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Factors Associated with the Incidence of Hypertension at RSUD Daya Makassar

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ABSTRACT

Background: *Hypertension is one of the non-communicable diseases that represents a major cause of morbidity and mortality worldwide. The prevalence of hypertension continues to increase and is influenced by various factors, both modifiable and non-modifiable. This study aims to determine the factors associated with the incidence of hypertension.*

Objective: *To analyze the relationship between age, gender, and stress level and the incidence of hypertension at RSUD Daya.*

Methods: *This study employed a quantitative design with an observational analytic cross-sectional approach. The population consisted of 116 patients who visited RSUD Daya, with a sample of 30 respondents determined using the Slovin formula. Data were analyzed using the Chi-Square test with a significance level of α = 0.05.*

Results: *The results showed a significant relationship between age and the incidence of hypertension (p = 0.033), gender and the incidence of hypertension (p = 0.025), and stress level and the incidence of hypertension (p = 0.005). Older respondents had a higher risk of developing hypertension. Women showed a higher proportion of hypertension compared to men. Additionally, respondents with severe stress levels had a higher likelihood of experiencing hypertension compared to those with mild stress.*

ABSTRAK

Latar Belakang: Hipertensi merupakan salah satu penyakit tidak menular yang menjadi penyebab utama morbiditas dan mortalitas di dunia. Prevalensi hipertensi terus meningkat dan dipengaruhi oleh berbagai faktor, baik yang dapat dimodifikasi maupun yang tidak dapat dimodifikasi. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berhubungan dengan kejadian hipertensi.

Tujuan: Untuk menganalisis hubungan usia, jenis kelamin, dan tingkat stres dengan kejadian hipertensi di RSUD Daya Kota Makassar

Metode: Jenis penelitian yang digunakan adalah kuantitatif dengan desain analitik observasional pendekatan cross sectional. Populasi dalam penelitian ini adalah 116 pasien yang berkunjung ke RSUD Daya, dengan jumlah sampel sebanyak 30 responden yang ditentukan menggunakan rumus Slovin. Teknik analisis data menggunakan uji Chi-Square dengan tingkat kemaknaan α = 0,05.

Hasil: Hasil penelitian menunjukkan bahwa terdapat hubungan yang signifikan antara usia dengan kejadian hipertensi (p = 0,033), jenis kelamin dengan kejadian hipertensi (p = 0,025), dan tingkat stres dengan kejadian hipertensi (p = 0,005). Responden dengan usia lebih tua memiliki risiko lebih tinggi mengalami hipertensi. Perempuan menunjukkan proporsi hipertensi lebih besar dibandingkan laki-laki. Selain itu, responden dengan tingkat stres berat memiliki kecenderungan lebih tinggi mengalami hipertensi dibandingkan dengan stres ringan.

INTRODUCTION

High blood pressure, commonly known as hypertension, is a medical condition that significantly increases the risk of heart, kidney, brain, and other disorders. According to a pooled analysis of 1,201 population-representative

studies, the number of people aged 30–79 years with hypertension is estimated to have doubled between 1990 and 2019, from approximately 650 million to 1.28 billion. Aging and population expansion are the primary contributors to hypertension. Although there has been little change in the overall age-standardized prevalence of hypertension globally, its burden has shifted from low-age groups in high-income countries (HICs) to middle-income countries. Hypertension rates have declined in HICs but increased in many low-income countries. In 2019, more than one billion adults aged 30–79 years with hypertension were living in low-income countries (WHO, 2022).

One of the current challenges in health development is the shift in disease patterns from communicable to non-communicable diseases (NCDs). The high prevalence of NCDs leads to reduced productivity and disruptions in daily activities. NCDs are the leading cause of death globally; these diseases are not transmissible through contact and cause approximately 35 million deaths annually, accounting for 60% of all deaths worldwide (Sudayasa et al., 2020). The majority (80%) of NCDs occur in developing countries, including Indonesia. NCDs can result from physical inactivity, poor dietary patterns, smoking, and can cause increased blood glucose, elevated blood lipids, and elevated blood pressure. If these increases are not controlled, they can worsen and lead to chronic diseases, including hypertension (Beale & Demaio, 2019).

