

# The relationship between nutritional status and the incidence of hypertension at primary health care facilities in the working area of bojongsoang community health center, bandung regency, 2025

Muhamad Rosyid Kusdiawan<sup>1</sup>, Mia Miranda Sitti<sup>2</sup>, Helmi Rosa Gunadi<sup>3</sup>

<sup>1,2,3</sup>Medical Education Program, Faculty of Medicine, Universitas Pasundan, Indonesia

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## ABSTRACT

**Background:** Hypertension is a major public health problem that increases the risk of cardiovascular disease, stroke, and renal failure. Nutritional status, particularly overweight and obesity, is one of the contributing factors to hypertension. The prevalence of hypertension and overnutrition in the working area of Bojongsoang Primary Health Care remains high, making it necessary to assess their relationship. **Methods:** This study used a cross-sectional design with secondary data obtained from a previous study. A total of 135 respondents who met the inclusion and exclusion criteria at primary health care facilities in the working area of Bojongsoang Health Center, Bandung Regency, in 2025 were included. Nutritional status was determined using Body Mass Index (BMI), and hypertension status was classified as controlled and uncontrolled. Data were analyzed using univariate analysis and bivariate analysis with the Chi-Square test. **Results:** Most respondents were classified as obese (42.2%) and overweight (17.8%). The majority of respondents had uncontrolled hypertension (65.9%). Bivariate analysis showed a significant association between nutritional status and the incidence of hypertension ( $p < 0.05$ ), with overweight and obese respondents having a higher proportion of uncontrolled hypertension compared to those with normal or underweight nutritional status. **Conclusion:** There is a significant relationship between nutritional status and the incidence of hypertension in primary health care facilities in the working area of Bojongsoang Health Center, Bandung Regency, in 2025. Nutritional status control, particularly the prevention of overweight and obesity, should be an essential component of hypertension management and prevention strategies.

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## Corresponding Author:

Muhamad Rosyid Kusdiawan,  
Medical Education Program,  
Universitas Pasundan,  
Jl. Sumatera No.41, Babakan Ciamis, Kec. Sumur Bandung, Kota Bandung, Jawa Barat, 40117, Indonesia  
Email: [mrosyidkusdiawan@gmail.com](mailto:mrosyidkusdiawan@gmail.com)

## INTRODUCTION

Hypertension has emerged as a significant public health issue in Indonesia because it can increase the risk of heart disease, kidney failure, and stroke. Nutritional status is one of the contributing factors, as it influences the balance between nutrient intake and the body's nutritional requirements (Allfazmy, 2022; Debora, 2023).

Imbalanced nutritional intake not only affects nutritional status but also contributes to various diseases, including hypertension. Nutritional status and the incidence of hypertension are associated with impaired elasticity of blood vessel walls, increased peripheral resistance, and changes in cardiac output, which contribute to irregular blood pressure regulation (Permatasari, K. R., Rahma, 2024). One form of nutritional imbalance is obesity, which is frequently associated with hypertension and whose prevalence continues to increase. Studies have shown a significant relationship between the two. Individuals with obesity based on body mass index (BMI) have a 1.64 times higher risk of developing hypertension compared to individuals with normal BMI. Data from the 2019 Basic Health Research (Riskesdas) also indicate that the high prevalence of hypertension in Indonesia is in line with the increasing number of people experiencing weight gain or overweight (Tiara, 2020).

Individuals with overnutrition or obesity are at risk of developing hypertension through various mechanisms. Increased body mass requires a greater supply of oxygen and nutrients to body tissues, leading to an increase in circulating blood volume. This condition results in higher pressure on arterial walls, which ultimately contributes to elevated blood pressure (Permatasari, K. R., Rahma, 2024).

Although hypertension is influenced by multiple factors such as physical activity, psychological stress, dietary sodium intake, smoking, and genetic predisposition, nutritional status was selected as the primary factor in this study because it represents a modifiable risk factor that is strongly associated with hypertension and can be assessed objectively using anthropometric measurements. In addition, overweight and obesity prevalence has continued to increase in Indonesia and contributes substantially to cardiovascular risk. Compared with factors such as stress and physical activity, nutritional status can be more consistently measured in primary healthcare settings and is directly related to long-term metabolic and hemodynamic changes that influence blood pressure regulation. Therefore, evaluating nutritional status is important for identifying high-risk individuals and developing practical community-based hypertension prevention strategies.

