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Risk Factors for Hypertension Incidence in the Riverbank Communities of Banjarmasin City

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Abstract:

Hypertension is a serious medical condition and a leading cause of death worldwide, including in Indonesia. South Kalimantan ranks second for the highest number of hypertension cases Indonesia. Banjarmasin City, particularly its riverbank areas, has unique environmental and socioeconomic conditions that may influence the health status of its residents, including the incidence of hypertension. This study aims to describe the risk factors for hypertension incidence among communities living along the riverbanks of Banjarmasin City, South Kalimantan. This descriptive study involved 70 respondents diagnosed with hypertension from three areas of Puskesmas (Community Health Center) in Banjarmasin City. The results of the study showed several risk factors for hypertension found among the respondents, including age ≥ 40 years (84.29%), female gender (65.71%), Banjar ethnicity (71.43%), high school or equivalent education level (64.29%), knowledge (50%), unemployed status (62.86%), family history of hypertension (68.57%), high salt consumption habits (65.71%), insufficient rest (42.86%), smoking habits (22.86%), low physical activity (62.86%), and obesity (31.43%). These findings indicate that the majority of respondents possessed a combination of both modifiable and non-modifiable risk factors. Therefore, early detection for non-modifiable risk groups and targeted health education and promotion efforts are essential to encourage lifestyle changes and prevent hypertension in the riverbank communities of Banjarmasin City.

Keywords: Banjarmasin city; Community; Hypertension; Incidence; Risk factors

Introduction

Hypertension, known as the "silent killer," is a serious and chronic medical condition that increases mortality rates due to cardiovascular and kidney diseases. Hypertension also significantly doubles the risk of coronary artery disease, quadruples the risk of congestive heart failure, and increases the risk of stroke by seven times.[1] Hypertension is defined as an increase in systolic blood pressure ≥140 mmHg and diastolic blood pressure ≥90 mmHg.[2]

According to the WHO report in 2023, it is estimated that 1.28–1.3 billion people (32-34% of the population) aged 30–79 years worldwide suffer from hypertension.[3] The prevalence of hypertension in Indonesia has fluctuated over the last decade. Based on the Basic Health Research (Riskesdas) data, in 2013, the prevalence of hypertension was 25.8%, which increased to 34.1% in 2018.[4] The 2023 Indonesian Health Survey (SKI) data shows a decrease in hypertension prevalence, with blood pressure measurements on individuals aged ≥18 years showing a prevalence of 30.8%. The provinces with the highest prevalence of hypertension in this age group are Central Kalimantan (40.7%), South Kalimantan (35.8%), and West Java (34.4%).[5] This indicates that the risk of hypertension is influenced not only by individual biological factors but also by the social and environmental conditions in which people live.

One of the areas that requires particular attention is Banjarmasin City, the capital of South Kalimantan Province, located in a tropical wetland region and known as the "City of a Thousand Rivers".[6] Banjarmasin City has slum areas along its riverbanks, accounting for 40%. Dense settlements along riverbanks create a unique yet challenging environment for public health. High humidity, limited access to health services, the widespread consumption of high salt and fat daily food, a lack of open spaces for physical activity, and suboptimal sanitation conditions are daily realities for riverbank communities.[7,8,9] In this context, the environment does not merely serve as a backdrop to people's lives, but it plays an active role in amplifying health risks, including hypertension.

Hypertension can be caused by both modifiable and non-modifiable factors. Non-modifiable factors include age, gender, ethnicity or race, and genetic factors such as a family history of hypertension, cardiovascular diseases, stroke, or kidney diseases. Meanwhile, modifiable factors include overweight or obesity, high salt consumption, physical inactivity (sedentary lifestyle), excessive alcohol consumption, medication side effects, smoking, high blood sugar history, kidney function disorders, and others.[10]

Research Method

Research design

This study is a descriptive research with a cross-sectional design aimed at illustrating the risk factors for hypertension among communities living in riverbank areas in Banjarmasin.

