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# Overview of Hypertension Prevalence and Its Main Risk Factors in Indonesia – a District-Level Data Analysis

## *Gambaran Prevalensi Hipertensi dan Faktor Risiko Utama di Indonesia – Analisis Data Tingkat Kabupaten/Kota*

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**ABSTRACT**

**Background:** Hypertension is one of the serious health problems in Indonesia with a prevalence of 34.1%. Specific risk factors including an unhealthy diet might influence the disease.
**Objectives:** The study aimed to describe the prevalence of hypertension, difference in the prevalence across districts/cities and regions, and analyze the main risk factors of the disease at district level in Indonesia.
**Methods:** This cross-sectional is a descriptive secondary data analysis of Basic Health Research 2018 using mean comparison, correlation, and multivariate linear regression analysis. The analysis incorporated aggregate data from 478 districts. The dependent variable was hypertension prevalence, and the independent variables were obesity, central obesity, smoking, salty, instant, and fatty food consumption, fruit and vegetable consumption, physical activity, and blood pressure check. The sampling technique was total sampling with criteria of all variables having complete data.
**Results:** The mean prevalence of hypertension in districts in Indonesia was 31.18%. There was no difference in hypertension prevalence between districts and cities but there was a difference across seven regions in Indonesia, namely Sumatera, Java-Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua. The most influential risk factors were regular blood pressure checks (Beta 0.326), lack of fruit and vegetable consumption (Beta 0.169), salty foods consumption (Beta 0.124), and fatty foods consumption (Beta 0.055).
**Conclusions:** Blood pressure checks and an unhealthy diet were the most influential risk factors for hypertension. It is recommended for the Government and the public to increase blood pressure screening and avoid unhealthy diets.

## INTRODUCTION

High blood pressure or hypertension, which constitutes a Non-communicable Disease (NCD), is a serious health problem. Worldwide, the prevalence of hypertension is 240 per 100,000 people of all ages, with 14.9 deaths per 100,000, and it is the 10th most common cause of death in 2019 In Indonesia[1]. In 2018, hypertension prevalence in the population aged 18 years and above was 34.1%. The prevalence increased from 25.8% in 2013[2,3].

Hypertension can be affected by a variety of risk factors, both modifiable and unmodifiable. Risk factors that cannot be modified include age, sex, and genetics. Meanwhile, risk factors that can be changed include obesity, smoking, lack of physical activity, excessive salt consumption, dyslipidemia, excessive alcohol consumption, as well as psychosocial and stress[4]. These risk factors need to be known and controlled to prevent hypertension and other NCDs. If hypertension is detected late, it leads to further complications, resulting in a condition where several organs are affected.

There are several serious complications caused by hypertension including heart disease, kidney disease, and diabetes mellitus. These complications led to high-cost medication and even deaths. Hypertension is one of the most serious NCDs because it is the silent killer[5], as the majority of people suffering from hypertension are not aware about the disease. Therefore, adequate prevention and control efforts are needed. The efforts to control NCD, including hypertension, have been included in the Ministry of Health's 2020-2024 Strategic Plan[6].

Hypertension control efforts should be developed through risk factor control and disease management programs. They could be implemented by



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NCD integrated posts (*Posbindu*), integrated services at primary health centers, and advanced health facilities[4]. The most influential risk factors of hypertension should be revealed to develop appropriate programs. Furthermore, this information will also serve to raise people's awareness to prevent hypertension.

The prevalence of hypertension in Indonesia is well known, but information on the difference in prevalence between regions is still needed. The program developed might be different across regions due to different prevalence of hypertension. While the burden differs among regions, the program should be prioritized in regions with a bigger burden. In addition, the most dominant risk factors for hypertension in Indonesia also needs to be discovered so that intervention to control these risk factors is more appropriate. These risk factors need to be explored in every district/city in Indonesia. Therefore, this study was conducted to describe the prevalence of hypertension, difference in the prevalence across districts/cities and regions, and analyzing its main risk factors in Indonesia at the district level.

