



Dietary Patterns, Hydration, and Hypertension among Community-Dwelling Older Adults in Indonesia: A Cross-Sectional Study

Lilis Setyowati¹✉, Azzahra Amelia Putri², Hilda Mazarina Devi³, Zahid Fikri¹, Sunardi¹, Chairul Huda Al Husna⁴, Nur Melizza⁵

¹ Department of Management, Program of Study in Nursing Science, Faculty of Health Sciences, University of Muhammadiyah Malang, Malang, East Java, Indonesia

² Program of Study in Nursing Science, Faculty of Health Sciences, University of Muhammadiyah Malang, Malang, East Java, Indonesia

³ Department of Community, Faculty of Health Sciences, University Tribhuwana Tungadewi, Malang, East Java, Indonesia

⁴ Department of Medical Surgical, Program of Study in Nursing Science, Faculty of Health Sciences, University of Muhammadiyah Malang, Malang, East Java, Indonesia

⁵ Department of Community, Program of Study in Nursing Science, Faculty of Health Sciences, University of Muhammadiyah Malang, Malang, East Java, Indonesia

Article Info

Article History:

Received:

13 June 2026

Revised:

21 July 2026

Accepted:

22 August 2026

Published:

31 August 2026

Keywords:

Hypertension

Dietary Patterns

Hydration Status

Elderly

Preventive Geriatric Nursing

Citation:

Setyowati, L., Putri, A.A., Devi, H.M., Fikri, Z., Sunardi, S., Al Husna, C.H., & Melizza, N. (2026). Dietary Patterns, Hydration, and Hypertension among Community-Dwelling Older Adults in Indonesia: A Cross-Sectional Study. *MEDICA (International Medical Scientific Journal)*, 8(8), 788–798.

Abstract

Hypertension is a growing public health issue among community-dwelling elderly in Indonesia. Dietary patterns and daily fluid intake are modifiable lifestyle factors that may influence blood pressure, yet their combined effects in community settings remain underexplored. This study aimed to examine the associations between dietary patterns and daily fluid intake and hypertension among Indonesian community-dwelling elderly and to identify implications for preventive geriatric nursing. A cross-sectional study was conducted among 146 elderly participants at the Elderly Integrated Health Post in Malang, East Java, Indonesia. Dietary patterns and daily fluid intake were assessed using a validated Food Frequency Questionnaire (FFQ). Dietary pattern scores were categorised as low (≤ 50), moderate (51-75), and high (≥ 76). Daily fluid intake was classified as adequate (≥ 2 liters/day) or inadequate (< 2 liters/day) based on self-reported consumption. Blood pressure was measured following WHO guidelines. Multiple logistic regression was used for data analysis. The prevalence of hypertension was low (9.6%). A moderate dietary pattern was significantly associated with lower odds of hypertension (AOR = 0.189; 95% CI: 0.039–0.912; $p = 0.038$), while a high dietary pattern showed a non-significant protective trend. Daily fluid intake was not significantly associated with hypertension. The low prevalence may have limited statistical power. This study suggests an association between better dietary patterns and lower hypertension odds among community-dwelling older adults. These findings support the development of practical dietary education programs by nurses at the Elderly Integrated Health Post as part of preventive geriatric nursing strategies in Indonesia.

© 2026 Borneo Scientific Publishing

Corresponding Author:

✉ Lilis Setyowati

Department of Management, Program Study of Nursing Science, Faculty of Health Sciences, University of Muhammadiyah Malang, Malang, East Java, Indonesia

Email: lilis@umm.ac.id

1. INTRODUCTION

Hypertension remains one of the most prevalent chronic conditions worldwide, posing substantial public health challenges, particularly among older adults (World Health Organization, 2023). According to the World Health Organization (WHO), hypertension affects approximately 1.28 billion people aged 30–80 years globally and is a leading cause of premature death, especially in low and middle-income countries (World Health Organization, 2025). In Southeast Asia, the prevalence is around 32.4% (World Health Organization, 2023), while in Indonesia, it continues to rise significantly along with the growing elderly population. The Indonesian Basic Health Research (Riskesdas) and Survey Kesehatan Indonesia (Badan Kebijakan Pembangunan Kesehatan, 2023) indicate that hypertension is a major contributor to morbidity and mortality in community-dwelling elderly, with physiological changes such as arterial stiffness and reduced renal function increasing susceptibility, particularly in women post-menopause (Iqbal & Jamal, 2023; Oktaria et al., 2023).

