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# Unraveling the Key Determinants of Life Style Compliance in Patients with Hypertension: Insights from a Multivariate Analytical Approach

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**Abstract:**

***Introduction:*** Numerous individuals with hypertension demonstrate non-compliance with pharmacological and non-pharmacological treatments, in addition to dietary and lifestyle modifications. Patient compliance is a crucial element in emergency scenarios, as demonstrated by multiple sources.

***Method:*** A quantitative correlational study design was employed to investigate variables affecting lifestyle adherence. 138 respondents met the following criteria: outpatients at Sokaraja I and II Community Health Centers, with a minimum of elementary school education, and aged 45-65 years. Participants were selected *via* purposive sampling. Multivariate, univariate, and bivariate analyses were performed to identify the primary factors affecting patient adherence to hypertension treatment and quality of life.

***Result:*** Bivariate analysis indicated that gender, salt intake, smoking habits, obesity, familial history of hypertension, and marital status were strongly correlated with lifestyle adherence ($p$-values < 0.05). In the multivariate analysis, marriage emerged as the variable with the greatest influence on adherence, with an odds ratio of 3.347. Married individuals were 3.347 times more likely to maintain a healthy lifestyle compared to their unmarried counterparts.

***Discussion:*** The findings of this study demonstrate the significance of marriage, as an individual's lifestyle is profoundly affected by familial support. Social cognitive theory posits that behavioral modifications are affected by both internal and external variables, including familial influences.

***Conclusion:*** Factors strongly associated with adherence to a healthy lifestyle include gender, salt intake, smoking, obesity, a familial history of hypertension, and marital status.

**Keywords:** Hypertension, Lifestyle adherence, Patient compliance, Health behavior, Risk factors, Social support.



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## 1. INTRODUCTION

Lifestyle changes, along with the consequences of overeating, smoking, and inadequate physical activity, are the causes of the increasing prevalence of cardiovascular disease and are targets for lifestyle changes through digital interventions because they are associated with lower blood pressure compared to control groups [1, 2]. The results of a systematic review indicate that a relatively stable and controlled cardiometabolic risk profile is closely associated with the lowest risk of CVD or death [3, 4]. The results of a systematic review of 12 studies explained that high adherence to the DASH diet was also associated with a lower risk of hypertension (OR: 0.80, 95% CI 0.70-0.91, I2 = 81%, PI 0.46-1.39), the results of this analysis also strengthen that high adherence to the DASH diet has a positive effect in reducing the risk of hypertension compared to low adherence. These data support and align with all hypertension guidelines, which indicate that lifestyle changes should be initiated early, even in populations with normal blood pressure [5]. Hypertension is a principal risk factor for numerous diseases, including cerebrovascular disorders, congestive heart failure, stroke, coronary heart disease, and renal disease, and it is associated with a high morbidity rate. The World Health Organization (WHO) estimates that 972 million individuals, representing 26.4% of the global population, have hypertension, with projections indicating an increase to 29.2% by 2025. Among the 972 million individuals with hypertension, 333 million are in developed countries, whereas 639 million are located in developing nations, including Indonesia [6].

The mechanism of hypertension involves endothelial cells in blood vessels, which play a crucial role in regulating vascular function by producing various vasoactive molecules, including nitric oxide and peptides. Endothelial dysfunction frequently occurs in cases of primary hypertension. The process by which the renin-angiotensin system induces hypertension involves the conversion of angiotensin I to angiotensin II by the angiotensin I-converting enzyme. Angiotensin II plays a crucial role in elevating blood pressure through two primary mechanisms: increasing the release of Anti-Diuretic Hormone (ADH) and stimulating thirst. Elevated ADH levels result in reduced urine excretion (anti-diuresis), leading to concentrated urine with high osmolality. To dilute it, the volume of the extracellular liquid will increase using an intriguing fluid mechanism from the intracellular component. Consequently, blood volume increases, ultimately elevating blood pressure [7].