According to the World Health Organization (WHO) in 2023, the global prevalence of hypertension is estimated at 33%, with approximately two-thirds of cases occurring in low- and middle-income countries. The number of hypertension cases is projected to continue increasing and is expected to reach 1.5 billion people worldwide by 2025 (World Health Organization., 2023). In Indonesia, the prevalence of hypertension has been reported at 36%. Based on data from the Basic Health Research (Riskesdas), the prevalence of hypertension reached 34.1% (KementerianKesehatanRepublikIndonesia, 2019).

Three provinces in Indonesia with the highest prevalence of hypertension among individuals aged  $\geq 18$  years are Central Kalimantan (40.7%), followed by South Kalimantan (35.8%), and West Java (34.4%) (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan, 2024). The high prevalence rate in West Java indicates that this region bears a substantial burden of hypertension, requiring special attention in prevention and control efforts, particularly at the primary health care level.

Bandung Regency, as one of the administrative areas in West Java, also has a relatively high prevalence of hypertension, reaching 41.36%. This figure is even higher than that of Bandung City, which has a prevalence of 36.79%. One example can be observed at the subdistrict-level primary health care facility, namely Bojongsoang Community Health Center, where the prevalence

of hypertension was recorded at 2.94% and ranked as the second most common disease after acute respiratory infections (ARI), with 4,961 cases. In 2020, hypertension remained the second most common condition with 1,803 cases. Although a decrease was observed compared to the previous year, the service coverage achievement remained low and had not met the target, with only 1,886 individuals reached out of a target population of 30,730 (Bandung, 2022).

Addressing nutritional status is essential in community-based hypertension prevention strategies because overweight and obesity are modifiable conditions that can be prevented through lifestyle interventions, nutritional education, and early weight control programs at the primary healthcare level. Community health centers play an important role in detecting individuals at risk and promoting healthy dietary behaviors to reduce the long-term burden of hypertension and cardiovascular disease. Without effective nutritional interventions, uncontrolled hypertension may continue to increase and contribute to higher healthcare costs, decreased quality of life, and increased risk of complications such as stroke and heart disease. Therefore, strengthening nutritional monitoring and obesity prevention programs at community health centers is considered an important public health priority.

These data illustrate the relationship between nutritional status and hypertension and its potential impact over the next 20 years. This study is expected to identify appropriate dietary patterns for patients with hypertension so that nutritional status assessment can be used as a preventive measure against possible complications resulting from inappropriate nutrient intake.

Based on the background described above, the researcher is interested in conducting a study entitled "The Relationship Between Nutritional Status and the Incidence of Hypertension at Primary Health Care Facilities in the Working Area of Bojongsoang Community Health Center, Bandung Regency, 2025."

## RESEARCH METHOD

### Study Design

This study applied a cross-sectional design using secondary data obtained from questionnaires that had been previously collected in a study entitled "The Effect of Knowledge Level, Self-Care, and Family Support on Blood Pressure Control in Hypertensive Patients at Primary Health Care Facilities" conducted by dr. Gianita Yulia Lestari, MMRS, in February 2025.

### Study Population

The study population consisted of individuals who had a history of blood pressure examination at primary health care facilities in the working area of Bojongsoang Community Health Center, Bandung Regency, in 2025.

### Inclusion and Exclusion Criteria

The inclusion criteria were medical records with complete patient data regarding nutritional status and blood pressure recorded in the questionnaire, patients aged  $\geq 25$  years, patients examined at Bojongsoang Community Health Center, and patients diagnosed with hypertension either clinically or based on blood pressure measurements.

