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Dietary Compliance Associated with Blood Pressure among Hypertensive Patients

Annisa Latief, Misnati Misnati, Nuryani Nuryani*

Departement of Nutrition, Polytechnic of the Ministry of Health Gorontalo, 96113 Gorontalo, Indonesia

Corresponding Author's Email: nuryanigz@gmail.com

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ABSTRACT

Hypertension, a non-communicable disease (NCD), is one of the most serious health issues today and is a major cause of stroke incidents, both systolic and diastolic blood pressure. Factors influencing hypertension include knowledge, dietary compliance, and eating patterns. The study aims to analyze the relationship between knowledge, dietary compliance, and family support with blood pressure in hypertensive patients. The study utilized an analytical survey with a cross-sectional design. The sample size was determined by Slovin formula as many as consisted of 67 hypertensive patients selected using accidental sampling. Data were processed using the chi-square test. The measurement of variable using structured questionnaire. Descriptive analysis revealed the majority nutritional status as normal (58.1%) and overweight (26.9%), the age category 56-65 years old as many as 43.3%, low level of knowledge (28.4%), low dietary compliance (41.8%), and low family support (25.4%). The measurement blood pressure indicated 56.7% of the subject have controlled blood pressure. The research finding revealed that hypertensive patients with knowledge level at good category in 20 (41.7%) and low level of knowledge in 9 (47.3%). Dietary compliance was categorized as compliant in 28 (58.2%) with normal blood pressure and 11 (16.4%) with hypertension, while family support was good 26 (52.0%) with normal blood pressure and 24 (48.0%) with hypertension. The results showed a significant association was found between dietary compliance and blood pressure (p=0.003), but there were not significant assocation between knowledge and family support with blood pressure (p=0.671 and p=0.181), respectively. The study indicated that association between dietary compliance and blood pressure in hypertensive patients. Lifestyle modification strategies should be promoted to maintain long-term dietary compliance among hypertension patients.

Key Messages:

- The study identified risk factor that influence control blood pressure among hypertension subject.
- Dietary compliance significant associated with control blood pressure among hypertensive patients, however the level of knowledge and family support did not have association with blood pressure.
- Lifestyle modification strategies should be promoted to maintain long-term dietary compliance among hypertension patients.

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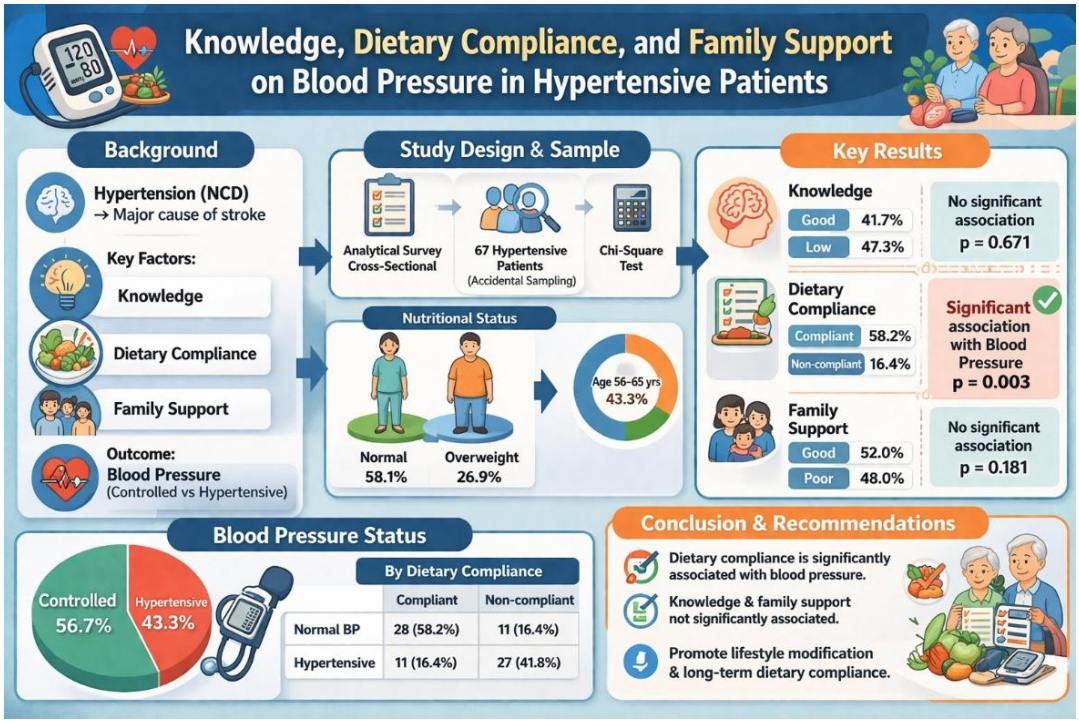
GRAPHICAL ABSTRACT



