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The Role of Educational Interventions in Mitigating Hypertension Among the Elderly: A Systematic Review

Ake Royke Calvin Langingi[1*], Mareyke Yolanda Lusia Sepang[2], Meylani Dewi Wowor[2], Ignatia Yohana Rembet[2], Stella Rasu[4], Priscila Evangelin Asa[3], James Komaling[2], Ifka Wangi Kobis[4]

[1] Hospital Administration Study Program, Gunung Maria Health Sciences College, Tomohon, Indonesia.
[2] Nursing Study Program, Gunung Maria College of Health Sciences, Tomohon, Indonesia.
[3] Health Informatics Study Program, Gunung Maria Health Sciences College, Tomohon, Indonesia.
[4] Occupational Safety and Health Study Program, Gunung Maria Health Sciences College, Tomohon, Indonesia.

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Corresponding Author:
Ake Royke Calvin Langingi
ake.langingi2@gmail.com

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Abstract: Hypertension is one of the most common major health problems in the elderly population and is a major cause of global morbidity and mortality. Factors such as aging, unhealthy lifestyles, low medication adherence, and the presence of comorbidities contribute significantly to the increase in hypertension in the elderly. This study aims to analyze factors associated with hypertension in the elderly, including demographic, lifestyle, and medical factors, through a systematic review (SR) approach. The study was conducted by searching scientific literature from various reputable databases published between 2019 and 2025, using inclusion criteria that included the elderly population, blood pressure measurements, and the identification of relevant risk factors. The synthesis results indicate that demographic factors such as advanced age and female gender, lifestyle factors such as high salt consumption, low physical activity, and smoking habits, and medical factors such as family history of hypertension, medication adherence, and the presence of comorbidities (especially diabetes and heart disease) are the main determinants of the degree of hypertension in the elderly. Non-adherence to medication contributes to the severity of hypertension, wheres adherence contributes to the control of hypertension.

Keywords: Educational interventions; Elderly; Hypertension; Risk factors; Systematic review

Introduction

One of the biggest threats to global public health, especially for the elderly, is hypertension. According to estimates from the World Health Organisation (WHO), the prevalence of hypertension rises with age, affecting over 1.28 billion adults globally. The prevalence of hypertension in the senior population (those 60 years of age and older) can exceed 60% (Calabrese et al., 2019). According to the findings of the 2023 Indonesian Health Survey (SKI), the prevalence of hypertension in the country's senior population was 49.5% among those aged 55–64 and 57.8% among those aged 65–74 (Ministry of Health of the Republic of Indonesia, 2024), making it the highest chronic disease prevalence in this age group. The growing prevalence of kidney failure, stroke, and cardiovascular disease in society is significantly impacted by this illness. In addition to being a major risk factor for coronary heart disease and stroke, hypertension in the elderly also affects cognitive decline and increases the chance of frailty (Guasti et al., 2022).

The intricacy of the factors influencing hypertension in older persons makes research on the issue both academically and practically urgent. There are still gaps in our knowledge of the relationships between the psychosocial, behavioral, and

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environmental factors that cause hypertension in older persons, despite the fact that multiple studies have shown a connection between lifestyle, hereditary factors, and metabolic disorders and hypertension (Akbar et al., 2024). Several studies have shown that factors such as high salt consumption, low physical activity, central obesity, and psychological stress play a significant role in increasing blood pressure in older age (Calista et al., 2025; Aronow, 2020). However, behavioral-based interventions and holistic approaches to hypertension management in the elderly, especially in developing countries, are still rarely implemented effectively (Silvanasari et al., 2024).

Theoretically, the phenomenon of hypertension in the elderly can be explained through a biopsychosocial approach that emphasizes the interaction between biological factors (arterial stiffness due to aging), psychological factors (stress and anxiety), and social factors (including family support and the living environment) (Laurent & Boutouyrie, 2020). This model provides a conceptual basis for understanding the dynamics of complex chronic diseases such as hypertension in the elderly population. In the context of public health policy, this theory is relevant because it emphasizes the need for integration between medical and non-medical aspects in hypertension management (Yulianti et al., 2025).