Multiple modifiable factors contribute to hypertension risk, including age, gender, lifestyle, dietary patterns, and fluid intake. The relationship can be explained step by step as follows: First, unhealthy dietary patterns characterized by high sodium, saturated fat, and processed food intake combined with low consumption of fruits, vegetables, and fiber promote sodium retention and oxidative stress. Second, inadequate fluid intake disrupts fluid balance, leading to increased blood viscosity and activation of the renin-angiotensin-aldosterone system (RAAS). Third, these changes impair vascular function through endothelial dysfunction, arterial stiffness, and reduced nitric oxide bioavailability. Finally, the cumulative effects elevate peripheral vascular resistance and blood pressure, increasing the risk of hypertension. Poor dietary habits characterized by high sodium and saturated fat intake and low fiber intake along with inadequate fluid intake, significantly exacerbate blood pressure elevation (Awan et al., 2024; Batubo et al., 2024).

In local Indonesian settings, specific dietary habits such as high coffee consumption and high-sodium processed snacks play a prominent role in blood pressure regulation. Evidence from Malang Regency demonstrated a significant positive correlation between coffee consumption frequency and elevated blood pressure among hypertensive individuals ($r = 0.424$, $p < 0.05$) (Melizza et al., 2021). Furthermore, educational gaps in local communities remain a major obstacle, whereas structured short-term nursing educational interventions have been shown to significantly improve hypertension management knowledge ($p = 0.000$) and attitudes ($p = 0.008$) in rural Malang (Kurnia et al., 2020).

Insufficient fluid intake can increase blood viscosity and activate the renin-angiotensin-aldosterone system, thereby further elevating the risk of hypertension (Miura, Matsuo, & Seumatsu, 2025). Theoretical frameworks, such as Guyton's theory on sodium-fluid balance and Armstrong's dehydration model (Brands, 2020), underscore the interplay between diet, hydration, and cardiovascular regulation (Jhee et al., 2022). Despite the well-established links between diet, hydration, and blood pressure, existing evidence remains inconsistent and fragmented. Most previous studies have examined these factors in isolation, focusing either on single nutrients (e.g., sodium) or on clinical/hospital-based populations rather than exploring their combined effects in real-world community settings (Ardissino et al., 2022). Furthermore, findings across studies show inconsistencies regarding the relative importance of dietary patterns versus fluid intake, with some reporting strong associations. In contrast, others find null results, particularly in Asian elderly populations. This lack of integrated research in non-clinical, community-based contexts among Indonesian older adults represents a critical gap in the literature (Bracci et al., 2024; Mariani et al., 2024).

The current study addresses these inconsistencies by simultaneously examining dietary patterns and daily fluid intake in relation to hypertension using a validated FFQ among 146 community-dwelling elderly in Malang. The novelty lies in its emphasis on integrated lifestyle factors in an Elderly Integrated Health Post and its explicit focus on practical implications for preventive geriatric nursing intervention, building upon local nursing evidence on self-care, health promotion, and community education (Kurnia et al., 2023). The objective of this study was to examine the associations between dietary patterns, daily fluid intake, and hypertension among Indonesian community-dwelling elderly and to identify implications for preventive geriatric nursing practice.

2. METHODS

This study employed a descriptive-analytical, cross-sectional design. The study was conducted from November 2023 to January 2024 at the Integrated Health Post Sukun in Malang, East Java, Indonesia. The study population consisted of registered and active middle-aged and older adults at the Integrated Health Post. A total of 146 participants were recruited using purposive sampling. The minimum requirement of 10–15 events per the sample size was determined based on feasibility within the active membership of the Integrated Health Post (approximately 200 registered elderly), the expected prevalence of hypertension in this population around 30–50% (Badan Kebijakan Pembangunan Kesehatan, 2023), and predictor variables for stable logistic regression models (with 5–6 predictors planned). Although this sample size was considered adequate for exploratory analysis, the observed low number of hypertension cases ($n=14$) limited statistical power for some subgroup analyses. Purposive sampling was chosen due to practical constraints in accessing elderly participants in a community setting and to ensure participants could actively participate and provide reliable self-reported data. However, this approach may increase the risk of selection bias and limit generalizability to the broader elderly population.

Inclusion criteria were individuals aged 45 years or older (to capture both middle-aged and older adults, consistent with Indonesian geriatric health programs and the rising risk of hypertension starting from middle age), actively participating in the Integrated Health activities, and able to communicate effectively. Exclusion criteria included older adults with severe comorbidities that could interfere with data collection.

