.2
No	181	58.8

Table 2. Factors associated with hypertension among adults.

Variable	Hypertension				Total		p	OR
	Yes		No		n	%		
	n	%	N	%				
Gender								
Male	13	4.22	104	33.76	117	37.9	0.33	1.46 (0.67–3.20)
Female	15	4.87	176	57.14	191	62.01		
Family history								
Yes	26	8.44	176	57.14	202	65.58	0.01	7.68 (1.78–33.02)
No	2	0.64	104	33.76	106	34.41		
Obesity								
Yes (BMI ≥ 30)	3	0.97	8	2.59	11	3.57	0.03	4.08 (1.01–16.35)
No (BMI < 30)	25	8.11	272	88.31	297	96.42		
Smoking								
Current smoking	13	4.22	63	20.45	76	24.67	0.01	2.98 (1.35–6.60)
Never smoking	15	4.87	217	70.45	232	75.32		
Physical activity								
Less activity (Metabolic Equivalent/ week < 600)	13	4.22	61	19.80	74	24.02	0.01	3.11 (1.40–6.89)
Vigorous activity (Metabolic Equivalent/ week ≥ 600)	15	4.87	219	71.10	234	75.97		
Alcohol consumption								
Yes	18	5.84	109	35.38	127	41.23	0.01	2.82 (1.25–6.34)
No	10	3.24	171	55.51	181	58.76		

study’s objectives, risks, and benefits and was asked to sign a consent form. All personal information provided by the respondents was kept strictly confidential.

Results

The characteristics of the respondents are summarized in Table 1. According to Table 1, there were 28 hypertense respondents (9.1%) and 280 non-hypertense respondents (90.9%). The majority of respondents (62%) were female, and 65.6% had a family history of hypertension. There were 11 obese respondents (3.6%) and 297 non-obese respondents (96.4%). The majority of respondents (95.7%) had never smoked, engaged in vigorous activity (76%), and did not drink alcohol (58.8%).

Table 2 shows the correlation between gender, family history, obesity, smoking, physical activity, and alcohol consumption and hypertension among adults in Mapanget Village, North Minahasa. Table 2 reveals a relationship between family history and hypertension (p-value

0.01). Respondents who have a family history of hypertension are at 7.6 times higher risk of experiencing hypertension than those without a family history. Obesity was associated with hypertension (p-value 0.01), and obese people have a 4.0-fold higher risk of developing hypertension than non-obese people. The findings also showed a relationship between smoking and hypertension (p-value 0.01), with smokers having a 2.9-fold higher risk of developing hypertension than nonsmokers. A lack of physical activity was associated with hypertension (p-value 0.01), and respondents who exercised less had 3.1 times per week faced a higher risk of experiencing hypertension. Alcohol consumption was associated with hypertension (p-value 0.01), and respondents who consumed alcohol faced a 2.8-fold higher risk of experiencing hypertension as compared to respondents who did not consume alcohol.

Discussion

Gender is a risk factor for hypertension. Men are more likely to experience hypertension due

to the low estrogen levels in the body as compared to women, who have high estrogen levels in their bodies before menopause (Pérez-López et al., 2010). Furthermore, women have more arterial estrogen receptors than men, so they are less likely to experience hypertension. Estrogen inhibits sympathetic nerve activity by activating nitric oxide, resulting in vasodilation (Reckelhoff, 2018). However, after the age of 60, females are more likely than males to have hypertension. The older the participants were, regardless of gender, the more likely they were to have hypertension (Choi et al., 2017). The participants in this study are adults aged 19 to 44 years old, and there is no relationship between gender and hypertension. This study follows research in Nigeria and Jati Luhur Health Center Bekasi, which found no relationship between gender and hypertension (Ajayi et al., 2016; Maulidina, 2019). In fact, hypertension is a serious condition that requires medical attention and lifestyle changes, regardless of gender.

Family history is also considered a risk factor for hypertension. Specifically, it is an important non-modifiable risk factor. Blood relatives tend to have many of the same genes that can predispose a person to hypertension. Genes are the genetic units that are passed from parents to their children. Relatives may share similar habits, such as diet, exercise, and smoking, all of which can increase the risk of hypertension (Centers for Disease Control and Prevention, 2005). High sodium-lithium counter-transport, low urinary kallikrein excretion, elevated uric acid levels, high fasting plasma insulin concentration, high-density LDL sub-fraction, high blood pressure index, fat pattern, oxidative stress and body mass index, sodium intake, and heavy metal exposure are all genetic factors associated with high blood pressure (Ranasinghe et al., 2015). The finding showed a relationship between family history and hypertension. There were several associations found between family history and hypertension prevalence. In Saudi Arabia, researchers found that individuals with a family history of hypertension are at a two-fold higher risk of experiencing hypertension as compared

to people without a family history of hypertension (Shah et al., 2015). These results are consistent with a study on pre-hypertension among young adults (20 – 30 years old) in Udupi District, South India, which found an association between family history and hypertension (Desai et al., 2021).

