PANAKEIA 2 (2) 2025

PANAKEIA JOURNAL OF EPIDEMIOLOGY

https://e-journals2.unmul.ac.id/

Hypertension in the Kutai Community in Penyinggahan Village, West Kutai Regency. Is There a Relationship with Physical Activity? A Cross-Sectional Study

Wahyudi[1]✉, Irfansyah Baharuddin Pakki[1], Siswanto[1], Muh. Amri Arfandi[1]

[1]Epidemiology, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia

Article Info

Article History:
Submitted 22-09-2025
Revised 22-09-2025
Accepted 19-12-2025

Kata Kunci:
Hipertensi, Aktivitas Fisik, Pola Konsumsi, Masyarakat Kutai, Faktor Risiko

Keywords:
Hypertension, Physical Activity, Dietary Patterns, Kutai People, Risk Factors.

Abstrak

Hipertensi merupakan masalah kesehatan utama di Indonesia dengan prevalensi di Kalimantan Timur mencapai 39,3%, termasuk di Kabupaten Kutai Barat. Penelitian ini bertujuan menganalisis hubungan konsumsi makanan dan minuman berisiko serta aktivitas fisik dengan kejadian hipertensi pada masyarakat Suku Kutai di wilayah kerja Puskesmas Penyinggahan. Penelitian cross-sectional dilakukan pada 2023 dengan sampel 140 responden berusia 30-64 tahun yang dipilih secara purposive sampling. Pengumpulan data menggunakan kuesioner FFQ dan IPAQ, dianalisis secara univariat, bivariat *(Chi-Square dan Fisher's Exact Test),* dan multivariat (Regresi Logistik). Hasil menunjukkan 51,4% responden menderita hipertensi dengan hubungan signifikan terhadap IMT berisiko (p=0,000; OR=3,699), aktivitas fisik berat-sedang (p<0,05), serta konsumsi lemak, minyak, garam, dan gula (p<0,05). Tidak ditemukan hubungan signifikan dengan protein, serat, kalium, buah, sayuran, usia, jenis kelamin, maupun etnis. Simpulan penelitian menyatakan bahwa IMT berisiko, kurang aktivitas fisik, serta pola konsumsi rendah protein, serat, dan kalium merupakan faktor risiko dominan terhadap kejadian hipertensi pada masyarakat Kutai.

Abstract

Hypertension is a major health problem in Indonesia, with a prevalence rate of 39.3% in East Kalimantan, including in West Kutai Regency. This study aims to analyze the relationship between consumption of high-risk foods and beverages and physical activity with the incidence of hypertension among the Kutai people in the working area of the Penyinggahan Health Center. A cross-sectional study was conducted in 2023 with a sample of 140 respondents aged 30–64 years selected by purposive sampling. Data were collected using FFQ and IPAQ questionnaires and analyzed using univariate, bivariate (Chi-Square and Fisher's Exact Test), and multivariate (Logistic Regression) methods. The results showed that 51.4% of respondents suffered from hypertension, with significant associations found with high-risk BMI (p=0.000; OR=3.699), moderate-to-vigorous physical activity (p<0.05), and consumption of fat, oil, salt, and sugar (p<0.05). No significant relationships were found with protein, fiber, potassium, fruits, vegetables, age, gender, or ethnicity. In conclusion, high-risk BMI, inadequate physical activity, and dietary patterns low in protein, fiber, and potassium are dominant risk factors for hypertension among the Kutai people.

Alamat korespondensi:
Jl. Sambaliung, Gn. Kelua, Kec. Samarinda Utara,
Kota Samarinda, Kalimantan Timur 75119

eISSN : 3089 – 7262

INTRODUCTION

Hypertension, or high blood pressure, is a global health problem known as the silent killer because it often shows no symptoms until it causes fatal complications such as heart disease, stroke, and kidney failure. The prevalence of hypertension continues to increase globally, including in Indonesia, where according to the 2018 Basic Health Survey (Riskesdas), the prevalence reached 31.7%. East Kalimantan Province, where this research was conducted, has a prevalence of 39.3%, with West Kutai Regency recording hypertension as the most common disease.

