



Quick Understanding of Hypertension Incident in Rural Populations

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Article Info

Article History:
Submitted July 2025
Accepted November 2025
Published January 2026

Keywords:
Age; Dietary; Gender;
Hypertension; Jobs

DOI
<https://doi.org/10.1529/kemas.v21i3.29683>

Abstract

This study aims to identify the main determinants of hypertension in rural areas by looking at the influence of diet, age, gender, and employment status in the community of Tagolu Village, Lage Sub-district, Poso District. Hypertension, known as the “silent killer”, is one of the leading causes of death globally, with more than 1.13 billion sufferers. This is a quantitative study with a cross-sectional design in 2022. 57 respondents from 134 populations were randomly drawn. The research instrument used a validated questionnaire. Data analysis was performed using the Chi-square test with a significance level of 95% using SPSS. The main results of the study indicate a significant association between dietary patterns and the incidence of hypertension ($p = 0.001$; $OR = 50,000$; 95% $CI: 9,175-272,466$), with poor dietary patterns having a prevalence of hypertension of. Although the variables of age ($OR = 1.579$), gender ($OR = 1.429$), and employment status ($OR = 0.700$) did not show statistical significance ($p > 0.05$), the OR values indicate a trend toward increased risk of hypertension in the elderly and male groups, while employment status did not have a significant effect. Research findings indicate that poor dietary patterns are strongly associated with hypertension.

Introduction

Hypertension, often called the “silent killer,” is one of the leading contributors to mortality worldwide. It is characterized by systolic blood pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg. The World Health Organization (WHO) reported that in 2015, over 1.13 billion people suffered from hypertension, with a growing trend, especially in developing countries (WHO, 2017). Non-communicable diseases (NCDs) have escalated globally due to lifestyle changes, including sedentary behavior and poor diet (Balwan & Kour, 2021). Among these, hypertension ranks as one of the most prevalent, affecting 1 in 3 adults worldwide, as reported by the WHO (2015). Its asymptomatic nature makes it dangerous because often undiagnosed until complications arise (Guo *et al.*, 2021).

Hypertension remains a significant health challenge among rural populations,

where its prevalence often exceeds that in urban areas. Studies indicate that lifestyle changes associated with urbanization, including reduced physical activity and increased consumption of processed foods, contribute to this issue (SOUSA *et al.*, 2021). For example, the incidence of stage 2 and 3 hypertension is higher among rural populations compared to urban populations, primarily due to socio-economic factors and inequities in access to healthcare services (Jing *et al.*, 2021; Samanic *et al.*, 2020). These findings underscore the urgent need for targeted public health strategies to address hypertension in rural populations worldwide.

The incidence of hypertension in Indonesia has increased from 25.8% in 2013 to 34.1% in 2018, highlighting a growing public health challenge attributed to these nutritional trends (Ardiani *et al.*, 2023). In Central Sulawesi, the prevalence soared to 51.2% in 2019,

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making it one of the regions with the highest incidence rates. Preliminary observations at the Tagolu Community Health Center revealed information related to hypertension cases, which is the highest prevalence of disease among the 10 most common health problems in the area. Furthermore, the prevalence rate has shown a significant increase over the years, with 465 cases in 2019, 530 cases in 2020, and 249 cases by mid-2021. These data indicate an uncontrolled fluctuation in hypertension prevalence (Profil Puskesmas Tagolu, 2020).

In addition, understanding demographic variables in Tagolu Village, such as age, gender, and socioeconomic status, is crucial. Age is a significant risk factor for hypertension, with prevalence rates increasing in older populations (Nasir *et al.*, 2023). Furthermore, community access to healthcare services and health literacy levels can significantly influence the management and prevention strategies available for hypertension (Rahmawati *et al.*, 2021). Rural residents may face barriers due to limited access to medical facilities or information on hypertension management, which further complicates disease control efforts (Saleh *et al.*, 2024).

Demographic factors such as advanced age and male gender have been documented as significant determinants, in line with findings from community-based studies (Wachamo *et al.*, 2020). Additionally, low awareness of the disease and risk factors exacerbates the high prevalence of undiagnosed and untreated hypertension, a similar issue observed in other rural areas (Teshome *et al.*, 2023). These interrelated biological, behavioral, and environmental factors highlight the urgent need for community interventions, prompting this study to analyze the increasing prevalence of hypertension in rural areas through demographic factors such as diet, age, occupation, and gender.

Method

This study employs a clear and systematic approach to ensure the reliability and validity of the findings and aims to evaluate the relationship between dietary patterns and hypertension by collecting several data points, including respondent characteristics consisting

of education, gender, occupation, and age. This was a descriptive-quantitative analytic study using a cross-sectional design. The population consisted of 134 residents. The sample size was calculated using the Slovin formula, resulting in 57 respondents. Sampling was conducted using proportional random sampling in sub-village clusters. Inclusion criteria: Residents who were able to communicate, read, and write. Exclusion criteria: Individuals who were unavailable during the study or suffered from serious illnesses.