## METHODS

This cross-sectional study is a secondary data analysis of the Ministry of Health's 2018 Basic Health Research. The data collected were in the form of hypertension prevalence and risk factors. The dependent variable of this study was hypertension prevalence, and the independent variables included prevalence of overweight, obesity, central obesity, smoking, consumption of salty foods, consumption of instant foods, consumption of fatty foods, lack of fruits vegetables consumption, lack of physical activity, and routine blood pressure checks. This study used a total sampling technique with criteria of all variables having complete data. The data analyzed comprised 478 districts/cities with respondents aged 18 years and above.

Data analysis performed were descriptive, comparative, bivariate, and multivariate analysis. Descriptive analysis was conducted to describe the distribution of independent and dependent variables. The comparative analysis used an independent t-test to discover the difference in prevalence between districts and cities and the ANOVA test to determine the difference in hypertension prevalence between 7 regions of Indonesia, namely Sumatera, Java-Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua. Furthermore, bivariate analysis determined the association between the determinants and prevalence with a Pearson correlation test with a significance of 0.05. Meanwhile, multivariate analysis was conducted to assess the most affected risk factors for hypertension with a multiple linear regression test with a significance of 0.05. The steps of multivariate analysis were bivariate selection with a correlation test using a p-value of <0.25, modeling by the Enter method, and determination of the final model[7]. This study has obtained ethical approval from Universitas Esa Unggul Ethical Commission Number 0923-12.028 /DPKE-KEP/FINAL-EA/UEU/I/2024 dated January 1, 2024.

## RESULTS AND DISCUSSIONS

The results of the descriptive analysis in the form of hypertension distribution and its risk factors can be seen in table 1. The average (mean) prevalence of hypertension in districts/cities in Indonesia was 31.18%. In terms of risk factors, the mean prevalence *of* overweight per district/city was 13.08%, obesity was 20.45%, central obesity was 29.97%, smoking was 28.39%, salty food consumption was 22.89%, instant food consumption was 8.68%, fatty food consumption was 33.43%, lack of fruit and vegetable consumption was 94.85%, lack of physical activity was 32.80%, and regular blood pressure checks was 10.92%.

**Tabel 1.** Distribution of hypertension prevalence and its risk factors

| No | Prevalence | Mean (%) | Median (%) | Standard Deviation (%) | Minimum (%) | Maximum (%) |
|---|---|---|---|---|---|---|
| 1 | Hypertension | 31.18 | 31.53 | 8.09 | 5.77 | 51.99 |
| 2 | Overweight | 13.09 | 13.31 | 2.53 | 2.58 | 19.99 |
| 3 | Obesity | 20.45 | 20.06 | 5.78 | 3.64 | 37.71 |
| 4 | Central obesity | 29.97 | 30.09 | 6.91 | 5.99 | 49.68 |
| 5 | Smoking | 28.39 | 28.41 | 3.94 | 8.04 | 37.94 |
| 6 | Salty food consumption | 22.89 | 19.68 | 15.11 | 1.64 | 79.42 |
| 7 | Instant food consumption | 8.68 | 6.87 | 6.22 | 1.18 | 43.89 |
| 8 | Fatty food consumption | 33.43 | 31.91 | 17.01 | 2.02 | 77.61 |
| 9 | Lack of fruit and vegetable consumption | 94.85 | 96.38 | 5.00 | 58.98 | 100.0 |
| 10 | Lack of physical activity | 32.80 | 31.16 | 11.33 | 10.69 | 73.03 |
| 11 | Routine blood pressure check | 10.92 | 10.64 | 5.39 | 1.13 | 58.39 |

Table 2 shows that the prevalence of hypertension in districts and cities were almost the same, namely 31% respectively. By regions, the highest prevalence of hypertension was in the Kalimantan region (38.58%) and the lowest in the Papua region (23.18). There was no difference in the prevalence of hypertension between districts and cities (p-value 0.915) but there were differences in seven regions in Indonesia (p-value <0.001).



