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Original Article

Determinant of Hypertension among Adults in West Java, Indonesia: Analysis of National Basic Health Research Data 2018

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Abstract

Background: Hypertension is a serious health problem worldwide. Many studies on the determinants of hypertension have been done, however studies in West Java are still very minimal. This study aimed to determine the risk factors for hypertension among adults in West Java, Indonesia.

Methods: This study used a cross-sectional method with a quantitative approach using secondary data from the National Basic Health Research 2018. The final number of individuals sampled was 46,186 people. Data analysis was performed using simple logistic regression and multiple logistic regression methods.

Results: The mean age of the sample was 42.97 years (SD=15.37), and females were the predominant (52.95%). The majority of samples consumed sweet beverages (31.06%) and salty foods more than once a day (29.22%), did not smoke (59.17%), had a normal body mass index (BMI) (53.78 %), and had experienced gum disease and dental problems in the last year (56.75 %). Physical activity in metabolic equivalent task (MET) minute was 5,917.79. There was a significant positive association between age and hypertension, with an odds ratio (OR) of 1.06 and a 95% confidence interval (CI) of 1.05–1.06. Furthermore, the analysis found a significant negative correlation between physical activity and hypertension, with an OR of 0.999 and a 95% CI of 0.9999874–0.9999962.

Conclusions: Hypertension is significantly associated with age, whereas physical exercise is negatively associated. Priority should be given to elderly individuals and people with a high BMI for interventions such as routine blood pressure monitoring and education.

Keywords: Determinants of hypertension, hypertension, risk factors of hypertension.

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Introduction

Hypertension is a condition in which blood pressure is continuously higher than normal.[1] Hypertension is commonly asymptomatic, however, this condition can cause organ damage through excessive mechanical stress and accelerated atherosclerosis.[1,2]

Hypertension is a serious public health issue worldwide.[2,3] Around 1.13 billion people had hypertension worldwide in 2015.[4] More than a third of the Indonesia's population had hypertension in 2018.[5] This condition is worrying, considering that this disease was a significant risk factor for premature death and disability worldwide in 2015.[3] In 2018, West Java was ranked second after South Kalimantan in terms of hypertension prevalence, the prevalence was 39.6%.[5] In addition to the high prevalence, West Java was also the province with the highest population in Indonesia, according to the 2020 census.[6] Based on this data, it can be concluded that West Java is one of the provinces in Indonesia with the worst hypertension problem. Apart from the already severe problem, studies regarding the determinants of hypertension in West Java still need to be done.

Therefore, this study was conducted with the aim of finding out the determinant factors

of hypertension in West Java by further analyzing data from the 2018 National Basic Health Research (*Riset Kesehatan Dasar* 2018, Riskesdas 2018). Hopefully, this study could provide a contribution in the form of evidence-based suggestions to help overcome hypertension problems in West Java, Indonesia.

Methods

This study was a correlative analytic study using secondary data from a previous cross-sectional study, namely Riskesdas 2018. Data was accessed at https://labmandat.litbang.kemkes.go.id by following the applicable terms and conditions. This study was approved by the Research Ethics Committee Universitas Padjadjaran, with approval number 856/UN6.KEP/EC/2021. Data analysis was performed between December 2021 and March 2022.

The target population in this study was all population of West Java, Indonesia. The study's sample was residents included in the Riskesdas 2018, who met the exclusion and inclusion criteria. The inclusion criteria were individuals aged ≥18 and living in West Java. Exclusion criteria were incomplete data entry and pregnant women. The sampling scheme used in the Riskesdas 2018 was identical to the *Survei Sosial Ekonomi Nasional* (Susenas) Maret 2018 sampling scheme, which used a complex sampling scheme.[5] To overcome the inherent sampling bias problems in a complex sampling scheme, this study used survey estimation parameters in the form of primary sampling units, strata, and sampling weights included in the dataset for bivariate and multivariable analysis. Data analysis was done using simple and multiple logistic regression methods using the enter algorithm with a significance value of 0.05. The software used in this study was STATA version 14.

