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Original Research Paper

The Relationship Between Dietary Patterns, Physical Activity, and Stress Levels with the Incidence of Hypertension among Adults of Productive Age

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Abstract

Background: Hypertension is a major public health concern among productive-age individuals, influenced not only by genetic factors but also by modifiable lifestyle factors such as diet, physical activity, and stress. **Objective:** This study aimed to analyze the relationship between diet, physical activity, and stress levels with the incidence of hypertension among individuals in the productive age group. **Methods:** A quantitative research design with a Cross-Sectional approach was employed using purposive sampling involving 112 hypertensive respondents of productive age, and data were analyzed using the Spearman-Rho correlation test. **Results:** The findings revealed a significant positive relationship between dietary patterns and hypertension incidence (p = 0.001). More than half of the respondents engaged in light physical activity, and a positive correlation was observed between physical activity and hypertension (p = 0.001). Additionally, stress levels were significantly correlated with hypertension incidence (p = 0.001). These results indicate that poor dietary adherence, low physical activity, and high stress levels contribute to the increasing prevalence of hypertension among productive-age adults. **Conclusion:** Maintaining a balanced diet, engaging in regular physical activity, and managing stress effectively are crucial strategies to prevent hypertension and promote cardiovascular health in the productive age population.

Keywords: *Hypertension; diet; physical activity; stress.*

Introduction

Based on World Health Organization (WHO) data, non-communicable diseases (NCDs) currently represent the leading causes of mortality worldwide, accounting for approximately 63% of all deaths each year[1]. Hypertension is defined as a systolic blood pressure exceeding 140 mmHg and/or a diastolic pressure exceeding 90 mmHg, based on two separate measurements taken five minutes apart under resting conditions, indicating a significant elevation in blood pressure[2]. According to WHO, the global prevalence of hypertension was estimated to exceed 1.28 billion individuals in 2021, with a prevalence of 36% recorded in the Southeast Asia region. The 2018 Basic Health Research Survey (Riskesdas) reported that the prevalence of hypertension in Indonesia reached 34.1%[1]. The increasing frequency of hypertension in low- and middle-income countries is primarily influenced by key factors such as unhealthy dietary patterns especially excessive sodium intake and insufficient potassium intake lack of physical activity, smoking habits, and alcohol consumption[3]. The prevalence of hypertension remains high in Central Java, accounting for approximately 60–80% of total disease burden in the region[4]. In Sukoharjo Regency alone, 1,114 individuals

were reported to have been diagnosed with hypertension in 2022.

The mechanism underlying hypertension is influenced by various interrelated factors[5]. Non-adherence to hypertension management recommendations among patients increases the risk of complications. Preventive efforts can be achieved through the adoption of a healthy lifestyle, including maintaining a balanced diet, reducing salt consumption, engaging in regular physical activity, and avoiding smoking and alcohol use[6]. Genetic predisposition and family eating habits also play a role in the occurrence of hypertension[7]. The implementation of a healthy diet is essential in reducing the risk of hypertension. The key determinants of dietary management include knowledge about foods that promote health and attitudes that discourage the consumption of foods that contribute to elevated blood pressure[8]. Stress and anxiety can trigger increased blood pressure through sympathetic nervous system activation[9,10]. According to Indonesia's Ministry of Health Regulation No. 4 of 2019, the productive age range is defined as 15 to 59 years. As individuals age, blood pressure tends to rise due to collagen accumulation in vascular smooth muscle walls[11].

Although hypertension is often associated with older adults, it is also increasingly prevalent among individuals of productive age, including adolescents and young adults. Genetic predisposition, high-stress levels, and unhealthy lifestyle habits are major determinants of hypertension risk among individuals aged 20–45 years. Furthermore, studies have identified contributing factors to hypertension in the productive age group (15–64 years)[12]. Many individuals remain unaware of their hypertensive condition until complications occur[13]. The management of hypertension generally involves both non-pharmacological and pharmacological approaches. Non pharmacological interventions include lifestyle modification, reduced sodium intake especially from table salt and processed foods regular exercise, sufficient rest, and stress management[14].

A study conducted by Muliana et al. (2024) found that several factors increase the risk of hypertension in productive-age individuals, including low physical activity, poor sleep quality, unhealthy dietary habits, and obesity[15]. Similarly, Hardin and Manao identified a significant association between stress levels and hypertension among productive-age individuals, showing that stress is one of the most prominent contributors to elevated blood pressure[16]. Preliminary data collected from the Kartasura Health Center in June 2024 revealed that out of 189 individuals diagnosed with hypertension, 156 were within the productive age group. Interviews and questionnaires with 10 respondents indicated that most exhibited poor dietary compliance, low physical activity, and moderate stress levels related to their condition.