The theoretical foundation of this research uses epidemiological theory, which posits that a disease can arise due to risk factors related to the host, agent, and environment. For the host, factors include physical activity and consumption patterns; for the agent, hypertension itself is the disease; and for the environment, factors include culture, stigma, geography, and the economic level of the community. The originality of this study, which distinguishes it from previous research, lies in its methodology (cross-sectional design), its focus on the Kutai ethnic community, and its location in the working area of the Penyinggahan Health Center in West Kutai Regency.

The increase in cases is caused by various risk factors, including age, gender, family history, as well as modifiable behavioral factors such as consumption of foods high in salt, sugar, and fat; consumption of risky beverages; lack of physical activity; and stress. The Kutai community in the working area of the Penyinggahan Health Center has specific cultural characteristics and consumption patterns, such as the belief that broth-based dishes already provide sufficient vegetable intake, which may potentially become risk factors.

Based on this background, this study aims to analyze the relationship between the consumption of high-risk foods, the consumption of high-risk beverages, and physical activity with the incidence of hypertension among the Kutai community in the area. This research is expected to provide information for the health center and local government in designing more effective prevention strategies and health promotion programs.

METHOD

This study employed an analytical observational design with a cross-sectional approach, where measurements of independent and dependent variables were conducted simultaneously at a single point in time. The study was carried out in the working area of the Penyinggahan Community Health Center, West Kutai Regency, in July 2024. The study population consisted of Kutai ethnic community members aged 30–64 years who visited the health center. A total of 140 respondents were selected as samples using purposive sampling technique based on specific inclusion criteria: being of Kutai ethnicity, aged 30–64 years, willing to participate as respondents, and having no history of kidney disease, hormonal disorders, or use of medications affecting blood pressure.

Data collection was conducted using several instruments. A respondent identity questionnaire was used to gather demographic data such as age, gender, occupation, and education level. A Food Frequency Questionnaire (FFQ) was applied to measure the frequency of

consumption of various types of high-risk foods and beverages over the past month. The short version of the International Physical Activity Questionnaire (IPAQ) was used to assess respondents' physical activity levels across various domains. Additionally, blood pressure was measured using a digital sphygmomanometer, and anthropometric measurements were taken to calculate Body Mass Index (BMI).

Data analysis was performed statistically using SPSS software. Univariate analysis was used to describe sample characteristics and the frequency distribution of each variable. Bivariate analysis employed the Chi-Square test and Fisher's Exact test to examine the relationship between independent variables and the incidence of hypertension, with risk magnitude expressed as an Odds Ratio. Multivariate analysis using logistic regression was conducted to control for confounding variables and identify dominant risk factors influencing the incidence of hypertension.

RESULT AND DISCUSSION

Based on the univariate analysis of characteristics and dependent variables among 140 respondents, demographic data revealed that the majority of respondents (93.6%) belonged to the adult age group (30-59 years), while the elderly group (60-64 years) accounted for 6.4%. The gender distribution was relatively balanced, with females comprising 50.7% and males 49.3%. In terms of health indicators, Body Mass Index (BMI) distribution showed near-equality: 51.4% of respondents fell within the normal (non-risk) BMI category, while 48.6% were in the risk category (severely underweight, underweight, overweight, and obese). Regarding hypertension, 51.4% of respondents were diagnosed with hypertension, while the remaining 48.6% were not. Ethnically, the vast majority of respondents (92.9%) identified as Kutai, with the remainder (7.1%) being of mixed Kutai-Banjar ethnicity.

