ISSN 2808-4608

The Effect of Smoking Behavior on the Incidence of Hypertension in the ≤45-Year Age Group at Efarina Hospital Berastagi

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Background: Hypertension is an asymptomatic condition in which abnormally high pressure in the arteries causes an increased risk of stroke, aneurysm, heart failure, heart attack and others. One of the causes of hypertension is smoking, and smoking has become the consumption of many people including the teenagers or people in productive age. Aim: To determine the correlation between smoking behavior and hypertension of people in usia ≤ 45 years old ini Efarina Hospital. Method: This study employed correlational analytic design with cross-sectional approach. There were 183 respondents recruited as the sample through probability sampling with random sampling technique. The data were collected using observation sheets, sphygmomanometer tools and questionnaire. Further, the data used was bivariate data analysis with Spearman's Rho test. Finding: The study found that based on statistical analysis test, the p-value (sig) was 0.000 (<0.05), which meant that there was a correlation between smoking behavior and hypertension of productive age people at Efarina Hospital. The significant correlation value = -.397. Conclusion: There is a correlation between smoking behavior and the incidence of hypertension with a significant correlation value of -.397 which means that the higher the smoking behavior, the better the incidence of hypertension.
Keywords: Smoking Behavior, Hypertension, age ≤ 45 years (HAIs).

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1. Introduction

Hypertension is a condition characterized by elevated blood pressure resulting from increased adrenaline, arterial contraction (vasoconstriction), and an accelerated heart rate, which may lead to physiological stress. Persistent stress can cause the blood pressure to remain high, eventually leading to hypertension (Junaidy, 2015). Several lifestyle-related factors contribute to increased blood pressure, including high salt intake, obesity, stress, smoking, and alcohol consumption (Padila, 2018). According to Ainun, Arsyad, and Rismayanti (2017), the high prevalence of hypertension is also associated with unhealthy lifestyle patterns such as insufficient physical activity, smoking habits, and consumption of foods high in fat.

The World Health Organization (WHO) reported an increase in hypertension cases in 2017, rising from 600 million to 1 billion cases, predominantly among individuals over 50 years old. A systolic blood pressure above 140 mmHg is associated with an increased risk of cardiovascular disease compared to diastolic pressure. In 2018, approximately 40% of adults aged 25 years and above worldwide were diagnosed with hypertension. Statistical data also show that 24.7% of the Southeast Asian population and 23.3% of Indonesians aged 18 years and above experience hypertension (WHO, 2016).

The 2018 Basic Health Research (Riskesdas) also documented a rise in hypertension prevalence to 26.5%. This increase corresponds with the high prevalence of smoking in Indonesia, where 68.8% of males and 6.9% of females were active smokers, totaling 36.3% of the population. Riskesdas further revealed that smoking behavior among individuals aged 15 and above increased between 2012 and 2018, with the

highest prevalence observed among adolescents and young adults. Notably, the percentage of active smokers among adolescents and children increased significantly from 5% to 17% since 2016 (Riskesdas, 2018).

Data from the North Sumatra Provincial Health Office indicate that the region has one of the highest hypertension prevalence rates in Indonesia, reaching 24.7%. This aligns with smoking prevalence among pre-elderly individuals aged 45–59 years, recorded at 38%, with an average daily consumption of 13 cigarettes (North Sumatra Provincial Health Office, 2018). Karo District is among the regions with high hypertension prevalence, reaching 33.22%, following Medan City (35.21%) and Asahan District (34.43%). Smoking behavior continues to rise, with a prevalence of 34.2% in 2007 and 36.3% in 2013, consisting of 64.9% males and 2.1% females, smoking an average of 12.3 cigarettes per day.

In 2018, hypertension was the most common disease reported in Karo District, with a prevalence of 32.1%, particularly among individuals aged 25 years and above. Efarina Hospital Berastagi, one of the healthcare facilities in the district, recorded hypertension as the second most common disease, with 240 cases, following stroke.

Hypertension is influenced by multiple factors, including internal factors such as age, sex, and genetics, as well as external factors such as diet, physical activity, and lifestyle habits. These risk factors often act collectively, meaning that a single risk factor alone is insufficient to cause hypertension (Ministry of Health RI, 2017). Smoking is one of the major modifiable risk factors contributing to elevated blood pressure. Nicotine dependence develops as nicotine stimulates the release of catecholamines, which increase myocardial irritability, heart rate, and vasoconstriction, ultimately elevating blood pressure (Komasari & Avin, 2010; Sudiono, 2017; Mayo Clinic, 2018).