The age criterion of  $\geq 25$  years was applied because the risk of hypertension and metabolic disorders associated with overnutrition generally increases in adulthood after prolonged exposure to unhealthy lifestyle factors, such as excessive caloric intake, low physical activity, and obesity. In addition, hypertension prevalence tends to rise progressively after early adulthood, making this age group more relevant for assessing the relationship between nutritional status and blood pressure. The inclusion of participants aged  $\geq 25$  years was also intended to improve population homogeneity and reduce potential bias related to transient blood pressure changes that are more common in younger individuals.

The exclusion criteria were medical records of patients with a history of other chronic diseases that could affect blood pressure aside from hypertension, such as diabetes mellitus, infection, or chronic kidney injury.

### **Sample Size and Sampling Technique**

The minimum sample size was calculated using a correlation study formula for numerical variables. The minimum required sample size was 45.94, which was rounded up to 46 respondents. To anticipate potential subject loss (drop-out), an additional 15 samples were added, resulting in a minimum sample size of 61 respondents.

Initially, the total population consisted of 178 samples. After the screening process based on the inclusion and exclusion criteria, a total of 135 subjects met the criteria and were eligible for further analysis. Therefore, data analysis was conducted on 135 samples.

The sampling technique used in this study was total sampling, in which all subjects in the population who met the inclusion criteria and did not meet the exclusion criteria were included as research samples. This technique was chosen because the total population size was manageable and could be studied comprehensively.

### **Research Variables**

The independent variable in this study was nutritional status, while the dependent variable was the incidence of hypertension.

### **Operational Definition of Variables**

Nutritional status was categorized based on Body Mass Index (BMI), calculated using the formula body weight (kg) divided by height squared ( $m^2$ ). Nutritional status was classified into underweight (BMI <18.5), normal (BMI 18.5–25), overweight (BMI >25–27), and obesity (BMI ≥27). For analysis purposes, nutritional status was grouped into overnutrition (overweight and obesity) and non-overnutrition (underweight and normal).

Body Mass Index (BMI) was selected as the indicator of nutritional status because it is a simple, standardized, and widely used anthropometric measurement for assessing general nutritional status and obesity risk in population-based studies. BMI data were consistently available in the secondary dataset used in this study, allowing uniform classification of respondents' nutritional status. Although waist circumference and waist-to-hip ratio are considered useful indicators of abdominal obesity, these measurements were not comprehensively recorded in the available data. In addition, BMI remains one of the most commonly recommended indicators in primary healthcare settings due to its practicality, low cost, and applicability in large-scale community screening programs.

Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg. Hypertension status was classified into controlled hypertension (optimal, normal, and high-normal blood pressure) and uncontrolled hypertension (grade 1–3 hypertension and isolated systolic hypertension).

### **Research Instruments**

instrument used in this study was secondary data that had been previously collected. The data included nutritional status (BMI), blood pressure, age, and sex.

### **Study Location and Time**

The study was conducted at primary health care facilities in the working area of Bojongsoang Community Health Center, Bandung Regency, in 2025. This location was selected because secondary data related to nutritional status and hypertension were available and the prevalence of hypertension remained relatively high. The study was conducted from May 2025 to August 2025, including data collection, data analysis, and reporting.

### **Data Collection Procedure**

Data collection utilized secondary data obtained from questionnaires previously collected at primary health care facilities in the working area of Bojongsoang Community Health Center, Bandung Regency, in 2025. The collected data included nutritional status, hypertension status, age, and sex.

### Data Analysis

Data analysis consisted of univariate and bivariate analyses, with results presented in tables and figures. Univariate analysis was conducted to describe the distribution of nutritional status and blood pressure categories using frequency and percentage distributions.

Bivariate analysis was performed to determine the association between nutritional status and the incidence of hypertension at primary health care facilities. Nutritional status was categorized based on BMI, and hypertension incidence was classified as controlled or uncontrolled. Because both variables were categorical, the Chi-Square ( $\chi^2$ ) test was used. If the Chi-Square assumptions were not met, particularly when expected cell counts were less than five, Fisher's Exact Test was applied. Normality testing was not performed because the analyzed variables were categorical and did not require assumptions of normal distribution.