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**Table 2.** Differences of hypertension prevalence between districts and regions

| Variable | Mean (%) | Standard Deviation (%) | Standard Error (%) | p-value | n |
|---|---|---|---|---|---|
| District/Muncipality | | | | | |
| District | 31.20 | 8.27 | 0.4 | 0.915* | 400 |
| Municipality | 31.09 | 7.14 | 0.80 | | 78 |
| Region | | | | | |
| Sumatera | 26.88 | 8.07 | 0.65 | <0.001** | 150 |
| Java-Bali | 36.69 | 5.19 | 0.46 | | 127 |
| Nusa Tenggara | 26.80 | 4.61 | 0.81 | | 32 |
| Kalimantan | 38.58 | 5.67 | 0.75 | | 56 |
| Sulawesi | 29.50 | 6.38 | 0.71 | | 80 |
| Maluku | 26.46 | 4.68 | 1.02 | | 21 |
| Papua | 23.18 | 5.17 | 1.49 | | 12 |

*Independent t-test, significant if p-value <0.05
**ANOVA test, significant if p-value <0.05

Bivariate analysis was performed to select independent variables (risk factors) that will be included in the multivariate analysis. If the correlation has a value of p-value <0.25, it enters the multivariate model. Based on the analysis, there were 7 variables significantly correlated with the prevalence of hypertension (p-value <0.05). These 7 out of 10 variables became variables in the multivariate analysis because they have a p-value of <0.25. Three variables, namely the prevalence of central obesity (p-value=0.436), instant food consumption (p-value=0.474), and lack of physical activity (p-value 0.651) were not included in the multivariate model (Table 3).

**Table 3.** Association of risk factors and hypertension prevalence

| No. | Prevalence | r | p-value |
|---|---|---|---|
| 1 | Overweight | 0.114 | 0.013* |
| 2. | Obesity | 0.116 | 0.011* |
| 3. | Central obesity | 0.036 | 0.436 |
| 4. | Smoking | -0.018 | 0.018* |
| 5. | Salty food consumption | 0.294 | <0.001* |
| 6 | Instant food consumption | 0.033 | 0.474 |
| 7 | Fatty food consumption | 0.278 | <0.001* |
| 8 | Lack of fruit and vegetable consumption | 0.103 | 0.024* |
| 9 | Lack of physical activity | -0.021 | 0.651 |
| 10 | Routine blood pressure check | 0.289 | <0.001* |

*Correlation test, significant if p-value <0.05

In the multivariate analysis, of the 7 variables analyzed, the variables that had a p-value of > 0.05, namely obesity (p-value=0.912) and overweight (p-value=0.825) were excluded from the model. However, both variables affected $R^2$ and Beta of other variables by more than 10%. Thus, in the final model, these seven variables remained included. The risk factors that have the greatest impact on hypertension were regular blood pressure checks (Beta 0.326), lack of consumption of fruits and vegetables (Beta 0.169), consumption of salty foods (Beta 0.124), and consumption of fatty foods (Beta 0.055). The relationship between risk factors with hypertension on the results of multivariate analysis has met the assumption of the multiple Linear Regression Test, namely existence, homoscedasticity, collinearity, independence, linearity, and normality. The final multivariate final model is shown in table 4.

**Table 4.** Influence of risk factors on hypertension

| No. | Variable | B | Standard error | B standardized | p-value | $R^2$ |
|---|---|---|---|---|---|---|
| | Constant | | | | 0.019 | 0.196 |
| 1 | Overweight | 0.038 | 0.171 | 0.012 | 0.825 | |
| 2 | Obesity | 0.009 | 0.078 | 0.006 | 0.912 | |
| 3 | Smoking | -0.378 | 0.088 | -0.184 | <0.001* | |
| 4 | Salty food consumption | 0.124 | 0.026 | 0.231 | <0.001* | |
| 5 | Fatty food consumption | 0.055 | 0.024 | 0.117 | 0.023* | |
| 6 | Lack of fruit and vegetable consumption | 0.169 | 0.069 | 0.105 | 0.014* | |
| 7 | Routine blood pressure check | 0.326 | 0.071 | 0.217 | <0.001* | |

*Multiple linear regression test, significant if p-value <0.05



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The risk factors that have the greatest influence on hypertension discovered in this study were regular blood pressure checks, lack of consumption of fruits and vegetables, consumption of salty foods, and consumption of fatty foods. These results are in line with several theories and research. The risk factors for hypertension include obesity, excessive salt consumption, and dyslipidemia. Blood pressure-related sodium levels are known to rise in response to a diet high in salty foods[4,8,9]. A study in China shows that a higher number of clinic visits (routine checks) was associated with better blood pressure control[10]. High sodium consumption is a main risk factor for hypertension, while consumption of rich in fruit, vegetables, low in sodium and saturated fat, and low-fat dairy products could prevent and reduce hypertension[11]. Dietary sodium is associated with a rise in blood pressure. Meanwhile, dietary potassium could lower hypertension risk. Adequate consumption of fruits and vegetables constitute protection against hypertension[12]. There is an association between sodium intake and the level of blood pressure. This is because of a high salt intake related to the renin-angiotensin system, which is influenced by a high-sodium diet[13].