The independent variables were dietary patterns and daily fluid intake, while the dependent variable was hypertension status. Dietary patterns and daily fluid intake over the past month were assessed using a validated Food Frequency Questionnaire (FFQ) developed for middle-aged and older Indonesian adults. The FFQ has demonstrated acceptable validity and reliability for assessing dietary patterns and fluid intake in this population (Pearson's $r = 0.50$ – 0.81 ; ICC = 0.44 – 0.78) (Syauqy et al., 2021).

Dietary pattern scores were calculated based on the frequency of consumption of various food groups. Higher scores (≥ 76) indicate healthier dietary patterns (higher intake of fruits, vegetables, and nutrient-dense foods). In comparison, lower scores (≤ 50) reflect poorer dietary patterns (higher consumption of processed foods, high-sodium foods such as biscuits/cookies with salt, and coconut milk). Scores between 51 and 75 were categorized as moderate.

Daily fluid intake was classified as adequate (≥ 2 liters/day) or inadequate (< 2 liters/day), based on self-reported daily consumption (one glass ≈ 200 ml). The 2-liter cut-off was adopted based on standard geriatric hydration recommendations from the European Society for Clinical Nutrition and Metabolism (ESPEN) and WHO guidelines for older adults.

Blood pressure was measured according to WHO guidelines using a calibrated sphygmomanometer. Two measurements were taken at a 5-minute interval in a seated position after 10 minutes of rest, and the average of the two readings was used for analysis. Hypertension was defined as systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg.

Descriptive statistics were used to summaries participant characteristics and key variables, including frequencies (%), means, and standard deviations (SD). Multiple logistic regression analysis was performed to examine the associations between dietary patterns, daily fluid intake, and hypertension, with a low dietary pattern score as the reference category. The model adjusted for potential confounders including age, gender, education level, occupation, and body mass index (BMI). Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Model fit was assessed using the Hosmer–Lemeshow test, and Nagelkerke's R^2 indicated the proportion of variance explained. A significance level of $p < 0.05$ was used. All analyses were conducted using IBM SPSS Statistics version 26.0.

This study received ethical approval from the Health Research Ethics Committee of Universitas Muhammadiyah Lamongan, Indonesia (No. 342/EC/KEPK-S2/11/2023). All participants provided written informed consent before data collection, and the study was conducted in accordance with the Declaration of Helsinki.

3. RESULTS AND DISCUSSION

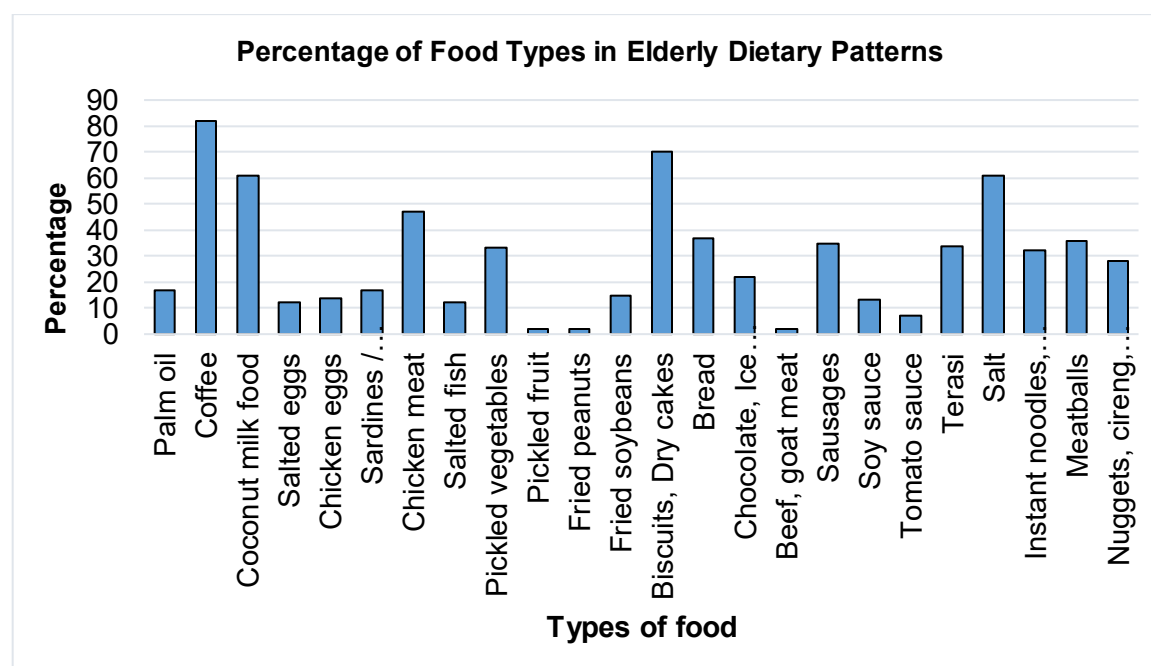
The characteristics of the 146 participants are shown in Table 1. The mean age of respondents was 62.19 years (SD = 8.29). Most were male (57.5%), had completed senior high school (53.4%), and were not working (52.1%). Most participants had a normal body mass index (63.0%). Only 9.6% ($n = 14$) were classified as having hypertension, indicating a relatively low prevalence in this community-dwelling elderly sample.