### Ethical Considerations

This study adhered to ethical principles including autonomy, nonmaleficence, beneficence, and justice. Patient privacy and confidentiality were maintained by not disclosing individual identities, and secondary data were used solely for scientific purposes with appropriate permission. The study was non-interventional and posed no risk to respondents. Data analysis was conducted objectively without discrimination, and all subjects meeting the inclusion and exclusion criteria were treated equally.

## RESULTS AND DISCUSSIONS

This study was conducted from May to August 2025. The sample was obtained from secondary data derived from questionnaires that had been previously collected in a study entitled "The Effect of Knowledge Level, Self-Care, and Family Support on Blood Pressure Control among Hypertensive Patients at Primary Health Care Facilities" conducted by dr. Gianita Yulia Lestari, MMRS, in February 2025 (Nazar, A. D., Lestari, R., & Widodo, 2024).

### Distribution of Nutritional Status

**Table 3.** Distribution of nutritional status of respondents

| Nutritional status | n  | (%)      |
|--------------------|----|----------|
| Underweight        | 7  | (5,2 %)  |
| Normal             | 47 | (34,8 %) |
| Overweight         | 24 | (17,8 %) |
| Obesitas           | 57 | (42,2 %) |

Table 1. shows the distribution of respondents' nutritional status based on Body Mass Index (BMI). Of the total 135 respondents, the majority were classified as obese, with 57 respondents (42.2%), followed by those with normal nutritional status, totaling 47 respondents (34.8%). Respondents classified as overweight numbered 24 individuals (17.8%), while the underweight category constituted the smallest proportion, with 7 respondents (5.2%). These findings indicate that the majority of respondents had overnutrition, reflecting a high prevalence of overnutrition among hypertensive patients at primary health care facilities (Permatasari, K. R., Rahma, 2024; Tiara, 2020).

The results further show that 59.3% of respondents experienced overnutrition (17.8% overweight and 42.2% obese), while 40.7% had normal or undernutrition. This proportion is higher than the prevalence of obesity in West Java, which reached 14.4% according to the 2019 Basic

Health Research (Riskseddas), indicating that hypertensive patients at Bojongsoang Community Health Center carry a significant burden of overnutrition. These findings are consistent with previous studies demonstrating a significant correlation between various obesity indices and increased blood pressure and hypertension incidence, where individuals with obesity have a substantially higher risk of developing hypertension compared to those with normal nutritional status (Mahiroh, H., Astutik, 2020; Rumaisyah, R., Fatmawati, 2023).

### Distribution of Hypertension Incidence

**Table 2.** Distribution of hypertension categories

| Hypertension                   | n  | (%)      |
|--------------------------------|----|----------|
| Optimal                        | 6  | (4,4 %)  |
| Normal                         | 15 | (11,1 %) |
| Normal-tinggi                  | 25 | (18,5 %) |
| Grade 1 hypertension           | 35 | (25,9 %) |
| Grade 2 hypertension           | 28 | (20,7 %) |
| Grade 3 hypertension           | 8  | (5,9 %)  |
| Isolated systolic hypertension | 18 | (13,3 %) |

Table 2. describes the distribution of hypertension based on blood pressure classification among respondents. Most respondents were classified as having grade 1 hypertension, totaling 35 respondents (25.9%), followed by grade 2 hypertension with 28 respondents (20.7%), and high-normal blood pressure with 25 respondents (18.5%). Additionally, 18 respondents (13.3%) were identified with isolated systolic hypertension, indicating that the majority of respondents were in an uncontrolled hypertension condition (Oparil, S., Acelajado, 2019)

Univariate analysis showed that 65.9% of respondents experienced uncontrolled hypertension (grades 1–3 and isolated systolic hypertension). This proportion exceeds the national hypertension control target of at least 50% controlled cases. Background data from Bojongsoang Community Health Center indicated that blood pressure control achievement was only 6.1%, which aligns with the high proportion of uncontrolled hypertension observed in this study and highlights the need for intensified hypertension control programs at the primary health care level (Bandung, 2022; Kemenkes, 2024).