The research was conducted in Tagolu Village, Lage District, Poso Regency. The instruments used in this study were questionnaires in the form of statements related to gender, age, and occupation. The questionnaire for measuring eating patterns was evaluated using a validated food frequency questionnaire consisting of 41 items. Hypertension status was determined by direct blood pressure measurement using a sphygmomanometer. Data were collected using a Likert scale assessment, then converted into categories based on median distribution. Blood pressure was measured using a digital sphygmomanometer. Data underwent editing, coding, tabulating, and entry. Cleaning was done to ensure accuracy. Descriptive statistics were calculated, and a chi-square test was used for bivariate analysis. Odds Ratios (OR) and 95% Confidence Intervals (CI) were used to quantify associations. A p-value ≤ 0.05 was considered statistically significant. Informed consent was obtained from all participants. Confidentiality and anonymity were upheld throughout the study.

Results and Discussion

This study aims to evaluate the relationship between dietary patterns and hypertension by collecting several data points, including respondent characteristics consisting of education, gender, occupation, and age. Furthermore, the variables' distribution is described in detail below. The characteristics of respondents obtained in this study consist of Gender, Education, Age, Jobs, Diet, and Hypertension. The complete distribution can be seen in Table 1, as follows:

Table 1. Respondent Characteristics

Characteristics	Category	Frequency (n=57)	Percentage (%)
Gender	Male	31	54.39
	Female	26	45.61
Education	Secondary (Junior & High School)	42	73.68
	Diploma	9	15.79
	Bachelor's degree	6	10.53
Age	Late Adulthood (40-45 years old)	20	35.09
	Early Old Age (46-55 years old)	29	50.88
	Late Old Age (56-63 years old)	8	14.04
Jobs	Permanent (Civil Servants, Honorary Employees, & Private Sector Employees)	21	36.84
	Temporary (Farmers, Housewives & Self-Employed)	36	63.16

Table 1 shows the characteristics of the 57 respondents involved in this study. Most respondents were male (54.39%), with 45.61% being female. In terms of educational background, the majority of respondents (73.68%) had a secondary education background (junior high school and senior high school), while diploma and bachelor's degree holders accounted for 15.79% and 10.53%, respectively. Based on age categories, the late adult age group (46–55 years) dominated at 50.88%, followed by the early elderly age group (40–45 years) at 35.09%, and the late elderly age group (56–63 years) at 14.04%. In terms

of employment, most respondents worked in temporary jobs such as farming and housework (57.89%), while 36.84% had permanent jobs (civil servants, contract workers, and private sector employees), and only 5.26% were self-employed. These characteristics indicate that the majority of respondents are in their late productive years, with a secondary education level and unstable employment, which can socially and economically influence their lifestyle and access to healthcare services, and contribute to their vulnerability to hypertension in rural areas such as Tagolu Village.

Table 2. Distribution Factor of Hypertension

Independent Variables	Category	Hypertension		Total n= 57	P-value	OR (95% CI)
		Hyper-tension	Non-Hypertension			
Diet	Poor	25 (92.6%)	2 (7.4%)	27	0,001	50.000 (9.175 - 272,466)
	Good	6 (20%)	24 (80%)	30		
Jobs	Permanent (Employee)	10 (47.6%)	11 (52.4%)	21	0.520	0.70 (0.236–2.077)
	Non-Permanent (Farmers, Housewives, Self-Employed)	14 (38.9%)	22 (61.1%)	36		
Gender	Woman	14 (38.9%)	22 (61.1%)	36	0.520	1.429 (0.482–4.238)
	Man	10 (47.6%)	11 (52.4%)	21		

Age	Elderly (≥ 60 years)	17 (45.9%)	20 (54.1%)	37	0.424	1.579 (0.513–4.855)
	Adult (<60 years)	7 (35.0%)	13 (65.0%)	20		

The results of the analysis in Table 2 show that dietary patterns have a very strong association with the incidence of hypertension ($p=0.571$). Poor dietary patterns are associated with hypertension in 92.6% of cases, while good dietary patterns are associated with hypertension in only 38.7% of cases. The odds ratio (OR) of 50 (95% CI: 9.175–272.466) indicates that poor dietary patterns have the potential to significantly increase the risk of hypertension. These findings are consistent with previous research by Armalina *et al.* (2020), which highlights the importance of maintaining blood pressure through a healthy lifestyle, including diet, especially among the elderly. In addition, research by Suprpto *et al.* (2021) also found that lifestyle factors, such as smoking and alcohol consumption, can increase the risk of hypertension, reinforcing the finding that diet as part of lifestyle plays an important role in the incidence of hypertension.

