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Primary Hypertension Screening in the Urban Community of Ngawi Regency

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ABSTRACT

Background: The urban population experienced epidemiological changes affecting health, with hypertension being a major issue. This study identified risk factors for primary hypertension in the urban population of Ngawi Regency.
Methods: It used quantitative research with a cross-sectional approach and proportional random sampling. The sample consisted of 170 respondents aged 15–59 years, selected based on inclusion and exclusion criteria. Data collection used a sphygmomanometer for blood pressure, a scale and stature meter to calculate Body Mass Index (BMI), an Food and Agriculture Organization (FAO) questionnaire for physical activity, and a Food Frequency Questionnaire for dietary patterns. Data analysis was performed using univariate and bivariate analyses using the chi-square test with a significance level of <0.05.
Results: The results showed that four variables were significantly associated with the incidence of primary hypertension: age ≥45 years (p<0.001; OR=9.178), family history of hypertension (p<0.001; OR=3.218), overeating (p=0.010; OR=3.102), and BMI and obesity (p<0.001; OR=4.970). Meanwhile, gender, physical activity, alcohol consumption, and smoking habits did not show a significant association.
Conclusion: It was concluded that age, family history, diet, and BMI are the main determinants of primary hypertension in the urban area of Ngawi. Preventive measures can be implemented through health education, regular blood pressure checks, adopting a low-salt diet, increasing physical activity, and weight control to reduce the incidence of hypertension in urban communities.

Keywords: ***Primary Hypertension; Risk Factors; Screening Primary; Urban Community***

INTRODUCTION

Hypertension remains one of the most common and widely encountered non-communicable diseases (NCDs) worldwide, affecting populations across all socioeconomic and demographic groups. As a chronic condition characterized by persistently elevated blood pressure, hypertension arises from a complex interplay of genetic predispositions, physiological regulatory mechanisms, and environmental exposures that collectively contribute to its development.[1] Primary (essential) hypertension accounts for the vast majority of cases, representing approximately 90–95% of hypertension among adults.[2] I According to the 2017

American College of Cardiology/ American Heart Association (ACC/AHA) guidelines, hypertension is defined as a systolic blood pressure of at least 130 mmHg and/or a diastolic blood pressure exceeding 80 mmHg.[3] Even though several biological mechanisms have been proposed, including dysregulation of the renin, angiotensin, aldosterone system, endothelial dysfunction, increased sympathetic activity, and impaired sodium handling, no theory fully explains the pathogenesis of primary hypertension, indicating a multifactorial and still-evolving understanding of this condition.[4]

The global burden of hypertension continues to rise at an alarming pace. The World Health Organization (WHO) in 2024 that approximately 1.4 billion people worldwide are suffer from hypertension, representing roughly one in every three adults individuals globally has been diagnosed with this condition.[5] Projections estimate that this number will increase to 1.5 billion cases by 2025, making hypertension one of the fastest-growing global health concerns. Each year, around 10.44 million deaths are attributed to hypertension and its related complications, including stroke, ischemic heart disease, and kidney failure.[6] The increasing prevalence, combined with low awareness and inadequate control rates in many regions, highlights the urgent need for effective community-level strategies, especially in areas undergoing rapid demographic and lifestyle transitions.

In Indonesia, hypertension represents a major national health challenge that continues to escalate. Based on the 2018 Indonesia Basic Health Research (Riskesdas) reported that the prevalence of hypertension in East Java Province reached 36.3%, marking a significant rise compared to the 26.4% reported in 2013. [7] This sharp increase indicates changes in lifestyle, aging population structure, and potentially improved detection through screening efforts. The estimated number of individuals aged ≥15 years living with hypertension in East Java is approximately 11.7 million, with a nearly equal distribution between 48.8% in males and 51.2% in females.[8] These findings demonstrate that hypertension is not only widespread but also increasing at a rate that necessitates stronger public health responses and improved screening and management efforts.

At the district level, the Ngawi Regency Health Office reported approximately 273,696 individuals living with hypertension in 2023, indicating a considerable local disease burden.[9] This high prevalence underscores the need for localized assessments and targeted prevention strategies tailored to the unique demographic and environmental characteristics of communities within Ngawi. Considering that Ngawi is experiencing an ongoing process of urbanization, with shifts in occupational patterns, dietary behaviors, and lifestyle practices, understanding the dynamics of hypertension in its urban communities has become increasingly critical.

