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Determinant Factors Of Hypertension Incidence In The Productive Age Group (15–64 Years) In The Working Area Of WEE Karou Community Health Center, West Sumba Regency

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Abstract

Hypertension is a non-communicable disease characterized by systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, which often occurs without symptoms but can lead to serious complications such as cardiovascular disease, stroke, and chronic kidney disease. Productive-age populations are increasingly at risk due to lifestyle-related factors. This study aimed to analyze the determinant factors of hypertension among productive-age individuals (15–64 years) in the working area of Wee Karou Community Health Center, Sumba Barat Regency. This study employed a quantitative analytic observational design using a case-control approach. The study was conducted in January–February 2026. The sample consisted of 170 respondents, including 85 cases (hypertensive individuals) and 85 controls (non-hypertensive individuals), selected using simple random sampling with matching based on age and gender. Data were collected using questionnaires and medical record documentation. Data were analyzed using univariate and bivariate analysis with the Chi-square test and Odds Ratio (OR) at a 95% confidence level. Results: The results showed that obesity was significantly associated with hypertension (p = 0.044; OR = 1.97), smoking habits were significantly associated with hypertension (p = 0.044; OR = 1.97), poor sleep quality showed a significant association (p = 0.001; OR = 2.91), and betel quid consumption was also significantly associated with hypertension (p = 0.037; OR = 2.23). Among all variables, poor sleep quality showed the strongest association with hypertension incidence. Conclusion: Obesity, smoking habits, poor sleep quality, and betel quid consumption are determinant factors of hypertension among productive-age individuals in the Wee Karou Health Center area.

Keywords: Hypertension, Obesity, Smoking, Sleep Quality, Betel Quid Consumption, Productive Age.

INTRODUCTION

Hypertension is a condition in which systolic blood pressure reaches ≥140 mmHg and/or diastolic blood pressure reaches ≥90 mmHg persistently. This condition often occurs without symptoms; however, it has the potential to cause target organ damage such as the heart, brain, kidneys, and blood vessels. The main complications of hypertension include coronary heart disease, heart failure, ischemic and hemorrhagic stroke, chronic kidney disease, hypertensive retinopathy, and systemic vascular damage, all of which significantly increase global morbidity and mortality rates (WHO, 2021).

The physical impact of hypertension also significantly affects the psychological condition of patients, leading them to feel that their life is meaningless due to prolonged weakness and chronic illness, which may even last a lifetime (Prastika et al., 2021). Economically, hypertension imposes a substantial burden, including long-term treatment costs that may last for one year or even a lifetime, loss of productive working days due to medical care, costs for managing complications, and premature death caused by hypertension (Maulia et al., 2021).

Hypertension is one of the most significant public health problems globally and has been recognized as a leading cause of premature death worldwide. According to the latest report from the World Health Organization (WHO), approximately 1.4 billion adults aged 30–79 years worldwide live with hypertension, yet nearly half of them (46%) are unaware of their condition. This situation contributes to more than 10 million deaths annually, making hypertension the greatest risk factor for cardiovascular diseases such as ischemic heart disease, heart failure, stroke, and chronic kidney failure. WHO emphasizes that hypertension is a major cause of preventable morbidity and premature mortality if early detection and control are implemented. Furthermore, WHO reports that in the last three years, the global prevalence of hypertension has continued to increase in absolute numbers,

particularly in Southeast Asia and the Western Pacific region, despite slight improvements in developed countries due to increased awareness of healthy lifestyles and risk factor control (WHO, 2025).

Based on the Basic Health Research (Riskesdas) 2018, the number of people with hypertension in Indonesia reached 63,309,620 individuals, with 427,218 deaths related to hypertension. Riskesdas 2018 also reported that the prevalence of doctor-diagnosed hypertension among individuals aged 18 years and older was highest in the age group ≥75 years (69.5%). Based on gender, women had a higher prevalence (36.9%) compared to men (31.3%). In terms of residence, urban populations showed a higher prevalence of hypertension (34.4%) compared to rural populations (33.7%).

In East Nusa Tenggara Province, hypertension cases were recorded at 188,452 in 2021, 230,958 in 2022, and 145,898 in 2023 (Provincial Health Office of NTT, 2022). Meanwhile, data from the Sumba Barat District Health Office show fluctuating trends from 2021 to 2025, with 5,267 cases in 2021, 4,156 cases in 2022, 3,721 cases in 2023, 2,330 cases in 2024, and 2,482 cases in 2025. This indicates that hypertension remains a significant public health issue requiring continuous attention and control.

