

# Hypertension in Indonesia in 2018: An Ecological Analysis

Azizah Andzar Ridwanah<sup>1</sup>, Hario Megatsari<sup>2</sup>, Agung Dwi Laksono<sup>3</sup>

<sup>1</sup>Officer, Health Office of East Java Province, Surabaya, Indonesia, <sup>2</sup>Lecturer, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia, <sup>3</sup>Researcher, National Institute of Health Research and Development, the Indonesia Ministry of Health, Jakarta, Indonesia

## Abstract

Hypertension is a degenerative disease that is often found in conjunction with other degenerative diseases. The study was aimed at analyzing ecologically the factors related to the prevalence of hypertension in Indonesia. The study was conducted using secondary data from the 2018 Indonesia Basic Health Survey. All provinces were taken as samples. Apart from the prevalence of hypertension, 4 other variables analyzed as independent variables were the prevalence of obesity, the percentage of the population with less physical activity, the percentage of daily smokers, and the percentage of the population with salty food consumption habits  $\geq 1$  per day. Data were analyzed using a scatter plot. The results of the study found that the higher the prevalence of obesity in a province, the higher the prevalence of hypertension in that province. The higher the percentage of the population with less physical activity in a province, the higher the prevalence of hypertension in that province. The higher the percentage of daily smokers in a province, the higher the prevalence of hypertension in that province. The higher the percentage of the population with salty food consumption habits  $\geq 1$  per day, the higher the prevalence of hypertension in that province. It was concluded that the four independent variables analyzed ecologically were positively related to the prevalence of hypertension in Indonesia.

**Keywords:** hypertension, ecological analysis, physical activity, healthy behavior.

## Introduction

Globally degenerative diseases such as cancer, diabetes, heart disease are the leading causes of death worldwide. Hypertension is one of the main dilemmas that lead to heart disease. Between 1990 and 2020, hypertension is estimated to increase by 120% in women, and 137% in men in developing countries, and 30-60% in developed countries<sup>1</sup>. Hypertension causes death with the number reaching 10.4 million deaths per year in the world<sup>2</sup>. Hypertension or high blood pressure is defined as an increase in systolic blood of more than 140 mmHg and diastolic blood pressure of more than 90 mmHg at two measurements with an interval of five minutes in a well-rested state<sup>3</sup>. Currently, cases of hypertension in Indonesia are in a fairly large number with a prevalence of

34.11%<sup>4</sup>. This figure shows that one-third of Indonesia's population suffers from hypertension and has a risk of decreasing health status.

Hypertension is the biggest risk factor for cardiovascular disease. Hypertension is a condition in which the blood pressure in the arteries increases and causes the heart to work too hard. This disorder is popular as "the silent killer" because there are no specific symptoms in the early stages of its appearance. Hypertension rarely presents with specific symptoms, its identification is generally through screening or when a person seeks treatment for another disease<sup>5</sup>. Hypertension that does not get proper treatment or control can lead to cardiovascular system anomalies that endanger other vital organs in the body<sup>6</sup>. A prolonged increase in blood pressure can cause damage to the kidneys (kidney failure), heart (coronary heart disease), and brain (stroke)<sup>3</sup>.

---

**Corresponding Author:**

**Hario Megatsari**

Email: hario.megatsari@fkm.unair.ac.id

If the right steps are not taken, the morbidity and mortality rate from cardiovascular disease will increase even more. Lack of attention to managing hypertension can have significant economic and social impact<sup>7</sup>. There are several micro and macro effects of the high prevalence of hypertension. If viewed from an economic point of view, the costs caused by hypertension include direct medical costs which are more expensive, and indirect costs include decreased productivity. These direct or indirect costs can be a significant economic burden<sup>8</sup>. Hypertension can cause a person to lose his/her workforce faster than people with normal blood pressure. Life expectancy in patients with hypertension is also shorter than in patients with normal blood pressure. Broadly speaking, the high prevalence of hypertension and the costs incurred in its treatment can have an impact on the Gross National Product and the inflation rate of a region or country<sup>9</sup>.