Before analysis, data was cleaned to select individuals to fit inclusion and exclusion criteria. The number of individuals before data cleaning was 48,465, after excluding pregnant women, it became 47,828. Data cleaning continued with the variables age, salty food consumption, sugary beverage consumption, gender, gum and dental disease, and smoking habits. No individual was excluded from this stage. Then data cleaning continued with the variables body mass index (BMI) status, physical activity, and the blood pressure measurement. The final number of individuals included in the study was 46,186.

The dependent variable used in this study was hypertension. The mean blood pressure measurements were applied using the European Society of Cardiology criteria to determine the hypertension status.[2] Meanwhile, the independent variables were age, gender, salty food consumption, sweetened beverage consumption, smoking habit, BMI status, and ental gum disease history.

Consumption of salty foods and sweetened beverages was a description of consumption in the last month. Likewise for the smoking habits variable, current smokers were those who were still smoking in the last month, and former smokers were those who had not smoked in the last month. The physical activity variable was calculated by multiplying metabolic equivalent of task (MET) by the total minute of physical activity in one week, following global physical activity questionnaire (GPAQ) guidelines.[7] According to GPAQ, the MET for moderate-intensity activity was 4, and 8 for vigorous activity.[7] For the BMI status variable, BMI ≥27 was considered obese, 27>BMI≥25 was considered overweight, 18.5≤BMI<25 was normal, and <18.5 was underweight.[5] A history of gum and the dental problem was categorized as "yes" if in the last year the individuals experienced at least one of the following complaints, namely swollen gums and or abscesses, gums that bleed easily, cavities, damaged or sore teeth, loose teeth, and loss of a tooth.

Results

The mean age of the sample was 42.97 years (SD=15.37), slightly more than half were females (52.95%), the majority of the sample consumed sweetened beverages and salty foods more than once a day, the proportions were 31.06% and 29.22%. Most of the samples did not smoke (59.17%). The mean of MET minute was 5,917.79. Most people in the sample had a normal BMI (53.78%). Most people had experienced gum and dental problem in the last year (56.75 %) (Table 1).

The results of bivariate analysis demonstrated that all variables except salty food consumption had significant relationship with hypertension. However, after multivariable analysis was carried out, the statistically significant variables were reduced to age, BMI status, and physical activity (Table 2).

The result of the multivariable analysis showed a significant association between age and hypertension with an odds ratio of 1.06 (95% CI 1.05–1.06). A significant correlation was also found in the physical activity variable with an odds ratio of 0.9999918 (95% CI

Table 1 Basic Characteristics of Data

Variable	n (%)
Age, Mean ± Standard deviation	42.97 ± 15.37
Gender	
Male	21,731 (47.05)
Female	24,455 (52.95)
Salty foods consumption	
>1 time a day	13,494 (29.22)
One time a day	11,341 (24.56)
3–6 times a week	8,149 (17.64)
1–2 times a week	8,238 (17.84)
≤ 3 times a month	3,017 (6.53)
Never	1,947 (4.22)
Sweetened beverages consumption	
>1 time a day	14,347 (31.06)
One time a day	13,533 (29.30)
3–6 times a week	6,917 (14.98)
1–2 times a week	7,268 (15.74)
≤3 times a month	2,117 (4.58)
never	2,004 (4.34)
Smoking habits	
Current smoker, everyday	14,075 (30.47)
Current smoker, not everyday	2,258 (4.89)
Former smoker	2,524 (5.46)
Never smoke	27,329 (59.17)
Physical activity in MET minute, mean±standard deviation	5,917.79 ± 6,863.10
BMI status	
Obesity	10,749 (23.27)
Overweight	6,311 (13.66)
Normal	24,839 (53.78)
Underweight	4,287 (9.28)
History of dental and gum disease	
Yes	26,212 (56.75)
No	19,974 (43.25)
Hypertension status	
Yes	19,251 (41.68)
No	26,935 (58.32)

Note: MET= Metabolic equivalent task, BMI= Body mass index

0.9999874–0.9999962). The odds ratio for BMI status were 2.59 (95% CI 2.43–2.77) for obesity, 1.58 (95% CI 1.45–1.72) for overweight, and 0.55 (95% CI 0.49–0.61) for underweight compared to normal BMI status. These three variables and categories had a p-value of less than 0.001 (Table 2).