Data from Wee Karou Community Health Center show that hypertension is among the top ten most common diseases in its service area and is one of the largest contributors to hypertension cases in Sumba Barat Regency. In 2023, there were 403 cases, in 2024 there were 296 cases, and in 2025 there were 468 cases. Wee Karou Health Center serves a community with diverse social, cultural, and lifestyle characteristics, which may influence the pattern of hypertension occurrence in the area.

Hypertension is more commonly found in older age groups; however, productive age groups, including adolescents and young adults, are also increasingly at risk. Individuals in this age group often experience high levels of stress and activity, leading them to neglect healthy lifestyles (Erma et al., 2021). Research by Pebriyani et al. (2022) shows that productive age groups are vulnerable to hypertension due to unbalanced lifestyle factors such as irregular eating habits, stress, and lack of rest. Major risk factors contributing to hypertension in this age group include obesity, smoking habits, and poor sleep quality, which can increase blood pressure through metabolic disturbances and activation of the sympathetic nervous system (Rachmawati et al., 2023). Based on the above facts supported by reliable data sources, the researcher is interested in conducting a study to analyze the determinant factors of hypertension incidence in the productive age group (15–64 years) in the working area of Wee Karou Community Health Center, West Sumba Regency.

RESEARCH METHODS

This study is a quantitative research with an analytical observational design using a case-control approach. This design aims to identify risk factors for hypertension through a retrospective approach by comparing the case group (individuals with hypertension) and the control group (individuals without hypertension), and then tracing potential risk factors that may have influenced the condition in the past.

This study was conducted in the working area of Wee Karou Community Health Center, Loli District, West Sumba Regency, East Nusa Tenggara Province, for one month, from January to February 2026. The study population included productive age individuals (15–64 years) who either had or did not have hypertension. The case population consisted of 194 individuals with hypertension, while the control population consisted of 415 individuals without hypertension based on medical record data from July to October 2025. The study sample consisted of 170 respondents with a 1:1 ratio, namely 85 cases and 85 controls, determined using the Lemeshow formula for case-control studies. The sampling technique used probability sampling with simple random sampling, where respondents were randomly selected using Microsoft Excel (RANDBETWEEN function). Matching was also performed based on age and gender to ensure comparability between the case and control groups.

Data collection in this study was conducted using questionnaires administered directly to respondents to obtain information related to factors associated with hypertension. In addition, data collection was supported by documentation, namely secondary data obtained from records or medical records available at Wee Karou Community Health Center. The instruments used included questionnaires as the main tool for collecting primary data through structured questions, and documentation as a supporting data source derived from written records, archives, and medical records related to hypertension cases in the study area.

Data analysis in this study was performed using univariate and bivariate analysis. Univariate analysis was used to describe the characteristics of each study variable, both independent and dependent variables, through frequency distributions and percentages. The variables analyzed included betel nut consumption, obesity, smoking habits, sleep quality, and hypertension incidence. Bivariate analysis was used to examine the relationship between independent and dependent variables. The statistical test used was the Chi-Square test with a significance level of $p < 0.05$ to determine whether there was a significant association between risk factors and hypertension incidence. If the Chi-Square assumptions were not met, Fisher's Exact Test was used as an alternative. Furthermore, the strength of the relationship between variables was analyzed using Odds Ratio (OR) with a 95% Confidence Interval (CI) to determine whether a factor is classified as a risk factor, protective factor, or has no association with hypertension incidence.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of respondents in this study describe the distribution of subjects based on gender, age group, education level, occupation, and hypertension status. This description is important to provide a descriptive overview of the respondents included in the sample in the working area of Wee Karou Community Health Center.

Table 1. Respondent Characteristics in the Wee Karou Community Health Center Area

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	90	52.9
	Female	80	47.1
Age Group	15–24 years	26	15.3
	25–34 years	34	20.0
	35–44 years	36	21.2
	45–54 years	34	20.0
	55–64 years	40	23.5
Education	No formal education	20	11.8
	Primary school/equivalent	13	7.6
	Junior high school/equivalent	13	7.6
	Senior high school/equivalent	74	43.5
	Higher education	50	29.4
Occupation	Private employee	27	15.9
	Teacher/Civil servant/Police	24	14.1
	Student	24	14.1
	Housewife	19	11.2
	Retired	19	11.2
	Fisherman/Farmer	19	11.2
	Entrepreneur	16	9.4
	Laborer/driver/ride-hailing worker	13	7.6
	Unemployed	9	5.3
Hypertension Status	Hypertension (case)	85	50.0
	Non-hypertension (control)	85	50.0
Total		170	100