Study subjects

The study subjects are individuals who were newly diagnosed with hypertension in the service areas of three community health centers (Puskesmas) in Banjarmasin City: Banjarmasin Indah Health Center, Teluk Dalam Health Center, and Alalak Selatan Health Center. A total of 70 participants were involved.

Sample size determination

The sample size was determined based on the population served by each

participating health center, taking into account the time constraints and the availability of research resources.

Measurements

Measurements included the administration of a questionnaire containing information related to respondent characteristics and risk factors for hypertension, such as age, sex, ethnicity, education level, knowledge, occupation, family history of hypertension, smoking habits, physical activity, salt consumption, sleep adequacy, and Body Mass Index (BMI).

Statistical analysis

The collected data were analyzed using univariate analysis to describe respondent characteristics based on the variables studied. The results are presented in the form of frequency distribution tables and descriptive narratives.

Results

Sub title

The results of this study are presented in **Table 1** and **Table 2**, which show the frequency distribution of respondents based on non-modifiable and modifiable risk factors for hypertension.

Table 1 presents the non-modifiable risk factors for hypertension, including age, sex, ethnicity, and family hypertension of hypertension. The findings indicate that the majority of respondents were aged 40 years and above (84,29%), while 15,71% were under 40 years old. In terms of sex, most respondents were female (65,71%), with males comprising 34,29% of the respondents. Regarding ethnicity, the majority of respondents identified as Banjar ethnicity (71,43%), followed by Bugis (12,86%), Javanese (8,57%), Sundanese (4,29%), and Batak (2,86%). In terms of family history, 68,57% of respondents reported having a family history of hypertension, while 31,43% did not. These findings suggest that a significant proportion of the study population possessed non-modifiable risk factors that may contribute to the development of hypertension, particularly older age, female sex, and a positive family history.

Table 1 Frequency distribution of respondents according to non-modifiable factors

Variable	Category	Frequency	%
Age	<40 years old	11	15,71
	≥40 years old	59	84,29
Sex	Male	24	34,29
	Female	46	65,71
Ethnicity	Banjar	50	71,43
	Bugis	9	12,86
	Jawa	6	8,57
	Sunda	3	4,29
	Batak	2	2,86
Family history of hypertension	Present	48	68,57
	Absent	22	31,43

Table 2. Frequency distribution of respondents according to modifiable factors

Variable	Category	Frequency	%
Education level	No formal education	2	2,86
	Elementary school	9	12,86
	Junior high school	5	7,14
	Senior high school	45	64,29
	Diploma/Bachelor's Degree	9	12,86
Knowledge	Good	35	50
	Poor	35	50
Occupation	Housewife / unemployed	44	62,86
	Private sector employee	26	37,14
Smoking habits	Yes	16	22,86
	No	54	77,14
Physical activity	Exercise	26	37,14
	Does not exercise	44	62,86
High sodium consumptions	Yes	46	65,71
	No	24	34,29
Sleep adequate	Yes	40	57,14
	No	30	42,86
Body mass index	Underweight (<18,5)	2	2,86
	Normal (18,5 – 25,0)	36	51,43
	Overweight (25,1 – 27,0)	10	14,29
	Obesitas (>27,0)	22	31,43

Table 2 presents the distribution of respondents based on modifiable risk factors for hypertension. The majority of respondents (64.29%) had completed senior high school, while smaller proportions had elementary education (12.86%), a diploma or bachelor's degree (12.86%), junior high school (7.14%), or no formal education (2.86%). Regarding knowledge, the distribution was evenly split, with 50% having good knowledge and 50% having poor knowledge about hypertension. Most respondents (62.86%) were housewives or unemployed, and 37.14% were private sector employees. In terms of lifestyle habits, 77.14% of the participants did not smoke, while 22.86% did. However, a majority (62.86%) reported not engaging in regular physical activity, and 65.71% admitted to consuming high levels of sodium, which are both significant risk factors for hypertension.