Table 1. Respondent characteristics at Integrated Health Post Sukun Malang ($n = 146$).

Characteristics	Result
Gender	
Male	84 (57.5%)
Female	62 (42.5%)
Education	
Elementary School	39 (26.7%)
Junior High School	17 (11.6%)
Senior High School	78 (53.4%)
Bachelor	12 (8.2%)
Occupation	
Work	70 (47.9%)
Not Working	76 (52.1%)
Age (mean, SD)	62.19 (8.29)
Middle Age (45-59)	52 (35.6%)
Elderly (60-74)	84 (57.5%)
Old (75-90)	10 (6.8%)
BMI (mean, SD)	23.96 (3.69)
Underweight	8 (5.5%)
Normal	92 (63%)
Overweight	38 (26%)
Obesity	8 (5.5%)

Blood Pressure	
Normal	132 (90.4%)
Hypertension	14 (9.6%)
Dietary Pattern	
Low	56 (38.4%)
Medium	53 (36.3%)
High	37 (25.3%)
Fluid Intake (2L/day)	
Adequate	51 (34.9%)
Insufficient	95 (65.1%)

Dietary pattern scores showed that 38.4% of participants had low scores, 36.3% had moderate scores, and 25.3% had high scores. The majority (65.1%) had inadequate hydration status (<2 litres/day). As illustrated in Graphic 1, the most frequently consumed foods among the elderly were biscuits/cookies (often prepared with added salt and coconut milk) and coffee, indicating a dietary pattern high in processed, high-sodium foods and low in nutrient-dense options such as fruits and vegetables.



Graphic 1. Overview of food types in dietary patterns.

Multiple logistic regression analysis (Table 2) demonstrated that dietary patterns were significantly associated with hypertension. Participants with moderate dietary pattern scores had significantly lower odds of hypertension compared to the reference group (AOR = 0.189; 95% CI: 0.039–0.912; $p = 0.038$). However, the association for the high dietary pattern score did not reach statistical significance (AOR = 0.256; 95% CI: 0.053–1.253; $p = 0.093$). This lack of significance can be explained by several factors: (1) the relatively small overall sample size ($n=146$); (2) the small number of participants in the “High” dietary pattern category ($n=37$, 25.3%); and (3) the very low prevalence of hypertension in this sample (only 9.6%, $n=14$ cases). These conditions resulted in low statistical power and wide confidence intervals, making the estimates imprecise, especially for the “High” category.

The notably low prevalence of hypertension (9.6%, n=14) in this study should be highlighted, as it substantially limited the statistical power and stability of the logistic regression estimates. This low event rate particularly affected the ability to detect significant associations in the high dietary pattern and hydration status categories, as reflected in the wide confidence intervals.

Table 2. Association between dietary patterns, fluid intake, and hypertension among older adults.

Variable	AOR (95% CI)	R ²	p-value
Dietary Pattern			
Low	ref		ref
Moderate	0.189 (0.039 – 0.912)	0.116	0.038
High	0.256 (0.053 – 1.253)		0.093
Fluid Intake	1.983 (0.512 – 7.677)		0.321

Notes: 95% CI: 95% Confidence Interval; AOR: Adjusted Odds Ratio; * significance at p-value < 0.05; data were analyzed using Multiple Logistic Regression; Ref: Category Reference; R²: Nagelkerke's R2.

The wide confidence intervals observed in Table 2, particularly for the “High” dietary pattern category (0.053–1.253) and fluid intake (0.512–7.677), indicate imprecise estimates. This imprecision is largely due to the small number of hypertension cases (only 14 out of 146 participants).

