



**THE RELATIONSHIP BETWEEN ENERGY DRINK CONSUMPTION DEPENDENCE,
ALCOHOL CONSUMPTION LEVEL, AND OBESITY ON THE INCIDENCE OF
HYPERTENSION**

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ABSTRACT

Hypertension is non-communicable disease with high and increasing incidence. Based on the Profile Book of Asy-Syifa' West Sumbawa Hospital 2022, there were 2686 cases of hypertension. Dependence on energy drink consumption, alcohol consumption level, and obesity play a role in causing hypertension through their effects on impaired cardiac output and vascular resistance. This research aimed to analyse the relation between dependence energy drink consumption, alcohol consumption level, and obesity to the incidence of hypertension at Asy-Syifa' Hospital, West Sumbawa. The research utilized an observational analytical approach utilizing a cross-sectional study design. A total of 75 samples were chosen through a purposive sampling method, adhering to the inclusion and exclusion criteria. Data was gathered using questionnaires, BMI results, and patient blood pressure examination results. The data was analyzed using the Chi-Square correlation test. The analysis results indicated a correlation between dependence on energy drink consumption and its association with the incidence of hypertension in Asy-Syifa' West Sumbawa Hospital ($p = 0.026$). There is an association between alcohol consumption levels and the incidence of hypertension in Asy-Syifa' Hospital West Sumbawa ($p = 0.002$). There is an association between obesity and the incidence of hypertension in Asy-Syifa' Hospital West Sumbawa ($p < 0.001$).

Keywords : alcohol consumption level; energy drink dependence; hypertension; obesity

INTRODUCTION

Hypertension is a condition where the systolic blood pressure rises to 140 mmHg or higher and/or the diastolic blood pressure reaches 90 mmHg or more (Perhimpunan Dokter Hipertensi Indonesia, 2021). The global prevalence of hypertension, as reported by the Global Burden of Hypertension affects 33% of adults aged 30-79 years worldwide. The Southeast Asian region according to WHO has a prevalence of hypertension above 45% (World Health Organization, 2023). Modifiable risk factors for hypertension include family history, age, and gender. Unmodifiable risk factors include an unhealthy diet, obesity, excessive alcohol consumption, smoking, stress, high cholesterol, and diabetes (Ekasari et al., 2021). The consumption of energy drinks among the community has increased compared to the previous year. Energy drinks are drinks containing caffeine and taurine, multivitamins, macronutrients, ginseng, ginger, and so on in the form of 150 mL, 250 mL bottles or powders dissolved into drinks. Each package contains at least 100 kcal of energy (Anggadiredja et al., 2021). The negative impact of consuming caffeine in high doses results in relaxation of bronchial smooth muscle, stimulating the central nervous system to activate sympathetic response, increased heart muscle contraction, and increased blood pressure (Windasari, 2021).

Alcohol consumption in West Nusa Tenggara according to RISKESDAS in 2018 increased significantly to 38.7%. Alcohol is a drink containing ethanol or ethyl alcohol (C₂H₅OH) (Anggadiredja et al., 2021). Alcohol thickens the blood, forcing the heart to work harder. This leads to elevated cortisol levels in the

blood, which in turn stimulates the renin-angiotensin-aldosterone system (RAAS), resulting in an increase in blood pressure (Jayanti et al., 2017). The prevalence of obesity in Indonesia according to Riskesdas in 2018 was 21.8% (Arifani & Setyaningrum, 2021). Obesity is a condition where a person has a BMI ≥ 25 according to the Asia Pacific guidelines (Lim et al., 2017). In obesity, high levels of fat increase the release of leptin. High leptin conditions cause activation of pro-inflammatory cytokines and result in hypertension (Rumaisyah et al., 2023). Obesity can also show signs of oxidative stress due to an imbalance of the body's free radicals, including Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS). Oxidative stress affects endothelial dysfunction and atherosclerosis resulting in hypertension (Suryadinata & Sukarno, 2019). Previous studies have not discussed the relationship between energy drink consumption dependence, alcohol consumption levels, obesity, and the incidence of hypertension, especially in West Sumbawa Regency. This study will discuss The examination of the connection between dependence energy drink consumption, level of alcohol consumption, and obesity to the occurrence of hypertension in Asy-Syifa' Hospital, West Sumbawa.