Using a systematic review methodology, this study seeks to determine and examine the variables associated with the prevalence of hypertension in the elderly. “What are the determinants most associated with hypertension in the elderly based on current scientific evidence?” is the primary research topic that needs to be addressed. The biological, behavioral, social, and environmental factors that have been demonstrated to play a major role in hypertension are included in this focus. This study aims to give a thorough understanding of modifiable risk factors to lower the prevalence of hypertension complications in the senior population by using a systematic review approach.

The scientific contribution of this study lies in the integration of various recent empirical findings on the determinants of hypertension in the elderly, which have not been widely synthesized in a multidimensional context. This article offers novelty in the form of a strengthened conceptual model that emphasizes the importance of a holistic approach and cross-sectoral interventions for controlling hypertension in the elderly.(Mbali et al., 2024;Yulianti et al., 2025)The results of this study are expected to enrich the scientific literature and serve as a basis for developing evidence-based geriatric health policies at the national and global levels.

Method

This study used a systematic review (SR) approach to analyze factors associated with hypertension levels in the elderly. The SR approach was chosen because it allows researchers to systematically and transparently identify, evaluate, and synthesize relevant empirical evidence, resulting in robust, evidence-based conclusions (Veginadu et al., 2022). This approach follows the 2020 PRISMA (Preferred Reporting Items for Systematic Reviews) guidelines, which emphasize explicit stages ranging from research question formulation, literature identification, study selection, data extraction, to analysis and synthesis of results (Page et al., 2021).

The primary data in this study were scientific literature published in reputable journals over the past six years (2019–2025), both nationally and internationally. The type of data reviewed was secondary, consisting of empirical research results (quantitative, qualitative, or mixed methods) examining the relationship between demographic, lifestyle, and medical factors with the degree of hypertension in the elderly population. The databases used include PubMed, Scopus, and Google Scholar for international publications, and Garuda and SINTA for national publications. The literature search was conducted using a combination of keywords such as "hypertension severity," "elderly," "determinants," "risk factors," "geriatric population," and "systematic review," adjusted using Boolean operators (AND, OR, NOT) to increase the relevance of the search results (Carrera-Rivera et al., 2022).

The literature search protocol followed the standardized steps outlined in PRISMA, encompassing four main stages: identification, screening, eligibility, and inclusion (Figure 1). In the identification stage, all relevant articles were collected based on predetermined keywords and databases. The screening stage was conducted to remove duplicates and literature that did not align with the research focus. In the eligibility stage, articles were evaluated based on their abstracts and content to ensure they met the inclusion criteria. The inclusion stage included only literature that met all selection criteria and had adequate methodological quality (Simamora & Gaffar, 2024).

In this study, the inclusion criteria included scientific publications published between 2019 and 2025. These studies must focus on the elderly population, namely individuals aged 60 years and above. Furthermore, the studies must explore the relationship between demographic, lifestyle, and medical factors with the severity of hypertension among the elderly. Only articles available in full text and in English or Indonesian were included.

Meanwhile, exclusion criteria included non-research articles such as editorials, opinion pieces, or commentaries that did not contribute substantially to the research data. Furthermore, studies involving non-elderly populations were excluded, along with articles lacking usable data or lacking clear methodology. These criteria were designed to ensure that only relevant and high-quality studies were considered in the analysis (Page et al., 2021).