Table 1. Univariate Analysis: Respondent Characteristics and Dependent Variable Distribution

Variable	Frequency	Percentage (%)
Age		
Adult (30-59 years)	131	93,6
Elderly (60-64 years)	9	6,4
Gender		
Female	71	50,7
Male	69	49,3
Body Mass Index (BMI)		
At Risk (Severely underweight, underweight, overweight, and obese)	68	48,6
Not At Risk (Normal)	72	51,4
Hypertensio		

Variable	Frequency	Percentage (%)
Yes	72	51,4
No	68	48,6

Source: Primary Data, 2025

Based on statistical test results, there was no significant relationship between age categories (adult and elderly) and the incidence of hypertension. This is based on the Fisher's Exact Test result (p-value = 0.167). Although proportionally the elderly group showed a higher percentage of hypertension (77.8% compared to 49.6% in adults), this difference was not statistically significant due to the very small sample size of the elderly group (only 9 respondents). Thus, it is concluded that there is no significant relationship between age and hypertension.

Based on statistical analysis results, there was a significant relationship between at-risk BMI (Body Mass Index) categories and hypertension incidence (p-value = 0.000 in Pearson Chi-Square test). Of the 68 respondents with at-risk BMI, 46 people (67.6%) had hypertension and 22 people (32.4%) did not. Conversely, of the 72 respondents with not at-risk BMI, 26 people (36.1%) had hypertension and 46 people (63.9%) did not. The at-risk and not at-risk BMI category variables showed an OR value of 3.699 (95% CI 1.838-7.446) with p-value 0.000. This indicates that respondents with BMI in the at-risk category (severely underweight, underweight, overweight, and obese) had a 3.7 times higher likelihood of having hypertension compared to respondents with not at-risk BMI (normal). This result is statistically significant ($p < 0.05$), so it can be concluded that at-risk BMI is a strong risk factor for hypertension incidence.

Based on statistical analysis results, there was no significant relationship between ethnicity and hypertension incidence. This is indicated by a p-value of 0.328 in Fisher's Exact Test, which is the most accurate test for this data condition. Of the 130 Kutai ethnicity respondents, 65 people (50.0%) had hypertension and 65 people (50.0%) did not. In the Kutai-Banjar ethnic group consisting of 10 respondents, 7 people (70.0%) had hypertension and 3 people (30.0%) did not.

Based on research data results, more than half of the respondents were recorded as having hypertension. Specifically, 72 respondents or 51.4% of the total sample had this condition. Meanwhile, 68 respondents or 48.6% were declared not to have hypertension. This distribution shows that the health burden related to hypertension in the studied population is quite high, with the proportion of sufferers slightly higher than those without.

Table 2. of Bivariate Analysis: Relationship Between Independent Variables and Dependent Variable

Independent Variable	Dependent Variable Hypertension				n	%	P-value
	Yes		No				
	n	%	n	%			
Age							
Adult	65	90	66	97	131	94	0.167
Elderly	7	10	2	3	9	6	
Gender							
Famale	35	49	36	53	71	51	0.609
Male	37	51	32	47	69	49	
BMI							
At Risk	46	64	22	32	68	49	0.000
No At Risk	26	36	46	68	72	51	
Physical Activity							
Active	13	18	34	50	47	34	0,000
Inactive	59	82	34	50	93	66	
Risk Food Consumption							
Carbohydrates							
Moderate	60	83	62	91	122	87	
Low	7	10	3	4	10	7	0,364
Never	5	7	3	4	8	6	
Protein							
Moderate	54	75	58	85	122	80	0,128
Low	18	25	10	15	28	20	
Fiber							
Tinggi	9	12	11	16	20	14	
Moderate	40	56	46	68	86	62	0,093
Low	23	32	11	16	34	24	
Fruit							
Moderate	43	60	44	65	87	62	0,543
Low	29	40	24	45	53	38	
Lemak							
Moderate	19	26	31	46	50	36	
Low	24	33	26	38	50	36	0,004
Never	29	41	11	16	40	28	
Oil							
Moderate	46	64	22	32	68	49	
Low	9	12	9	13	18	13	0,000
Never	17	24	37	55	54	38	
Salt							
High	52	72	23	34	75	54	0,000

