

ORIGINAL ARTICLE

Determinants of Hypertension In The Coastal Area of Ketapang District

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ABSTRACT

Introduction: Hypertension remains a significant global health problem with a complex multifactorial etiology with a high prevalence in coastal areas affected by various risk factors. In particular, there is a scarcity of research focusing on the coastal communities of Ketapang Regency, which may have distinct characteristics contributing to the high prevalence of hypertension. This study aims to comprehensively investigate and analyze various factors related to the incidence of hypertension in the coastal area of Ketapang Regency. **Methods:** This cross-sectional study was conducted involving 360 participants who were selected using accidental sampling, based on Slovin's formula, during POSBINDU activities. The questionnaire consisted of gender, educational background, family history of hypertension, obesity, smoking habits, dietary patterns, physical activity, and stress levels. **Results:** Based on the results of the analysis using the Chi-Square Test, it was found that the results were gender ($p < 0.001$), education (p -value 0.683), family history (p -value 0.042), obesity (p -value 0.003), smoking habit ($p < 0.001$), diet (p -value 0.025), physical activity (p -value 0.035), stress level ($p < 0.001$). **Conclusion:** This study revealed a significant association between gender, family history, obesity, smoking habits, diet, physical activity, stress levels, and the occurrence of hypertension. However, it found no correlation between education level and hypertension prevalence in the coastal region of Ketapang Regency. The study recommends a comprehensive, risk-factor-based approach to hypertension intervention in the community.

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INTRODUCTION

Hypertension is a major contributor to mortality rates in many developing countries (1), and leading global risk factor for mortality (2). Hypertension is characterized by an elevation in systolic blood pressure (≥ 140 mmHg) and diastolic blood pressure (≥ 90 mmHg) (3). Hypertension is a significant risk factor that contributes to the development of cardiovascular and vascular conditions, including stroke, heart failure, coronary artery disease, and kidney failure (4). It is estimated by the World Health Organization (WHO) that approximately 1.5 billion people worldwide will be affected by hypertension by 2025. In Southeast Asia, hypertension ranks the third highest, with 25% of the population (5). The global age-standardized prevalence of hypertension among individuals aged 30-79 years was 33.1% in 2019 (6). In Southeast Asia, the prevalence was slightly lower at 32.4%, while Indonesia reported a higher rate of 34.1% (7).

The results of the Indonesian Health Survey in 2023 show a decrease in the prevalence of hypertension. According to the results of blood pressure measurements, the prevalence of hypertension in people aged >18 years decreased from 34.1% in 2018 to 30.8% in 2023. In contrast, the prevalence of hypertension in West Kalimantan in 2018 was 37%, dropping to 30.9% in 2023 (8). According to data from the Ketapang City Health Office, a total of 19,910 hypertension cases were recorded in 2022, with the highest number, 2,570 cases, reported in the service area of the Tuan-Tuan Health Center (9). Although the prevalence of hypertension tends to decrease, there is still a gap in knowledge of hypertension status in the community.

Coastal areas, such as Ketapang Regency, face unique health challenges due to certain socio-demographic, genetic and lifestyle factors. These factors include eating habits, physical activity, and access to healthcare, all of which contribute to the development and management of hypertension (10). Gender plays a significant role in the risk of developing hypertension. Previous studies have indicated that the prevalence and presentation of hypertension vary between men and women. Women are at a higher risk of hypertension compared to men,

primarily due to hormonal differences. The decline in estrogen levels in women increases their susceptibility to hypertension, particularly in older age. A family history of hypertension is often recognized as a genetic factor associated with an increased risk of developing the condition (11).

Obesity, a significant risk factor for hypertension, is widely acknowledged as a major contributor to elevated blood pressure. There is a strong correlation between a high body mass index (BMI) and the risk of hypertension, driven by complex mechanisms such as the activation of the sympathetic nervous system and insulin resistance (12). Blood pressure increases because obesity makes the arteries tense and the heart works more (13). In addition, smoking can damage blood vessels and increase blood pressure because of the harmful substances contained in cigarettes that cause damage to blood vessels. Scientific evidence indicates that exposure to chemicals in cigarettes can harm the endothelium of blood vessels (14).