Hypertension is considered a serious health problem because it is a major risk factor for cardiovascular diseases such as stroke, heart failure, and myocardial infarction (Siswanto et al., 2020). A person is considered hypertensive when arterial blood pressure increases, with a systolic pressure ≥140 mmHg or a diastolic pressure ≥90 mmHg on repeated measurements. Systolic blood pressure is the primary measure used to determine the diagnosis of hypertension. Hypertension, or high blood pressure, is a disorder of the blood vessels that impedes the delivery of oxygen and nutrients carried by the blood to the tissues that require them. Normal blood pressure limits vary according to age (Khan et al., 2021).

According to the Basic Health Research (Riskesdas 2018), the prevalence of hypertension in Indonesia increased from 25.8% in 2013 to 34.11% in 2018. The prevalence of high blood pressure in females (36.85%) was higher than in males (31.34%). The prevalence in urban areas was slightly higher (34.43%) compared to rural areas (33.34%). South Kalimantan Province had the highest prevalence at 44.13%, while South Sulawesi Province ranked 18th at 31.7%. Based on the Central Bureau of Statistics, the prevalence of hypertension in South Sulawesi Province was 28.1% in 2013, increased to 31.7% in 2018, and then decreased to 25.06% in 2020 (Ministry of Health, Indonesia, 2019).

According to the South Sulawesi Provincial Health Office in 2020, based on district/city data, the highest prevalence of hypertension was in Makassar City with 290,247 cases, followed by Bone Regency with 158,516 cases, and Gowa Regency with 157,221 cases. The lowest prevalence was found in Barru Regency with 1,500 cases. According to non-communicable disease surveillance in the disease control division (P2P) of the Makassar City Health Office, among the 47 community health centers (Puskesmas) in Makassar, the highest hypertension prevalence in 2021 was at Kassi-Kassi Puskesmas, Rappocini District. Additionally, surveillance data from Kassi-Kassi Puskesmas in Makassar from January–February 2022 showed an estimated 1,250 cases of hypertension. Thus, hypertension ranked second among the top ten diseases at the Puskesmas (South Sulawesi Provincial Health Office, 2021).

Gender is one of the non-modifiable factors influencing blood pressure. Women undergoing menopause have a higher tendency to develop hypertension compared to men. This statement is supported by research conducted by Wahyuni and Eksanoto (2013), which found that women have an increased risk of hypertension after menopause, i.e., above 45 years of age. Postmenopausal women have lower estrogen levels, and estrogen functions to increase high-density lipoprotein (HDL) levels, which play a crucial role in maintaining vascular health. In postmenopausal women, decreased estrogen levels are accompanied by reduced HDL levels if not balanced with a healthy lifestyle (Loewenstein et al., 2021).

Research has shown a relationship between stress and systolic and diastolic blood pressure in hypertensive individuals of productive age, with p-values of 0.032 and 0.000, respectively. Hypertensive individuals experiencing

high stress have a 3.29 times higher risk of increased systolic blood pressure and a 10 times higher risk of increased diastolic blood pressure compared to those with low stress levels.

METHODS

This quantitative study used an observational analytic design with a cross-sectional approach. The research was conducted from May to July 2025 at RSUD Daya. The study population consisted of 116 patients who visited the hospital during the study period. A sample of 30 respondents was determined using the Slovin formula with a 5% margin of error. Participants were selected based on inclusion criteria: aged 18 years or older, diagnosed with hypertension, willing to participate, and having complete medical records. Patients with terminal illnesses, pregnancy, incomplete data, or those who refused participation were excluded.