INTRODUCTION

Hypertension is a cardiovascular condition that appears without any obvious symptoms, and often sufferers do not realize that they have hypertension. Elevated blood pressure (BP) is defined as an systolic BP of 120–139 mmHg or diastolic BP of 70–89 mmHg (1). Hypertension is a major global health concern, affecting over a billion people and significantly contributing to cardiovascular disease, kidney failure, and stroke (2). Hypertension is also referred to as a "silent killer", it does not show signs that are easily detectable so that it risks endangering health.

Controlling blood pressure is an important step in reducing the risk of high blood pressure. It has been reported that morbidity and mortality due to hypertension can be significantly reduced with effective treatment. The treatment of hypertension requires two approaches, namely pharmacological (taking drugs) and non-pharmacological through behavioral approaches (3,4). Treatment for high blood pressure does not only rely on medications, but must also be combined with healthier lifestyle changes to achieve optimal results. This can be done by control weight, decrease salt intake, exercise, decrease alcohol consumption, and stop smoking. The role of diet is also very important in managing high blood pressure. A combination of a healthy lifestyle and an appropriate diet, and salt intake regulation can help improve blood pressure control (5).

There are two factors that can affect the healing process of a disease, namely internal factors and external factors (6). Internal factors can include dietary knowledge and dietary compliance, while external factors can be family support. Knowledge and long-term dietary compliance to food is a major obstacle in people with hypertension. A significant positive correlation was found between the hypertension knowledge score with adherence to antihypertensive treatment (4). Adherence to treatment is one of the critical factors affecting the success of hypertension management (7).

Lifestyle modifications, including nutritional strategies, are important in non-pharmacological interventions (8). The growing evidence suggest that diet can control blood pressure levels, both directly and indirectly, with certain dietary patterns and nutrients potentially having antihypertensive effects (9). High risk food consumption and lifestyle risk factor positive associate with NCD such as hypertension (10). Dietary strategies play a key role in the management of hypertension, with their effects spanning various physiological processes. Non-compliance in carrying out a diet increases complications of other diseases. It is crucial to tailor

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dietary changes to patient's nutritional needs and preferences to ensure long-term adherence and effectiveness intervention (11). However dietary adherence relatively low among hypertensive patients (12).

External factors that family support plays an important role in supporting the effectiveness of treatment of hypertension patients, including dietary compliance. Family members can provide motivation, emotional support, and practical assistance in lifestyle changes and medication adherence. Families can be involved in preparing healthy meals, encouraging patients to exercise, and reducing stressors in the patient's environment (13). Good family support to self-care was associated with better control of BP (12).

Hypertension, a grave global health concern, affects more than one billion people in the worldwide. The prevalence of hypertension in adults aged 30–79 years was estimated 1.4 billion adults in worldwide, that represents 33% of adults hypertension in 2024 (14). The prevalence of hypertension decreased significantly in high-income countries but increased in middle and low-income countries (15). Based on the results of National Health Survey in 2023 indicated the prevalence of hypertension in adult was 30.8% while in Gorontalo as many as 28% (16). Based on a preliminary survey conducted at the Kota Selatan Health Center for the last three months indicated a total of 200 hypertensive patients.

Both medical and behavioral approaches are effective in treating hypertension. Patients need to keep their BP under control to avoid complications that could lead to death through reduce complication of hypertension such as the brain, heart, and muscle (7). The costs of complications arising from hypertension are estimated to outweigh the costs of managing hypertension, indicating that effective hypertension management can provide far-reaching economic benefits to healthcare systems (17). The global prevalence of hypertension remains relatively high, a pattern that is similarly observed in Gorontalo. Numerous studies have examined various risk factors associated with hypertension; however, research specifically addressing factors such as level of knowledge, family support, and treatment adherence in the Gorontalo context remains limited. The study was aimed to investigate the association between knowledge, dietary compliance and family support with blood pressure among hypertensive patients.