Independent Variable	Dependent Variable Hypertension				n	%	P-value
	Yes		No				
	n	%	n	%			
Moderate	2	3	6	9	8	6	
Never	18	25	39	57	57	40	
Potassium							
Moderate	13	18	24	35	37	26	0,021
Low	59	82	44	65	103	74	
Sugar							
High	61	85	42	62	103	74	0,002
Moderate	11	15	26	48	37	26	
Risky Beverage Consumption							
Moderate	23	32	13	19	36	26	
Low	39	54	24	35	63	45	0,000
Never	10	14	31	46	41	29	

Source: Primary Data, 2025

Bivariate Test Results on Respondent Characteristics and Hypertension Incidence the bivariate test results for respondent characteristics and hypertension incidence showed non-significant outcomes for the variables of age (p=0.167) and gender (p=0.609). Only BMI demonstrated a significant relationship with hypertension (p=0.000). The Odds Ratio (OR) value of 3.699 (95% CI: 1.838–7.446) with a p-value of 0.000 indicates that respondents with a BMI in the "at-risk" category had 3.7 times higher odds of developing hypertension compared to those with a BMI in the "not at-risk" category. This discrepancy is attributed to the age categorization, where the elderly group (aged ≥60 years) comprised only 9 individuals (6.4%) out of the total sample of 140. The significant imbalance in age distribution resulted in insufficient variation for a statistically significant relationship to be detected. A similar issue arose with the ethnicity variable, where 10 respondents (7.1%) identified as Kutai-Banjar, while 130 (92.9%) identified as Kutai. The uneven distribution across ethnic categories led to non-significant analytical results regarding hypertension. Contextually, in Penyinggahan Village and its surroundings, respondents with overweight and obese BMI were predominantly from the middle to upper economic strata, characterized by high consumption of food and beverages and low levels of physical activity.

The physical activity variable showed a significant relationship with hypertension. A p-value of 0.000 ($p<0.05$) indicates a statistically significant association. Contextually, in Penyinggahan Village, physical activity levels are notably low due to the perception that daily work for livelihood already constitutes sufficient physical

activity. Additionally, most respondents aged 30–64 were unfamiliar with exercise as a form of physical activity. Even walking was rarely undertaken except when commuting to work.

Carbohydrate Source Consumption Variable the carbohydrate source consumption variable revealed that most respondents, both with and without hypertension, had a "Moderate" consumption pattern. Among the hypertensive group, 122 individuals consumed carbohydrates at a moderate level. The p-value of 0.364 ($p>0.05$) indicates no statistically significant difference in carbohydrate consumption patterns between hypertensive and non-hypertensive groups.

Protein Source Consumption Variable protein consumption was dominated by the "Moderate" category with 122 respondents, while the "Low" category comprised 28 individuals. The p-value of 0.128 ($p>0.05$) indicates no significant relationship between protein consumption and hypertension incidence. Contextually, in Penyinggahan Village, consumption of homemade protein sources such as chicken, beef, and fish was low due to the predominantly middle to lower economic status of the community, limiting their ability to afford such protein sources. Alternatives included cheaper animal-based proteins like chicken liver and eggs, and plant-based proteins like tofu and tempeh. Most low-income households relied solely on plant-based proteins for daily nutritional needs.

Fiber Source Consumption Variable fiber consumption was divided into three categories: "Moderate" (86 respondents), "Low" (34 respondents), and "High" (20 respondents). With a p-value of 0.093 ($p>0.05$), the results were not statistically significant, indicating no association between fiber consumption and hypertension incidence. Contextually, in Penyinggahan Village, a prevalent stigma existed where rice mixed with tea was considered a vegetable dish (any broth-based dish was perceived as containing vegetables, e.g., fish-based soups). This misconception led to inadequate understanding of vegetable consumption, resulting in low fiber intake. Additionally, most respondents belonged to low-income groups, relying on affordable and locally available fiber sources such as water spinach, young corn, corn, and cassava leaves.