This preliminary study at the Kartasura Health Center highlights the urgent need to address hypertension among productive-age individuals characterized by poor dietary habits, low physical activity, and moderate stress levels. The study aims to analyze the relationship between these three factors and the prevalence of hypertension in this population. Findings are expected to offer evidence-based insights to support targeted interventions and strengthen health promotion strategies for hypertension prevention in primary healthcare settings.

Materials and Methods

Study Design

This study employed a quantitative research approach with a descriptive correlational design and adopted a cross-sectional methodology. Data were collected at a single point in time to analyze the relationship

between lifestyle factors and hypertension prevalence.

Sample

Data were collected using a purposive sampling technique and calculated with the Slovin formula between June and November 2024. The study involved 112 respondents diagnosed with hypertension who met the inclusion and exclusion criteria. The inclusion criteria consisted of hypertensive patients aged 15–64 years at the Kartasura Public Health Center who consented to participate. The exclusion criteria included respondents with comorbidities or complications and those unable to read or write.

Data Collection Technique

Data were collected using three types of questionnaires: the DASH diet compliance questionnaire to evaluate dietary patterns, the International Physical Activity Questionnaire (IPAQ) to assess physical activity levels, and the Perceived Stress Scale (PSS-10) to measure perceived stress levels. The data collected were primary data that met the inclusion criteria, and respondents completed the provided questionnaires. The validity and reliability tests indicated that the DASH instrument had a validity value of *r count* > 0.635 and a reliability coefficient (Cronbach's alpha) of 0.8017. The IPAQ instrument demonstrated a validity of 0.442 and reliability of 0.713, while the PSS-10 had a Cronbach's alpha value of 0.81.

Data Analysis Technique

Data analysis was conducted using univariate and bivariate approaches with the Spearman-Rho correlation test. First, univariate analysis was applied to describe the respondents' characteristics and each variable related to hypertension. Then, bivariate analysis was conducted to examine the correlations using the Spearman-Rho test.

Ethical Consideration

This study adhered to ethical research principles, including informed consent, confidentiality, justice, respect for individuals, and beneficence. Ethical approval was obtained from the Health Research Ethics Committee of Dr. Moewardi General Hospital, with the certificate number 2.390/X/HREC/2024.

Results

The findings presented in Figure 1 regarding respondent characteristics indicate that the majority of respondents were aged 41–51 years, accounting for 51 respondents (45.5%), followed by the 29–40 years group with 20 respondents (17.9%), and the 52–64 years group comprising 41 respondents (36.6%). Most respondents were female, totaling 65 respondents (58%), while male respondents accounted for 47 (42%). In terms of education level, the majority had completed senior high school (SMA) with 43 respondents (38.4%), followed by elementary school (SD) with 19 respondents (17%), junior high school (SMP) with 35 respondents (31.3%), and higher education with 15 respondents (13.4%). Regarding occupation, most respondents were housewives or unemployed (45 respondents, 40.2%), followed by laborers (32 respondents, 28.6%), entrepreneurs (21 respondents, 18.8%), and civil servants (14 respondents, 12.5%).

Based on the univariate analysis of 112 respondents, the majority experienced grade 2 hypertension (51 respondents, 46%), followed by prehypertension (25 respondents, 22%) and grade 1 hypertension (36 respondents, 32%). Most respondents (89 respondents, 79.5%) exhibited noncompliance with the DASH dietary pattern, while 23 respondents (20.5%) adhered to the recommended dietary pattern. In terms of physical activity, most respondents (58 respondents, 51.8%) had low activity levels, followed by moderate activity (38 respondents,

33.9%) and high activity (16 respondents, 14.3%). Regarding stress levels, 25 respondents (22.3%) experienced mild stress, 54 respondents (48.2%) experienced moderate stress, and 33 respondents (29.5%) experienced severe stress, with the majority exhibiting moderate stress levels.

Based on the bivariate analysis, within the prehypertension group, most respondents were noncompliant with a healthy dietary pattern (47.3%) and only a small portion were compliant (4.5%). Among those with grade 1 hypertension, most respondents were also noncompliant (26.8%), while only 7.14% adhered to the recommended diet. In the grade 2 hypertension group, nearly half were noncompliant (5.4%), while 9% followed a healthy diet. The Spearman correlation test revealed a significant correlation between dietary patterns and hypertension cases, with a correlation coefficient of 0.387 (p-value = 0.001). These findings indicate that dietary habits are associated with the increased incidence of hypertension among adults in the Kartasura Public Health Center.