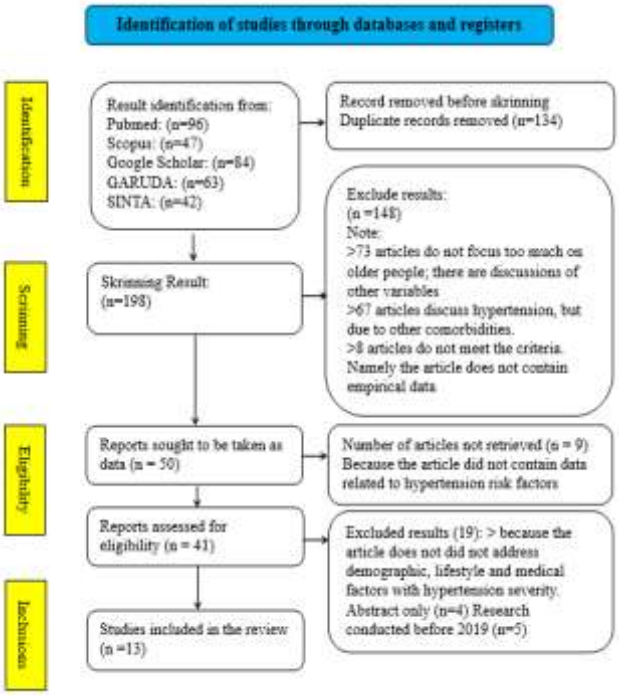

Figure 1. Journal identification flow

The unit of analysis in this study was the findings of previous research identifying the determinants of hypertension in the elderly. Data from each study that met the inclusion criteria were extracted using a standardized form that included author name, year of publication, country of origin, study design, sample size, respondent characteristics, risk factors studied, and key findings indicating a relationship with hypertension severity (Munn et al., 2020).

Data analysis techniques were conducted through narrative synthesis and thematic analysis, grouping research findings into three broad categories: demographic factors, lifestyle factors, and medical factors. To maintain consistency and transparency in the analysis, software such as Covidence for literature management was used for thematic coding. Synthesis was conducted by comparing patterns and consistency of results across relevant studies and assessing the strength of evidence generated from each factor group (Noyes et al., 2019).

In addition, an assessment of the methodological quality of each study was conducted using the Joanna Briggs Institute (JBI) Critical Appraisal Tool, which is tailored to the research design of quantitative studies, SR. This evaluation ensures that only studies with good internal validity and low risk of bias are included in the final synthesis (Munn et al., 2020). Thus, the methodology applied in this study ensures that the analysis results have high scientific credibility, are relevant to the context of the elderly population, and can be used as a basis for evidence-based decision-making in the field of public health.

Result and Discussion

The results of a systematic review of the variables linked to hypertension in the senior population are summarized in this section. Thirteen scholarly papers from national and international journals published between 2019 and 2025 were considered in this review. The study's overall findings revealed differences in the biological, behavioral, socioeconomic, and clinical management factors that influence the prevalence and management of hypertension in the elderly.

Twenty-three percent of the thirteen reviewed articles were meta-analyses and systematic reviews, with the remaining articles being conceptual and narrative reviews. The temporal distribution revealed a notable rise in publications between 2019 and 2025, suggesting that as the world's population ages, there will be an increasing focus on hypertension in the elderly (Mustapa et al., 2025). Most studies were from Asia (especially Indonesia, China, and Japan) and Western Europe, with a primary focus on prevalence, risk factors, and health education-based intervention strategies.

Analysis of biological determinants shows that advanced age, male gender, high body mass index (BMI), family history of hypertension or diabetes, and dyslipidemia are the factors most consistently associated with increased blood pressure.(Natasya & Aminah, 2025). In addition, other studies also show that arterial stiffness due to structural changes in the blood vessel walls is the main physiopathological mechanism in elderly hypertension.(Roth et al., 2023).

Behavioral factors such as lack of physical activity, excessive salt consumption, and smoking contribute significantly to the high prevalence of hypertension in the elderly. Regular physical activity has been shown to lower systolic blood pressure by an average of 8–12 mmHg and improve the functional capacity of hypertensive elderly individuals.(Asnani & Evi, 2020). In addition to long-term effects, acute physical exercise also produces significant post-exercise hypotension (Reia et al., 2020).