The government's effort to deal with the incidence of hypertension is to direct health centres with promote, prevent, and control hypertension have been carried out, starting with IEC (Communication, Information, and Education) counseling for the community about hypertension, early detection, partnerships, and community empowerment. Early detection is carried out by health centres by providing health examination services and also serving blood pressure checks through programmes that can be accessed in the community such as the Integrated Development Post for Non-Communicable Diseases (Posbindu PTM) (Rumaisyah et al., 2023). Despite government efforts, hypertension cases at Asy-Syifa' Hospital in West Sumbawa are still among the top 10 diseases. Based on the profile book of Asy-Syifa' West Sumbawa Hospital, outpatient essential hypertension cases are still increasing, from 366 new visit patients in 2021 to 400 new visit patients in 2022. This shows that hypertension is a serious health problem in West Sumbawa Regency. (RSUD Asy-Syifa' Sumbawa Barat, 2021, 2022). The purpose of this study is to see the relationship between the dependence of energy drink consumption on the incidence of hypertension in Asy-Syifa' West Sumbawa Hospital, to see the relationship between the level of alcohol consumption on the incidence of hypertension in Asy-Syifa' West Sumbawa Hospital, and to see the relationship between obesity and the incidence of hypertension in Asy-Syifa' West Sumbawa Hospital

METHODS

This research employed a quantitative approach using an observational analytical study with a cross-sectional design. This research was conducted in August - September 2024 which took place at the Internal Polyclinic of Asy-Syifa' West Sumbawa Hospital. The participants in this study were individuals diagnosed with hypertension in internal clinic Asy-Syifa' West Sumbawa Hospital, patients who had a history of energy drink consumption, patients who had a history of alcohol consumption, and obese patients in the internal clinic of Asy-Syifa' West Sumbawa Hospital. The participants in this study were a subset of the population that satisfied the specified inclusion and exclusion criteria. The samples calculated using the Lemeshow formula is $67.24 = 68$ people. To prevent errors during the study, the researcher added 10% of the initial sample size so that the sample size for this study consisted of 75 individuals. The independent variables is energy drink consumption dependence, alcohol consumption level, and obesity. While the dependent variable is the incidence of hypertension. The research tools used the DSM V criteria energy drink consumption dependence questionnaire, the WHO-AUDIT scale alcohol consumption level questionnaire, and patient medical record (RM) data consisting of blood pressure, weight, and height. The results analysed univariately and bivariately. Bivariate analysis in this study was used to see the association between the dependent and the independent variable using the Chi-Square test. The analysis was assisted by Statistical Package For The Social Science (SPSS) with a significant level (α) = 0.05 and Confidence Interval (CI) = 95% with testing conditions based on the p value. If the p-value is less than 0.05, H_0 is rejected and H_a is accepted, indicating a relationship between the variables

being tested. If the p-value is greater than 0.05, H₀ is accepted and H_a is rejected, suggesting no relationship between the variables being tested.

RESULTS

Table 1.
Respondent Characteristics (n= 75)

Respondent Characteristics	f	%
Age		
20-29 y.o.	20	26,7
30-39 y.o.	7	9,3
40-49 y.o.	23	30,7
50-59 y.o.	25	33,3
Job		
Labour	12	16
Honorary Employee	2	2,7
Farmer	25	33,3
Civil Servant	3	4
Police	5	6,7
Driver	2	2,7
Self-employed	25	33,3
Unemployment	1	1,3
Last Education		
Elementary School	14	18,7
Junior High School	7	9,3
Senior High School	42	56
Undergraduate	11	14,7
Master	1	1,3

Based on Table 1, the majority of respondents, based on age, are between 50-59 years old, with 25 individuals (33,3%), based on occupation, farmers and self-employed jobs each 25 people (33,3%), and based on the latest education, the most is senior high school with 42 respondents (56%).

Table 2.
Univariate Analysis of Hypertension Incidence (n= 75)

Variable	F	%
No Hypertention	42	56
Hypertention	33	44

Based on Table 2, from 75 samples of respondents at Asy-Syifa' West Sumbawa Hospital, there were 33 hypertensive respondents (44%).

Table 3.
Univariate Analysis of Energy Drink Consumption Dependence (n= 75)

Variable	F	%
No Dependence	31	41,3
Mild Dependence	19	25,3
Moderate Dependence	12	16
Severe Dependence	13	17,3

According to Table 3, from 75 samples of respondents at Asy-Syifa' West Sumbawa Hospital, the number of respondents with mild dependence was 19 people (25,3%), moderate dependence was 12 people (16%), and heavy dependence was 13 people (17,3%). Therefore, the total number of respondents dependent on energy drink consumption was 44 people (58,7%).