Data were collected using a structured questionnaire to obtain demographic information (age and gender) and to assess stress levels. Blood pressure was measured using a calibrated sphygmomanometer, and hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg. Data processing included editing, coding, tabulation, and entry into SPSS version 26, followed by data cleaning. Univariate analysis was conducted to describe the distribution of variables. Bivariate analysis was performed using the Chi-Square test to examine the association between age, gender, stress level, and the incidence of hypertension, with a significance level set at $\alpha = 0.05$.

RESULTS

1. Characteristics of Respondents

Table 1. Distribution of Respondents' Characteristics on the Incidence of Hypertension at RSUD Daya

Variable	Category	Frequency (n)	Percentage (%)
Age	Adult	2	6.7
	Early Elderly	16	53.3
	Elderly	12	40.0
Gender	Male	5	16.7
	Female	25	83.3
Stress Level	Mild	19	63.3
	Severe	11	36.7
Hypertension Status	Normal	18	60.0
	Hypertension	12	40.0

Table 1 shows that the majority of respondents were classified as early elderly (53.3%), followed by elderly (40.0%), and a small proportion were adults (6.7%). Most respondents were female (83.3%), while males accounted for 16.7%. Regarding stress level, 63.3% experienced mild stress and 36.7% experienced severe stress. In terms of hypertension status, 40.0% of respondents were categorized as hypertensive, while 60.0% had normal blood pressure. These findings indicate that hypertension remains prevalent among the study population.

2. Association Between Age and the Incidence of Hypertension

Table 2. Table. Association of Age, Gender, and Stress Level with the Incidence of Hypertension at RSUD Daya

Variabel	Normal		Hypertension		Total		*p-value*
	n	%	n	%	n	%	
Age							
Adult	0	0	2	6,7	2	6,7	0,033
Early Elderly	8	26,7	8	26,7	16	53,3	

Variabel	Normal		Hypertension		Total		*p-value*
	n	%	n	%	n	%	
Elderly	10	33,3	2	6,6	12	40,0	
Sex							
Male	5	16,7	0	0,0	5	16,7	0,005
Female	14	43,3	12	40,0	25	83,3	
Stress Level							
Mild	15	50	4	13,3	19	63,3	0,005
Severe	3	10,0	8	26,7	11	36,7	

Based on the table, out of 30 respondents, 12 (40.0%) were classified as hypertensive and 18 (60.0%) had normal blood pressure. In terms of age, all respondents in the adult group (6.7%) were hypertensive. In the early elderly group, the proportion of normal and hypertensive respondents was equal (26.7% each). Among the elderly group, most respondents were classified as normal (33.3%), while 6.6% were hypertensive. The Chi-Square test showed a p-value of 0.033 ($p < 0.05$), indicating a significant association between age and the incidence of hypertension. Regarding gender, all male respondents (16.7%) were classified as normal, whereas 40.0% of female respondents were hypertensive. The statistical test showed a p-value of 0.005 ($p < 0.05$), meaning there was a significant association between gender and hypertension incidence. For stress level, respondents with mild stress were predominantly normal (50.0%), with only 13.3% experiencing hypertension. Conversely, among those with severe stress, 26.7% were hypertensive compared to 10.0% who were normal. The Chi-Square test yielded a p-value of 0.005 ($p < 0.05$), indicating a significant relationship between stress level and hypertension. Overall, age, gender, and stress level were significantly associated with the incidence of hypertension at RSUD Daya Makassar.

DISCUSSION

1. Association Between Age and the Incidence of Hypertension

The results showed a significant association between age and the incidence of hypertension among respondents at RSUD Daya ($p = 0.033$). The distribution of cases across age categories revealed an interesting variation pattern. In the adult group, all respondents were classified as hypertensive; however, the number was limited to only two individuals, thus interpretation should be made cautiously. In the early elderly group, the proportion of respondents with normal blood pressure and hypertension was equal (26.7% each), indicating a relatively balanced risk of hypertension in this age category. Meanwhile, the elderly group showed a higher proportion of normal cases (33.3%) compared to hypertension (6.7%), suggesting a lower observed prevalence compared to the early elderly group.