Education level and economic status have been shown to contribute to blood pressure control. Elderly individuals with low health literacy tend to have poor blood pressure control and poor medication adherence (Handayani et al., 2025). A meta-analysis in China showed that adherence to antihypertensive medication was only 43%, with low education and not having a partner as significant factors that decreased adherence (Liu et al., 2025).

Health literacy programs have been shown to be effective in improving understanding and adherence to hypertension management among older adults. A systematic review of eight studies showed that face-to-face group interventions and facilitative approaches improved health literacy scores and reduced mean blood pressure (Onprasonk et al., 2024).

Pharmacotherapy studies show that administration of low-dose diuretics and beta-blockers reduces cardiovascular morbidity and mortality in the elderly by 25–40% compared to the control group (Heidari et al., 2022). An individualized approach to therapy was also identified as an important strategy, taking into account the patient's risk profile and comorbid conditions (Wander et al., 2025; Tewari et al., 2024).

A meta-analysis of four randomized clinical trials with a total of 12,456 participants showed that intensive systolic blood pressure targets (<130 mmHg) reduced cardiovascular events by 31% and stroke risk by 35%, but increased the incidence of hypotension by 32% (Ahmad & Nguyen, 2023).

A review of 13 international clinical guidelines revealed variation in the age ranges for older adults and optimal blood pressure targets. However, there was general consensus that interventions should consider individualization of therapy, fall risk, and quality of life (Pillay et al., 2024).

A study in Indonesia highlighted the contribution of occupation, income, and physical activity to the risk of hypertension. Older adults who were still working or physically active were 0.72 times less likely to develop hypertension than those who were inactive (Handayani et al., 2025) This demonstrates the importance of community-based interventions and promotion of physical activity in controlling hypertension in the elderly in the local context (Azami-Aghdash et al., 2025).

From the overall study, four main themes were identified, namely biological and metabolic determinants, including age, gender, BMI, and dyslipidemia; behavioral and social factors, including diet, physical activity, and health literacy; pharmacotherapy adherence and service systems, involving drug access, doctor–patient relationships, and social support; and individualized clinical management strategies that consider the balance between blood pressure targets and the risk of side effects. These findings collectively indicate that hypertension in the elderly is the result of a complex interaction between biological, behavioral, socio-economic, and public health policy factors that require a multidimensional approach and personalized interventions.

Table 1. Article Data Extraction Results

Title, Author, Year	Research purposes	Research Method	Results/Outcomes
The Analysis of Factors Influencing Hypertension in Elderly: A Literature Study. Ario Wahid Sauma, Isyeu Sriagustini, Sinta Fitriani, Wuri Ratna Hidayani, & Leni M. Malabanan (Sauma et al., 2022).	Examining a journal of factors that influence the incidence in the elderly.	Descriptive analytics using a literature review design. Total of included is 7 articles.	The most dominant factors that influence the incidence of hypertension in terms of behavior include smoking, salt consumption, coffee consumption, and physical activity.
Analysis of factors related to the incidence of hypertension in the elderly. Mbali, M., Herman, S. and Rahman, A. (Mbali et al., 2024)	Analyze factors related to the incidence of hypertension in the elderly.	Used a cross-sectional design, an analytical study that studies the causes of incidents or incidents	The results of this study indicate that there is a relationship between physical activity obesity, diet, smoking habits and work with the incidence of hypertension in the elderly in working
Factors Influencing Blood Pressure Control in Older Adults Hypertension: A Systematic Review. Handayani, NF, Haryanto, J., & Sari, DW (Handayani et al., 2025)	This review identifies factors that influence blood pressure control behavior of the elderly with hypertension	Used a systematic review. Total of included is 16 articles.	This review shows that economics, health literacy and education are the main factors in blood pressure control behavior in elderly people suffering from hypertension
Risk factors and prevalence of hypertension in older adults from south-eastern Poland: an observational study. Leszczak J, Czenczek-Lewandowska E, Asif	The purpose of this study was to assess the prevalence and risk factors for hypertension in older	An observational study was conducted in a group of older adults attending the University of the Third	The highest prevalence of hypertension is significantly related to obesity and excess adiposity. The level of education was a strong risk factor for hypertension in the study