This study revealed a significant association between dietary patterns and hypertension among Indonesian community-dwelling elderly. Participants with moderate dietary pattern scores exhibited lower hypertension risk compared to those with low scores (Zeng et al., 2025) while those with high scores showed a similar but statistically non-significant protective trend. In contrast, hydration status showed no significant association with hypertension. These findings should be interpreted with caution given the notably low prevalence of hypertension in the sample, which may have influenced the statistical power of the analysis.

The observed protective effect of better dietary patterns may be attributed to reduced consumption of high-sodium processed foods, such as biscuits and cookies prepared with salt and coconut milk (Silva et al., 2023), along with relatively improved intake of nutrient-dense foods (Gibson & Ashwell, 2011; Piernas et al., 2022; Yang, et al., 2022). However, sustaining long-term dietary modifications in community health settings is strongly linked to personal self-care management, self-efficacy, and family support (Kurnia et al., 2023). Therefore, encouraging realistic, moderate dietary improvements through accessible local foodstuffs represents a pragmatic and achievable goal for community-dwelling elderly (Kurnia et al., 2022).

The weaker association in the high dietary pattern group could be influenced by potential reporting bias in the FFQ, inaccuracies in sodium-potassium estimation, or compensatory eating behaviors among participants (Kwon et al., 2022; Zwager et al., 2025). Meanwhile, the absence of a significant relationship with hydration status might be explained by individual differences in fluid needs (Cheuvront et al., 2016; Rozi et al., 2023; Li et al., 2023), limitations in self-reporting, or the generally healthy characteristics of this community sample.

Furthermore, unmeasured lifestyle confounders such as sleep quality and physical activity may interact with blood pressure regulation in older adults. Sleep quality impairment has been documented to adversely affect blood pressure control in hypertensive patients in local primary care (Kurnia et al., 2023). To complement dietary and hydration management, non-pharmacological nursing interventions such as

structured walking activity programs have been proven effective in reducing blood pressure and associated headache symptoms in hypertensive elderly in community settings (Rifqah, & Marta, 2025).

In addition, compensatory behaviors among older adults, such as consuming small portions of high-risk foods or balancing them with healthier options, might have mitigated the actual effect on hypertension (Tang et al., 2025). These findings carry important implications for preventive geriatric nursing in Indonesia. Community nurses working in Integrated Health Posts for the Elderly should prioritize practical and culturally appropriate dietary education, with moderate improvements in dietary quality as the main intervention, using affordable local foods (Syamsu et al., 2025; Amin et al., 2025).

Although hydration status did not show a significant association in this study, encouraging adequate fluid intake remains a supportive component of comprehensive care for the elderly (Cavallo, 2024; Edmonds et al., 2021). Future longitudinal research with larger sample sizes, more objective dietary and hydration measurements, and better control of confounders is recommended to validate these associations and further develop evidence-based nursing interventions to prevent hypertension in older adults. Finally, reverse causation cannot be ruled out, as individuals already diagnosed with hypertension may have changed their dietary patterns toward healthier ones (Wu et al., 2025; Pirastu et al., 2022).

4. CONCLUSION

This study demonstrates that dietary patterns are significantly associated with hypertension among community-dwelling elderly in Indonesia. Older adults with moderate dietary pattern scores had lower odds of hypertension compared to those with low scores. Although high dietary pattern scores also showed a protective trend, the association was not statistically significant. In contrast, daily fluid intake was not significantly associated with hypertension in this population.

However, these findings should be interpreted with caution. The findings were based on a cross-sectional design, which limits the ability to establish causal relationships. Moreover, the study had a relatively low prevalence of hypertension within a small sample of community-dwelling older adults. This low number of events likely resulted in an unstable logistic regression model, wide confidence intervals, and limited statistical power, particularly for detecting associations in the high dietary pattern category.

Despite these limitations, the study highlights the importance of improving dietary quality as a modifiable factor associated with lower odds of hypertension among community-dwelling older adults. The results provide valuable implications for preventive geriatric nursing, particularly in Integrated Health Posts for the Elderly. Community nurses should focus on practical and culturally appropriate dietary education programs using affordable local foods to help the elderly achieve moderate improvements in their daily dietary patterns. While daily fluid intake did not show a significant association in this study, promoting adequate fluid intake remains an essential component of holistic geriatric care.