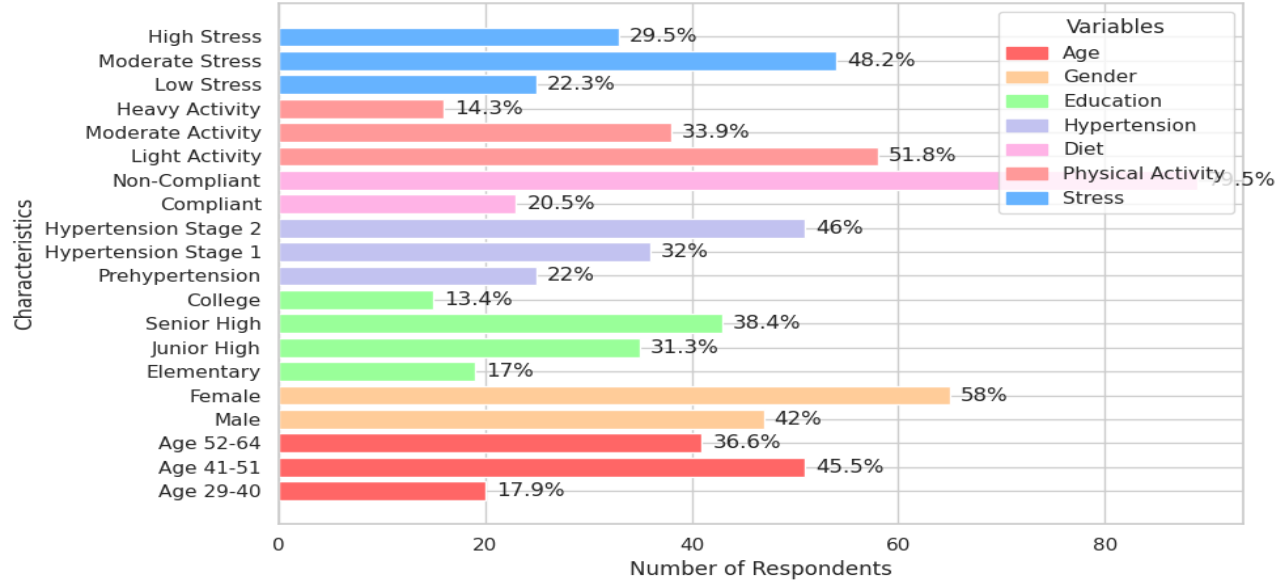

Figure 1. Respondent characteristics and univariate analysis

Table 2. The Relationship between Eating Patterns, Physical Activity, and Stress Levels with Hypertension Incidence in the Productive Age Group at Kartasura Health Center

Indicator	Hypertension Occurrence						*P-Value*	r
	Prehypertension		Hypertension Stage 1		Hypertension stage 2			
	n	%	n	%	n	%		
Eating Patterns								
Compliant	5	4,5	8	7	10	9	0,001	0,387
Non-Compliant	53	47,3	30	26,8	6	5,4		
Physical Activity								
Light Activity	17	15,2	20	18	15	13,4	0,001	1.000
Moderate Activity	8	7,1	22	19,6	8	7,1		
Heavy Activity	5	4,4	7	6,2	10	9		
Stress Level								
Low Stress	4	3,1	29	23	25	20	0,001	0,469
Moderate Stress	11	8,7	21	16,6	6	4,7		
High Stress	10	8	4	3,1	16	12,7		

Source: Primary Data, 2024

Based on the bivariate analysis of the prehypertension group, most respondents engaged in light physical activity (15.2%), while only a small proportion participated in moderate (7.1%) or vigorous (4.4%) physical activities. This indicates that many individuals in the prehypertension group tend to be physically inactive, preferring light activities over more intense physical exercises. In the grade 1 hypertension group, the percentage of participants engaging in moderate (19.6%) and light (18%) activities was higher compared to those performing vigorous activities (6.2%). In the grade 2 hypertension group, there was a more balanced distribution across light (13.4%), moderate (7.1%), and vigorous (9%) activity levels. Although many individuals with grade 2 hypertension performed light physical activities, some also participated in moderate or vigorous intensity exercises. The Spearman correlation test indicated a significant relationship between the level of physical activity and hypertension cases, with a correlation coefficient of 1.000 (p-value = 0.001). These findings suggest that physical activity level is associated with an increased incidence of hypertension among individuals of productive age at Kartasura Public Health Center.