The results of research from 34 articles analyzed that old age is closely related to the main factors, namely comorbid diseases such as heart disease, hypertension, diabetes, stroke, physical weakness, history of previous falls, depression, Parkinson's disease, and pain [8]. Research states that risk factors for hypertension in Africa are due to non-compliance with medication, aging, male gender, dyslipidemia, metabolic syndrome, history of previous cardiovascular events, lack of physical activity, stress, excessive salt intake, alcohol, and coffee consumption [9]. The 2018 Basic Health Research in Indonesia indicated that hypertension is the predominant ailment among the senior population. The prevalence of hypertension in the elderly escalates with advancing age. Improvement in blood pressure during hypertension can manifest symptoms that vary among individuals, often lacking specificity or resembling other diseases. Consequently, hypertension is referred to as a silent killer, as it frequently presents no symptoms and tends to remain uncontrolled [10]. Prolonged elevated blood pressure can result in harm to various organs, including stroke, coronary heart disease, and left ventricular hypertrophy. Stroke problems frequently contribute to mortality in individuals with hypertension [11].

Complications arising from hypertension demonstrate persistent ineffectiveness in public health management and patient understanding at home. Inadequate health management is characterized by a systematic and integrated approach necessary for daily therapeutic measures against the disease [12]. Significant challenges in adhering to prescribed regimens result in an inability to follow daily treatment plans and take actions to reduce risk factors [13]. Complications arising from hypertension indicate a persistent ineffectiveness in public health management, and patient understanding at home asserts that inadequate health management is characterized by a systematic approach and integration necessary for daily therapeutic actions against disease. Significant challenges in adhering to the prescribed regimen result in an inability to include a daily treatment plan and to undertake actions to mitigate risk factors. The reason is the impact of matter that will create a gap in inefficient health management, which leads to uncontrolled recurrence of hypertension. Managing hypertension through lifestyle modifications. Adherence to a healthy diet, compliance with antihypertensive medication, and environmental modifications are critical factors that can help manage hypertension and reduce the risk of complications [14].

Numerous individuals with hypertension exhibit non-compliance with both pharmaceutical and non-pharmacological treatments, as well as with lifestyle and dietary habits. Various references indicate that patient compliance is a significant factor in pressing incidents [15]. Adherence to antihypertensive medication is a crucial factor in the successful management of hypertension in patients. Inadequate adherence to medication or lifestyle modifications beneficial for hypertensive patients can elevate the risk of cardiovascular disease consequences [16]. Compliance may also refer to the degree to which individuals with hypertension adhere to guidelines provided by healthcare authorities; compliance issues frequently arise in the long-term management of hypertension [17].

Non-compliance with therapy is increasing, leading to undesirable effects. Ensuring compliance with regulations regarding many pharmaceuticals presents intricate challenges for patients with chronic conditions, particularly Cardiovascular Disease (CVD). The absence of antihypertensive medication is the primary reason for

uncontrolled blood pressure. Consequently, a significant proportion of patients with hypertension (almost three-quarters) did not achieve adequate blood pressure management due to non-compliance. Therapeutic compliance has emerged as a clinically intriguing topic since the 1970s. Compliance therapy not only addresses treatment adherence for hypertension but also encompasses dietary modifications, physical activity, and lifestyle changes. Overall, long-term therapy compliance is reported to be 40-50%, whereas short-term therapy compliance is significantly higher, at 80-90%. Conversely, adherence to a low-style lifestyle is only 20-30% [18]. Patient adherence to hypertension medication is a significant factor influencing blood pressure control. The results of in-depth interviews with hypertension patients and/or family caregivers receiving treatment at a government-owned hospital in north-central Nigeria, with 25 hypertension patients and 13 family caregivers, identified factors contributing to non-compliance with hypertension self-management: personal, family/community, and clinical/organizational factors [19]. Consequently, individuals with hypertension often exhibit non-compliance with long-term antihypertensive medication regimens. Research findings indicate that treatment adherence is also affected by factors such as disease information and patient motivation about hypertension, for the consumption of antihypertensive medication [20].