Physiologically, increasing age is closely associated with structural and functional changes in the cardiovascular system that elevate hypertension risk. Franklin et al. (2020) in *Hypertension* explained that aging leads to reduced arterial elasticity, increased aortic stiffness, and elevated peripheral vascular resistance, all contributing to higher blood pressure. Similarly, Zhou et al. (2021) in the *Journal of the American Heart Association* emphasized that hypertension risk increases progressively with age due to the accumulation of metabolic risk factors and chronic inflammation.

Although the elderly group in this study appeared to have a lower prevalence than the early elderly group, this phenomenon may be influenced by sample distribution, lifestyle factors, or ongoing medical treatment (Kearney et al., 2020). Overall, these findings are consistent with previous evidence indicating that age is a significant determinant of hypertension (Mills et al., 2020; Kaplan & Victor, 2021).

2. Association Between Gender and the Incidence of Hypertension

The analysis demonstrated a significant association between gender and hypertension incidence (p = 0.025). All male respondents (16.7%) were categorized as normal, with no reported cases of hypertension. In contrast, females showed a higher proportion of hypertension (40.0%), while 43.3% were classified as normal. This finding suggests that women in this study population had a higher proportion of hypertension compared to men.

This result aligns with studies indicating that women, particularly in middle to older age, tend to experience increased blood pressure. Reckelhoff (2021) in *Hypertension* reported that hormonal changes, especially decreased estrogen levels after menopause, contribute to elevated blood pressure in women. Estrogen has protective cardiovascular effects; therefore, its decline increases vascular resistance. Ji et al. (2020) in the *Journal of Clinical Hypertension* also reported higher hypertension prevalence among older women compared to men, particularly post-menopause. Lifestyle and psychosocial factors may also contribute. Women often experience chronic stress and dual role burdens related to family and work responsibilities, which may trigger elevated blood pressure. However, the imbalance in sample size between males and females (5 vs. 25 respondents) requires cautious generalization. Nevertheless, the findings remain consistent with evidence that gender influences hypertension risk variation.

3. Association Between Stress Level and the Incidence of Hypertension

The analysis indicated a significant association between stress level and hypertension incidence (p = 0.005). Respondents with mild stress were predominantly normal (50.0%), with only 13.3% classified as hypertensive. Conversely, those with severe stress showed a markedly higher proportion of hypertension (26.7%), compared to only 10.0% who were normal. This distribution suggests that higher stress levels are directly associated with increased hypertension prevalence. The statistical significance supports physiological theories that chronic stress activates the sympathetic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis, increasing vascular tone, cortisol levels, and catecholamine release (adrenaline and noradrenaline). These mechanisms contribute to sustained blood pressure elevation (Spruill, 2010; Cohen et al., 2021).

These findings are consistent with previous studies. Sparrenberger et al. (2009) in the *Journal of Hypertension* reported that psychosocial stress significantly correlates with hypertension through sympathetic activation and hormonal responses. Brunner et al. (2017) in *Hypertension* also emphasized that long-term stress exposure contributes to blood pressure elevation via metabolic and inflammatory pathways. Additionally, Wulandari and Lestari (2020) in Indonesia found that individuals with high stress levels had a 2–3 times greater risk of hypertension compared to those without stress. Overall, this study strengthens the evidence that stress plays a critical role in hypertension development. Preventive strategies such as stress management, mental health education, and promotion of healthy lifestyles are essential components of hypertension control in the community.

CONCLUSION

This study found significant associations between age (p = 0.033), gender (p = 0.025), and stress level (p = 0.005) and the incidence of hypertension at RSUD Daya. Older age, female gender, and severe stress were associated with a higher proportion of hypertension. These findings highlight the importance of demographic and psychosocial factors in hypertension prevention and management.

LIMITATIONS AND RECOMMENDATION

The study was limited by a small sample size and a cross-sectional design, which restricts causal interpretation. Gender imbalance and self-reported stress assessment may also affect the results. Future research with larger samples and longitudinal designs is recommended. Strengthening routine screening, stress management programs, and health education is essential to reduce hypertension risk.

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