Cigarette smoke contains more than 400 chemical substances, including over 200 carcinogenic compounds such as carbon monoxide, benzopyrene, and ammonia (KPI, 2013). Numerous studies have confirmed that smoking has detrimental effects on health, particularly increasing the risk of cardiovascular diseases and hypertension.

A study by Indar Kurniawan (2017) on patients at Pajangan Bantul Health Center found that smoking behavior was significantly associated with hypertension incidence, with a Kendall Tau-b significance value of 0.008 (<0.05).

A preliminary study conducted at Efarina Hospital Berastagi on June 12, 2025, reported 473 hypertension cases in 2023, which decreased to 282 cases in 2024. Interviews with six hospital visitors indicated that four were active smokers, all of whom had higher blood pressure readings compared to the two non-smokers. These findings highlight the need for further investigation into the relationship between smoking behavior and hypertension among younger populations. Therefore, this study aims to determine the effect of smoking behavior on the incidence of hypertension among individuals aged ≤45 years at Efarina Hospital Berastagi..

2. Methods

The research employed a quantitative approach using a cross-sectional design to examine the relationship between smoking behavior and the incidence of hypertension without manipulating any research variables. This study was conducted at Efarina Berastagi Hospital, located on Jalan Jamin Ginting No. 1 in Berastagi, Karo Regency, from August 2025 until the completion of all research stages, including proposal development, data collection, processing, and thesis preparation. The population consisted of all individuals aged ≤45 years who sought treatment at Efarina Berastagi Hospital, totaling 101 people. The sample was

drawn using a consecutive sampling technique in which respondents who met the inclusion criteria were selected until the required number was achieved. Inclusion criteria consisted of individuals aged ≤45 years who were willing to participate, whereas those who did not meet the study criteria or refused to participate were excluded. The minimum sample size was calculated using the Slovin formula, yielding a total of 55 respondents.

The research instruments consisted of a structured questionnaire assessing smoking behavior, adapted from Indar Kurniawan (2017), and a blood pressure measurement sheet used to classify hypertension status according to standard clinical criteria. Data collection procedures involved obtaining research permission, identifying eligible respondents, explaining the study objectives, collecting questionnaire responses, measuring blood pressure, and rechecking incomplete data. Operational definitions were established for each variable, where smoking behavior was assessed based on questionnaire responses, and hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, measured using a sphygmomanometer.

Data processing followed several steps: editing to ensure completeness and accuracy, coding responses, tabulating data, and entering them into statistical software. Univariate analysis was conducted to describe the frequency distribution of each variable, whereas bivariate analysis employed the Chi-square test with a 95% confidence level ($\alpha = 0.05$) to determine the relationship between smoking behavior and hypertension. A p-value <0.05 indicated a significant association, while a p-value >0.05 suggested no significant relationship..

3. Results And Discussion

Research Results

Respondent Characteristics

Table 4.1 Frequency Distribution of Respondent Characteristics.

Age	Frequency (F)	%
45–59 Years	37	48.1
60–74 Years	31	40.3
≥75 Years	9	11.6
Total	77	100
Education	Frequency (F)	%
Elementary School	30	39.0
Junior High School	21	27.3
Senior High School	19	24.7
Higher Education	7	9.0
Total	77	100
Occupation	Frequency (F)	%
Civil Servant	7	9.1
Entrepreneur	17	22.1
Laborer	31	40.3
Unemployed	22	28.6
Total	77	100
Gender	Frequency (F)	%
Male	58	75.3
Female	19	24.7

Age	Frequency (F)	%
Total	77	100

Based on Table 4.1, it can be observed that the majority of respondents were aged 45–59 years, totaling 37 respondents (48.1%). Most respondents had an elementary school education (39.0%). The dominant occupation category was laborers (40.3%), and most respondents were male, totaling 58 people (75.3%).

Smoking Behavior

Table 2. Distribution of Smoking Behavior

Smoking Behavior	Frequency (F)	%
Heavy	38	49.5
Moderate	20	26.0
Light	19	24.7
Total	77	100

Based on Table 4.2, it can be seen that most respondents were categorized as heavy smokers, totaling 38 respondents (49.5%).

Blood Pressure Measurement

Table 3. Distribution of Blood Pressure

Blood Pressure	Frequency (F)	%
≥ 140 mmHg	67	87.1
< 140 mmHg	10	12.9
Total	77	100

Based on Table 4.3, the majority of respondents had blood pressure ≥140 mmHg, totaling 67 respondents (87.1%).