The pattern of hypertension burden also demonstrates important geographical variations. Riskesdas data consistenly show that hypertension is more common in urban areas (35.4%) than in rural areas (30.7%), likely influenced by differences in lifestyle, dietary patterns, stress exposure, and access to health care.[7] Interestingly, global studies present a more complex picture, in Low and middle income countries (LMICs), the hypertension prevalence has increased markedly both in rural and urban settings between 1990 and 2020 in both urban and rural areas, with some evidence suggesting a faster rise in rural populations due to rapid epidemiological and nutritional transitions.[10] However, Indonesia's pattern appears to differ, and these contrasting trends underscore the importance of localized research to understand context-specific determinants.

Despite the high burden of hypertension in Ngawi Regency, research specifically addressing primary hypertension risk factors and screening outcomes within its urban communities remains limited. Existing data often aggregate urban and rural populations, masking important differences in risk profiles, environmental exposures, and health behaviors. As urban areas in Ngawi undergo rapid modernization, there is a growing need to assess how these changes influence the prevalence, detection, and risk patterns of primary hypertension. Screening-based studies are particularly essential, as they provide early identification of individuals at risk, enable timely intervention, and reduce long-term complications.

Therefore, this study aims to bridge the existing research gap by examining primary hypertension screening outcomes in the urban community of Ngawi Regency and identifying factors associated with elevated blood pressure. Findings from this research are expected to support the development of targeted community-level interventions, enhance early detection strategies, and inform local health policies to address the growing burden of hypertension in rapidly urbanizing settings.

METHODS

This type of research is quantitative design using a cross-sectional approach. The research was conducted from June to July 2024 in the urban area of Ngawi Subdistrict, Ngawi Regency, an administrative region undergoing rapid urbanization and considered suitable for assessing primary hypertension screening in an urban community setting.

The study population consisted of 300 residents living in the Ngawi Subdistrict. A proportional random sampling technique was applied to ensure adequate representation from each neighborhood within the subdistrict. Based on the sample size estimation and the distribution of the population, a total of 170 participants were selected for inclusion in the study. Participant recruitment was carried out according to predefined inclusion and exclusion criteria. The inclusion criteria were: (1) individuals residing in the urban area of Ngawi Kota Subdistrict during the data collection period, (2) willingness to participate as evidenced by providing informed consent, and (3) adults aged 15–59 years.

The exclusion criteria were: (1) individuals who were not present at the location during data collection despite prior confirmation, and (2) individuals diagnosed with hypertension accompanied by severe disease complications, which may alter blood pressure readings or affect the assessment of primary hypertension.

Data collection involved both direct measurement and structured questionnaire administration. The Preliminary demographic survey was used to identify eligible residents. Data collection was carried out in collaboration with trained local health cadres who assisted in identifying households and coordinating respondent availability. Upon meeting eligibility criteria, participants underwent blood pressure measurement conducted by trained researchers using a calibrated sphygmomanometer following standardized measurement procedures. Anthropometric measurements, including body weight and height, were taken using a digital scale and a stature meter. Body Mass Index (BMI) was calculated using the standard formula (kg/m^2). [11][12]

Information on demographic characteristics and behavioral risk factors including age, gender, family history, dietary pattern, physical activity, BMI, smoking habits, and alcohol consumption. It was collected through face-to-face interviews using a structured questionnaire. Physical activity levels were assessed using the Food and Agriculture Organization (FAO) Physical Activity Questionnaire, while dietary

patterns were evaluated using a Food Frequency Questionnaire (FFQ).[13][14] Responses from both instruments were processed using a validated screening platform to categorize physical activity levels and dietary risk profiles.

The collected data were analyzed using STATA version 17. Data analysis consisted of univariate and bivariate procedures. Univariate analysis was used to describe the frequency distribution of respondent characteristics and risk factors. For bivariate analysis, the chi-square test was applied to examine the association between independent variables and primary hypertension status. A significance level of $p < 0.05$ was used as the threshold for determining statistically significant relationships. [15]

Ethical considerations were adhered to throughout the study. Ethical approval and research permission were obtained from the Medical and Health Research Ethics Committee Faculty of Medicine Universitas Islam Al-Azhar Mataram (Approval Number: 204/EC-04/FK-06/UNIZAR/XI/2025). Prior to participation, respondents were informed about the purpose, procedures, risks, and benefits of the study. Each participant provided written informed consent. Data confidentiality and anonymity were maintained, and participation was voluntary, with respondents allowed to withdraw at any point without consequence. Data collection required approximately 30 minutes per respondent, including informed consent, blood pressure and BMI measurement, and completion of physical activity and dietary questionnaires.