### Bivariate Analysis

**Table 3.** Association between nutritional status and hypertension incidence

| Table 3: Association between Nutritional Status and Hypertension Incidence |                     |                |            |         |                     |
|----------------------------------------------------------------------------|---------------------|----------------|------------|---------|---------------------|
|                                                                            |                     | Hypertension   |            | P Value | Uji                 |
|                                                                            |                     | not controlled | controlled |         |                     |
|                                                                            |                     | n (%)          | n (%)      |         |                     |
| Nutritional status                                                         | Excessive nutrition | 81 (100%)      | 0 (0%)     | 0.042   | Fisher's Exact Test |
|                                                                            | Balanced nutrition  | 8 (14,8%)      | 46 (85,2%) |         |                     |

Table 3. presents the results of the bivariate analysis between nutritional status and hypertension incidence. Among respondents with overnutrition (overweight and obesity), all respondents were categorized as having uncontrolled hypertension, indicating a strong association between overnutrition and uncontrolled hypertension. In contrast, among respondents with non-overnutrition status (underweight and normal), the majority experienced controlled hypertension, with 46 respondents (85.2%), while only 8 respondents (14.8%) had uncontrolled hypertension (Permatasari, K. R., Rahma, 2024).

The Fisher's Exact Test yielded a p-value of 0.042 ( $p < 0.05$ ). Based on risk estimation from the 2×2 contingency table, respondents with overnutrition (overweight and obesity) had approximately a 6.75-fold higher risk of experiencing uncontrolled hypertension compared to those with normal or underweight nutritional status. This finding indicates a statistically significant association between nutritional status and hypertension incidence at primary health

care facilities in the working area of Bojongsoang Community Health Center, Bandung Regency, in 2025 (Mahiroh, H., Astutik, 2020; Rumaisyah, R., Fatmawati, 2023).

Fisher's Exact Test was considered more appropriate than the Chi-Square test in this analysis because several cells in the 2×2 contingency table had expected frequencies of less than five, including cells with zero values. Under these conditions, the assumptions required for the Chi-Square test were not fully met, which could reduce the accuracy of the statistical results. Fisher's Exact Test provides a more reliable estimation of significance for categorical data with small or uneven cell distributions, making it more suitable for this study.

## Discussion

The findings of this study demonstrate a significant association between nutritional status and hypertension incidence. Respondents with normal or underweight nutritional status had a lower likelihood of experiencing uncontrolled hypertension compared to those who were overweight or obese ( $p < 0.05$ ). These results are consistent with epidemiological evidence reported by Rumaisyah et al., which showed a positive relationship between higher BMI and increased hypertension risk (Mahiroh, H., Astutik, 2020; Rumaisyah, R., Fatmawati, 2023; Tiara, 2020).

Nutritional status contributes to increased blood pressure through several pathophysiological mechanisms, including heightened sympathetic nervous system activity, activation of the renin-angiotensin-aldosterone system, insulin resistance, and chronic inflammatory processes. These mechanisms can lead to increased peripheral resistance and sodium retention, ultimately resulting in elevated blood pressure (Indonesia, 2021; McCance, 2018; Oparil, S., Acelajado, 2019; Shariq, O. A., & McKenzie, 2020).

Several studies have demonstrated that weight reduction leads to significant decreases in both systolic and diastolic blood pressure, highlighting weight management as a crucial strategy in the prevention and treatment of hypertension, particularly among individuals with excess body weight (Bell, K., Twiggs, 2019; Kolegium Dokter Indonesia, 2019; McEvoy, J. W., 2024).

Numerous epidemiological studies and recent scientific literature further support the positive association between nutritional status and hypertension incidence. A large multinational study involving more than 47,000 participants showed that abdominal fat accumulation significantly increased hypertension risk, even after adjustment for age and disease history, indicating a dose-response relationship between waist circumference and hypertension (Sun, J., Su, 2024). Similarly, a large cohort analysis reported that higher body mass index and sustained weight gain were associated with an increased risk of hypertension development, following a linear pattern with rising blood pressure (Kosami, K., Kuwabara, 2024; Mahiroh, H., Astutik, 2020).

