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ORIGINAL ARTICLE

ANALYSIS OF DOMINANT RISK FACTORS FOR HYPERTENSIVE DISEASE

Analisis Faktor Risiko Dominan terhadap Penyakit Hipertensi (Data Sekunder Puskesmas Kecamatan Johar Baru, Jakarta Pusat Tahun 2021)

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ABSTRACT

Background: Hypertension is a non-communicable disease with a high morbidity and mortality rate. This disease frequently triggers the iceberg phenomenon as numerous individuals remain unaware of the affliction. **Aim:** This study determines the most dominant risk factors for the incidence of hypertension. **Methods:** The quantitative study method used was conducted in September 2022. The study population utilized secondary data sourced from the Visit data at the Johar Baru Health Center in South Jakarta during 2021. The initial dataset consisted of 102,647 patients, out of which 13,946 had hypertension. Furthermore, data analysis involved employing the Chi-square test and Multiple Logistic Regression, with a significance level of 95%. **Results:** The Chi-Square test yielded significant results, indicating a relationship between risk factors for hypertension and seven out of the nine free variables examined. These variables included Body Mass Index (BMI) (p-value=0.000), excess salt consumption (p-value=0.000), underfeeding fruits and vegetables (p-value=.000), lack of physical activity (p-value=0.000), excess fat consumption (p-value=0.000), gender (p-value=0.000), and age (p-value=0.000), with a p-value of <0.05. Meanwhile, smoking (p-value=0.516) and drinking alcohol (p-value=0.859) variables, with a p-value of >0.05 had no relationship. **Conclusion:** The result showed that BMI was the most dominant risk factors for hypertension, with an OR of 1,610. Therefore, people with an abnormal BMI have a 1,610 times risk of developing hypertension.

ABSTRAK

Latar belakang: *Hipertensi merupakan salah satu penyakit tidak menular dengan angka morbiditas dan mortalitas yang tinggi hingga saat ini. Penyakit ini juga sering menimbulkan fenomena gunung es karena banyak*

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orang yang tidak menyadari bahwa dirinya menderita hipertensi. ***Tujuan:*** *Penelitian ini bertujuan untuk mengetahui faktor risiko yang paling dominan terhadap kejadian hipertensi.* ***Metode:*** *Jenis penelitian ini adalah kuantitatif dan dilakukan pada bulan September 2022. Populasi menggunakan data sekunder dari data kunjungan di Puskesmas Johar Baru, Jakarta Selatan, Tahun 2021. Data awal sebanyak 102.647 pasien, dengan jumlah data pasien hipertensi sebanyak 13.946. Analisis data yang digunakan uji Chi-square dan Regresi Logistik Berganda, dengan tingkat signifikan 95%.* ***Hasil:*** *Hasil uji Chi-Square, dari 9 variabel bebas, didapatkan 7 variabel yang memiliki hubungan dengan faktor risiko hipertensi, yaitu indeks massa tubuh (p-value = 0,000), konsumsi garam berlebih (p-value =0,000), kurang makan buah dan sayur (p-value =0,000), kurang aktivitas fisik (p-value =0,000), konsumsi lemak berlebih (p-value =0,000), jenis kelamin (p-value =0,000), dan usia (p-value =0,000), dengan nilai p-value < 0,05. Sedangkan dua variabel bebas yang tidak memiliki hubungan, yaitu variabel merokok (p-value = 0,516) dan minum alkohol (p-value = 0,859), dengan nilai p-value >0,05.* ***Kesimpulan:*** *Penelitian ini menemukan bahwa variabel Indeks Massa Tubuh merupakan faktor risiko yang paling dominan untuk terjadinya hipertensi, dengan nilai OR sebesar 1,610. Artinya, orang dengan Indeks Massa Tubuh (IMT) yang tidak normal memiliki risiko 1.610 kali untuk mengalami hipertensi.*

INTRODUCTION

Hypertension is a non-communicable disease with a high prevalence of morbidity and mortality (1). In Indonesia, the number of people with this disease is estimated to be around 15 million, but only 4% have controlled hypertension. The prevalence rate in adults ranges from 6% to 15%, with approximately 50% being unaware of their condition, leading to a propensity for severe hypertension due to a lack of awareness and avoidance of risk factors. Moreover, approximately 90% of cases can be attributed to essential hypertension (2). Therefore, hypertension disease is often called the "silent killer" and causes the iceberg phenomenon.