Unhealthy diets, including a lack of fruit and vegetables consumption as well as consumption of fatty food might cause hypercholesterolemia and obesity which are the intermediate factors of hypertension. There is an association between hypercholesterolemia, obesity, and hypertension[14,15]. A study by Rahajeng et al. (2009)[5] shows that risk factors associated with hypertension include obesity and abdominal obesity. of the study conducted by Faisal et al. (2022)[16] indicates that the significant risk factors for hypertension include obesity. Meanwhile, of the study by Sartik et al. (2017)[17] reveals that exercise habits and body mass index are related to hypertension incidence. Likewise, Wahidin et al. 2019)[18] discover that the main risk factor for hypertension is obesity.

Hypertension management program includes the screening of hypertension risk factors, management of hypertension risk factors, holistic management of hypertension, management of hypertension at the Integrated NCD Post (*Posbindu*), Management of hypertension in first-level health facilities (FKTP), management of hypertension in advanced health facilities (FKTL), as well as follow-up and referrals[19]. Hypertension prevention and control programs through various existing efforts need to include the main risk factors in education, screening, and counseling activities. This is done so that all risk factors can be controlled. The activities of *Posbindu* need to include efforts to control these main risk factors in the services provided.

Non-communicable disease contributes 70% of the total disease burden with main risk factors including high blood pressure, unhealthy diet, hyperglycemia, and obesity. However, the program for the prevention, promotion, and early detection of NCDs is not optimal[20]. As there is a gap between the program and the burden of NCD, there is a need for strengthening the promotion through suitable media or information technology, enhancing early detection, and controlling risk factors, especially unhealthy diet. In terms of controlling risk factors, control priorities are still needed, including increasing the coverage of blood pressure checks, fruit and vegetable consumption, salty food consumption, and fatty food consumption. Therefore, efforts to control these hypertension risk factors should be reinforced through measures at the *Posbindu* and education in the community. In addition, surveillance of risk factors also needs to be strengthened. *Posbindu*-based surveillance activities have been implemented but need to be intensified and the results need to be used to improve NCD prevention and control programs, including hypertension[17].

Management of hypertension patients is another effort needed to control blood pressure. The results of the study provide information about self-care for people with hypertension in Southeast Asian countries[21–23]. The main factors in the development of hypertension include obesity risk factors, low physical activity, risky food consumption, and inadequate blood pressure medication. The efficacy factor emphasizes high-quality, nutritious, and wholesome food. On the other hand, factors that contribute to self-care can be found within the individuals themselves, such as the desire to seek out healthcare facilities and using technology to minimize medication.

This study has strengths in data representativeness by incorporating 478 out of 514 districts (93%) which could be generalized at the national level. Meanwhile, this study has limitations related to the study design and quality of the data. As cross-sectional study design has limitations in the association between independent variables and dependent variables due to the measurement of the variables at one time, so the association of determinants of hypertension in this study remained uncertain. Meanwhile, this study used secondary data where some of the independent variables (diet and physical activity) were collected through interviews which could lead to subjective results.

## CONCLUSIONS

The average prevalence of hypertension in districts/cities in Indonesia was 31.18%. There was a difference in hypertension prevalence among 7 regions in Indonesia, with the biggest prevalence in the region of Kalimantan and the smallest in the Papua region. The risk factors that have the greatest influence on hypertension are regular blood pressure checks, lack of fruit and vegetable consumption, consumption of salty foods, and consumption of fatty foods. It is recommended for the Government and the public to increase the efforts of blood pressure screening, promoting a healthy diet (fruits and vegetables), and reducing the consumption of salty and fatty foods.

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## CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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**AUTHOR CONTRIBUTIONS**

MW: conceptualization, methodology, investigation, data analysis, supervision, writing, and editing; ISM: methodology, data curation and analysis; RH: methodology; data curation and analysis; AAL: discussion, review, and editing.

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