On the other hand, the employment variable did not show a significant difference in the prevalence of hypertension ($p=0.520$), with an OR of 0.70 (95% CI: 0.24–2.08). This indicates that the type of employment, whether permanent or non-permanent, does not directly contribute to the risk of hypertension. However, the age variable, although it has weak significance ($p=0.424$), shows a higher potential with a CI range of 1.58–4.86. This finding is supported by the research of Sofiana and Rahmawati (2019), which states that advanced age is an independent risk factor for cardiovascular disease, including hypertension, due to physiological changes that occur with aging. Additionally, Armalina *et al.* (2020) also found that the prevalence of hypertension among the elderly is higher than in other age groups, consistent with the results of this study. The gender variable was also not significant ($p=0.52$), but had an OR of 1.43 (95% CI: 0.48–4.24), indicating that male respondents had a relatively higher potential risk. Although not significant, this finding aligns with the study

by Suprpto *et al.* (2021), which reported that smoking habits are more common among men and contribute to an increased risk of hypertension. Additionally, the study by Sofiana and Rahmawati (2019) also found that men are more susceptible to stroke, which is often associated with hypertension. Therefore, although not statistically significant, gender remains an important factor to consider in hypertension prevention interventions.

As also shown by Nirmalasari *et al.* (2025), who stated that there is no correlation between age, gender, and occupation with dietary compliance among hypertensive patients. The age variable, although showing weak significance, still indicates a trend toward increased risk, particularly in the elderly population, consistent with the findings of Armalina *et al.* (2020) who noted that the aging process reduces cardiovascular protection and increases susceptibility to hypertension. Thus, the results of this study align with the literature, indicating that interventions targeting dietary behavior and early detection in the elderly population are crucial strategies for controlling hypertension at the population level.

Based on these results, it can be identified that the variables that are determining factors for hypertension are dietary patterns, especially poor ones, which not only have strong significance but also a high potential for occurrence (OR = 50). Next is age, especially in the elderly category, which is the second determining factor variable. Although it does not have strong significance, it has a fairly high potential for occurrence (OR = 1.579). Gender is the third determining factor, particularly male gender. Although it does not have strong significance, it has a fairly high potential incidence (OR= 1.429). The main findings of characteristics in this study indicate that most respondents were individuals with upper secondary education (adequate), were in the productive age group, and were actively involved in the private and informal sectors.

Overall, the interpretation of the results of this study shows that unhealthy eating patterns are the most dominant factor in increasing the risk of hypertension, followed by advanced age as a physiological predisposing factor, and male gender as a secondary risk factor. Ikhlasia *et al.* (2025) identified that consumption of fatty foods and overweight status are the most significant predictors of hypertension prevalence in Indonesia. Furthermore, Nirmalasari *et al.* (2025) demonstrated that non-pharmacological interventions involving deep breathing exercises and a 30° head-up position significantly reduced systolic blood pressure in hypertensive stroke patients. Bottom of Form

These findings indicate a significant correlation between unhealthy eating patterns and hypertension risk factors. Unhealthy dietary patterns have emerged as a major contributor to increased hypertension risk. This is supported by literature emphasising diet as a critical determinant influencing blood pressure levels (Han *et al.*, 2021). Additionally, advanced age is recognized as a physiological risk factor, with research showing that hypertension prevalence increases with age. Gender differences also play a role, with studies showing that men are more susceptible to hypertension, a finding consistent with existing epidemiological research (Zhu *et al.*, 2024).

The demographic trends of respondents in this study are in line with existing literature, which shows that employment status plays a crucial role in health outcomes, including the prevalence of hypertension (Fan *et al.*, 2023). In addition, although respondents reported maintaining good eating habits, the persistently high prevalence of hypertension suggests that diet quality plays an important, albeit insufficient, role in reducing the risk of hypertension. The complexity of dietary influences suggests that simply adopting better eating habits may not fully address the underlying causes of hypertension, as evidenced by evidence linking poor diet to higher incidence rates of this condition (Li *et al.*, 2023). A study shows that rural residents in Malaysia have a higher prevalence of hypertension, associated with excessive sodium and fat intake in their diet, coupled with a lack

of physical activity. These findings are also reflected in research conducted in the United States, where rural communities exhibit higher rates of obesity and hypertension, influenced by inadequate access to affordable, healthy food options (Samanic *et al.*, 2020).

One of the main factors contributing to hypertension in rural areas is diet. Studies show that rural communities often have diets high in fat and sodium, which are widely recognized as factors contributing to increased blood pressure. Specifically, sodium sources in the diet, such as processed foods and excessive salt use, play a significant role in the pathogenesis of hypertension (Noroozi *et al.*, 2022). Comparisons of dietary habits show that urban residents generally have better access to a variety of nutrient-rich foods, which can improve overall diet quality and reduce hypertension-related risks (Curi-Quinto *et al.*, 2022). Additionally, rural areas often face shortages of healthcare personnel, limiting access to effective hypertension management and educational resources (Saleem *et al.*, 2022). This inequality in access to healthcare services is exacerbated by socioeconomic factors, where lower income is often associated with poor dietary habits and higher rates of diet-related diseases, including hypertension (Mphekgwana *et al.*, 2020).