In terms of sleep patterns, 57.14% of the respondents reported having adequate sleep, while 42.86% did not. Based on body mass index (BMI), 51.43% had a normal weight, while 31.43% were obese, 14.29% were overweight, and 2.86% were underweight. These findings indicate that while some protective behaviors like non-smoking are common, other modifiable risk factors such as poor diet, physical inactivity, and obesity are prevalent among the respondents, highlighting the need for health promotion strategies focused on lifestyle changes to prevent hypertension.

Discussion

Non-Modifiable Risk Factors for Hypertension in Communities Living in Riverbank Areas in Banjarmasin City

Age

The findings of this study indicate that the majority of respondents were aged 40 years and older (84,29%), while 15,71% were under 40 years old. Suggesting that advancing age is a key non-modifiable risk factor for hypertension. This result is in line with a study by Sari et al. (2024), which reported a significant association between age and the incidence of hypertension, with an odds ratio (OR) of 16,01. This means that older individuals were 16 times more likely to develop hypertension compared to younger age groups.[11] Similarly, Maria et al. (2022) found that most hypertensive patients were aged 45 years and above (67,40%), and the association between age and hypertension was statistically significant (p = 0.000). The increased prevalence of hypertension in individuals aged 40 years and older may be attributed to decreased awareness of the importance of regular health check-ups and a lack of attention to healthy lifestyle practices within this age group.[12]

Sex

Analysis results show that most respondents were female (65.71%), while males accounted for 34.29%. This is consistent with the findings of Garwahusada and Wirjatmadi (2020), who reported that hypertension is more common among women due to hormonal factors, specifically decreased estrogen levels and psychological influences.[13] Additionally, a study by Putri et al. (2025) also found that women are more susceptible to hypertension than men. One contributing factor is that men tend to have fewer health facility visits, resulting in undetected hypertension cases. In contrast, women more frequently visit healthcare facilities for contraception and gynecological services, leading to higher diagnosis rates.[14]

Ethnicity

The analysis also shows that the majority of respondents were of Banjar ethnicity (71.43%), while a small percentage were Sundanese (2.86%). This is largely due to the study being conducted in Banjarmasin City, where the Banjar ethnic group forms the majority. A study by Huldani et al. (2020) showed a significant association between Banjar ethnicity and hypertension, influenced by both lifestyle factors and genetic predispositions. The typical dietary pattern of the Banjar community, which is high in fat, carbohydrates, and protein, may lead to hyperuricemia. This condition contributes to elevated blood pressure through mechanisms such as oxidative stress, endothelial dysfunction, and activation of the renin-angiotensin system. These findings emphasize the importance of incorporating ethnic-based approaches in hypertension prevention and management.[15]

Family history of hypertension

Analysis revealed that a majority of respondents (68.57%) had a family history of

hypertension, while 31.43% did not. Debora et al. (2023) stated that individuals with a family history of hypertension are 7.68 times more likely to develop the condition.[16] Similarly, Ulva and Iriyanti (2021) found that individuals with a family history of hypertension had a 9.3 times greater risk of developing hypertension compared to those without such a history.[17]

These findings reaffirm that non-modifiable risk factors such as age, sex, ethnicity, and family history, play a critical role in the development of hypertension. A deeper understanding of these inherent risk factors is essential for designing early screening strategies and health promotion programs that can effectively target vulnerable populations.

Modifiable Risk Factors for Hypertension in Communities Living in Riverbank Areas in Banjarmasin City

Education Level

The findings reveal that most respondents had a senior high school education (64.29%), with only a small proportion having no formal education (2.86%). Prior research by Putri et al. emphasizes the significant impact of educational attainment on hypertension incidence among young adults.[14] Higher education levels are often linked to better health literacy, which influences healthier lifestyle choices, such as improved dietary habits, regular exercise, and routine medical check-ups. These behaviors contribute to the early detection and management of hypertension.[18]

Knowledge

Half of the respondents were found to have good knowledge about hypertension, while the other half had poor knowledge. Previous research by Setyaningrum et al (2024) has shown a strong correlation between knowledge and hypertension, with better knowledge being associated with a lower incidence of the condition.[19] A study by Hamid (2024) also highlighted that knowledge plays a significant role in shaping behaviors related to non-communicable diseases.[20] Widya et al. (2024) found a significant association between knowledge levels and preventive behaviours among patients at Gunungsari Health Center, highlighting the importance of patient education in mitigating hypertension complications.[21]