Hypertension control can be done with the use of drugs and lifestyle modifications<sup>3</sup>. Modifications to a healthy lifestyle can prevent or delay hypertension and reduce cardiovascular risk. Changes in a healthy lifestyle are at the forefront of anti-hypertension therapy<sup>2</sup>. Based on this background, this study aims to analyze ecologically the factors related to the prevalence of hypertension in Indonesia.

## **Materials and Methods**

### **Study Design**

The study was conducted using an ecological analysis approach. The ecological analysis focuses on comparisons not individually but between groups. In the ecological analysis, the data analyzed is aggregate data at a certain group or level, in this study, it is the provincial level<sup>10</sup>. The variables in an ecological analysis can be aggregate measurements, environmental measurements, or global measurements. The purpose of the ecological analysis in epidemiology is to make biological inferences about effects on individual risk or to make ecological inferences about effects on groups<sup>11</sup>.

### **Data Source**

The study was conducted using secondary data from the 2018 Indonesia Basic Health Survey report. The 2018 Indonesia Basic Health Survey report is an official publication from the Ministry of Health of the Republic of Indonesia. The unit of analysis in this study is the province. All provinces in Indonesia were analyzed (34 provinces).

### **Data Analysis**

The dependent variable in this study was the prevalence of hypertension. Hypertension was recorded based on the doctor's diagnosis history (internist and general practitioner)<sup>4</sup>. There were 4 independent variables analyzed in this study, namely prevalence of obesity, percentage of the population with less physical activity, percentage of daily smokers, and percentage of the population with salty food consumption habits  $\geq 1$  per day.

Data were analyzed bivariate using a scatter plot. The linear fit line was used as the basis for determining the tendency of the relationship between the prevalence of hypertension and the independent variable. The analysis in this study was carried out with SPSS 21 software.

## **Results and Discussion**

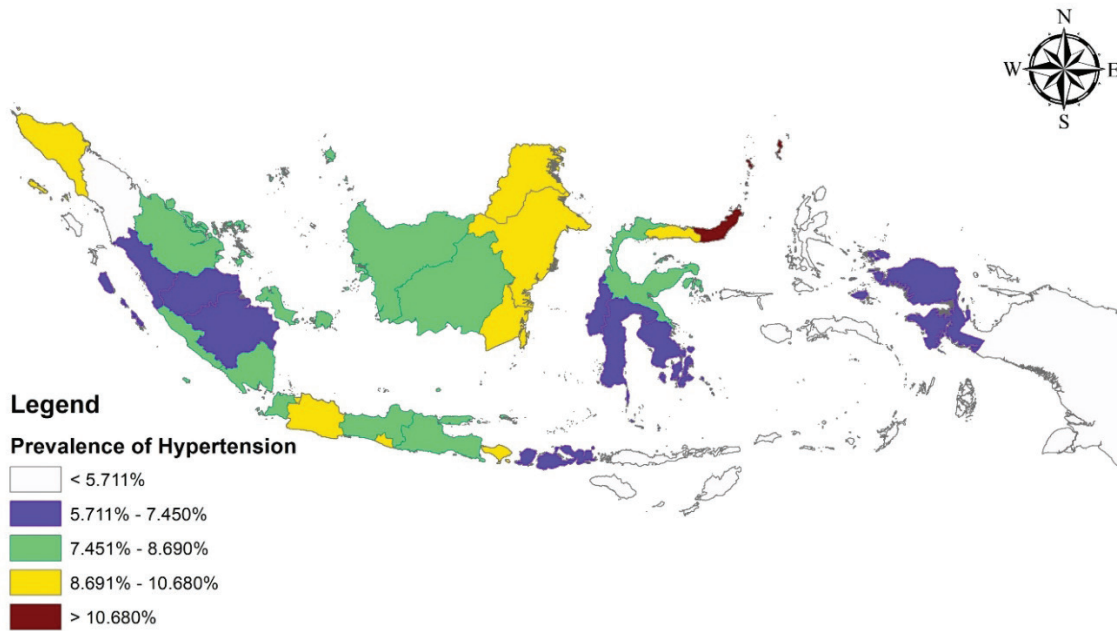
Table 1 presents descriptive statistics of the prevalence of hypertension and other variables analyzed in this study. The information presented informs that the lowest prevalence is 4.4%, while the highest prevalence is 13.2%. The range of prevalence of hypertension among provinces in Indonesia is quite wide. Meanwhile, the prevalence range or the percentage of other variables also appears to be quite high. For example, in the variable percentage of the population with salty food consumption habits  $\geq 1$  per day, the range is between 7.0% -54.1%.