The exact cause is unknown but has long been considered disease involving many factors (3). According to some literature, the high incidence is influenced by two irreversible factors, namely age, gender, and ethnicity. The second factors can be changed, including Body Mass Index (BMI)/obesity (4), the habit of consuming alcoholic beverages (5), lack of exercise/physical activity, finishing excess salt (6), lack of physical activity, and smoking habits (7). Previous studies indicated that within hypertension population, a significant proportion comprises individuals from the young adult and elderly age groups, with a higher prevalence observed among females. Additionally, one notable complication associated with hypertension is the development of cardiovascular disease (8).

The initial survey results show that hypertension in the Johar Baru District Health Center is relatively high with an annual increase. The data can be seen from the data on patient visits at the Johar Baru Community Health Center from 2019 to 2021, as presented in Table 1:

Table 1
The number of hypertension diseases based on visit data at the Johar Baru Community Health Center District, Central Jakarta from 2019 to 2021

Gender	Hypertension Data		
	Year 2019	Year 2020	Year 2021
Male	2.545	8.917	5.787
Female	3.674	14.189	8.159
Total	6.294	23.106	13.946

This study aims to determine the most dominant risk factors in understanding the predominant risk factors for the incidence of hypertension to add references in the treatment and prevention of disease.

METHODS

This type of study is quantitative with a cross-sectional design, and analytic observations of the most dominant risk factors of the independent variables include:

1. Age variable: The current age of respondent, with the productive period grouping, is unproductive in
the age range >64 years.
2. Gender: Gender classification of respondents.
3. Smoking history: Habit/behavior of smoking cigarettes or ever smoking in everyday life.
4. Physical activity: Sports habits usually carried out by subjects regularly, 2-3 times weekly. As well as
the ideal duration carried out by the study subject at each time exercising (9).
5. Excess salt consumption: In Yes Category, when the patient consumes more than 2000 mg of sodium
or the equivalent of 1 teaspoon per day.
6. Excess fat consumption. In Yes Category, when the patient consumes saturated fat above 10% of total
energy.
7. Eating limited fruits and vegetables: In Yes Category, patients did not consume 300-400 grams of
fruits and vegetables per person per day.
8. Drinking alcohol: Habit/behavior of smoking cigarettes or having smoked in daily life.
9. BMI: BMI classification is divided into 2, namely average ≤25, and overweight/obesity, namely >25
(10).
10. The dependent variable is the incidence of hypertension, shown when a person has systolic and
diastolic blood pressure of more than 140 mmHg and 90 mmHg (9).

The population comprises the complete set of patient visit data recorded at the Johar Baru Health Center in the year 2021. This dataset encompasses a total of 102,647 visit records, of which 13,946 pertain to patients diagnosed with hypertension. The determination of the sample size involves a comprehensive non-probability sampling technique, where the completeness of patient data is considered. Following the processes of data cleaning and normalization, the final dataset comprised a total of 17,080 visits, with hypertension data pertaining to 9,571 patients. The instrument was not tested for validity and reliability because the data used was secondary. Data analysis used SPSS 25, with univariate, bivariate (Chi-Square), and multivariate analysis at a p-value of 0.05. This study used ethical principles, namely expediency, confidentiality, and justice, and obtained an honest clearance letter with number 015/KEPK/UNPRI/II/2023.

RESULTS

Based on the findings in Table 2, the Chi-Square bivariate test was conducted to examine the relationship between the independent and dependent variables. The results showed that a total of eight independent variables demonstrated a significant association, indicated by p-values below 0.05. These variables include age, sex, lack of physical activity, consumption of excess salt, consumption of excess fat, inadequate intake of fruits and vegetables, and BMI. Therefore, these variables have a relationship as risk factors for hypertension, where smoking and the alcohol variables have a p-value above 0.05. In conclusion, the variables have no relationship with risk factors for hypertension and are issued to test multivariate at a p-value of >0.02.