Title, Author, Year	Research purposes	Research Method	Results/Outcomes
M, Baran J, Mazur A, Wyszyńska J. (Leszczak et al., 2024)	adults from south–eastern Poland.	Age. A non-random sampling method was used. All participants who met the inclusion criteria were recruited.	group. Logistic regression analyzes showed that hypertension was more common in participants with a higher BMI
Risk Factors Predicting Hypertension in the Elderly. Sutriyawan A, Fardhoni F, YusuffA A, Akbar H, Sangaji M. (Sutriyawan et al., 2022)	This study aimed to investigate non-modifiable and modifiable risk factors, as well as the most common risk factors related to hypertension in the elderly.	A cross-sectional study. Totally 245 respondents	Age, family history, obesity, physical activity, stress, excessive salt consumption, alcohol drinking, and inadequate fiber consumption are risk factors for hypertension in the elderly. The degree of stress was the most important risk factor for the occurrence of hypertension in the elderly.
Factors associated with Uncontrolled Hypertension among the elderly hypertension in Rural Region of Vietnam. Hung Nguyen Trong, Huong Nguyen Thi, Cuong Le Duc, Thuy Bui Thi, Linh Nguyen Phuong, Minh Nguyet Tran Thi, Nhung Le Thi Tuyet, Dung Pham Thi, Ninh Thi Nhung, Loc Vu The, Chinh Pham Thi Kieu, Duong Phan Huong, Hiep Phan Hoang, Duong Tran Thanh, Tien Nguyen Quoc, Cuong Nguyen Duy (Trong et al., 2024)	This study was to determine factors including biochemical markers, dietary habits, and social-anthropometric association with uncontrolled hypertension among elderly hypertension in rural regions of Vietnam	A cross-sectional study. Totally 272 respondents	This study suggests that unhealthy dietary habits including lack of vegetable consumption and high drinking habits are important factors associated with uncontrolled hypertension in elderly patients in rural Vietnam
Risk Factors Of Hypertension In The Elderly Within The Family: A Literature Review. Gesit Wira Mustapa, Tantut Susanto, Nurfika Asmaningrum (Mustapa et al., 2025).	This literature review aims to identify risk factors that influence the occurrence of hypertension in the elderly in the family environment through a literature review approach.	Descriptive analytics using a literature review design. Total of included is 10 articles.	The study results show that several main risk factors for hypertension in the elderly in the family include unhealthy eating patterns (excessive salt consumption), low physical activity, obesity, psychological stress, and low social support from family members. Genetic factors also play a role, but their interaction with lifestyle and family environmental conditions increases the potential for hypertension.
Prevalence of hypertension and associated risk factors in older adults in Kurdistan, Iraq. Mariwan Saka, Sherzad Shabu and Nazar Shabila (Saka et al., 2020)	To determine the prevalence of hypertension in a population of older adults in Erbil, Kurdistan, Iraq and identify the risk factors associated with hypertension.	A cross-sectional study. Totally 1480 respondents.	There was a significant association between hypertension and increasing age, male sex, being married, low education level, unemployment, poor economic situation, sedentary lifestyle, lack of regular physical exercise, and increasing body mass index
Family Support on Blood Pressure in Elderly Hypertension: A Literature Review. Rahayu, MR ., Adriani, RB ., & Patriyani, REH (Rahayu et al., 2023)	To examine the relationship between family support and blood pressure management in hypertensive elderly	Using a literature review design. Total of included is 10 articles.	Good family support contributed to improved medication adherence, hypertension diet adherence, and improved quality of life for the elderly. The most influential forms of support include emotional, social, instrumental, and financial support.
Analysis of Risk Factors Contributing to Hypertension in Pre-Elderly and Elderly	To identify the primary risk factors for hypertension in pre-elderly and elderly	The study utilized a cross-sectional design involving pre-elderly	Nutritional and sodium intake were significantly associated with hypertension among pre-elderly and