Diet significantly influences hypertension and plays a crucial role in managing its risk. Hypertension has been associated with excessive sodium intake, insufficient potassium, and diets rich in saturated fats (15). Hypertension can also be associated with a lack of physical activity (16). Supported stress levels can trigger physiological responses that increase blood pressure, but long-term stress can increase the risk of hypertension (17). In 2017, the Institute for Health Metrics and Evaluation (IHME) reported that among 1.7 million deaths in Indonesia, 23.7% were attributed to hypertension, 18.4% to hyperglycemia, 12.7% to smoking, and 7.7% to obesity (18). Uncontrolled hypertension accounts for 40% of deaths at a young age. Among the controllable and uncontrollable risk factors, there are many factors that affect hypertension. While risk factors such as gender, genetics, race, and age are beyond control, factors like obesity, smoking, diet, physical activity, and stress levels can be effectively managed.

Researchers have previously investigated cases of hypertension in coastal areas and found that coastal communities are the main cause (19). Although researchers have previously investigated cases of hypertension in coastal areas and suggested that coastal communities face a disproportionately high burden of hypertension due to their environmental and socio-economic conditions (20), there is still a lack of context-specific research that examines the unique characteristics of certain coastal regions. For example, coastal communities are often exposed to high sodium levels in drinking water caused by seawater intrusion, which has been linked to increased blood pressure and elevated hypertension risk (21). Moreover, many coastal populations—particularly in rural or underdeveloped regions—face limited access to healthcare services,

health education, and nutritious food options, which further exacerbates their vulnerability to chronic diseases such as hypertension(22). Given the unique environmental and socio-economic characteristics of the coastal area of Ketapang Regency, there is an urgent need for a comprehensive study to identify factors related to the incidence of hypertension. These factors, including gender, education, family history, obesity, smoking habits, physical activity, and stress levels, have not been thoroughly explored in relation to hypertension risk in this region.

MATERIALS AND METHODS

Research design

This cross-sectional study was conducted on individuals aged 20 to 40 years in Ketapang Regency. A total of 360 participants were selected through accidental sampling, based on Slovin's formula, during POSBINDU activities.

Study instruments

A structured, self-administered questionnaire in Bahasa was used to collect data, with permission obtained from the original authors of previous studies (23). The questionnaire addressed various factors, including gender, education, family history of hypertension, obesity, smoking habits, dietary patterns, physical activity, and stress levels. The respondents and instrument showed a reliability value of 0.88, with a Cronbach's alpha coefficient of 0.95.

Data analysis

The gathered data were analyzed with the Statistical Package for Social Sciences (SPSS) software to assess deviations, frequencies, and percentages, offering a detailed overview of the study population. The Kolmogorov-Smirnov test was used to assess the distribution of data responses. The Chi-square test was applied to evaluate the associations between gender, education level, family history of hypertension, obesity, smoking habits, dietary patterns, physical activity, stress levels, and hypertension. A p-value of ≤ 0.05 was considered statistically significant.

Ethical clearance

Ethical approval for the study was granted by the Human Research Ethics Committee of the Faculty of Health Sciences, Universitas Muhammadiyah Pontianak (No: 019/KEPK-FIKES/UM PONTIANAK/2023). The research was conducted in compliance with the principles of the Helsinki Declaration and institutional guidelines.

RESULTS

The univariate analysis from the Table I indicates that the majority of respondents were women (56.1%), with the highest proportion having completed high school education (35.6%). Additionally, most respondents had a family history of certain conditions (58.9%) and

Table I. Univariate Analysis of Hypertension Determinants in the Coastal Area of Ketapang Regency (n = 360)