Based on the results presented in Table 3, the multivariate analysis was performed using the enter method logistic regression test. In this analysis, variables with odds ratio (OR) values greater than 1 are considered to be risk factors. It is protective when the OR value is <1, and BMI has the greatest OR value at 1.61. BMI is indicative of risk of developing hypertension, with individuals classified as obese having a 1.61 times higher likelihood compared to those with an average BMI. Additionally, several risk factors variables are associated with this increased risk, namely excess salt consumption, inadequate intake of fruits and vegetables, lack of physical activity, and excessive fat consumption. Conversely, gender and age variables exhibit an OR value <1, indicating a lower risk.

Table 2
Chi-Square Test Results of Secondary Data of Puskemas Johar Baru in 2021

Variable	Category	Hypertension		Total	df	Asymptotic Significance (2-sided)
		Yes	No			
Age	Productive	5,739	8,405	14,144	1	.000
		33.60%	49.20%	82.80%		
	Unproductive	1,767	1,169	2,936		
		10.30%	6.80%	17.20%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Gender	Male	3,193	4,549	7,742	1	.000
		18.70%	26.60%	45.30%		
	Female	4,313	5,025	9,338		
		25.30%	29.40%	54.70%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Smoke	Smoking	1,691	2,117	3,808	1	.516
		9.90%	12.40%	22.30%		
	Not Smoking	5,815	7,457	13,272		
		34.00%	43.70%	77.70%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Physical Activity	Lack of Physical Activity	2,365	2,633	4,998	1	.000
		13.80%	15.40%	29.30%		
	There is Physical Activity	5,141	6,941	12,082		
		30.10%	40.60%	70.70%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Excess Salt Consumption	Yes	3,313	3,113	6,426	1	.000
		19.40%	18.20%	37.60%		
	No	4,193	6,461	10,654		
		24.50%	37.80%	62.40%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Excess Fat Consumption	Yes	3,142	3,421	6,563	1	.000
		18.40%	20.00%	38.40%		
	No	4,364	6,153	10,517		
		25.60%	36.00%	61.60%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		

(*Continued*)

Table 2
Continued

Variable	Category	Hypertension		Total	df	Asymptotic Significance (2-sided)
		Yes	No			
Underfeeding Fruits and Vegetables	Yes	2,884	3,147	6,031	1	.000
		16.90%	18.40%	35.30%		
	No	4,622	6,427	11,049		
		27.10%	37.60%	64.70%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
Drinking Alcoholic Beverages	Yes	2	3	5	1	.859
		0.00%	0.00%	0.00%		
	No	7,504	9,571	17,075		
		43.90%	56.00%	100.00%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		
BMI	Abnormal (Obesity/ Overweight)	3,000	2,758	5,758	1	.000
		17.60%	16.10%	33.70%		
	Usual	4,506	6,816	11,322		
		26.40%	39.90%	66.30%		
	Total	7,506	9,574	17,080		
		43.90%	56.10%	100.00%		

Source: Secondary Data processed by SPSS in 2022

Table 3
Multivariate test results from Logistic Regression Enter Method, secondary data of Puskemas Johar Baru in 2021

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
BMI	0.48	0.03	203.88	1	0.00	1.61	1.51	1.72
Excess Salt Consumption	0.46	0.03	180.81	1	0.00	1.58	1.48	1.69
Underfeeding Fruits and Vegetables	0.20	0.03	37.34	1	0.00	1.23	1.15	1.31
Lack of Physical Activity	0.10	0.04	7.33	1	0.01	1.10	1.03	1.18
Excess Fat Consumption	0.08	0.03	4.62	1	0.03	1.08	1.01	1.15
Gender	-0.18	0.03	30.53	1	0.00	0.84	0.79	0.89
Age	-0.75	0.04	313.98	1	0.00	0.47	0.44	0.51
Constant	**-0,75**	**0,13**	**31,28**	**1**	**0.00**	**0,47**		