Based on the bivariate analysis of the prehypertension group, the majority of respondents experienced moderate (8.7%) and severe (8%) stress levels, while only a small proportion had mild stress (3.1%). In the grade 1 hypertension group, most respondents experienced mild (23%) and moderate (16.6%) stress, with only a small number showing severe stress (3.1%). In the grade 2 hypertension group, more respondents experienced mild (20%) and severe (12.7%) stress levels, with a lower percentage at the moderate level (4.7%). These results indicate that although many individuals with grade 2 hypertension experienced mild stress, a substantial portion also reported severe stress. The findings revealed a positive correlation between stress levels and hypertension incidence. The Spearman correlation analysis showed a correlation coefficient of 0.469 (p = 0.001), indicating a significant relationship between stress levels and the increased occurrence of hypertension among individuals in the productive age group.

This study also indicates a positive correlation between dietary patterns and the occurrence of hypertension. Of the 112 respondents, 23 respondents (20.5%) did not adhere to a healthy diet, while 89 respondents (79.5%) complied with a healthy eating pattern. The Spearman test yielded a p-value = 0.001, confirming that poor dietary habits contribute to an increased risk of hypertension.

Discussion

These findings are consistent with previous research showing that excessive salt and fat consumption is closely related to hypertension[17]. Based on statistical testing, a p-value of 0.028 (< α 0.05) was obtained, indicating a positive correlation between physical activity and the incidence of hypertension among respondents at Pancasan Health Center, Bogor City[18].

The stress-level analysis showed that 54 respondents (48.2%) with moderate stress levels had the highest prevalence of hypertension. The Spearman test revealed a significant correlation between stress levels and hypertension incidence, with a p-value of 0.001. Chronic stress is associated with an increased risk of hypertension among individuals of productive age[18]. Stress management is therefore an essential component of a healthy lifestyle that contributes to hypertension prevention.

A healthy diet plays a crucial role in preventing hypertension[19]. An unhealthy eating pattern can increase blood volume and pressure on blood vessel walls, triggering hypertension[20]. Furthermore, insufficient intake of potassium and magnesium can contribute to elevated blood pressure. A diet rich in fiber, low in salt, and nutritionally balanced helps maintain blood pressure stability and prevent hypertension[21].

Besides diet, physical activity is also vital in controlling blood pressure[22]. Exercise improves heart and cardiovascular function, enhances blood circulation, and reduces vascular tension[23]. Regular physical activities such as walking, jogging, or cycling have been shown to lower blood pressure[24]. Even for individuals already diagnosed with hypertension, exercise serves as an effective non-pharmacological therapy for BP control[25].

High stress levels are closely linked to the production of stress hormones cortisol and adrenaline which can elevate blood pressure[26]. Chronic stress, whether caused by work-related, personal, or social pressures, can alter lifestyle habits, such as increasing unhealthy food intake or reducing physical activity. Stress may also disrupt sleep patterns, which play a key role in blood pressure regulation. Therefore, managing stress through healthy methods such as meditation, relaxation techniques, or enjoyable activities can help maintain stable blood pressure[27].

In this study, the three factors diet, physical activity, and stress were found to be interrelated and mutually influential in increasing or reducing hypertension risk. For instance, individuals who exercise irregularly may compensate by consuming unhealthy foods, while those experiencing high stress often choose unhealthy foods as an emotional response. The interaction of these factors underscores the importance of a holistic approach to preventing and managing hypertension among productive-age adults.

Overall, the study emphasizes the importance of healthy eating habits, adequate physical activity, and effective stress management in preventing and controlling hypertension, particularly among the productive-age population at Kartasura Health Center[28,19]. Interventions focusing on these three aspects can help reduce hypertension prevalence and promote cardiovascular health awareness, ultimately fostering a supportive environment for hypertension prevention within the community.

Conclusion

These findings indicate a positive correlation between dietary patterns, physical activity, and stress levels in hypertension cases among individuals of productive age. Poor dietary habits, particularly excessive salt intake and irregular eating patterns, may contribute to an increased risk of developing hypertension. In addition, lack of physical activity and high stress levels further exacerbate health conditions that can trigger hypertension. As a preventive measure, it is crucial for individuals in the productive age group to adopt healthy eating habits, engage in regular physical activity, and manage stress effectively. Interventions that include health education are essential to reduce the prevalence of hypertension within this age group.

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