**Table 1: Descriptive Statistics of Prevalence of Hypertension and Related Variables by Province in Indonesia, 2018**

Descriptive Statistics	Prevalence of Hypertension	Prevalence of Obesity	Percentage of Population with Less Physical Activity	Percentage of Daily Smokers	Percentage of Population with Salty Food Consumption Habits $\geq 1$ per day
N	34	34	34	34	34
Mean	8.181	21.703	34.879	23.494	20.891
Median	8.245	21.050	33.950	23.350	20.450
Mode	4.4a	18.7a	33.7	22.1a	13.2
Std. Deviation	1.8755	4.2801	5.7920	2.6014	10.0377
Range	8.8	19.9	22.6	9.3	47.1
Minimum	4.4	10.3	25.2	18.8	7.0
Maximum	13.2	30.2	47.8	28.1	54.1

Source: The 2018 Indonesia Basic Health Survey

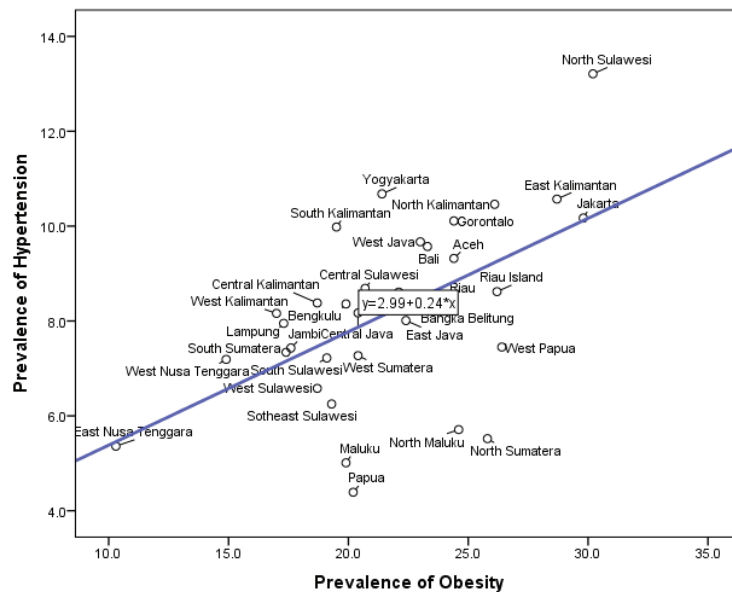
Figure 1 shows a map of the prevalence of hypertension by the province in Indonesia. Based on this spatial information, it can be seen that the prevalence of hypertension tends to be lower in Eastern Indonesia. It can be seen that the provinces of Papua, North Maluku, Maluku, and East Nusa Tenggara, have a lower prevalence of hypertension.