Occupation

This study found that the majority of respondents (62.86%) were unemployed or housewives. This align with the study by Putri et al., which found a significant association between employment status and hypertension ($p<0.001$, OR=1.267 (95% CI: 1.166–1.377). Employment status reflect socioeconomic conditions, with lower-paying jobs often linked to higher stress levels and limited access to healthcare, exacerbating health problems including hypertension.[14] A study by Esa (2022) also found a significant relationship between employment status and hypertension ($p = 0.003$; 95% CI: 1.661–10.871), where unemployed individuals had a 4.2 times higher hypertension risk. Unemployment may increase the hypertension risk through financial instability, stress, unhealthy coping mechanisms like alcohol or unhealthy foods, which are known risk factors. Overall, a combination of stress, lifestyle changes, and reduced health attention makes unemployment a significant factor in the increased risk of hypertension.[22]

Smoking history

Based on the smoking habits of respondents, 77.14% reported not smoking, while 22.86% identified as smokers. This aligns with a study by Esa (2022), which found no significant association between smoking and

hypertension (p=0.072).[22] Similarly, a meta-analysis by Aryanpur et al. (2019) showed no significant link between active or passive smoke exposure and hypertension among children and adolescents, though passive exposure was associated with increased systolic blood pressure. These findings suggest that while the direct relationship between smoking and hypertension may not be evident in younger individuals, passive smoke exposure could be a future risk factor.[23]

Conversely, evidence from other studies suggests a clearer link between smoking and hypertension among both current and former smokers.[24] Smoking is a major cardiovascular risk factor due to the presence of nicotine and carbon monoxide in cigarettes.[25] Nicotine affects heart rate and blood pressure by stimulating the release of catecholamines and activating the sympathetic nervous system. This stimulation leads to increased heart rate and blood pressure through elevated secretion of epinephrine and norepinephrine.[26] Research by Debora et al. (2023) demonstrated a significant association between smoking and hypertension, with a p-value of 0.01.[16] A study in Vietnam by Cuong et al. (2019) also found that men who smoked had a higher risk of hypertension compared to non-smokers, with the risk increasing proportionally with the number of cigarettes smoked per day (dose-response relationship). It should be noted, however, that this study did not further investigate whether respondents identified as active smokers were also exposed to secondhand smoke, which may have influenced the findings.[27]

Physical activity

A total of 62.86% of respondents reported not having a regular exercise habit, while 37.14% indicated that they engaged in physical activity. This finding aligns with the study by Debora et al. conducted in Minahasa, which found a significant association between physical inactivity and hypertension (p = 0.01). Respondents who rarely exercised were found to be 3.1 times more likely to develop hypertension compared to those who engaged in regular physical activity. Physical activity plays a critical role in maintaining blood pressure stability through its influence on cardiac performance and vascular elasticity. Lack of physical activity is closely linked to both obesity and hypertension, primarily due to reduced energy expenditure and an imbalance in fat metabolism. This imbalance can lead to an increased resting heart rate, causing the heart muscle to work harder with each contraction. The more forcefully the heart contracts, the greater the pressure exerted on arterial walls, leading to increased peripheral resistance and, consequently, elevated blood pressure.[16]

High sodium intake

Based on the respondents' dietary habits, 65.71% reported frequently consuming sodium in amounts exceeding one teaspoon per day, while 34.29% stated they did not have a habit of excessive sodium intake. This finding aligns with research conducted by Esa (2022), which found that high sodium consumption was significantly associated with the incidence of hypertension (p=0.0012, OR 3, 95% CI 1.273–7.005).[22] Excessive dietary sodium is a major risk factor for hypertension, as it can elevate blood pressure and contribute to cardiovascular disease.[28,29] The mechanisms underlying this relationship involve several physiological processes, including increased extracellular fluid volume, impaired renal function, and stimulation of the sympathetic nervous system, all of which contribute to elevated blood pressure.[29] Furthermore, a study by Istamayu (2024) also demonstrated a significant association between the frequency of salty food

consumption and hypertension, with a p-value of 0.048.[30]