Variable	Frequency (n)	Percentage (%)
Gender		
Man	158	43.9
Woman	202	56.1
Education Level		
No School	13	3.6
Primary school	88	24.4
Junior High School	78	21.7
High School	128	35.6
Academies/Colleges	53	14.7
Family History		
There is a family history	212	58.9
No Family History	148	41.1
Obesity		
Obesity	192	53.3
Normal	168	46.7
Smoking Habits		
Smoke	117	32.5
No Smoking	243	67.5
Diet		
Unhealthy	170	47.2
Healthy	190	52.8
Physical Activity		
Not Doing	169	46.9
Do at least 30 minutes per day	191	53.1
Stress Levels		
High Level of Stress	179	49.7
Low Level of Stress	181	50.3
Hypertension		
Hypertension	138	38.3
No Hypertension	222	61.7

Source: Primary Data, 2024

were classified as obese (53.3%). As many as 32.5% of respondents smoke, while 47.2% have an unhealthy diet. In terms of physical activity, 53.1% do at least 30 minutes of activity per day, and stress levels are almost balanced between high (49.7%) and low (50.3%). Regarding hypertension, 38.3% of respondents were diagnosed with hypertension, while another 61.7% did not experience hypertension.

Table II shows the analysis of factors associated with hypertension. From the data shown, there are several variables that have a significant association with hypertension (characterized by a p-value <0.05), namely: gender, family history, obesity, smoking habits, diet, physical activity, and stress levels. Among men, 49.4% had hypertension compared to 29.7% among women. Individuals with a family history of hypertension had a higher percentage (42.9%) than those without (31.8%).

Table II. Bivariate Analysis of Determinants of Hypertension in the Coastal Area of Ketapang Regency (n = 360)

Coastal Area of Kelampayan Regency (N = 588)						
Variable	Hypertension				p-value	PR (95% CI)
	Hyperten- sion		No Hyper- tension			
	f	%	f	%		
Gender						
Man	78	49.4	80	50.6	0.000*	1.662 (1.276 – 2.164)
Woman	60	29.7	142	70.3		
Education Level						
Primary Education	71	39.7	108	60.3	0.683	1.072 (0.842 – 1.393)
Higher Education	67	37.0	114	63.0		
Family History						
There is a family history	91	42.9	121	57.1	0.042*	1.352 (1.019 – 1.793)
No Family History	47	31.8	101	68.2		
Obesity						
Obesity	88	45.8	104	54.2	0.003*	1.540 (1.166 – 2.035)
Normal	50	29.8	118	70.2		
Smoking Habits						
Smoke	60	51.3	57	48.7	0.001*	1.598 (1.239 – 2.060)
No Smoking	78	32.1	165	67.9		
Diet						
Unhealthy	76	44.7	94	55.3	0.025*	1.370 (1.052 – 1.784)
Healthy	62	32.6	128	67.4		
Physical Activity						
Not Doing	75	44.4	94	55.6	0.035*	1.345 (1.034 – 1.751)
Do at least 30 minutes per day	63	33.0	128	67.0		
Stress Levels						
High Level of Stress	87	48.6	92	51.4	0.000*	1.725 (1.307 – 2.276)
Low Level of Stress	51	28.2	130	71.8		

Source: Primary Data, 2024

Obesity, smoking, unhealthy diet, lack of physical activity, and high stress levels also showed a significant association with hypertension. People with obesity had a hypertension rate of 45.8%, smokers 51.3%, those with an unhealthy diet 44.7%, those with no physical activity 44.4%, and those with high stress levels 48.6%. The only variable that did not show a significant association was education level (p-value = 0.683), with an almost equal percentage of hypertension between primary education (39.7%) and higher education (37.0%).

DISCUSSION

This study aims to identify both controllable and uncontrollable determinants of hypertension in the coastal area of Ketapang Regency. Uncontrollable sociodemographic factors include education level and gender, while controllable factors encompass obesity, smoking habits, diet, physical activity, and stress levels. Statistical analysis demonstrated a significant relationship between gender and the occurrence of hypertension in

the coastal region of Ketapang in 2024. This finding is consistent with a previous study, which also identified a significant association between gender and the occurrence of hypertension (24,25). Conversely, no significant association between gender and uncontrolled hypertension was identified in Penang, Malaysia, which examined factors influencing uncontrolled hypertension among patients undergoing treatment (26).