**Figure 1. Map of the Prevalence of Hypertension by Province in Indonesia, 2018**

Source: The 2018 Indonesia Basic Health Survey

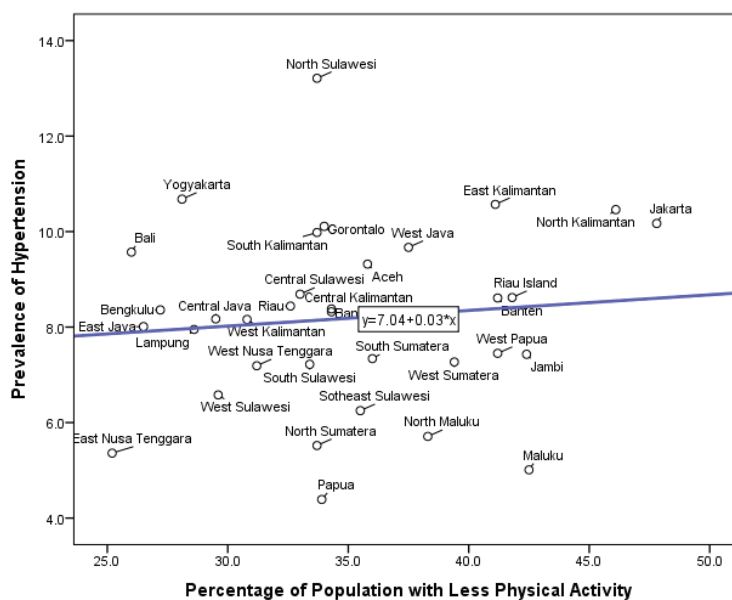
Figure 2 is a scatter plot of the prevalence of obesity and the prevalence of hypertension by the province in Indonesia. It can be seen that the relationship between the two variables shows a positive trend. This means that the higher the prevalence of obesity in a province, the higher the prevalence of hypertension in that province.



**Figure 2. Scatter Plot of Prevalence of Obesity and Prevalence of Hypertension by Province in Indonesia, 2018**

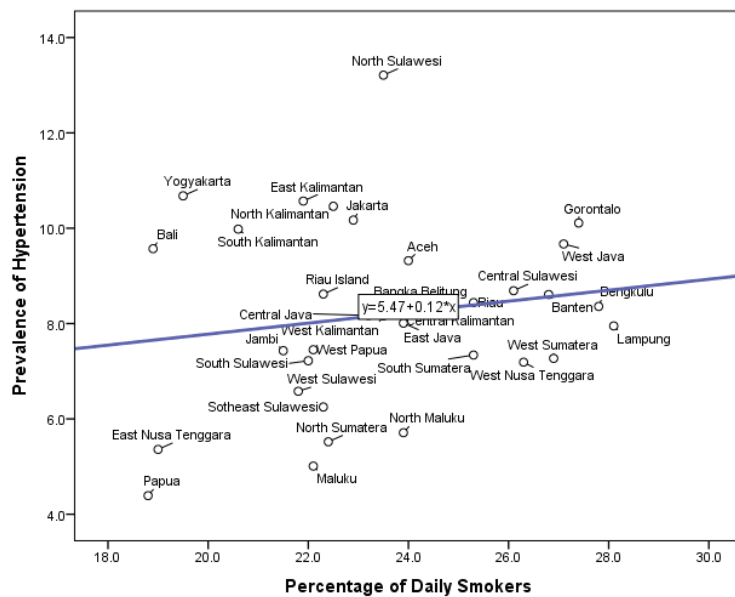
Source: The 2018 Indonesia Basic Health Survey

The scatter plot of the percentage of the population with less physical activity and the prevalence of hypertension by the province in Indonesia can be seen in Figure 3. The results of the scatter plot indicate that the two variables tend to have a positive relationship. This means that the higher the percentage of the population with less physical activity in a province, the higher the prevalence of hypertension in that province.



**Figure 3. Scatter Plot of Percentage of Population with Less Physical Activity and Prevalence of Hypertension by Province in Indonesia, 2018**