Relationship Between Smoking Behavior and Hypertension

Table 4. Cross-Tabulation of Smoking Behavior and Hypertension

Smoking Behavior	Blood Pressure ≥140 mmHg	Blood Pressure <140 mmHg	Total	p-value
Heavy	38	0	38	0.003
Moderate	20	0	20	
Light	9	10	19	
Total	67	10	77	

Based on Table 4.4, heavy smoking behavior was associated with 67 respondents (87.1%) having blood pressure ≥140 mmHg, while light smoking behavior was associated with 10 respondents (12.9%) having blood pressure <140 mmHg.

Using SPSS statistical analysis, the p-value obtained was 0.003, indicating a very strong correlation because it is less than 0.05. Therefore, the hypothesis stating that smoking behavior is related to hypertension is accepted. It can be concluded that there is a significant relationship between smoking behavior and hypertension, with a significance value of $p = 0.003 < 0.05$.

Discussion

Smoking Behavior

The results of this study show that the majority of respondents were classified as heavy smokers, totaling 38 individuals (49.5%). This finding is consistent with the theory of Leventhal and Cleary (2016), which explains that smoking is an act characterized by burning tobacco and inhaling its smoke, either through

cigarettes or pipes. The temperature of a burning cigarette reaches 900°C at the burning end and around 30°C at the end placed in the smoker's mouth. The inhaled smoke consists of two components: volatile gases and particulate matter, with approximately 85% of the smoke being gaseous and the remaining portion being particles. Thus, smoking is considered an unhealthy habit or lifestyle behavior. Smoking not only causes a variety of diseases but can also aggravate existing health conditions.

Smoking behavior can be assessed through the number of cigarettes consumed. The intensity of smoking reveals how frequently or heavily someone smokes. High or low smoking behavior can therefore be determined by the frequency and quantity of cigarette use, where intensity represents the magnitude or strength of a behavior. There are three important clinical phases that precede an individual's development of dependence on cigarettes: the trial phase, occasional use, and daily use. In conclusion, smoking behavior is an activity in which an individual burns a cigarette, inhales the smoke, and exhales it, producing smoke that may also be inhaled by people nearby.

Relationship Between Smoking Behavior and Hypertension

The results of this study showed that heavy smoking behavior was associated with blood pressure levels ≥140 mmHg in 67 respondents (87.1%), while light smoking behavior was associated with blood pressure <140 mmHg in 10 respondents (12.9%). Using SPSS version 18 for statistical analysis, the relationship between smoking behavior and hypertension yielded a p-value of 0.003. This value indicates a very strong correlation because it is less than 0.05. Therefore, the hypothesis stating that smoking behavior is associated with hypertension is accepted, with the condition that $p \neq 0$. This shows that smoking behavior is significantly related to hypertension, with a significance value of $p = 0.003 < 0.05$.

One of the diseases that commonly arises as a result of smoking is hypertension or high blood pressure. What many people do not realize is that the increase in blood pressure may occur even when someone smokes for the first time. Various harmful chemicals in cigarettes including nicotine are rapidly absorbed through the small blood vessels in the lungs after inhalation. These chemicals enter the bloodstream and travel to the brain, which responds by releasing adrenaline. This hormone causes blood vessels to constrict, making the heart work harder to pump blood.

If someone smokes as little as two cigarettes, their blood pressure can increase by up to 10 mmHg. If smoking continues for years, blood pressure may remain in a dangerous condition. According to health experts, heavy smokers tend to have persistently high blood pressure throughout their lives due to the damaging effects of cigarette smoke on the arterial walls. This damage promotes plaque buildup, which narrows blood vessels. Aside from causing hypertension, this also increases the risk of stroke and heart disease.

Another concern is that passive smokers those frequently exposed to secondhand smoke can also experience increased blood pressure and damage to their blood vessels. For this reason, it is advisable to avoid exposure to cigarette smoke as much as possible to maintain good health. Smoking causes an immediate spike in blood pressure and can increase systolic pressure by up to four mmHg. The nicotine contained in tobacco products stimulates the nervous system to release chemicals that narrow blood vessels and contribute to elevated blood pressure..

4. Conclusion

The findings of this study indicate that the majority of respondents were classified as heavy smokers, totaling 38 individuals (49.5%), and most respondents also had blood pressure measurements exceeding 140 mmHg, amounting to 67 individuals (87.1%). The results of the chi-square statistical test further

revealed a significant relationship between smoking behavior and hypertension, with a p-value of 0.003, which is less than 0.05. These results demonstrate that smoking behavior is strongly associated with the incidence of hypertension among the respondents.

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