RESULT

Based on table 1 regarding the frequency distribution of primary hypertension and the characteristics of respondents, it is known that the proportion of primary hypertension was 60 respondents (35.3%). The number of ages is more in the < 45 years group with a frequency of 90 respondents (53%). In gender, the proportion is more in women, namely 110 respondents (64.7%). In family history, it is known that as many as 50 respondents (29.4%) have a family history of hypertension. In the diet variable, it is known that 75 respondents (44.1%) have an excessive diet. While in physical activity, the proportion that was mostly done was light as many as 81 respondents (47.6%). In alcohol consumption, it is known that 40 respondents (23.5%) consume it. In smoking habits, it is known that 40 respondents (23.5%) have a smoking habit. Meanwhile, the dominant BMI is not obese as many as 125 respondents (73.5%).

Table 1. Frequency distribution of primary hypertension incidence and respondent characteristics

Characteristic	Category	N	%
Hypertension	Non-hypertensive	110	64.7
	Primary hypertension	60	35.3
Age	< 45 years	90	53
	≥ 45 years	80	47
Gender	Male	60	35.3
	Female	110	64.7
Family History	None	120	70.6
	Present	50	29.4
Dietary Pattern	Normal	95	55.9
	Excessive	75	44.1
Physical Activity	Light	81	47.6
	Moderate	52	30.6
	Intense	37	21.8
Alcohol Consumption	Non-consumer	130	76.5
	Consumer	40	23.5
Smoking	Non-smoker	130	76.5
	Smoker	40	23.5
BMI	Not obese	125	73.5

Note: N (%) is number of respondents and its percentage.

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a frequency of 90 respondents (53%). In gender, the proportion is more in women, namely 110 respondents (64.7%). In family history, it is known that as many as 50 respondents (29.4%) have a family history of hypertension. In the diet variable, it is known that 75 respondents (44.1%) have an excessive diet. While in physical activity, the proportion that was mostly done was light as many as 81 respondents (47.6%). In alcohol consumption, it is known that 40 respondents (23.5%) consume it. In smoking habits, it is known that 40 respondents (23.5%) have a smoking habit. Meanwhile, the dominant BMI is not obese as many as 125 respondents (73.5%).

Table 2. Distribution of relationships between age, sex, family history, diet, physical activity, alcohol consumption, smoking, and BMI with primary hypertension in urban communities

Incidence of Primary Hypertension in the Urban Community						
Variable	**Category**	**Yes**	**No**	**Total**	**p-value**	**OR (95% CI)**
		N (%)	**N (%)**	**N (%)**		
Age	< 45 years	20 (22.2)	70 (77.8)	90 (100)	<0.00	9.178 (3.946 - 21.387)
	≥ 45 years	37 (46.2)	43 (53.8)	80 (100)		
Gender	Male	12 (20.0)	48 (80.0)	60 (100)	0.115	1.856 (0.921 - 4.109)
	Female	36 (32.7)	74 (67.3)	110 (100)		
Family History	No	25 (20.8)	95 (79.2)	120 (100)	<0.00	3.218 (2.122 - 8.774)
	Yes	24 (48.0)	26 (52.0)	50 (100)		
Dietary Pattern	Normal	19 (20.0)	76 (80.0)	95 (100)	0.01	3.102 (1.272 - 5.001)
	Excessive	29 (38.7)	46 (61.3)	75 (100)		
Physical Activity	Light	20 (24.7)	61 (75.3)	81 (100)	0.198	1.709 (0.477 - 2.485)
	Moderate	12 (23.0)	40 (77.0)	52 (100)		
	Heavy	13 (35.1)	24 (64.9)	37 (100)		
Alcohol Consumption	No	20 (15.4)	110 (84.6)	130 (100)	0.845	0.481 (0.194 - 1.142)
	Yes	21 (52.5)	19 (47.5)	40 (100)		
Smoking	Non-smoker	40 (30.8)	90 (69.2)	130 (100)	0.831	0.805 (0.375 - 1.900)
	Smoker	11 (27.5)	29 (72.5)	40 (100)		
BMI	Non-obese	30 (24.0)	95 (76.0)	125 (100)	<0.00	4.970 (2.208 - 9.092)
	Obese	20 (44.4)	25 (55.6)	45 (100)		

Note: N (%) is number of respondents and its percentage.