Source: The 2018 Indonesia Basic Health Survey

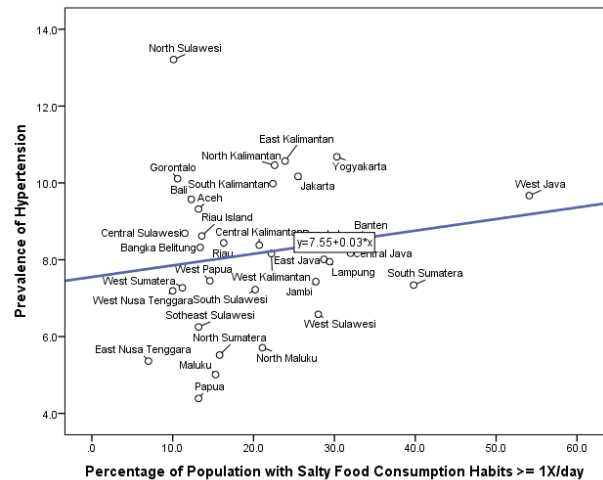


**Figure 4. Scatter Plot of Percentage of Daily Smokers and Prevalence of Hypertension by Province in Indonesia, 2018**

Source: The 2018 Indonesia Basic Health Survey

Meanwhile, Figure 4 is the scatter plot of the percentage of daily smokers and the prevalence of hypertension by the province in Indonesia. Based on the scatter plot, it can be seen that the relationship between the two variables shows a positive trend. This means that the higher the percentage of daily smokers in a province, the higher the prevalence of hypertension in that province.

Moreover, the relationship between the percentage of the population with salty food consumption habits  $\geq 1$  per day and the prevalence of hypertension by the province in Indonesia can be seen in Figure 5. Based on the scatter plot, it can be seen that the relationship between the two variables shows a positive trend. This means that the higher the percentage of the population with salty food consumption habits  $\geq 1$  per day in a province, the higher the prevalence of hypertension in that province will be.



**Figure 5. Scatter Plot of Percentage of Population with Salty Food Consumption Habits  $\geq 1$  per day and Prevalence of Hypertension by Province in Indonesia, 2018**

Source: The 2018 Indonesia Basic Health Survey

The information found in this study is consistent with the results of previous studies in Tanzania, Kenya, and South Africa. It is informed that in the study that obesity or overweight, low physical activity, and consumption of fatty foods increase the risk of hypertension<sup>12-14</sup>. Not only in adults, but previous studies have also informed that obesity in children and adolescents has also been found to increase the risk of hypertension<sup>15</sup>. On the

other hand, besides physical activity, risky lifestyles such as smoking and drinking alcohol are also reported to increase the risk of hypertension<sup>16,17</sup>.

Although it has limitations because it is carried out by ecological analysis, the information on the results of this study is useful for the government in providing policy directions to reduce the prevalence of hypertension in Indonesia<sup>18,19</sup>. The government must continue to encourage people to have a healthy lifestyle and promote prevention efforts by doing enough physical activity, not smoking, and reducing salty food consumption to the recommended safe limit.

Lifestyle modification in society requires the participation of all parties. Prevention and control of hypertension in society are very complex and requires collaboration across stakeholders including government, academia, society, and others.

### Conclusion

Based on the results of the study, it could be concluded that the four independent variables analyzed ecologically were positively related to the prevalence of hypertension in Indonesia. The four variables are the prevalence of obesity, the percentage of the population with less physical activity, the percentage of daily smokers, and the percentage of the population with salty food consumption habits  $\geq 1$  per day.

**Acknowledgments:** The authors are grateful to the Ministry of Health of the Republic of Indonesia for providing a report as material for analysis in this study.

**Source of Funding:** Self-funding

**Conflict of Interests:** Nil

**Ethical Clearance:** The study was conducted by utilizing secondary data from published reports. For this reason, ethical clearance is not required in the implementation of this study.