Regarding medication adherence, the Riskesdas 2018 report indicates that a majority of patients with hypertension, specifically 54.4%, consistently take their prescribed medication. The population that does not consume drugs regularly constitutes 32.27%, while those who do so occasionally account for 13.33%. Among the complete individuals with elevated blood pressure who do not regularly consume medication, a significant proportion, specifically 59.8%, report feeling healthy. There exists a discrepancy between hypertension sufferers based on measurement, quantified at 34.11, and those diagnosed with hypertension, represented at 8.36%. This indicates that at least 25% of the population has elevated blood pressure yet remains undiagnosed or unaware of their condition. Blood pressure measurement is a critical action for preventing hypertension and mitigating problems (Health Research and Development Agency, Ministry of Health of the Republic of Indonesia, 2019).

Intervention models for hypertension patients through various methods, such as community-based tele-rehabilitation programs, are necessary, and it is important to demonstrate that these programs can benefit patients with chronic diseases in the community [21]. Another source of systematic review research on 28 studies with 8257 participants and a mean overall participant age of 57.4 years [range, 46-71 years]; 4962 [60.1%], women. A systematic review and meta-analysis of digital health interventions for hypertension management in populations experiencing health disparities found that blood pressure reduction was greater in the intervention group than in the standard care group [22]. A study of 42 studies that met the inclusion criteria linked Continuity of Care (CoC) to reduced hospitalization rates (16 of 18 studies) and concluded that there is a strong association between higher continuity of care and reduced mortality, risk of complications, and utilization of health services among DM and HT patients [23]. Adopting a healthy lifestyle is crucial for managing blood pressure and preventing complications. This raises the research question: “Is there a correlation between individual characteristics and lifestyle adherence in hypertensive patients?”

## 2. METHOD

This quantitative study investigated lifestyle adherence among individuals with and without hypertension. This research employed a quantitative correlational methodology to investigate the factors affecting lifestyle adherence. A total of 138 respondents met the following criteria: outpatients at Sokaraja I and II Community Health Centers, with at least an elementary school education, and aged 45-65 years. Participants were selected *via* purposive sampling. Univariate, bivariate, and multivariate analyses were performed to identify the primary determinants affecting patient adherence behavior and quality of life associated with hypertension. The exclusion criteria comprised individuals receiving treatment at healthcare facilities and those with cognitive impairments. The researcher employed a purposive sample method in this scientific investigation. Participants were selected according to the researcher’s inclusion and exclusion criteria. This project has successfully undergone ethical review by Universitas Muhammadiyah, No. KEPK/UMP/114/I/2025.

The requisite sample size for each community health center was determined using a distribution proportional to population size. This study employed the following instruments: the dependent variable instrument assessed adherence to suitable activity, dietary rules, and smoking cessation, demonstrating validity and reliability, with a Content Validity Index (CVI) of 0.964 and a Cronbach’s alpha of 0.955 for behavior [24]. The independent variables in this investigation included age, gender, occupation, blood pressure, marital status, family history, obesity, smoking, coffee use, and salt consumption. This study delineates the research variables, represented in a frequency distribution expressed as percentages for each variable. This analysis employed an investigation of independent variables presumed to be associated with the dependent variable. Bivariate analysis investigated the correlation among the dependent variables. The Chi-Square test was employed to analyze the association between independent and dependent variables, while logistic regression was used to analyze variables significantly affecting lifestyle.