Based on Table 1, the characteristics of respondents in this study show that out of 170 respondents, the majority were male, with 90 individuals (52.9%), while females accounted for 80 individuals (47.1%). This indicates a relatively balanced gender distribution among respondents. Based on age group, most respondents were in the 55–64 years age group, totaling 40 individuals (23.5%), followed by the 35–44 years age group with 36 individuals (21.2%). The 25–34 years and 45–54 years groups each consisted of 34 individuals (20.0%), while the 15–24 years group had the lowest number, with 26 individuals (15.3%). Regarding education level, most respondents had completed senior high school/equivalent, totaling 74 individuals (43.5%), followed by higher education graduates with 50 individuals (29.4%). Respondents with no formal education numbered 20 individuals (11.8%), while those with primary and junior high school education each accounted for 13 individuals (7.6%). Based on occupation, respondents had diverse backgrounds. The most common occupation was private employees, with 27 individuals (15.9%), followed by teachers/civil servants/police and students, each with 24 individuals (14.1%). Housewives, retirees, and fishermen/farmers each accounted for 19 individuals (11.2%). Entrepreneurs numbered 16 individuals (9.4%), laborers/drivers/ride-hailing workers 13 individuals (7.6%), and unemployed respondents 9 individuals (5.3%). Based on hypertension status, the number of respondents in both the case (hypertension) and control (non-hypertension) groups was equal, with 85 individuals (50.0%) each. This indicates that the sample distribution between case and control groups was balanced in accordance with the case-control study design.

Bivariate Analysis

The bivariate analysis in this study was conducted to examine the relationship between independent variables, namely obesity, smoking habits, sleep quality, and betel quid consumption, and the dependent variable, hypertension incidence among productive-age individuals (15–64 years) in the working area of Wee Karou Community Health Center. The statistical test used was the Chi-Square test with a 95% confidence level.

Relationship between Obesity and Hypertension Incidence

Table 2. Relationship between Obesity and Hypertension Incidence among Productive-Age Individuals in the Wee Karou Community Health Center Area

Obesity Status	Case n (%)	Control n (%)	Total	p-value	OR (95% CI)
Obese	55 (57.3)	41 (42.7)	96	0.044	1.97 (1.06–3.64)
Not obese	30 (40.5)	44 (59.5)	74		
Total	85	85	170		

Based on Table 2, among 96 obese respondents, 55 individuals (57.3%) were classified as hypertension cases, while 41 individuals (42.7%) were controls. Meanwhile, among 74 non-obese respondents, 30 individuals (40.5%) were cases and 44 individuals (59.5%) were controls.

The Chi-Square test showed a p-value of 0.044 (<0.05), indicating a significant relationship between obesity and hypertension incidence. The OR value of 1.97 indicates that obese respondents have a 1.97 times higher risk of developing hypertension compared to non-obese respondents.

Relationship between Smoking Habits and Hypertension Incidence

Table 3. Relationship between Smoking Habits and Hypertension Incidence among Productive-Age Individuals in the Wee Karou Community Health Center Area

Smoking Habit	Case n (%)	Control n (%)	Total	p-value	OR (95% CI)
Smoker	44 (59.5)	30 (40.5)	74	0.044	1.97 (1.06–3.64)
Non-smoker	41 (42.7)	55 (57.3)	96		
Total	85	85	170		

Based on Table 3 among 74 smokers, 44 individuals (59.5%) were cases and 30 individuals (40.5%) were controls. Among 96 non-smokers, 41 individuals (42.7%) were cases and 55 individuals (57.3%) were controls. The Chi-Square test showed a p-value of 0.044 (<0.05), indicating a significant relationship between smoking habits and hypertension incidence. The OR value of 1.97 indicates that smokers have a 1.97 times higher risk of developing hypertension compared to non-smokers.

Relationship between Sleep Quality and Hypertension Incidence

Table 4. Relationship between Sleep Quality and Hypertension Incidence among Productive-Age Individuals in the Wee Karou Community Health Center Area

Sleep Quality	Case n (%)	Control n (%)	Total	p-value	OR (95% CI)
Poor	50 (64.1)	28 (35.9)	78	0.001	2.91 (1.56–5.44)
Good	35 (38.0)	57 (62.0)	92		
Total	85	85	170		

Based on Table 4, among 78 respondents with poor sleep quality, 50 individuals (64.1%) were cases and 28 individuals (35.9%) were controls. Among 92 respondents with good sleep quality, 35 individuals (38.0%) were cases and 57 individuals (62.0%) were controls. The Chi-Square test showed a p-value of 0.001 (<0.05), indicating a significant relationship between sleep quality and hypertension incidence. The OR value of 2.91 indicates that individuals with poor sleep quality have a 2.91 times higher risk of developing hypertension compared to those with good sleep quality.