Source: Secondary Data processed by SPSS in 2022

DISCUSSION

Variable BMI

The results showed that BMI variable had a relationship with hypertension risk factors in the secondary data, with a p-value of 0.00 and highest OR value of 1.61 (>1 is risk). The result was supported by Hossain et al. (2019), where for every 5 kg/m2 increase in BMI, the OR for hypertension was 1.79 (95% CI: 1.65-1.93), 1.59 (95% CI: 1.58-1.61), and 2.03 (95% CI: 1.90-2.16) in Bangladesh, India, and Nepal. The association between BMI and hypertension was consistent across different subgroups defined by gender, age,

urbanicity, educational attainment, and household wealth index (11).

Variable Excess Salt Consumption

The results showed that the variable of excess salt consumption was related to risk factors for hypertension in the secondary data, with a p-value of 0.00 and an OR value of 1.58 (>1 is risk). According to Han et al (14), a high intake of food salt had the most vital role in the incidence of hypertension. In studies related to salt intake, it is important to distinguish between the term's "salt" and "sodium" (12,13). It was commonly acknowledged that 1 gram of salt composed of 40% sodium and 60% chloride. Considering guidelines provided by reputable organizations such as the World Health Organization (WHO) and the American Heart Association, it was recommended that normal and healthy adults should limit their daily sodium intake to less than 2.02.0 g/day or 2.3 g/day (15).

Variables of Underfeeding Fruits and Vegetables

The results showed that the variable of eating fewer fruits and vegetables had a relationship with risk factors for hypertension, with a p-value of 0.00 and an OR value of 1.23 (>one risk). This aligns with a study in a hospital in Banjarbaru, South Kalimantan, where there was a relationship between fruit and vegetable consumption and the incidence of hypertension. The Spearman rank correlation test results obtained a significant value of 0.00, less than 0.05 (16).

Fruits and vegetables are good sources of magnesium and potassium and can lower blood pressure in body. Therefore, cultivating a habit of consuming fruits and vegetables on a daily basis is strongly advised. These nutritious foods are abundant in vitamins and minerals, which play crucial roles in regulating maintenance and growth within body (17).

Variable Lack of Physical Activity

The results showed that the variable lack of physical activity was associated with risk factors for hypertension, with a p-value of 0.00, and an OR value of 1.10 (>1 is risk). Lack of physical activity was often associated with increased non-communicable/chronic disease (18). However, excessive activity also increased blood pressure, pre-hypertension, and hypertension (19). Physical activity or exercise should be conducted regularly to provide a protective or preventive effect against chronic disease, such as hypertension (12).

Variable Consumption of Excess Fat

The results showed that the variable of Excess Fat Consumption had a relationship with risk factors for hypertension, with a p-value of 0.00 and an OR value of 1,08 (>one is risky). Excess fat consumption also affected high low cholesterol deposits in the blood. The buildup and plaque in the blood caused blockages that decreased the elasticity of blood vessels (17). Therefore, blood pressure volume increased and became risk factors for hypertension (20,21).

Gender Variables

The results showed that the gender variable had a relationship with hypertension risk factors, with a p-value of 0.00 and an OR value of 0.85 (<1 is protective). From the results, most of the respondents who suffered from hypertension were 25.30% and 18.70% of females and males

This study was consistent with Garwahusada (22), where Chi-Square analysis obtained a relationship between gender and hypertension with a significant p-value of 0.00 <0.05 and OR=8.23. The number of men aged 46-56 years had a greater prevalence of hypertension (32.5%) compared to women (13.0%) at the Central Java Provincial Health Office.

Moussouni et al (23) stated that the prevalence of prehypertension and hypertension was 36.20% (95% confidence interval: 35.20-37.50%) and 31.60% (95% CI: 30.50-32.70%), respectively. Prehypertension was substantially higher in men, while hypertension was higher in women residing in Algeria between 2016 and 2017.

Gender was identified as a risk factor for hypertension that could not be changed, but it did not serve as a determining factor for the incidence of hypertension. The percentage of the possibility of hypertension was found to be the same for both men and women when individuals were able to maintain a healthy diet BMI, and engage in regular physical activity.