Discussion

This study found that there were differences between the results of bivariate and multivariable analyses. This occurs because confounding factors affect the results, and the bivariate analysis does not account for this. Therefore, further interpretation is based on multivariable analysis.

Multivariable analysis demonstrated that age was positively associated with hypertension, meaning that the odds of experiencing hypertension increase with age. This result is in line with previous studies.[8,9] Aging is associated with increased oxidative stress and chronic inflammation. These conditions eventually contribute to diminished production of vasodilators by endothelial cells, reduced artery elasticity, and activation of the renin-angiotensin-aldosterone system

Table 2 Results of Bivariate and Multivariable Analysis to Determine the Determinant of Hypertension in West Java, Indonesia

Variable	Bivariate		Multivariable	
	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age	1.05(1.05–1.06)	<0.001	1.06(1.05–1.06)	<0.001
Gender				
Male	0.69(0.66–0.72)	<0.001	0.93(0.85–1.01)	0.082
Female	Ref	-	Ref	-
Salty foods consumption				
>1 time a day	0.91(0.81–1.04)	0.289	1.16(1.01–1.33)	0.037
One time a day	0.92(0.81–1.05)	0.045	1.14(0.99–1.31)	0.071
3–6 times a week	0.89(0.78–1.02)	0.092	1.07(0.93–1.24)	0.341
1–2 times a week	0.92(0.77–0.99)	0.204	1.00(0.87–1.15)	0.990
≤ 3 times a month	0.91(0.80–1.07)	0.155	0.97(0.82–1.14)	0.679
never	Ref	-	Ref	-
Sweetened beverages consumption				
>1 time a day	0.50(0.44–0.57)	<0.001	0.78(0.67–0.90)	0.001
One time a day	0.56(0.49–0.64)	<0.001	0.79(0.69–0.92)	0.003
3–6 times a week	0.58(0.50–0.67)	<0.001	0.90(0.77–1.05)	0.175
1–2 times a week	0.67(0.58–0.77)	<0.001	0.90(0.78–1.05)	0.172
≤3 times a month	0.78(0.66–0.92)	0.004	0.88(0.73–1.06)	0.176
never	Ref		Ref	-
Smoking habits				
Current smoker, everyday	0.68(0.64–0.72)	<0.001	0.92(0.84–1.01)	0.07
Current smoker, everyday	0.81(0.72–0.91)	0.001	1.01(0.88–1.16)	0.88
Former smoker	1.22(1.10–1.36)	<0.001	1.04(0.91–1.18)	0.52
Never smoke	Ref	-	Ref	-
Physical activity in MET minute	0.999 (0.9999813-0.999989)	<0.001	0.999	<0.001
BMI status				
Obesity	2.56(2.41–2.72)	<0.001	2.59(2.43–2.77)	<0.001
Overweight	1.64(1.52–1.77)	<0.001	1.58(1.45–1.72)	<0.001
Normal	ref	-	ref	-
Underweight	0.62(0.56–0.68)	<0.001	0.55(0.49–0.61)	<0.001
History of dental and gum disease				
Yes	1.07(1.02–1.12)	<0.006	0.95(0.90–1.00)	0.075
No	Ref	-	Ref	-

Note: MET= Metabolic equivalent task, BMI= Body mass index

(RAAS).[8,9] These factors contribute to an increase in total peripheral resistance.