Sleep adequacy

Based on the assessment of sleep adequacy, 57.14% of respondents reported having sufficient rest, with a sleep duration ranging from 5 to 7 hours per night. Meanwhile, 42.86% stated that they did not get enough rest. A study by Pitoy (2024) found no significant association between sleep quality and blood pressure (p=1.000).[31] This is consistent with the findings of Galindra et al. (2024), which showed no significant relationship between the degree of hypertension and sleep quality (p=0.115).[32]

However, other studies have suggested that both the duration and quality of sleep can influence the risk of hypertension. Short sleep duration that defined as less than five hours per night has been associated with increased risk and prevalence of hypertension.[33,34] Poor sleep quality has also been strongly linked to higher incidence of hypertension. Ningtyas (2024) reported that 61.7% of elderly individuals with poor sleep quality suffered from hypertension.[35] Furthermore, gender and age are also contributing factors to sleep quality. Women are more susceptible to the effects of poor sleep on hypertension, while older adults often experience changes in sleep patterns that may increase their risk of developing hypertension. Maintaining healthy sleep patterns in older adults can significantly reduce the risk of hypertension.[36,37]

Body Mass Index (BMI)

Based on the BMI assessment of the respondents, 51.43% had a normal BMI, 31.43% were obese, 14.29% were overweight, and 2.86% were underweight. Although individuals with a normal BMI generally have a lower risk of hypertension compared to those who are obese, this does not mean they are immune to hypertension. Research shows that factors such as lifestyle and genetic predisposition can cause variations in blood pressure even among individuals with a normal BMI.[38]

An increase in BMI is significantly associated with a higher risk of hypertension.[28,39,40] Ulum (2023) explains that as body mass increases, more blood supply is required, leading to an increase in circulating blood volume, which results in higher blood pressure on the vessel walls.[39] Furthermore, Tan (2023) found that for each 1-point increase in BMI, the incidence of hypertension increases by 8-10%, depending on gender.[41] Among the elderly, higher BMI is also a risk factor for hypertension, as found by Werdani et al. (2022).[42] Research by Xiao et al. (2024) demonstrates that BMI correlates with increased vascular resistance and faster heart rate in hypertensive patients. Overall, BMI plays a crucial role in determining hypertension risk. Individuals with a higher BMI, especially those who are obese, have a greater risk of developing hypertension. While individuals with a normal BMI have a lower risk, other factors such as lifestyle and genetic predisposition still influence their blood pressure levels.[43]

This descriptive study found that hypertension has various risk factors, both modifiable and non-modifiable. A comprehensive approach is essential for early prevention and treatment. Therefore, strategies involving health education, lifestyle changes, and early detection are needed to reduce the prevalence of hypertension, particularly among groups in the population that are vulnerable to these risk factors.

Conclusions

This descriptive study conducted among communities living along the riverbanks of Banjarmasin identified a range of risk factors associated with the incidence of hypertension. Non-modifiable risk factors

included age, gender, ethnicity, and family history of hypertension, while modifiable risk factors comprised education level, health knowledge, employment status, physical activity, smoking habits, salt intake, sleep adequacy, and body mass index. The majority of respondents were aged ≥ 40 years, female, of Banjar ethnicity, unemployed, had a family history of hypertension, engaged in low physical activity, consumed excessive salt, and demonstrated limited knowledge about hypertension. These characteristics reflect a population with a substantial burden of both modifiable and non-modifiable risks.

Although the study does not establish causal relationships, the findings underscore the importance of targeted health promotion strategies. Efforts to reduce the incidence of hypertension in riverbank communities should involve comprehensive, such as health education, promotion of physical activity, dietary modification, and early risk detection. Public health interventions tailored to the ecological and socio-cultural context of wetland urban environments like Banjarmasin are crucial for effective prevention. Further analytical research is recommended to explore the strength of associations between specific risk factors and hypertension outcomes..

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