## 3. RESULT

The information is structured in a tabular fashion. Table **1** presents respondent characteristics by age, gender, education, occupation, blood pressure, marital status, familial history of hypertension, obesity, smoking behaviors, coffee consumption, salt intake, and adherence to lifestyle recommendations. Table **2** illustrates the

relationships among age, gender, education, occupation, blood pressure, marital status, familial history of hypertension, obesity, smoking behaviors, coffee consumption, and salt intake, and their association with lifestyle compliance. Table 3 presents the multivariate logistic regression results for the variables most significantly associated with lifestyle compliance. Tables 1, 2, and 3 are presented as follows.

**Table 1. Classifying respondents according to age, gender, education, occupation, blood pressure, marital status, familial hypertension history, obesity, smoking habits, coffee consumption, salt intake, and lifestyle compliance.**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| Age | - | - |
| Pre-Elderly | 117 | 84.8 |
| Elderly | 21 | 15.2 |
| Gender | - | - |
| Female | 93 | 67.4 |
| Male | 45 | 32.6 |
| Education | - | - |
| Primary education | 102 | 73.9 |
| Secondary education | 36 | 26.1 |
| Employement | - | - |
| Working | 73 | 52.9 |
| Not working | 65 | 47.1 |
| Blood pressure | - | - |
| Hypertension | 59 | 42.8 |
| Normal tension | 79 | 57.2 |
| Marital Status | - | - |
| Married | 103 | 74.6 |
| Not married | 35 | 25.4 |
| Family history of hypertension | - | - |
| Yes | 84 | 60.9 |
| No | 54 | 39.1 |
| Obesity | - | - |
| Yes | 44 | 31.9 |
| No | 94 | 68.1 |
| Smoking | - | - |
| Yes | 41 | 29.7 |
| No | 97 | 70.3 |
| Coffee intake | - | - |
| > 2 cups | 70 | 50.7 |
| < 2 cups | 68 | 49.3 |
| Daily salt intake | - | - |
| > 1 teaspoon | 78 | 56.5 |
| < 1 teaspoon | 60 | 43.5 |
| Lifestyle compliance | - | - |
| Not obey | 54 | 39.1 |
| Obedient | 84 | 60.9 |

**Table 2. Analyzing the correlation of age, gender, occupation, blood pressure, marital status, family history, obesity, smoking, coffee intake, and salt intake in relation to lifestyle compliance.**

| Variable | Lifestyle Compliance | | n | *p*-value |
|---|---|---|---|---|
| | Obedient | Not Obey | | |
| Age | - | - | - | - |
| Pre-Elderly | 46 | 71 | 117 | 1,000 |
| Elderly | 8 | 13 | 21 | - |
| Gender | - | - | - | - |
| Female | 26 | 67 | 93 | 0,000* |
| Male | 28 | 17 | 45 | - |
| Education | - | - | - | - |
| Primary education | 39 | 63 | 102 | 0,870 |
| Secondary education | 15 | 21 | 36 | - |
| Employement | - | - | - | - |
| Working | 27 | 46 | 73 | 0,710 |
| Not working | 27 | 38 | 65 | - |
| Blood pressure | - | - | - | - |
| Hypertension | 26 | 33 | 59 | 0,395* |
| Normal tension | 28 | 51 | 79 | - |
| Marital Status | - | - | - | - |
| Married | 33 | 70 | 103 | 0,006* |
| Not married | 21 | 14 | 35 | - |
| Family history of hypertension | - | - | - | - |
| Yes | 42 | 42 | 84 | 0,002* |
| No | 12 | 42 | 54 | - |
| Obesity | - | - | - | - |
| Yes | 26 | 18 | 44 | 0,002* |
| No | 28 | 66 | 94 | - |
| Smoking | - | - | - | - |
| Yes | 29 | 12 | 41 | 0,000* |
| No | 25 | 72 | 97 | - |
| Coffee intake | - | - | - | - |
| > 2 cups | 32 | 38 | 70 | 0,152 |
| < 2 cups | 22 | 46 | 68 | - |
| Daily salt intake | - | - | - | - |
| > 1 teaspoon | 42 | 36 | 78 | 0,000* |
| < 1 teaspoon | 12 | 48 | 60 | - |