Future research using longitudinal designs, larger sample sizes with adequate numbers of hypertension cases, and more objective measurement methods (e.g., 24-hour dietary recall or biomarkers) is strongly recommended to provide more precise estimates, greater statistical power, and to confirm these associations, thereby strengthening the evidence base for effective nursing interventions to support healthy aging in Indonesia.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Lilis Setyowati contributed to conceptualization, methodology, data curation, formal analysis, investigation, writing – original draft, writing – review and editing, and project administration. Azzahra Amelia Putri contributed to investigation, data curation, formal analysis, and writing – original draft; hilda mazarina devi contributed to conceptualization, methodology, supervision, validation, and writing – review and editing. Zahid Fikri contributed to investigation, data curation, project administration, and writing – review and editing. Sunardi contributed to methodology, validation, supervision, and writing – review and editing. Chairul Huda Al Husna contributed to conceptualization, formal analysis, supervision, and writing – review and editing. Nur Melizza contributed to conceptualization, methodology, validation, supervision, and writing – review and editing. All authors have read and agreed to the published version of the manuscript.

ACKNOWLEDGEMENT

The authors would like to express sincere gratitude to all participants who generously contributed their time and information to this study. We also thank the management and health workers at the Integrated Health Post for the Elderly Sukun, Malang, for their valuable support and cooperation during data collection. This research was conducted with the support of the Faculty of Health Sciences at the University of Muhammadiyah Malang. The authors declare no conflicts of interest.

FUNDING

This research received no external funding.

DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors declare that an AI-assisted tool (ChatGPT, OpenAI) was used solely to assist with language editing, improving English readability, and grammar refinement during the preparation of this manuscript. The AI tool was not used for study design, data collection, statistical analysis, interpretation of results, or drawing scientific conclusions. The authors retain full ownership, responsibility, and accountability for the final content and scientific integrity of the published work.

REFERENCES

- Al Amin, M., Najib, A., Rajab, A. A., & Amanda, E. (2025). Peningkatan Imunitas dan Kualitas Hidup Lansia Melalui Penerapan Program Pola Hidup Sehat dengan Pemanfaatan Bahan Pangan Lokal, Desa Badean, Banyuwangi. *Jurnal Pengabdian Masyarakat (JUDIMAS)*, 3(2), 572-585. <https://doi.org/10.54832/judimas.v3i2.660>
- Ardissino, G., Perrone, M., Ghiglia, S., Salice, P., Tel, F., Dardi, E., Bollani, T., Mezzopane, A., Capone, V., Ardissino, M., Vergori, A., Piantanida, S., Di Michele, S., Tchana, B., Filippucci, L., De Luca, F., Consonni, D., & Buzzetti, R. (2022). Fluid intake and blood pressure in children: the salus per aquam project. *Journal of Hypertension*, 40(1), 171–179. <https://doi.org/10.1097/HJH.0000000000002992>
- Awan, M. U. M., Nasir, W., Zafar, S., Mushtaq, H. H., Ullah, A., Hayyat, M., ... & Noor, A. (2024). Assessment of modifiable risk factors associated with hypertensive patients. *Journal of Health and Rehabilitation Research*, 4(2), 1518–1523. <https://doi.org/10.61919/jhrr.v4i2.1165>
- Badan Kebijakan Pembangunan Kesehatan. (2023). *Indonesian Health Survey 2023*. Jakarta: Badan Kebijakan Pembangunan Kesehatan.