METHODS

The study was use an analytical survey with a crosssectional study design. The location of the research was in the working area of the Kota Selatan Health Center, Gorontalo City in July-December 2024. The study population was all hypertensive patients who visit the Health Center, which was 200 people. The subject were taken by accidental sampling method. The sample size was determined by the Slovin formula to get 67 subjects with hypertension (18). The inclusion criteria in this study were hypertensive patients, subjects in a conscious and cooperative to participate in study data collection interviews.

The research instrument used variable height, weight, blood pressure measurement tools (sphygmanometer) and structure questionnaires. Subject characteristics include gender, body mass index (BMI), age and residential area. The knowledge variable was a knowledge that patients have related to the hypertension diet consisting of 15 question items, categorized as low knowledge (total knowledge score < 60%) and good knowledge (total knowledge score ≥ 60%). Diet adherence was the level of dietary adherence of hypertensive patients to the given diet, measured using a structured questionnaire of 10 question items, categorized as low compliance (total score < mean) and good compliance (total score ≥ mean). Family support was the level of family support in implementing a hypertension diet, measured using a structured questionnaire of 9 question items, categorized as low (total score < mean scores) and good categories (total score ≥ mean scores). The questionnaire used has been tested for validity and realism in previous research (19). Blood pressure was measured twice with using manual sphygmomanometer, the subject before measured their blood pressure has rested for at least 5 minutes, avoiding caffeine, smoking, and physical activity for 30 minutes prior. Written informed consent was obtained from all participants after a full explanation of the study objectives and procedures. Participation was voluntary, and confidentiality of the data was ensured.

Univariate analysis is carried out by calculating the frequency distribution of each variable and presented in the form of numbers and percentages. Independent variables in this study included knowledge, dietary adherence, and family support. Data analysis using the Chi square test. The study approved by etichal committee health study Health Polytechnic of Gorontalo number DP.04.03/KEPK/081/2024.

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CODE OF HEALTH ETHICS

Data analysis using the Fisher test. The study approved by etichal committee health study Health Polytechnic of Gorontalo number DP.04.03/KEPK/081/2024.

RESULTS

Respondents were 67 patients who had hypertension. The data on the characteristics of the respondents was revealed that women reached 53 respondents (79.1%), nutritional status according to BMI was mostly in the normal category as many as 39 respondents (58.1%), overweight 18 respondents (26.9%) and obesity grade I as many as 6 respondents (9%). The age group was more 56-65 years old, namely 29 respondents (43.3%) and 66-75 years, namely 24 respondents (35.8%). The level of knowledge in good category 48 respondents (71.6%), dietary adherence in good compliance as many as 39 respondents (58.2%), good family support as many as 50 respondents (74.6%). The result of measurement blood pressure revealed 29 respondents have high blood pressure (43.3%). The descriptive of the characteristics of the research subjects was presented in Table 1.

The results of the bivariate analysis showed that there was a significant relationship between dietary adherence and hypertension, while there was no relationship between knowledge and family support and hypertension in the study subjects. Respondents with a good level of knowledge had blood pressure in the normal category revealed 28 respondents (58.3%), while the level of knowledge with low knowledge had high blood pressure 9 respondents (47.3%). The results of statistical analysis showed that the p-value of 0.671 showed that there was no significant relationship between knowledge and blood pressure. The majority of respondents who adhered to the diet had normal blood pressure as many as 28 respondents (41.7%), while those who did not comply had high blood pressure amounted to 18 respondents (26.8%). Statistical analysis showed that a p-value of 0.003 indicated dietary adherence was significantly associated with blood pressure control. Respondents whose family support was good had normal blood pressure amounted 26 respondents (52%), while the level of family support was not good and had high blood pressure amount 5 respondents (29.5%). Statistical analysis obtained a p-value of 0.181 which indicated that there was no relationship between family support and blood pressure. The descriptive of the relationship between knowledge, dietary adherence and family support with hypternesion was shown in Table 2.