In the previous study, it was found that male respondents experienced more hypertension (87.5%) compared to female respondents (21.4%) (24). Men tend to develop hypertension in their late thirties, whereas women are more likely to experience it during menopause (27). Women's blood pressure increases more sharply with age, especially systolic blood pressure. Hypertension is more commonly observed in women after the age of 55 (28). Hormonal differences between the sexes contribute to this pattern.

The analysis revealed no significant correlation between education level and the incidence of hypertension in Ketapang's coastal area. This finding is consistent with findings from other research (29). However, these findings contradict previous studies that also found that low levels of education were associated with the incidence of hypertension (30,31). Research in China also supports these findings which found that people with primary and below education levels showed poorer blood pressure control and a higher risk of newly diagnosed hypertension compared to people with high education levels (30).

The bivariate analysis results also indicated that a relationship was found between family history and the incidence of hypertension. A higher prevalence of 42.9% was observed among respondents with a family history of hypertension compared to those without. A family history of hypertension and hereditary or genetic predisposition were identified as the main risk factors (32). If primary hypertension is left naturally untreated and supported by the environment for 30 to 50 years, symptoms and signs will appear in individuals suffering from hypertension due to its genetic characteristics (33).

This study revealed a correlation between obesity and overweight and the occurrence of hypertension among the population in the coastal area of Ketapang Regency, highlighting these factors as contributors to the high prevalence of hypertension in Indonesia. These findings align with a study conducted on individuals aged 25 to 60 years, which demonstrated that those with central obesity are 3.63 times more likely to experience hypertension compared to those without central obesity (34). Previous studies have shown that obesity and hypertension have a significant relationship with each other. It is caused by a complex relationship between various mechanisms including improper activation of SNS and RAAS, adiposity disorders and natriuresis

pressure disorders exacerbated by physical compression of the kidneys (35).

Hypertension can be triggered by smoking habits, which are increasingly prevalent among adolescents and young adults today. The results of the study show that the theory is in accordance with the reality in the field that most of the respondents are smokers and the majority of them are men. In the long term, smoking can increase blood pressure due to increased endothelial dysfunctional inflammatory chemicals, plaque, and blood vessel damage. Smoking causes an increase in blood pressure for about thirty minutes (36).

The incidence of hypertension and diet were significantly correlated, according to the bivariate data. This finding is supported by previous research that also states that diet has an effect on hypertension (37). The results showed that 44.7% respondents had an unhealthy diet. This is based on the results of the questionnaire analysis which showed that respondents still consumed foods high in salt. Line with previous research showed there was a meaningful relationship between salt intake and the incidence of hypertension (38). A high salt consumption can cause the arteries to constrict, making it difficult for the heart to pump blood through the narrowed area. This leads to hypertension, which is further exacerbated by an increase in blood pressure and plasma volume.

Hypertension can be caused by an unhealthy diet and lack of physical activity. In this study, a meaningful relationship was obtained between lack of physical activity and the incidence of hypertension. Supported by research conducted on Minangkabau ethnic women in Padang City, it is stated that there is a significant relationship between physical activity and the incidence of hypertension (39). Regular physical activity, such as daily 30-minute exercise, enhances heart and lung endurance, lowers blood pressure, improves cardiovascular function, raises HDL cholesterol, and reduces atherosclerosis (40).

The degree of stress was the last component in this analysis that was substantially correlated with the occurrence of hypertension. Facts in the field show that respondents who have a higher level of stress experience hypertension (48.6%) compared to respondents who have a low stress level (28.2%). Stress can contribute to hypertension by triggering hormone release that increases heart rate and blood flow. Chronic stress may cause cardiovascular changes and hormonal imbalances, leading to high blood pressure (41).

CONCLUSION

The study concluded that hypertension is strongly correlated with modifiable factors such as obesity, smoking, nutrition, physical activity, and stress levels. However, a relationship was also identified between

gender, family history and hypertension prevalence, which is a non-modifiable factor. On the other hand, no notable association was observed between education level and the prevalence of hypertension. This highlights the need for cross-sectoral efforts to raise awareness and enhance hypertension control within the community. Future studies are recommended to design interventions tailored to address specific risk factors in the population.

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