Table 2 shows the results of the analysis that the p value <0.05 includes the variables of age, family history, diet, and body mass index (BMI). The results of the age variable analysis significantly affect the incidence of primary hypertension in urban communities with p value = <0.00 and OR = 9.178, which means that age ≥ 45 years has a risk of experiencing primary hypertension 9.178 times compared to age < 45 years. Family history variable has a significant influence on the incidence of primary hypertension with p value = <0.00 and OR = 3.218 which means that someone who has a family history of hypertension has a risk of 3.218 of developing hypertension. The diet variable shows p value = 0.010 and OR = 3.102 which means that diet affects the incidence of primary hypertension and someone with an excessive diet has a risk of developing hypertension than someone with a normal diet. While the BMI variable shows a p value = <0.00 and OR = 4.970, which means that someone with an obese BMI category has the

opportunity or risk of developing hypertension compared to someone with a non-obese BMI category.

DISCUSSION

The findings of this study indicate that age, family history, diet, and body mass index (BMI) are significantly associated with the incidence of primary hypertension among Ngawi regency urban communities. All four variables demonstrated p-values < 0.05, confirming their statistical significance. These results are consistent with well-established evidence showing that hypertension is a multifactorial condition influenced by both non-modifiable and modifiable risk factors.[16][17] Although gender, physical activity, alcohol consumption, and smoking were also identified as contributing factors, their influence in this study was relatively small.

Age was found to be an important determinant of primary hypertension. Cases of hypertension tend to increase with age compared to younger people.[18, 19] This is due to changes in the arterial wall, where in old age arteries thicken due to collagen buildup. As a result, blood vessels gradually become narrower and stiffer, resulting in reduced elasticity.[20]

A person who has a family history of hypertension has a greater risk of developing hypertension than a person who does not have a family history of hypertension.[21] This is usually related to genetic factors, where many genes play a role in the development of hypertension. Genetic factors contribute about 30% to the variation in blood pressure across populations.[22] Genes that play a role in the pathophysiology of hypertension include simplicity genes, endothelial sodium channels, and defects in the 11β hydroxylase dehydrogenase gene.[23]

Diet can affect hypertension if unhealthy foods are consumed over a long period of time or repeatedly.[24] An unhealthy diet, such as frequently eating foods high in sodium and fat in large amounts or more than needed, can increase blood pressure.[25] Foods high in sodium and fat cause fat accumulation in the body, which impedes blood flow. This impaired blood flow to the heart due to fat accumulation results in high blood pressure, or hypertension.[26] As we age, nutritional needs increase, and blood pressure tends to rise with it. A poor diet, which in this case is not done for a long period of time, can be accompanied by optimal physical activity.

Obesity or overweight is one of the risk factors for hypertension and is considered an independent factor, which means it is not influenced by other risk factors. An unhealthy lifestyle is one of the factors that can cause someone to be obese.[27] Obesity can cause hypertension through various mechanisms, both directly and indirectly.[28] Directly, obesity increases cardiac output because the greater the body mass, the more blood that must be pumped, so that cardiac output increases. [29] Indirectly, obesity stimulates sympathetic nervous system and Renin Angiotensin Aldosterone System (RAAS) activity through mediators such as cytokines, hormones, and adipokines.[30] The hormone aldosterone plays an important role in water and sodium retention, leading to increased blood volume.[31]

Overall, the study reinforces the interplay of both non-modifiable (age, family history) and modifiable (diet, BMI) factors in the development of primary hypertension. The significant influence of modifiable factors suggests that targeted health promotion interventions particularly those focused on improving diet quality and reducing obesity may have a substantial impact on reducing the burden of hypertension in urban settings. Strengthening screening efforts for high-risk groups, especially older adults and individuals with a family history of hypertension, is also essential for early detection and prevention.

CONCLUSION

The results of the analysis can be concluded that there are four variables that show a significant relationship between risk factors associated with the incidence of primary hypertension in urban communities in Ngawi Regency, namely age, family history, diet, and Body Mass Index (BMI). While the other four variables show no significant relationship, but have the opportunity to trigger the incidence of primary hypertension in urban communities in Ngawi Regency, namely gender, physical activity, alcohol consumption, and smoking. Urban communities in Ngawi Regency should regularly check their blood pressure to be able to take prevention as early as possible, avoid risk factors that can cause hypertension by avoiding alcohol consumption, smoking habits, normal diet with a low salt diet, always doing physical activity for at least 30 minutes every day, and controlling body weight.

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