**Note:** *Significant: $p < 0,05$.

**Table 3. Multivariate logistic regression analysis of variables that most influence lifestyle adherence.**

| Variables | ρ-value | OR | (95% CI) | |
|---|---|---|---|---|
| | | | Lower | Upper |
| Daily salt intake | 0.031 | 0.299 | 0.099 | 0.897 |
| Smoking | 0,000 | 0.160 | 0.064 | 0.401 |
| Obesity | 0.003 | 0.241 | 0.094 | 0.617 |
| Family history of hypertension | 0.318 | 0.582 | 0.201 | 1.685 |
| Marital Status | 0.018 | 3.347 | 1.234 | 9.073 |

**Note:** *Significant: $p < 0.05$.

## 4. DISCUSSION

Table **1** illustrates that the majority of respondents are in the pre-elderly age group, comprising 117 individuals (84.8%). The predominant gender among respondents is female, with 93 individuals (67.4%). The most common level of education attained is primary education, represented by 102 respondents (73.9%). A significant portion of respondents (73, 52.9%) are employed, while 79 individuals (57.2%) have normal blood pressure. The most prevalent marital status is married, with 103 respondents (74.6%). A family history of hypertension is reported by 84 individuals (60.9%). Most respondents are not obese (94, 68.1%), and a majority do not smoke (97, 70.3%). Daily coffee consumption is balanced, yet the majority exceed the recommended daily salt intake (78 respondents, 56.5%). Compliance with lifestyle recommendations is noted in 84 individuals (60.9%), although a significant proportion (54%) is non-compliant.

Previous studies indicate that respondents surveyed received far more from women than from men. Most women tested have a higher risk of elevated blood pressure than men [25]. A study in three Nigerian states (Abia, Oyo, and Kano) used a cross-sectional design to assess gender differences in the prevalence, awareness, and health-seeking behavior for hypertension in 924 young adults aged 18–40 years. The results of the study revealed that the prevalence of hypertension among young adults in the three states was higher among women than men, awareness of high Blood Pressure (BP) was higher among female respondents than male respondents, and women also visited health services more frequently than men [26]. Gender is a risk factor for hypertension that remains unmodifiable. Men are more susceptible to high blood pressure than women due to their lifestyle choices. Postmenopausal women are more likely to experience hypertension compared to men due to hormonal variables [27].

Obesity is a primary risk factor for the development of hypertension. Excess weight imposes an increased burden [28]. The heart and resistance vessels regulate blood flow, ultimately increasing blood pressure. Fat accumulation, particularly visceral fat, is closely associated with metabolic dysfunctions such as insulin resistance, endothelial dysfunction, and heightened sympathetic nervous system activity, as well as the renin-angiotensin-aldosterone system, all of which contribute to the pathogenesis of hypertension. Individuals with obesity exhibit two to three times the propensity for hypertension compared to those with normal body weight. Consequently, regulate weight through patterns. Maintaining a balanced diet and an active lifestyle is crucial for preventing and controlling hypertension. Research corroborates that obesity is significantly associated with hypertension [29]. Adhering to the DASH diet is essential for managing patients with hypertension due to its tight association with blood pressure regulation [30].

Table **2** delineates the correlations among gender characteristics, daily salt intake, smoking habits, obesity, familial history of hypertension, and marital status, all of which are significantly associated with lifestyle compliance variables ($p < 0.05$). This is attributed to the fact that, generally, women are more attentive to compliance with treatment and lifestyle choices, whereas men often neglect their health and underestimate their bodily conditions. A systematic literature review summarizing published evidence from 2010 to 2019 found that factors and reasons for hypertension medication non-adherence included patient demographics, patient beliefs or perceptions about medications, costs or financial barriers, and clinical characteristics, such as a new hypertension diagnosis or a higher burden of comorbidities [31]. Other studies have linked hegemonic masculinity or traditional masculine standards to decreased utilization of health services among men, as they perceive seeking medical help as a manifestation of weakness or powerlessness [32]. The prevalence of hypertension in the Hui Chinese community has been identified as a risk factor for hypertension, including daily salt intake, family history, alcohol consumption, smoking, weekly meat consumption, body mass index, and physical activity. Early screening and treatment of hypertension require special attention [33]. These risk factors align with the causes of cardiovascular disease common across several countries, regardless of socioeconomic level, gender, or education. Individual awareness and educational programs are needed to promote a healthy lifestyle, a nutritious diet, and increased physical activity to improve health and reduce the risk of cardiovascular disease [34].