- Batubo, N. P., Auma, C. I., Moore, J. B., & Zulyniak, M. A. (2024). Evaluating modifiable hypertension risk in Nigerian adults — The Nigerian diet risk score. *Proceedings of the Nutrition Society*, 83(OCE4), E386. <https://doi.org/10.1017/S0029665124006244>
- Bracci, E. L., Davis, C. R., & Murphy, K. J. (2024). Nutrition interventions in aged care: the need and challenges in the aged care context. *Recent Progress in Nutrition*, 4(4), 1-37. <http://dx.doi.org/10.21926/rpn.2404019>
- Brands, M. W. (2020). Unifying approach for interpreting the physiological effect of high salt intake. *Hypertension*, 75(3), 620-622. <https://doi.org/10.1161/HYPERTENSIONAHA.119.14030>
- Cavallo, M. (2024). The importance of hydration and nutritional support. *In the frail surgical patient: a geriatric approach beyond age (pp. 175-179)*. Cham: Springer.
- Cheuvront, S. N., & Kenefick, R. W. (2016). Am i drinking enough? yes, no, and maybe. *Journal of the American College of Nutrition*, 35(2), 185–192. <https://doi.org/10.1080/07315724.2015.1067872>
- Edmonds, C. J., Foglia, E., Booth, P., Fu, C. H. Y., & Gardner, M. (2021). Dehydration in older people: A systematic review of the effects of dehydration on health outcomes, healthcare costs and cognitive performance. *Archives of gerontology and geriatrics*, 95, 104380. <https://doi.org/10.1016/j.archger.2021.104380>
- Gibson, S., & Ashwell, M. (2011). Dietary patterns among British adults: compatibility with dietary guidelines for salt/sodium, fat, saturated fat and sugars. *Public Health Nutrition*, 14(8), 1323–1336. <https://doi.org/10.1017/S1368980011000875>
- Iqbal, A. M., & Jamal, S. F. (2023). Essential Hypertension. *In StatPearls [Internet]*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK539859/>
- Jhee, J. H., Park, H. C., & Choi, H. Y. (2022). Skin sodium and blood pressure regulation. *Electrolyte & Blood Pressure*, 20(1), 1–9. <https://doi.org/10.5049/EBP.2022.20.1.1>
- Kurnia, A. D., Hariyati, S., Melizza, N., Al Husna, C. H., Amatayakul, A., & Handoko, A. (2023). Personal factors related to self-care management among people with hypertension at primary health care: A cross-sectional study. *Jurnal Keperawatan Padjadjaran*, 11(3), 203–213. <https://doi.org/10.24198/jkp.v11i3.2340>
- Kurnia, A. D., Masruroh, N. L., Melizza, N., Prasetyo, Y. B., & Hidayani, H. N. (2022). Factors associated with dietary behaviour among patients with type 2 diabetes mellitus in rural Indonesia. *Journal of the ASEAN Federation of Endocrine Societies*, 37(2), 60-64. <https://doi.org/10.15605/jafes.037.02.02>
- Kurnia, A. D., Melizza, N., Ruhyanudin, F., Masruroh, N. L., Prasetyo, Y. B., Setyowati, C. I., & Khoirunnisa, O. (2020). The effect of educational program on hypertension management toward knowledge and attitude among uncontrolled hypertension patients in rural area of Indonesia. *Community health equity research & policy*, 42(2), 181-188. <https://doi.org/10.1177/0272684X20972846>
- Kwon, Y. J., Lee, H. S., Park, G., & Lee, J. W. (2022). Association between dietary sodium, potassium, and the sodium-to-potassium ratio and mortality: A 10-year analysis. *Frontiers in nutrition*, 9, 1053585. <https://doi.org/10.3389/fnut.2022.1053585>
- Li, S., Xiao, X., & Zhang, X. (2024). Association between plain water intake and risk of hypertension: longitudinal analyses from the China Health and Nutrition Survey. *Frontiers in Public Health*, 11, 1280653. <https://doi.org/10.3389/fpubh.2023.1280653>
- Mariani, E., Basrowi, R. W., Dilantika, C., & Sundjaya, T. (2024). *Nutritional strategies to enhance health and quality of life in the elderly: A literature review*. *Bali Medical Journal*, 13(3), 1490–1498. <https://doi.org/10.15562/bmj.v13i3.5563>
- Melizza, N., Kurnia, A. D., Masruroh, N. L., Prasetyo, Y. B., Ruhyanudin, F., Mashfufa, E. W., & Kusumawati, F. (2021). Prevalensi Konsumsi Kopi dan Hubungannya Dengan Tekanan Darah. *Faletehan Health Journal*, 8(1), 10–15.