In this study, hypertension was 0.999 (95% CI 0.9999889–0.9999951) times less likely to be found as physical activity increased by one MET.minute. This result is in line with previous studies.[10–12] Physical activity is associated with increased baroreceptor sensitivity, nitric oxide bioavailability, and blood vessel elasticity.[13] These factors contribute to a decrease in peripheral resistance, consequently a decrease in blood pressure.[13]

This study found an association between BMI status and hypertension. Compared with normal BMI status, obese people are 2.59(95%CI 2.43–2.77) times more likely to have hypertension. Overweight people are 1.58(95%CI 1.45–1.72) times more likely to have hypertension. On the other hand, underweight people are 0.55(95%CI 0.49–0.61) times less likely to have hypertension compared to people with normal BMI status. These positive association results are in line with previous study.[14] Obesity contributes to mechanical obstruction of kidney blood vessels, increased leptin concentration, hyperinsulinemia, and sleep apnea. Mechanical obstruction of the kidney blood vessels and hyperinsulinemia stimulate the RAAS.[15] Conversely, hyperinsulinemia, sleep

apnea, and hyperleptinemia also stimulate the sympathetic nervous system. The RAAS and sympathetic stimulation contribute to the increase in blood pressure.[15]

No significant association was found between hypertension and salty food consumption and sweetened beverage. These results are different from previous studies. A meta-analysis of randomized controlled trials demonstrated that sodium consumption increases blood pressure.[16] Sugar consumption has also been demonstrated to increase blood pressure in previous studies.[17,18] These two variables have the potential to cause a recall bias problem by asking about consumption in the last month. There are likely differences in perceptions regarding beverages that are considered sweet and foods that are considered salty among respondents. These problems may contribute to the difference in results from previous studies.

There was no association between hypertension and smoking habits. Results from previous studies are somewhat inconclusive; data analysis from the Indonesian Family Life Survey (IFLS) has demonstrated the same statistically non-significant association result.[19] Some studies have demonstrated a positive association.[20,21] Conversely, contradicting results are also found, other results have demonstrated a negative association.[22,23] Considering that previous studies are inconclusive, it is not surprising to find an insignificant result in this study. Considering similar results in Indonesia based on an IFLS study, there is a possibility that smoking has no effect on hypertension in West Java. This insignificant result is not surprising considering the conflicting results of previous studies.

The results of the study showed there was no association between the gum and dental disease history and hypertension. This result is not in line with previous studies. Studies in recent years have demonstrated that gum disease could be a potential risk factor for hypertension.[24–26] A study of hypertensive adults in the United States (US) has shown that good oral health is associated with lower blood pressure by 2.3 to 3 mmHg and associated with a lower risk of hypertension therapy failure.[25] In addition, a causal relationship has also been demonstrated in a clinical trial.[24] A potential weaknes in this variable is that the data is obtained by asking about dental and gum complaints in the last year, this has the potential to cause recall bias. In addition, the 1-year time frame may be too long for the effects of dental and gum problems to affect hypertension status. This may contribute to the differences in results from previous studies.

No significant association was found between hypertension and gender. Previous studies have demonstrated that the direction of the association is affected by age.[27,28] Young men are more likely to have hypertension. However, the tendency slowly changes with age, and as a result, older women are more likely to have hypertension.[27] Ovarian hormonal changes are thought to be the mechanism behind these changes.[28] Analyzing this variable across all age groups at once may make the results statistically insignificant, meaning that if observed from the population as a whole, gender is not associated with hypertension.

This study has strengths and weaknesses. The first weakness of the study is that this study used a cross-sectional design, this design cannot determine the causative direction. This study did not have control over data quality because it used secondary data from previous study. The data was also taken from respondents along with various variables, so it has the potential to cause bias problems because it would make respondents bored and not concentrate. On the other hand, this study has an advantage in sample size. The large sample size in this study can improve the reliability of the findings and make them more accurate and representative of the population investigated. A larger sample size also improves the generalizability of this study's results, meaning that the findings apply to a larger population than just the sample used for the study. Therefore, despite the weak study design and data quality, its large sample size can be considered a positive value.

In conclusion, the determinant factors for hypertension in West Java, Indonesia are age, BMI status, and physical activity. Further interventions such as routine blood pressure screening and education should be carried out, especially in people with old age, high body mass index, and sedentary lifestyles. Considering the limitations of this study, further prospective cohort studies focusing on hypertension and using more precise variable measures should be conducted.

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