Table 1. Descriptive of characteristic subject study hypertensive patients

Characteristic	Frequency	Percentage (%)
Sex		
Male	14	20,9
Female	53	79,1
BMI		
Underweight	4	6
Normal	39	58,1
Overweight	18	26,9
Obese grade I	6	9
Age		
40-55 years	10	14.9
56-65 years	29	43.3
66-75 years	24	35.8
76-85 years	4	6
Level of knowledge		
Good	48	71.6
Low	19	28.4
Dietary adherence		
Good compliance	39	58.2
Low compliance	28	41.8
Family support		
Good	50	74.6
Low	17	25.4
Blood pressure		
Normal	38	56.7
Hypertension	29	43.3
Total	67	100

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DISCUSSION

Hypertension is a primary risk factor for various cardiovascular conditions, such as stroke, heart failure, and coronary artery disease, and it also significantly contributes to chronic kidney disease (20). The awareness of hypertension among adults is relatively low, with an estimated 46% of adults with the condition not realizing that they have hypertension (8).

Table 2. Analysis association knowledge, dietary adherence and family support with hypertension

Variable	Normal		Hypertension		Total		p-value
	n	%	n	%	n	%	
Knowledge							
Good	28	58.3	20	41.7	48	71.6	0.671
Low	10	52.7	9	47.3	19	28.4	
Dietary adherence							
Good	28	41.7	11	16.4	39	58.2	0.003
Low	10	14.9	18	26.8	28	41.8	
Family support							
Good	26	52.0	24	48.0	50	74.6	0.181
Low	12	70.5	5	29.5	17	25.4	
Total	38	56.7	29	43.3	67	100	

The results of study revealed there was no association between knowledge with blood pressure. Appropriate educational materials important to increase hypertension knowledge among hypertensive patients, which could help improve treatment adherence and blood pressure control. Understanding the lifestyles and habits of hypertensive patients is crucial for proposing individualized health interventions. Effective counseling and education by a multidisciplinary health team can improve patient adherence (4). Insufficient knowledge about drug therapy and dietary regimens cause non-adherence to antihypertensive treatment (21). The study different with a study in Pakistan found that those who adequately controlled their BP had more knowledge about the disease (22). Patients with better knowledge are significantly more likely to have a positive attitude towards hypertension prevention (23). The results of the study showed that there was no significant relationship between knowledge and blood pressure in the research subjects. This was possibly caused by the knowledge factor being a factor that could indirectly influence a person's attitude and behavior in controlling blood pressure. In addition, there were possibly other factors that were more dominant in influencing blood pressure in the research subjects. This was related to the level of knowledge of the research subjects, which was mostly categorized as good.

The study indicated there no significant association was found between knowledge with blood pressure among hypertension patients. Knowledge is often no associated with blood pressure because awareness alone is insufficient to produce sustained behavioral and physiological change. Knowledge influences health outcomes indirectly through attitudes and practices, meaning that without consistent lifestyle modification and treatment adherence, increased knowledge may not translate into improved blood pressure control (24). Blood pressure is also strongly influenced by non-cognitive factors such as age, genetics, obesity, stress, and comorbid conditions, which can outweigh the effect of knowledge (25). WHO reports that although public awareness of hypertension has increased globally, blood pressure control rates remain low due to poor adherence to healthy diets, physical activity, and antihypertensive medication (26). The study also revealed that majority of the subject had good level of knowledge as many as 71.6% individuals with higher knowledge may often already diagnosed and receiving treatment, which can normalize blood pressure.

The eating habits of people in Gorontalo are generally high in fat and low in fiber, some local foods are often processed by frying or cooked with coconut milk such as yellow rice and fried foods. Low fiber intake is related to the lack of consumption of vegetables and fruits, generally the most frequently consumed vegetables are the stem parts of kale with stir-fried processing. Previous research shows that fiber intake in adults in Gorontalo was only 15.3 grams, the frequency of vegetable consumption was categorized as rarely 37% (27). The habit of consuming protein sources such as fish is relatively high, generally fried, cooked in sour sauce, or woku fish and grilled with added oily chili sauce.