The prevalence of hypertension is significantly influenced by various socio-demographic and lifestyle factors, especially age and work patterns. It is well-documented that older age correlates with higher rates of hypertension, making age a critical independent risk factor for developing hypertension (Adeleke *et al.*, 2024). In India, this shift has even been linked to increased consumption of processed foods and decreased physical activity, resulting in rural populations experiencing similar rates of hypertension as urban populations (Boro & Banerjee, 2022). This suggests that changes in dietary patterns, which often occur in rural areas due to urbanization, may be contributing to the rise in hypertension cases. Rural residents are often less aware of and understand hypertension and its management, leading to a higher prevalence of undiagnosed and untreated conditions. Hypertension rates in rural communities are significantly influenced

by dietary patterns and lifestyle, exacerbated by educational inequalities (Sani *et al.*, 2022). This paradox may stem from lifestyle factors beyond diet alone, including occupational stress, sedentary behavior, and insufficient physical activity, all of which can significantly contribute to hypertension (Dillon *et al.*, 2022). These findings emphasize the need for hypertension management strategies that consider multiple factors.

Comprehensive dietary and lifestyle interventions are vital, as diet serves as a modifiable risk factor crucial for preventing hypertension. Multiple meta-analyses support those dietary adjustments, such as increasing fruit and vegetable intake and reducing sodium consumption, that effectively lower blood pressure (Aljuraiban *et al.*, 2024). The intersection of dietary habits, work patterns, and age significantly shapes hypertension prevalence. Effective blood pressure management should adopt a multifaceted approach, integrating dietary modifications with lifestyle changes that address occupational stress and age-related risks (He *et al.*, 2019). Data suggest that despite self-reported good dietary habits, these individuals experience high rates of hypertension. The nature of hypertension, influenced not only by diet but also by socioeconomic status, is linked to occupational hazards and demographic factors such as age. Aging is recognized as a risk factor for hypertension, with studies indicating that older age groups exhibit consistently higher blood pressure levels, correlating directly with vascular stiffness and other physiological changes (Ovwasa *et al.*, 2023).

A study suggests that consumption of fruits, vegetables, whole grains, and unsaturated fatty acids is associated with a lower risk of hypertension and better blood pressure management. This association highlights the importance of an adequate diet not only for vulnerable groups but also across socioeconomic groups. Moreover, physical activity was determined to have a protective effect against hypertension when coupled with healthy dietary habits (Zhu & Wang, 2024). The role of socioeconomic factors cannot be underestimated, as research shows that lower levels of education and income are associated

with less healthy dietary choices and higher rates of hypertension (Zhai *et al.*, 2023). Individuals with lower levels of education not only have a higher prevalence of hypertension but also report poorer dietary quality, which may be attributed to financial constraints and limited nutritional knowledge (Sapala *et al.*, 2025). This incongruence emphasizes the importance of understanding the broader context of lifestyle choices and how occupational stressors might impact health despite purported healthy eating practices (Pai M *et al.*, 2023). Therefore, interventions should not only address dietary modifications but also consider occupational stress and age-related health changes, making a case for a multifaceted approach to managing hypertension (Wu *et al.*, 2022). These findings encourage further research into comprehensive approaches that combine dietary improvements with other preventive strategies.

The implications of these findings for public health are significant. Given the strong association between poor diet and hypertension, as well as the potential role of age and gender in triggering hypertension, preventive and promotional initiatives to prevent hypertension are important for improving public health and addressing public health challenges. This study has several limitations that need to be considered when interpreting the findings. First, the cross-sectional design of the study limits the ability to draw causal conclusions between variables. Second, the sample size was relatively small, which may affect the generalizability of the results. Further research is recommended to use a longitudinal design and a larger sample size, as well as to consider the dimensions of healthy living behavior comprehensively so as to potentially deepen understanding of the determinants of hypertension.

Conclusions

This study reveals a crucial finding that in rural communities, unhealthy eating patterns are strongly associated with an increased incidence of hypertension and are the primary predictor that can increase the incidence of hypertension, compared to healthy eating patterns. In addition, older age also shows a significant risk potential, although not statistically significant, while male gender

also shows a higher risk tendency. Employment status does not contribute significantly to hypertension. Further research is recommended to use a longitudinal design and a larger sample size, as well as to comprehensively consider the dimensions of healthy lifestyle behaviors to deepen understanding of the determinants of hypertension.

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