Fruit Consumption Variable fruit consumption was higher in the "Moderate" category (87 respondents) compared to the "Low" category (53 respondents). The p-value of 0.543 ($p>0.05$) clearly indicates no significant relationship between fruit consumption and hypertension incidence. Contextually, in Penyinggahan Village, fruit consumption was rare as the community depended on seasonal forest fruits available only during harvest periods. Seasonal fruits, available once a year, contributed to low fruit consumption among respondents.

Fat Source Consumption Variable fat consumption frequency was divided into three categories: "Never" (41 respondents), "Low" (33 respondents), and "Moderate" (26 respondents). The p-value of 0.004 proves a highly

significant statistical relationship between fat consumption patterns and hypertension incidence. Contextually, in Penyinggahan Village, consumption of cheese-banana fritters, chicken necks, and chicken feet was high due to their affordability (IDR 5,000 per serving). Most respondents had middle to lower economic status, limiting their access to expensive protein sources like chicken, beef, and fish. Instead, cheaper options like chicken necks and feet were consumed as alternative side dishes, leading to high fat intake (from chicken neck consumption) among most respondents.

Oil Source Consumption Variable oil consumption showed significant results. Sixty-four respondents consumed oil at a "Moderate" level, while 55 reported "Never" consuming oil. The p-value of 0.000 indicates a highly significant statistical relationship, confirming oil consumption as a strong factor associated with hypertension. Contextually, in Penyinggahan Village, most respondents used processed palm oil for frying snacks like fritters and vegetable patties, which were frequently consumed as breakfast items.

Salt Source Consumption Variable high salt consumption was reported by 72 respondents, with a p-value of 0.000 indicating a highly significant relationship with hypertension. Contextually, in Penyinggahan Village, consumption of processed foods and flavor enhancers high in salt (e.g., salted fish, cassava chips, soy sauce, chicken nuggets, and MSG-based seasonings) was common. Most residents aged >30 years preferred salted fish as a daily dish, as fishing was their primary livelihood. Additionally, salty snacks like cassava chips were frequently consumed during leisure time with family. The analysis revealed that not only pure salt but also processed foods and seasonings high in salt content were major risk factors for hypertension.

Potassium Source Consumption Variable most respondents (82 individuals) fell into the "Low" potassium consumption category. The p-value of 0.021 indicates a significant relationship with hypertension incidence.

Sugar Source Consumption Variable a significant relationship was found between sugar consumption and hypertension incidence, with a p-value of 0.002. Contextually, in Penyinggahan Village, sugar was consumed in the form of white and brown sugar in beverages (tea and coffee) and homemade chili sauce. High consumption of tea and coffee was common among respondents aged 30–64, who consumed these beverages throughout the day (morning, afternoon, evening, and night) with approximately 4–8 grams of sugar per serving. Brown sugar was often added to homemade chili sauce to balance flavors, enhance aroma, and improve taste, with sugar content ranging from 8–9 grams per 100 grams of chili sauce.

Risky Beverage Consumption Variable a significant relationship was observed between consumption of sugar-sweetened packaged beverages and hypertension, with a p-value of 0.000. Contextually, in Penyinggahan Village, many residents sold sweetened and flavored packaged beverages (e.g.,

Sprite, boba, and Pop Ice). Interestingly, the study found that some sweet beverages showed a protective effect against hypertension when consumed infrequently. This is because most respondents aged 30–64 were not regular consumers of flavored beverages but primarily drank tea and coffee throughout the day.

CONCLUSION

Based on the research findings, it can be concluded that the incidence of hypertension in Penyinggahan Village and its surrounding areas is significantly more influenced by lifestyle and dietary factors than by demographic factors. The main risk factors identified were a Body Mass Index (BMI) in the at-risk category, which increases the odds of hypertension by 3.7 times, supported by consumption patterns high in salt, sugar, and fatty foods that elevate the risk by up to 10 times. Additionally, a sedentary lifestyle, characterized by insufficient physical activity, also contributed to the increased risk. Among risky food consumption, significant relationships were found between fat, oil, salt, and sugar intake and hypertension. On the other hand, consumption of potassium-rich foods served as a protective factor against hypertension.