Title, Author, Year	Research purposes	Research Method	Results/Outcomes
Populations in the Kedaung Subdistrict, Depok, Indonesia. Gibran Wirayudha, Ibnu Malkan Bakhrul Ilmi1, Avliya Quratul Marjan (Wirayudha et al., 2024)	individuals in the Kedaung Subdistrict.	and elderly individuals from the Kedaung Subdistrict. The research sample consisted of 50 participants selected using stratified random sampling techniques	elderly individuals in the Kedaung Subdistrict.
Analysis of risk factors that influence pre-elderly hypertension events. Nursini Juiban Hadi, Saimi (Hadi & Saimi, 2024)	This is to identify and analyze factors contributing risks to incident hypertension in the pre-elderly population	This used a cross-sectional study design, with 42 pre-elderly	Family history factors, stressors, obesity, physical activity, consuming high fat food, habit of consuming salty food, habitual drinking coffee > 3 times a day, consuming junk food are variables that become risk factors for incident hypertension in the elderly.
Analysis of Factors Affecting Hypertension Control in the Elderly at the Meukek Health Center Uptd, Meukek District, South Aceh Regency. Salbiyah, Asriwati, Ismail Efendy, Aida Fitria (Salbiyah et al., 2024)	To analyze factors that influence control of hypertension in the elderly at the UPTD Health Center Meukek Anxiety Meukek South Aceh Regency	This design used a cross-sectional study, with 66 elderly	Some factors that influence control of hypertension include obesity, physical activity, restrictions on salt consumption. The most dominant factor influencing control of hypertension in the elderly is physical activity with.
Factors Related to the Incidence of Hypertension in the Elderly. Firman Prastiwi, Amin Aji Budiman, Nikma Alfi Rosida (Prastiwi et al., 2023)	To determine what factors can influence the incidence of hypertension in the elderly at Panti Jompo Sabar Hati Banyuanyar.	This design used a cross-sectional study, with 84 elderly	There is a relationship between gender, family history, and smoking history with the incidence of hypertension in the elderly.

The systematic synthesis of the results in this study confirms that hypertension in the elderly is a multifactorial phenomenon influenced by the interaction of biological, behavioral, social, and clinical management factors. The primary objective of this study was to identify and analyze factors associated with the degree of hypertension in the elderly. Based on findings from various studies, advanced age, high body mass index (BMI), a high-salt diet, lack of physical activity, and low medication adherence emerged as the most consistent determinants. These findings align with the research hypothesis that there is a significant relationship between demographic factors, lifestyle, and medical conditions and the degree of hypertension in the elderly (Mustapa et al., 2025).

Conceptually, the results of this study can be explained through the approach of the social determinants of health theory and the biopsychosocial model, which emphasizes that individual health is not only determined by biological factors, but also by the social environment and lifestyle behavior (Marmot et al., 2020). Older adults who have strong social support, good access to healthcare services, and high levels of health literacy tend to have better blood pressure control than those who are isolated or have less education (Suhat et al., 2022). Thus, the biopsychosocial framework provides a theoretical basis for understanding the complexity of hypertension in older adults from a multidimensional perspective.

When compared with previous studies, the results of this study strengthen the evidence presented by global meta-analyses that increasing age, being overweight, and high salt consumption consistently increase the risk of hypertension with an average odds ratio of 2.3 times higher than in the younger population (Koya et al., 2022). In addition, low physical activity has a linear relationship with increased systolic blood pressure, where every 10% decrease in activity is associated with a 1.8 mmHg increase in mean systolic pressure (Asnani & Evi, 2020)This study also found that adherence to antihypertensive medication is a critical determinant, where elderly people with low adherence have a twofold greater risk of experiencing uncontrolled hypertension (Liu et al., 2025).