Relationship between Betel Quid Consumption and Hypertension Incidence

Table 5. Relationship between Betel Quid Consumption and Hypertension Incidence among Productive-Age Individuals in the Wee Karou Community Health Center Area

Betel Quid Consumption	Case n (%)	Control n (%)	Total	p-value	OR (95% CI)
Regular	29 (64.4)	16 (35.6)	45	0.037	2.23 (1.10–4.52)
Irregular	56 (44.8)	69 (55.2)	125		
Total	85	85	170		

Based on Table 5 among 45 respondents who regularly consumed betel quid, 29 individuals (64.4%) were cases and 16 individuals (35.6%) were controls. Meanwhile, among 125 respondents who did not regularly consume betel quid, 56 individuals (44.8%) were cases and 69 individuals (55.2%) were controls.The Chi-Square test showed a p-value of 0.037 (<0.05), indicating a significant relationship between betel quid consumption and hypertension incidence. The OR value of 2.23 indicates that regular betel quid consumption increases the risk of hypertension by 2.23 times compared to irregular consumption.

Discussion

The Relationship between Obesity and Hypertension Incidence

Obesity is a condition of excess adiposity that may be accompanied by impaired distribution or function of adipose tissue. From a pathophysiological perspective, this condition contributes to hemodynamic and metabolic changes associated with increased blood pressure through sodium retention, volume expansion, as well as activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system (Rubino F, 2025). The results of this study showed a significant relationship between obesity and hypertension incidence among productive-age individuals in the working area of Wee Karou Community Health Center, with a p-value = 0.044 and OR = 1.97. Respondents with obesity had a 1.97 times higher risk of being classified in the hypertension group compared to non-obese respondents. The proportion of hypertension was also higher in the obese group than in the non-obese group. These findings indicate that excess body weight remains a relevant factor in the profile of hypertension among productive-age individuals.

This study is in line with Parvanova et al., who stated that obesity is strongly associated with hypertension and significantly contributes to primary hypertension (Parvanova, 2023). It is also consistent with Umara et al., who found that waist circumference had the strongest positive correlation with systolic blood pressure, while BMI correlated with diastolic blood pressure. These findings support the literature stating that body fat accumulation is not merely a nutritional status indicator but also part of the pathophysiological mechanism of hypertension (Umara et al., 2024).The relationship between obesity and hypertension can be explained through sympathetic nervous system activation, stimulation of the renin-angiotensin-aldosterone system, sodium retention, intravascular volume expansion, and endothelial dysfunction due to low-grade chronic inflammation. Visceral fat

distribution has a stronger metabolic impact than subcutaneous fat, leading to increased blood pressure through vascular and renal regulatory disturbances (Parvanova et al., 2023).

The study also found that 30 non-obese respondents still experienced hypertension. Cross-tabulation showed that 16 individuals (53.3%) were smokers, 14 individuals (46.7%) had poor sleep quality, and 10 individuals (33.3%) regularly consumed betel quid. This indicates that obesity is not the only factor associated with hypertension, as hypertension can still occur in non-obese individuals due to other risk factors. The relationship between obesity and hypertension highlights the need for comprehensive prevention efforts through weight control, a healthy diet low in salt and fat, regular physical activity, and continuous health education to reduce hypertension risk in the community.

The Relationship between Smoking Habits and Hypertension Incidence

Smoking is active exposure to cigarette smoke that can cause both acute and chronic effects on the cardiovascular system, particularly through endothelial dysfunction, inflammation, and thrombosis that accelerate atherosclerosis (Ishida et al., 2024). The results of this study showed a significant relationship between smoking habits and hypertension incidence among productive-age individuals in the Wee Karou Health Center area, with a p-value = 0.044 and OR = 1.97. Smokers had a 1.97 times higher risk of developing hypertension compared to non-smokers. The proportion of hypertension was also higher among smokers.

This finding is consistent with Elsyah et al., who analyzed the 2023 Indonesian Health Survey data in East Java, showing that smoking and exposure to secondhand smoke were significantly associated with hypertension ($p < 0.001$), with smoking status being the most dominant factor (Elsyah et al., 2025). It is also in line with Siregar et al., who emphasized that toxic substances in cigarettes, such as nicotine and carbon monoxide, can impair vascular and cardiac function (Siregar et al., 2026).

Physiologically, nicotine increases sympathetic nervous system activity, accelerates heart rate, causes vasoconstriction, and increases cardiac output. Long-term exposure worsens oxidative stress, endothelial function, arterial stiffness, and atherosclerosis, clearly demonstrating its harmful effects on the cardiovascular system (Hu et al., 2024).