Body mass index (BMI) is an indicator of nutritional status in adults, and it is calculated by dividing an individual's weight by the square of their height. According to WHO guidelines, obesity is defined as a body mass index of 30 kg/m² (Tumwesigye et al., 2020). Obesity or weight gain will result in increased cardiac output and peripheral arteriole resistance (Singh et al., 2017). Obesity activates mineral corticosteroid receptors that are not affected by aldosterone or angiotensin II. Increased visceral adiposity is associated with excess body weight, which can increase the risk of hypertension by 65 to 75% (Hall et al., 2015). Obese people have more adipose tissue, which increases vascular resistance and, as a result, the stress on the heart when pumping blood. Hyperinsulinemia and insulin-induced salt retention are two additional pathways involved in obesity-induced hypertension (Alsmadi et al., 2014; Channanath et al., 2015). Obesity has been linked to an increased risk of hypertension. This is consistent with previous research indicating a link between excess body fat and hypertension. The results also showed a relationship between obesity and hypertension. Research conducted in India and the United States found a relationship between obesity and hypertension in both sexes and at all ages (Ramya et al., 2016; Papathanasiou et al., 2015).

Smoking habits are often associated with an increased risk of hypertension for both smokers and ex-smokers (Wu et al., 2018). Smoking is a major cardiovascular risk factor for heart and blood disease. This is due to the nicotine and carbon monoxide content in cigarettes (Bruno et al., 2018). The nicotine content will affect the heart rate and blood pressure through the release of catecholamines and sympathetic nerve

stimulation. Nicotine, which stimulates the sympathetic nerves, causes an increase in the heart rate and blood pressure by increasing the release of epinephrine and norepinephrine (Leone, 2015). Long-term smoking increases blood pressure, which can lead to inflammation, endothelial dysfunction, plaque formation, and vascular damage (Gumus, 2013). The findings showed a relationship between smoking and hypertension. A study conducted in Vietnam also found a relationship between smoking and hypertension. Men who smoked faced a higher risk of hypertension than nonsmokers, which was dose-dependent (the more cigarettes smoked per day, the higher the increase in blood pressure (Cuong et al., 2019).

Physical activity is a form of self-control used to maintain or lose weight. Obesity prevention and moderate to vigorous physical activity can significantly reduce the risk of hypertension (Egan, 2017). Physical activity is defined as any movement of the limbs that results in an increase in energy expenditure above the resting level, as well as routine daily tasks, such as work, commuting, household activities, and other activities. This movement is caused by skeletal muscle contraction (Diaz & Shimbo, 2013). Physical activity is calculated by multiplying the weekly frequency by the duration of each activity performed and is classified as less activity, moderate activity, or strenuous activity (Santana et al., 2018). A lack of physical activity can increase the risk of obesity and lead to hypertension (Sihotang & Elon, 2020). Controlling and preventing hypertension requires not only pharmacological intervention but also healthy lifestyles that includes physical activity (Abrignani, 2018). Regular physical activity for 40 minutes per session three times per week can help to control or prevent hypertension (Brooks & Ferro, 2012). Adults should be able to perform at least 150 minutes of moderate-intensity aerobics per week or 75 minutes of vigorous aerobics per week. Physical activity helps to strengthen the heart, lungs, bones, and muscles. It can also help regulate a person's weight and blood pressure. Physical activity has been shown

to help prevent and manage high blood pressure. Our results showed a relationship between physical activity and hypertension. Research in Malaysia and India has found a relationship between physical activity and hypertension. People who engaged in moderate physical activity had a 40% higher risk of developing hypertension as compared to those who engaged in vigorous physical activity (Loh et al., 2013; Singh et al., 2017).

In several major countries around the world, alcohol is a major risk factor for disease. In the Western Pacific and the Americas, alcohol is the leading cause of disease, and in parts of Europe, it is the second leading cause of disease (Pereira et al., 2013). People who are healthy or have hypertension must be able to control their lifestyles, such as controlling and reducing their alcohol consumption if they are currently consuming excessively (Roerecke et al., 2018). The renin-angiotensin system in the body can be influenced by alcohol consumption. Excessive alcohol consumption can cause the renin-angiotensin system to become activated. When there is an increase in alcohol consumption that affects the renin-angiotensin system, fluid and electrolyte balance changes, and arterial blood pressure rises (Toffolo et al., 2014). Our results showed a relationship between alcohol consumption and hypertension. According to studies conducted in Australia and the United States, there is a correlation between alcohol consumption and the risk of hypertension. People over the age of 18 in Australia who have consumed excessive amounts of alcohol in the previous four weeks are at risk of experiencing hypertension. Alcohol consumption of seven to 13 glasses per week may increase the risk of experiencing stage-one or -two hypertension (Aladin et al., 2019; Pereira et al., 2013). Indonesia has a diverse ethnic population. Every ethnic group has unique cultures and traditions. North Sulawesi is famous for a liquor called saguer. Sauer has become a product closely associated with the Minahasa people. Palm trees, or sauer trees, produce sauer, a white liquid that tastes sweet when freshly harvested. Sauer is made through a

natural fermentation process, has a sour flavor, and contains about 5% alcohol. Sager is still used in traditional rituals and is considered a sacred drink.

This study focused on investigating the risk factors for hypertension in adults. It is essential to investigate the risk factors for hypertension so that adults can begin taking preventive measures at a young age. Healthy lifestyle changes are urgently needed to help control hypertension, such as reducing salt consumption, engaging in regular physical activity (such as walking 3 km/exercise 30 minutes per day at least 5 times per week), not smoking, eating a balanced diet, and reducing alcohol consumption. This study sampled only residents of Mapanget Village, North Minahasa. Thus, the results may not be representative and cannot be generalized to all of Indonesia's diverse regions. A study with a more representative sample is needed given Indonesian pluralism.

Conclusion

The factors that contribute to hypertension include family history, BMI, smoking habits, physical activity, and alcohol consumption. The goal of hypertension treatment is to decrease the risk factors for hypertension.

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