- <https://doi.org/10.33746/fhj.v8i01.140>
- Miura, S. I., Matsuo, Y., & Seumatsu, Y. (2025). Renin-angiotensin-aldosterone system and its relation to hypertension. *Hypertension Research*, 48(8), 2209-2217. <https://doi.org/10.1038/s41440-025-02229-5>
- Oktaria, M., Hardono, H., Wijayanto, W. P., & Amiruddin, I. (2023). Hubungan Pengetahuan dengan Sikap Diet Hipertensi pada Lansia. *Jurnal Ilmu Medis Indonesia*, 2(2), 69–75. <https://doi.org/10.35912/jimi.v2i2.1512>
- Piernas, C., Gao, M., & Jebb, S. A. (2022). Dietary patterns derived by reduced rank regression and non-communicable disease risk. *Proceedings of the Nutrition Society*, 1–8. <https://doi.org/10.1017/S0029665122001094>
- Pirastu, N., McDonnell, C., Grzeszkowiak, E. J., Mounier, N., Imamura, F., Merino, J., Day, F. R., Zheng, J., Taba, N., Concas, M. P., Repetto, L., Kentistou, K. A., Robino, A., Esko, T., Joshi, P. K., Fischer, K., Ong, K. K., Gaunt, T. R., Kutalik, Z., ... Wilson, J. F. (2022). Using genetic variation to disentangle the complex relationship between food intake and health outcomes. *PLoS Genetics*, 18(6), e1010162. <https://doi.org/10.1371/journal.pgen.1010162>
- Rifqah, F. T., & Marta, O. F. D. (2025). Penerapan terapi aktivitas berjalan kaki untuk mengurangi sakit kepala pada penderita hipertensi. *Jurnal Pustaka Keperawatan (Pusat Akses kajian Keperawatan)*, 4(1), 122-128. <https://doi.org/10.55382/jurnalpustakakeperawatan.v4i1.1476>
- Rozi, F., Majiding, C. M., & Siddiq, M. N. A. A. (2023). Pengukuran Tingkat Kecukupan Cairan (TKC) Individu dan Status Hidrasi. *Jurnal Gizi Kerja dan Produktivitas*, 4(2), 230-238. <https://dx.doi.org/10.62870/jgkp.v4i2.24986>
- Silva, G. M. D., Assumpção, D., Freiria, C. N., Borim, F. S. A., de Brito, T. R. P., & Corona, L. P. (2023). Association of Food Consumption According to the Degree of Processing and Sociodemographic Conditions in Older Adults. *Foods*, 12(22), 4108. <https://doi.org/10.3390/foods12224108>
- Syamsu, R. F., Fatiha, I. Al, & Sangkal, A. (2025). *Literature Review : Kebutuhan Gizi Pada Lansia*. 5(2), 217–228. <https://doi.org/10.52364/sehati.v5i2.127>
- Syauqy, A., Afifah, D. N., Purwanti, R., Nissa, C., Fitranti, D. Y., & Chao, J. C.-J. (2021). Reproducibility and validity of a food frequency questionnaire (FFQ) developed for middle-aged and older adults in Semarang, Indonesia. *Nutrients*, 13(11), 4163. <https://doi.org/10.3390/nu13114163>
- Tang, Y., Zhang, Z., & Liu, X. (2025). Lifestyle modifications and control of cardiovascular risk factors in older adults with hypertension: from NHANES 1999–2018. *BMC Geriatrics*, 25(1), 537. <https://doi.org/10.1186/s12877-025-06204-0>
- World Health Organization. (2023). *Global report on hypertension: the race against a silent killer*. <https://www.who.int/publications/i/item/9789240081062>
- World Health Organization. (2025). *Hypertension prevalence*. <https://www.who.int/news-room/fact-sheets/detail/hypertension>
- Wu, J., Chen, Y., Miao, Y., Li, Q., Tarimo, C. S., Dai, N., Zhao, Q., & Niu, Y. (2025). Association between lifestyle behaviors and body mass index with blood pressure classifications among older adults with hypertension in China. *Frontiers in public health*, 13, 1610715. <https://doi.org/10.3389/fpubh.2025.1610715>
- Yang, Y., Yu, D., Piao, W., Huang, K., & Zhao, L. (2022). Nutrient-Derived Beneficial for Blood Pressure Dietary Pattern Associated with Hypertension Prevention and Control: Based on China Nutrition and Health Surveillance 2015-2017. *Nutrients*, 14(15), 3108. <https://doi.org/10.3390/nu14153108>
- Zeng, Q., Xiao, C., Zeng, X., Cao, G., Liu, G., Wu, J., Lin, X., Deng, W., & Luo, J. (2025). Association between dietary index for gut microbiota and hypertension: a large cross-

sectional study from NHANES. *BMJ Nutrition, Prevention & Health*, 8(1), e001163.
<https://doi.org/10.1136/bmjnp-2024-001163>

Zwager, C. L., Esseghir, M. I., van Vliet, A. M. C., Daams, J. G., Vogt, L., & Olde Engberink, R. H. (2025). Estimated dietary Na⁺/K⁺-ratio and cardiovascular disease: a systematic review and meta-analysis. *Kidney and Blood Pressure Research*, 50(1), 712-722.
<https://doi.org/10.1159/000548424>