The study found that 41 non-smoking respondents still had hypertension. Cross-tabulation showed that 27 individuals (65.9%) were obese, 25 individuals (61.0%) had poor sleep quality, and 11 individuals (26.8%) regularly consumed betel quid. This indicates that smoking is not the only contributing factor to hypertension. These findings emphasize the importance of smoking cessation, reducing exposure to tobacco smoke, increasing awareness of its health risks, and promoting a healthy lifestyle to reduce hypertension risk.

The Relationship between Sleep Quality and Hypertension Incidence

Sleep quality refers to an individual's satisfaction with overall sleep experience, including sleep efficiency, latency, duration, and wakefulness after sleep onset. Poor sleep quality is also associated with increased blood pressure variability (Nelson KL, 2022). The results showed a significant relationship between sleep quality and hypertension incidence, with a p-value = 0.001 and OR = 2.91. Respondents with poor sleep quality had a 2.91 times higher risk of developing hypertension compared to those with good sleep quality.

This finding is consistent with Trimenda et al., who found a relationship between sleep quality and hypertension among final-year university students ($p = 0.020$), with 42.1% experiencing poor sleep quality (Trimenda et al., 2025). It is also consistent with Anggita et al., who found a significant relationship between sleep quality and hypertension among elderly individuals ($p < 0.05$), where 77.3% had poor sleep quality and 65.9% had hypertension (Anggita et al., 2024). Physiologically, poor sleep quality affects blood pressure through increased sympathetic tone, decreased parasympathetic activity, elevated stress hormones, circadian rhythm disruption, and reduced nocturnal dipping. Chronically, this results in persistently elevated blood pressure, explaining why sleep quality showed the strongest association among all studied variables (Zheng, 2025). The study also found that 35 respondents with good sleep quality still experienced hypertension, indicating that other risk factors also contribute. This highlights the importance of sleep hygiene, adequate sleep

duration, reduced screen time before bedtime, a comfortable sleep environment, and stress management.

The Relationship between Betel Quid Consumption and Hypertension Incidence

Betel quid consumption involves chewing betel nut or betel-based products containing arecoline as the main active alkaloid, and this habit has been associated with hypertension and adverse cardiovascular outcomes (Huang et al., 2024). The results showed a significant relationship between betel quid consumption and hypertension incidence, with a p-value = 0.037 and OR = 2.23. Regular betel quid users had a 2.23 times higher risk of developing hypertension compared to irregular users. This finding is important as it shows that a socio-cultural habit also has cardiovascular implications. This is consistent with Wenda et al., who found a significant relationship between betel nut consumption and hypertension in Papua ($p < 0.05$) (Wenda et al., 2020). It is also supported by Tseng et al., who reported higher hypertension risk among betel quid chewers in Taiwan (Tseng et al., 2008). Arecoline and other active compounds stimulate the autonomic nervous system, increase heart rate, and trigger hemodynamic responses that elevate blood pressure. Long-term exposure may contribute to sustained hypertension risk (Itaki et al., 2024). The study found that 56 respondents who did not regularly consume betel quid still had hypertension, indicating that multiple risk factors contribute to hypertension. These findings highlight the need for reducing or stopping betel quid chewing, increasing health education, and promoting healthy lifestyles to prevent hypertension.

CONCLUSION

Based on the results of the study on the determinants of hypertension among productive-age individuals (15–64 years) in the working area of Wee Karou Community Health Center, Sumba Barat Regency, it can be concluded that several behavioral and lifestyle factors are significantly associated with the occurrence of hypertension. Obesity was found to have a significant relationship with hypertension incidence, where obese individuals had a 1.97 times higher risk of developing hypertension compared to non-obese individuals (p-value = 0.044; OR = 1.97). Similarly, smoking habits were also significantly associated with hypertension, with smokers having a 1.97 times higher risk compared to non-smokers (p-value = 0.044; OR = 1.97).

In addition, sleep quality showed the strongest association among the studied variables. Respondents with poor sleep quality had a 2.91 times higher risk of experiencing hypertension compared to those with good sleep quality (p-value = 0.001; OR = 2.91). Furthermore, betel quid consumption was also significantly related to hypertension, where individuals who regularly consumed betel quid had a 2.23 times higher risk of developing hypertension compared to those who did not (p-value = 0.037; OR = 2.23). Overall, the findings of this study indicate that obesity, smoking habits, poor sleep quality, and betel quid consumption are important determinant factors that contribute to the occurrence of hypertension among productive-age individuals in the working area of Wee Karou Community Health Center.

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