### References

- Sharma P, Beria H, Gupta PK, Manokaran, Sumathra, Reddy AM. No Title. *J Pharm Sci Res*. 2019;11(6):2161–7.
- Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, et al. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. *Hypertension*. 2020;75(6):1334–57.
- The Ministry of Health of The Republic of Indonesia. Hypertension. The Ministry of Health of The Republic of Indonesia. 2014. 1–7 p.
- National Institute of Health Research and Development of The Indonesia Ministry of Health. The 2018 Indonesia Basic Health Survey (Riskesdas): National Report [Internet]. Jakarta; 2019. Available from: [http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan%7B%5C\\_%7DNasional%7B%5C\\_%7DRKD2018%7B%5C\\_%7DFINAL.pdf](http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan%7B%5C_%7DNasional%7B%5C_%7DRKD2018%7B%5C_%7DFINAL.pdf)
- Ajayi I, Sowemimo I, Akpa O, Ossai N. Prevalence of hypertension and associated factors among residents of Ibadan-North Local Government Area of Nigeria. *Niger J Cardiol*. 2016;13(1):67.
- Hasan M, Sutradhar I, Akter T, Gupta R Das, Joshi H, Haider MR, et al. Prevalence and determinants of hypertension among adult population in Nepal: Data from Nepal demographic and health survey 2016. *PLoS One*. 2018;13(5):1–14.
- WHO. Global Brief on Hypertension: Silent Killer, Global Public Health Crisis. Geneva: World Health Organization; 2013.
- Wang G, Grosse SD, Schooley MW. Conducting research on the economics of hypertension to improve cardiovascular health: defining and quantifying economic costs of hypertension. *Am J Prev Med*. 2017;53(6):S115–7.
- Alcocer L, Cueto L. Hypertension, a health economics perspective. *Ther Adv Cardiovasc Dis*. 2008;2(3):147–55.
- Laksono AD, Sandra C. Analisis Ekologi Persalinan di Fasilitas Pelayanan Kesehatan di Indonesia (Ecological Analysis of Healthcare Childbirth in Indonesia). *Bull Heal Syst Res*. 2020;23(1):1–9.
- Morgenstern H. Ecologic Studies in Epidemiology: Concepts, Principles, and Methods. *Annu Rev Public Health*. 1995;16:61–81.
- Khamis AG, Senkoro M, Mwanri AW, Kreppel K, Mfinanga SG, Bonfoh B, et al. Prevalence and determinants of hypertension among pastoralists in Monduli District, Arusha region in Tanzania: a cross-sectional study. *Arch Public Heal*. 2020;78(1):Article number 99.
- van Zyl S, van Rooyen FC, Joubert G, Kruger WH, Walsh CM. A Comparison of the Socio-Behavioral-

- Metabolic Risk Profiles and Associated Factors for Chronic Diseases of Lifestyle in Urban and Rural Communities in Central South Africa. *Front Public Heal.* 2020;8:Article number 570676.
14. Ongosi AN, Wilunda C, Musumari PM, Techasrivichien T, Wang C-W, Ono-Kihara M, et al. Prevalence and risk factors of elevated blood pressure and elevated blood glucose among residents of Kajiado county, Kenya: A population-based cross-sectional survey. *International J Environ Res Public Heal.* 2020;17(19):1–22.
  15. Stabouli S, Kollios K, Nika T, Chrysaidou K, Tramma D, Kotsis V. Ambulatory hemodynamic patterns, obesity, and pulse wave velocity in children and adolescents. *Pediatr Nephrol.* 2020;35(12):2335–44.
  16. Lookens J, Tymejczyk O, Rouzier V, Smith C, Preval F, Joseph I, et al. The Haiti cardiovascular disease cohort: study protocol for a population-based longitudinal cohort. *BMC Public Health.* 2020;20(1):Article number 1633.
  17. Musinguzi G, Musinguzi G, Ndejjo R, Ndejjo R, Ssinabulya I, Bastiaens H, et al. Cardiovascular risk factor mapping and distribution among adults in Mukono and Buikwe districts in Uganda: Small area analysis. *BMC Cardiovasc Disord.* 2020;20(1):Article number 284.
  18. Laksono AD, Kusriani I. Ecological Analysis of Stunted Toddler in Indonesia. *Indian J Forensic Med Toxicol.* 2020;14(3):1685–91.
  19. Wulandari RD, Laksono AD. Relationship between Midwife Ratio and Performance of Maternal and Child Health Programs in Indonesia (Hubungan antara Rasio Bidan dengan Kinerja Program Kesehatan Ibu dan Anak di Indonesia). *Bul Penelit Sist Kesehat.* 2019;22(3):208–214.