The results revealed association between dietary compliance with blood pressure among hypertensive patients. Non-pharmacological interventions can substantially reduce blood pressure because they are essential components of hypertension pathogenesis (28). The mechanisms dietary patterns to control blood pressure include

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the promotion of vasodilation, improvement of endothelial function, reduction of fluid retention, and mitigation of oxidative stress. Dietary patterns, such as the DASH (Dietary Approaches to Stop Hypertension) and Mediterranean diets, which emphasize fruit and vegetable consumption, have demonstrated efficacy in reducing blood pressure. Certain nutrients, such as potassium, calcium, and magnesium, have significant effects on blood pressure. However, successful implementation of these strategies can be hindered by various factors, such as adherence challenges, socioeconomic disparities, and cultural preferences (8).

The effectiveness of adherence dietary pattern is important strategies to manage hypertension [8]. Dietary adherence pose significant challenges, only approximately 35% of the hypertension patients managed to maintain the recommended dietary patterns (28). The dietary habits deeply rooted in cultural practices can be a barrier to the implementation of nutritional strategies for hypertension management (29). Socioeconomic disparities in hypertension could be attributed to differences in dietary patterns. Cultural preferences tailored dietary advice was more effective than generic dietary advice indicated that dietary habits deeply rooted in cultural practices can be a barrier to the implementation of nutritional strategies for hypertension management (30).

The results revealed not association between family support with blood pressure among hypertensive patients. Family support important as a motivational strategy to support management hypertensive patients. The adherence of lifestyle strategies indicates the effectiveness of motivational interviewing in enhancing patient commitment (8). Family support enhances adherence to self-care practices related to BP management. Better family support acts through improvements in the adherence to self-care activities and thereby improves BP control (12). It is important to develop intervention base on family. In a family centred approach, the proposed lifestyle changes and self-care strategies are more achievable and sustainable for the individuals and their family members (31).

The study revealed there was not association between family support with blood pressure. Family support is often not associated with blood pressure because social and emotional support does not directly affect the physiological mechanisms regulating blood pressure and mainly influences health outcomes indirectly through behavior. Despite strong family or community support, hypertension control remains suboptimal when adherence to lifestyle modification and medication is poor (26). The study design cross-sectional studies, family support was measured at one point in time and may not reflect long-term or practical support, while blood pressure was a dynamic outcome influenced by cumulative exposures, leading to a non-significant association between the variable (32). The results showed that there was no relationship between family support and the incidence of hypertension. There was a diversity of research findings compared to a number of previous studies, this may be due to differences in subject characteristics, socio-demographics, location and research design.

Dietary adherence of hypertensive patients was significantly related to blood pressure. So it was important to encourage hypertensive patients to regulate their diet according to the recommendations of the hypertension diet such as limiting salt consumption, increasing the consumption of vegetables and fruits, limiting the consumption of high-fat foods to improve the health status of people with hypertension. Passive intervention was important to be carried out with a nutrition education and counseling assistance approach to increase the awareness of hypertension patients. The collaboration of health workers in the delivery of comprehensive education also plays a role in improving the health status of hypertension patients. Follow-up study was important to look at factors that affect dietary adherence in people with hypertension with a larger coverage of subjects, as an effort to develop effective interventions in improving dietary adherence in people with hypertension. The limitation of study was using questionnaire that not yet validated, that for further research development it was important to carry out validity dan reliability tests of questionnaire.

CONCLUSION

There was a significant association of dietary adherence with blood pressure control, although there was no significant association of knowledge and family support with the incidence of hypertension. Nonetheless, studies with larger subjects longitudinally are important to identify risk factors, knowledge, dietary adherence and family support with the incidence of hypertension. To improve the health status of people with hypertension, it is important to carry out comprehensive nutrition education interventions to improve dietary adherence. Educational strategies can be carried out in the form of cross-sector collaboration of health workers in providing nutrition education such as good food selection, limiting risk food consumption in at-risk groups. A healthy eating pattern education program and local food-based food processing can be carried out by empowering local health

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cadres to improve the health status and blood pressure control in hypertension patients. This can support the Healthy Living Community Movement to increase consumption of fruit vegetables and physical activity and routinely check the health status high risk subject.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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