The relationship between gender and the health belief model involves demographic variables that affect an individual's perception of disease threat, the seriousness of the disease, and the evaluation of the advantages and disadvantages of taking action to manage the disease [20]. Generally, women tend to be more cognizant of the need to safeguard their health, characterized by regular health check-ups, the eating of nutritious food, and the avoidance of dangerous behaviors such as smoking and excessive alcohol consumption. Meanwhile, men frequently exhibit contradictory behaviors, such as insufficient attention to dietary intake, infrequent health examinations, and increased participation in high-risk activities. The difference is also influenced by biological variables, such as the protective function of the hormone estrogen in women against heart disease before menopause, as well as sociocultural influences that shape health perceptions and behaviors based on gender.

Table **3** presents the findings of the multivariate analysis regarding marital status, indicating a significant association with lifestyle adherence ($p$-value = 0.18; Odds Ratio [OR] = 3.347). Daily salt consumption is markedly correlated with lifestyle, as evidenced by a $p$-value of 0.031 and an odds ratio of 0.299. Obesity shows a substantial association with lifestyle, as evidenced by a $p$-value of 0.003 and an odds ratio of 0.241. Smoking is strongly correlated with lifestyle, as evidenced by a $p$-value of 0.000 and an odds ratio of 0.160. The five variables exert a limited influence on lifestyle adherence,

with marital status identified as the most significant predictor, exhibiting an odds ratio of 3.347. The findings of this study demonstrate the significance of marriage, as an individual's lifestyle is profoundly affected by familial support. Social cognitive theory posits that both internal and external factors, including familial influences, influence behavioral change. Our findings suggest that social support and familial dynamics serve as protective variables that can positively influence the lives of college students.

Systematic research on qualitative studies shows that families or caregivers play a complex yet comprehensive role in initiating and maintaining self-management-based cardiovascular care, serving as a bridge between the health care system and the individual [35]. Familial support can provide constructive motivation for beneficial lifestyle modifications [36]. Motivation is a crucial part of establishing and sustaining a healthy lifestyle. An individual who possesses robust intrinsic motivation and supportive extrinsic reinforcement is likely to exhibit greater consistency in their behavioral patterns. Such individuals are more likely to consume a nutritious diet, engage in regular physical activity, and refrain from detrimental habits such as smoking or excessive late-night activities. Motivation helps individuals overcome challenges or the recurrent feeling of lethargy that arises when initiating a new habit. The aspiration for prolonged familial togetherness, enhanced physical fitness, or increased self-confidence can be compelling motivations for maintaining a healthy lifestyle. Consequently, establishing clear and significant motivation is crucial for a healthy lifestyle. Not only does it become a debate, but it also genuinely integrates into everyday life.

Motivation is considered robust when an individual engages in everyday activities with positive expectations and the conviction that patients will adhere to the lifestyle prescribed for hypertension management. The greater the individual's motivation to manage hypertension, the higher the likelihood of adherence to a healthy lifestyle. Conversely, lower motivation correlates with a diminished quality of life in patients with hypertension [37]. Motivation is a crucial determinant of lifestyle adherence in people with hypertension. Insufficient motivation may result in inadequate adherence to medication regimens. This constitutes a hindrance to an improved quality of life. Motivation remains a critical issue, particularly in chronic illnesses, and recognizing the factors that affect lifestyle adherence can enhance treatment results. A limitation of this study is the lack of data on familial support for patients' lifestyles. Consequently, future studies are advised to collect data on the level of familial support among patients with hypertension. Familial support is essential for helping hypertension patients sustain a healthy lifestyle.