However, some findings have been inconsistent. For example, a longitudinal study in Europe showed that the effect of gender on hypertension became insignificant after controlling for hormonal factors and the use of antihypertensive medications (Chiu et al., 2023). This suggests the need to consider both biological and social contexts simultaneously in understanding variations in the degree of hypertension between

individuals. In contrast, studies in Asia have shown that cultural factors, such as high-sodium and low-fiber diets, remain dominant determinants even after demographic factors have been controlled (Sekhon et al., 2024).

The main scientific contribution of this article lies in the multidimensional integration of biological, behavioral, and socioeconomic determinants in the context of the elderly population, which has so far been studied separately in many studies. This study also enriches the literature by positioning medication adherence as the most dominant factor influencing the degree of hypertension, in line with the health behavior theory (Health Belief Model), which states that an individual's perception of the benefits and barriers of treatment influences adherence to therapy (Handayani et al., 2025).

From a methodological perspective, this study contributes by applying the Systematic Literature Review (SLR) approach based on the PRISMA guidelines which allows for the identification, evaluation, and synthesis of research results in a transparent and comprehensive manner (Page et al., 2021). This approach strengthens the reliability of the findings by cross-checking scientific sources and reducing the selection bias common in narrative reviews. Thus, the results of this study are not only descriptive but also synthetic, revealing key thematic patterns that are consistent across geographic and demographic contexts.

The main limitation of this research is its reliance on the quality and availability of data in the reviewed publications. Some studies used cross-sectional designs, which limit causal inference, while data on psychosocial factors such as stress and social support are rarely quantitatively examined (Ahmad & Nguyen, 2023). In addition, variations in the definition of "elderly" between studies (≥60 vs ≥65 years) may affect comparisons between studies.

The practical implications of this research are the need for a holistic intervention approach. Community-based education programs should focus on improving health literacy and medication adherence, while health policies should integrate social and environmental aspects into hypertension control strategies (Onprasonk et al., 2024). Recommendations for further research include the development of longitudinal data-based predictive models to assess the causal relationship between lifestyle factors and the degree of hypertension in the elderly, as well as exploring the integration of digital technology (telemonitoring, compliance applications) in the management of blood pressure in the elderly in the community (Zhang et al., 2024).

Conclusion

According to the study's findings, hypertension in the elderly is a complicated illness impacted by intricate relationships between behavioral, social, and biological factors. This study effectively identified a number of important factors that influence the severity of hypertension using a Systematic Literature Review methodology based on the PRISMA guidelines. These factors include advancing age, being overweight, consuming excessive amounts of salt, not exercising, and not taking antihypertensive medication as prescribed. It was also discovered that social factors, including family support, education level, and access to healthcare services, had a major impact on blood pressure control. All things considered, our review of the literature demonstrates that treating hypertension in the elderly requires a comprehensive strategy that takes into account both medical and psychological factors at the same time. This article's primary contribution is the creation of an integrated conceptual model that integrates medical, behavioral, and social viewpoints to identify the factors that contribute to hypertension in the elderly. By emphasizing the significance of medication adherence and health literacy as mediators between individual determinants and the incidence of hypertension, our findings contribute to the theoretical conversation in public health and gerontology. Practically speaking, the findings of this study serve as a foundation for the creation of more focused health interventions, especially in the form of community-based educational initiatives and regulations that emphasize lifestyle modifications and bolstering social support for the senior citizenry. In order to better understand the causal relationships between determinants and the efficacy of digital technology-based intervention strategies in enhancing adherence to therapy and blood pressure monitoring, it is advised that future research take a longitudinal and integrative approach. Furthermore, effective long-term hypertension control in the elderly while simultaneously enhancing their independence and quality of life in old age requires improved cooperation between medical experts, families, and social institutions.

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The authors declare no conflict of interest.

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