This underscores the importance of public health interventions focused on promoting healthy eating patterns, increasing physical activity, and controlling body weight, while considering the socio-economic conditions of the community, which often lead to the choice of cheap, high-risk foods as daily nutritional sources.

REFERENCES

Ali Akbar, M., Zunita, N., Shinta Zahara, A., & Pepayosa, E. (2024). Hubungan Pola Makan Terhadap Resiko Penyakit Hipertensi pada Mahasiswa Pendidikan Biologi Universitas Samudra (The Relationship Between Diet And The Risk Of Hypertension In Biology Education Students Of Samudra University). *Biology Science & Education*, *13*(2), 184–190. https://doi.org/https://doi.org/10.33477/bs.v13i2.7084

Batubara, F. R., & Wantian Suling, F. R. (2022). The Relationship of Physical Activity and Diet to the Incidence of Hypertension in the Elderly. *International Journal of Science and Healthcare Research*, *7*(4), 79–92. https://doi.org/10.52403/ijshr.20221011

Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

International Labour Organization. (2023). *World employment and social outlook*. https://doi.org/10.54394/SNCP1637

Kecamatan Penyinggahan Dalam Angka. (2023). *Kecamatan Penyinggahan Dalam Angka 2023*.

KEMKES RI. (2014). Pedoman Gizi Seimbang. *Pedoman (Guidelines)*. https://www.kemkes.go.id/folder/view/01/structure/pedoman-gizi-seimbang.html

Limper, U., Ahnert, T., Maegele, M., Froehlich, M., Grau, M., Gauger, P., Bauerfeind, U., Görlinger, K., Pötzsch, B., & Jordan, J. (2020).

Simulated hypergravity activates hemostasis in healthy volunteers. *Journal of the American Heart Association*, *9*(24). https://doi.org/10.1161/JAHA.120.016479

Lutfi Muta'ali. (2024). *Kecamatan Penyinggahan Dalam Angka 2024* (Timothy Yossy Reviano Santoso, Trans.).

Muntner, P. , H. S. T. , F. L. J. , M. W. M. , & W. P. K. (2020). Trends in Blood Pressure Control Among US Adults With Hypertension, 1999-2000 to 2017-2018. *JAMA*, *324*(12), 1190–1200.

Ningrum, A. W., Moch Bahrudin, & Hariono. (2025). The Relationship Between Diet and The Incidence of Hypertension at The Buduran Sidoarjo Health Center. *Global Ten Public Health and Nursing Journal*, *3*(1), 20–24. https://doi.org/10.36568/gtphnj.v3i1.117

Sirait, R. I., & Ronoatmodjo, S. (2024). Hubungan Frekuensi Konsumsi Makanan Instan Dengan Kejadian Hipertensi Pada Penduduk Berusia ≥ 18 Tahun Di Indonesia (Analisis Data RISKESDAS 2018). *Jurnal Kesehatan Masyarakat*, *12*(1), 91–98. https://doi.org/10.14710/jkm.v12i1.38576

Society of Hypertension (ISH). (2020). *PANDUAN PRAKTIS HIPERTENSI (INTERNATIONAL SOCIETY OF HYPERTENSION 2020)*. Society of Hypertension (ISH). https://www.neurologi.id/panduan-praktis-hipertensi-international-society-of-hypertension-2020/

Sugiyono. (2018). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.

Virani, S. S. , A. A. , A. H. J. , . . . & T. C. W. (2021). Heart Disease and Stroke Statistics 2021 Update: A Report From the American Heart Association. *Circulation*, *143*(8), 254–743.

WHO. (2020). *Physical activity*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/physical-activity

Zhao, L. , Z. Y. , W. J. , W. X. , & L. L. (2022). Sex Differences in Hypertension Prevalence, Awareness, Treatment, and Control: A Systematic Review and Meta-analysis. *Journal of Hypertension*, *40*(1), 78–88.