The presence of family as both emotional and practical support is crucial. For instance, family members can assist with preparing meals suitable for a hypertension diet, encourage patients to adhere to their medication schedule, and foster a tranquil, comfortable home atmosphere. Moreover, familial motivation can enhance patient compliance with medical advice. The existence of family support bridged by nurses increases family satisfaction and, consequently, improves the quality of communication and cognitive/emotional support for the family [38].

## 5. STRENGTHS AND LIMITATIONS

The strength of this study lies in the evidence that factors influencing lifestyle adherence among hypertension patients have high clinical relevance for preventing cardiovascular complications. The use of bivariate and multivariate analyses enables a more comprehensive identification of relationships among variables, thereby determining the most dominant and influential factors. However, this study also has several weaknesses, namely, the measurement of lifestyle variables using a questionnaire may introduce subjectivity or self-report bias, leading respondents to provide answers that do not fully reflect their actual condition. Another limitation is the potential for selection bias if the sampling technique is not random, which can affect the generalizability of the study's results.

## CONCLUSION

Motivation is a significant driver in the adherence to lifestyle modifications for patients with hypertension, since low motivation levels can lead to poor treatment compliance. This is one of the obstacles to achieving better quality goods. Motivation consistently garners attention, particularly in chronic diseases, and identifying the determinants of lifestyle compliance is essential for improving treatment outcomes. Furthermore, there is a necessity for familial support. Family support plays a crucial role in assisting patients with hypertension to adopt a healthy lifestyle. The presence of family as emotional and practical helpers is essential. For instance, family members can assist in preparing suitable meals for a hypertension diet, remind individuals to take their medication regularly, and foster a more tranquil, comfortable home atmosphere. Furthermore, family members' encouragement can enhance patient adherence to medical recommendations. With robust familial support, managing hypertension will facilitate a sustainable lifestyle, hence mitigating the likelihood of problems.

## AUTHORS' CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: N.I.: Conceptualized the study, selected the theoretical framework, and designed the research approach; M.L.R.: Conducted and analyzed the quantitative data; L.H.: Supervised the methodology and provided ongoing critical input throughout the research process; N.I.: Drafted the initial manuscript, including the introduction, methods, results, discussion, and conclusion; N.I.: Reviewed and revised the manuscript for intellectual content and consistency with international standards. All authors reviewed and approved the final version of the manuscript.

## LIST OF ABBREVIATIONS

ADH = Anti-Diuretic Hormone

BP = Blood Pressure

CVI = Content Validity Index

CVD = CardiovascularDisease

CoC = Continuity of Care

DM = Diabetes Mellitus

DASH = Dietary Approaches to Stop Hypertension

HT = Hypertension

OR = Odds Ratio

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research has passed the ethics review of the Ethics Committee of the Faculty of Health Sciences, Muhammadiyah University, No. KEPK/UMP/114/I/2025.

## HUMAN AND ANIMAL RIGHTS

All procedures involving human participants were conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments, or with comparable ethical standards.

## CONSENT OF PUBLICATION

Informed consent was obtained from all participants after providing information about the study's objectives, procedures, risks, and benefits. Participants were assured of confidentiality and the voluntary nature of their participation.

## STANDARDS OF REPORTING

STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

Data supporting the findings of this article are available at [https://pmc.ncbi.nlm.nih.gov/articles/PMC6477111/, https://pmc.ncbi.nlm.nih.gov/articles/PMC12785255/, https://pmc.ncbi.nlm.nih.gov/articles/PMC12331882/] at [Specify URL], reference numbers [13, 14, 20].

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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