Medical literature also describes obesity as a contributor to hypertension through inflammatory responses, oxidative stress, and endothelial dysfunction that accelerate atherosclerosis and impair long-term blood pressure regulation. These mechanisms explain why obesity is strongly associated with poor blood pressure control and increased cardiovascular risk (Melled et al., 2023; McCance & Huether, 2018).

Despite substantial evidence supporting the relationship between nutritional status and hypertension, not all studies report consistent findings. For example, a study conducted among patients with type 2 diabetes mellitus found no significant association between obesity and hypertension incidence, suggesting that comorbid metabolic conditions may modify the relationship between nutritional status and blood pressure regulation (Widagda, 2024).

Differences in findings across studies may be attributed to variations in population characteristics, study design, and the presence of confounding variables. Factors such as dietary sodium intake, physical activity, medication adherence, stress levels, occupational exposure, and environmental factors may independently influence blood pressure control and were not fully assessed in this study (Ardiansyah, 2024; Debora, 2023; Prastika, 2021).

At the community and health system level, inadequate hypertension control remains a major public health concern. National and regional data indicate that hypertension prevalence

continues to rise, while blood pressure control rates remain suboptimal, particularly at the primary health care level (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan, 2024; Bandung, 2022; KementerianKesehatanRepublikIndonesia, 2024).

Therefore, the findings of this study reinforce existing evidence that overnutrition is a key modifiable risk factor associated with uncontrolled hypertension. Interventions focusing on nutritional management, weight reduction, lifestyle modification, and integrated chronic disease management programs should be prioritized as part of hypertension control strategies at primary health care facilities (KementerianKesehatanRepublikIndonesia, 2019; Kolegium Dokter Indonesia, 2019; Permatasari, K. R., Rahma, 2024; Santoso, R., Rahman, 2022).

The findings of this study have important implications for chronic disease management programs at community health centers, particularly in strengthening hypertension prevention and control strategies. Since overnutrition was significantly associated with uncontrolled hypertension, routine nutritional assessment using BMI measurement should be integrated into primary healthcare screening programs and chronic disease monitoring services such as Posbindu PTM and Prolanis. Community health centers should also prioritize nutritional counseling, weight management education, promotion of physical activity, and regular blood pressure monitoring for individuals with overweight and obesity. Early identification of high-risk individuals through community-based screening may help reduce the long-term burden of cardiovascular complications and improve hypertension control outcomes at the primary healthcare level.

## CONCLUSION

Based on the study conducted at primary health care facilities in the working area of Bojongsoang Community Health Center, Bandung Regency, in 2025, several conclusions can be drawn. First, the distribution of respondents' nutritional status showed that the majority of respondents experienced overnutrition, consisting of obesity and overweight categories. Most respondents also had uncontrolled hypertension, indicating that hypertension control at the primary healthcare level remains suboptimal. Second, there was a statistically significant association between nutritional status and the incidence of hypertension. Respondents with overnutrition had a substantially higher risk of experiencing uncontrolled hypertension compared to respondents with normal or undernutrition status. These findings indicate that nutritional status is an important modifiable factor that should be prioritized in hypertension prevention and control efforts at community health centers.

Based on these findings, nutritional interventions focusing on weight management and obesity prevention should be strengthened in hypertension control programs. Regular nutritional assessment using BMI measurements, dietary counseling, reduction of excessive caloric and sodium intake, promotion of balanced nutrition, and encouragement of regular physical activity are important strategies to improve blood pressure control. Community-based programs such as Posbindu PTM and Prolanis should also enhance public education regarding healthy lifestyle behaviors to reduce cardiovascular risk and improve long-term health outcomes.

Future research is recommended to include additional variables that may influence hypertension, such as dietary sodium intake, physical activity, stress level, medication adherence, smoking behavior, and abdominal obesity indicators such as waist circumference and waist-to-hip ratio. Prospective studies with larger and more diverse populations are also needed to strengthen the evidence regarding the relationship between nutritional status and hypertension and to support the development of more comprehensive hypertension prevention strategies.

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