Age Variables

The results showed that the age variable had a relationship with hypertension risk factors with a p-value of 0.00 and an OR value of 0.47 (<1 is protective). This was in line with Khasanah (24) study, where there was a significant relationship between age and incidence of hypertension in the Sumbang II health center area of Banyumas

Regency. The results using the Chi-square test obtained a significant p-value=0.00 ≤ α (0.05).

The majority of individuals within the productive age group were affected by hypertension. This finding contrasts with the opinion of Moussouni et al (23), where the prevalence increased with age. According to different assumptions, there were changes in a person's intake and diet. For example, many fast food items are available, and food is easily obtained through online delivery and ordering. Therefore, an individual who fails to adhere to a healthy dietary regimen and lacks regular physical activity might develop hypertension, regardless of age.

Smoking Variables

The results showed that the smoking variable had no relationship with risk factors for hypertension with a p-value of 0.52. According to Syahrir et al (25), there was no significant relationship between smoking and the incidence of hypertension in the coastal area of East Kolono South Konawe subdistrict, from the results of statistical tests using the Chi-Square at α=5% and df=1, obtained the value X2 count <X2 table (0.26<3.84) with a test value of closeness (p-value=0.61>0.05).

Contrary to the findings presented in Thapliyal et al (26) study, there were significant associations observed between risk factors for hypertension and variables such as age, gender, smoking, and alcohol consumption, as evidenced by the results of both bivariate and multivariate tests.

The effects of smoking were mainly mediated by nicotine, which could increase blood pressure acutely and temporarily through stimulation of the sympathetic nervous system. However, in long-term exposure, nicotine had a different effect. The metabolites, such as cotinine and nicotine lowered blood pressure through vasodilating effects (27).

Alcohol Drinking Variables

The variable of alcohol drinking habits did not have an association with risk factors for hypertension, with a p-value of 0.86 This study supported Syahrir et al (25), where there was no significant relationship between alcohol consumption and the incidence of hypertension in the coastal area of East Kolono District, South Konawe. The results of statistical tests using the Chi-Square test at α=5% and df=1, obtained the value of X2 count <X2 table (0.35<3.84) with a test value of closeness (p-value=0.56).

The habit of drinking soft drinks and alcohol was often associated with non-communicable disease (28,29). The variable had no relationship with hypertension because Indonesian data were used due to the people's habit of drinking fizzy drinks.

Hypertension is a chronic disease that necessitates careful consideration of time and risk factors, as they can significantly impact the prevalence of this condition. Based on statistical analysis using secondary data sourced from the Johar Baru Health Center, three specific risk factors have been identified as influential in the development of hypertension. These factors encompass the variable of BMI, excessive salt consumption, and inadequate intake of fruits and vegetables. However, it is important to acknowledge that additional risk factors play a significant role in shaping the incidence of disease.

CONCLUSION

The results and analysis have reported a conclusive relationship between nine independent and dependent variables. Out of these, a total of seven variables have demonstrated a significant association with risk factors for hypertension. These variables include BMI, Excess Salt Consumption, Eating fewer fruits and vegetables, Lack of physical activity, Excess Fat Consumption, Gender, and Age. Meanwhile, smoking and drinking alcohol have no relationship with the bound variable. The results of the multivariate test showed that the variable with the highest OR is BMI at an OR magnitude of 1,610 (risky). Therefore, people with an abnormal BMI have a 1,61 times risk of developing hypertension.

The community can conduct prevention and control by paying attention to lifestyle, diet, and physical activity. A pivotal step in ensuring the well-being of people is to regularly seek medical attention at the nearest healthcare facility. Therefore, early symptoms of disease can be promptly identified to facilitate easier management and treatment.

CONFLICT OF INTEREST

No conflict of interest in this study.

AUTHOR CONTRIBUTIONS

JBG doing a search, analysis, and data analysis. TS participated in conceptualization,

supervision, editing, and reviewing. All authors read, give critical feedback, and approved the final version of the manuscript.

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