Table 4.
Univariate Analysis of Alcohol Consumption Level (n= 75)

Variable	f	%
No Consumption	17	22,7
Low Consumption Level	16	21,3
Medium Consumption Level	14	18,7
High Consumption Level	16	21,3
Very High Consumption Level	12	16

Based on Table 4, from 75 samples of respondents at Asy-Syifa' West Sumbawa Hospital, there were 16 respondents with low consumption level (21.3%), 14 respondents with moderate consumption level (18.7%), 16 respondents with high consumption level (21.3%), and 12 respondents with very high consumption level (16%). Therefore, a total respondents consumed alcohol was 58 people (77.3%).

Table 5.

Univariate Analysis of Obesity (n= 75)

Variable	F	%
No Obesity	29	38,7
Obesity	46	61,3

Based on Table 5, out of 75 samples of respondents at Asy-Syifa' West Sumbawa Hospital, 46 respondents (61.3%) were obesity.

Table 6.

Bivariate Analysis Energy Drink Consumption Dependence on the Hypertension Incidence

Energy Drink Consumption Dependence	Incidence of Hypertension				Total		p value
	No Hypertention		Hypertention		f	%	
	f	%	f	%			
No Dependence	21	28	10	13,3	31	41,3	0,026
Mild Dependence	13	17,3	6	8	19	25,3	
Moderate Dependence	3	4	9	12	12	16	
Severe Dependence	5	6,7	8	10,7	13	17,3	

Based on table 6, from 75 respondent samples, the Pearson Chi-Square correlation yielded a p-value of 0.026. Interpreting the results, since the p-value is less than 0.05, H0 is rejected and Ha is accepted. Thus, there is a relationship between energy drink consumption and the occurrence of hypertension at Asy-Syifa' West Sumbawa Hospital.

Table 7.

Bivariate Analysis Alcohol Consumption Level on the Hypertension Incidence

Alcohol Consumption Level	Incidence of Hypertension				Total		p value
	No Hypertention		Hypertention		f	%	
	f	%	f	%			
No Consumption	14	18,7	3	4	17	22,7	0,002
Low Consumption Level	9	12	7	9,3	16	21,3	
Medium Consumption Level	11	14,7	3	4	14	18,7	
High Consumption Level	4	5,3	12	16	16	21,3	
Very High Consumption Level	4	5,3	8	10,7	12	16	

Based on table 7, from 75 samples of respondents, the Pearson Chi-Square correlation test produced a p-value of 0.02. Interpreting the results, since the p-value is less than 0.05, H0 is rejected and Ha is accepted. Therefore, a relationship exists between the level of alcohol consumption and the incidence of hypertension in Asy-Syifa' West Sumbawa Hospital.

Tabel 8.

Bivariate Analysis Obesity on the Hypertension Incidence

Obesity	Incidence of Hypertension				Total		p value
	No Hypertention		Hypertention		f	%	
	f	%	F	%			
No Obesity	25	33,3	4	5,3	29	38,7	<0,001
Obesity	17	22,7	29	38,7	46	61,3	

Based on table 8, out of 75 sample respondents, the Pearson Chi-Square correlation test resulted in a p-value of <0.001. Interpreting the results, since the p-value is less than 0.05, H0 is rejected and Ha is accepted. Hence, there is a relationship between obesity and the occurrence of hypertension at Asy-Syifa' West Sumbawa Hospital.

DISCUSSION

Respondent Characteristics

The highest age of respondents was 50-59 years old, totalling 25 people (33.3%). The number of hypertensive patients in respondents aged 50-59 years was 11 people (14.7%). Based on the Joint National Association (JNC) VIII and American Heart Association surveys, the risk of suffering from hypertension will increase with age (Sinuraya et al., 2017). The most common occupation of respondents was farmer, 25 people (33.3%). The number of hypertensive patients in farmer respondents was 13 people (17.3%). Farmers are more at risk of hypertension due to the habit of consuming coffee and smoking (Ulfa et al., 2024). The highest number of respondents with senior high school education was 42 people (56%). The number of hypertensive patients in respondents with senior high school education was 18 people (24%). This is because the respondent's level of knowledge is still lacking so that the hypertension prevention behaviour of the respondents is still classified as lacking (Sinuraya et al., 2017).

Incidence of Hypertention

The results of this study 33 people (44%) of respondents aged 19 - 59 years suffered from hypertension. This figure exceeds the 2021 prevalence of hypertension among individuals aged 18 years and older in West Sumbawa Regency is 26%. This is attributed to both unchangeable risk factors (such as family history, age, and gender) and modifiable risk factors (including poor diet, insufficient physical activity, obesity, excessive alcohol consumption, smoking, stress, high cholesterol, and diabetes) (Ekasari et al., 2021).

Energy Drink Consumption Dependence

The analysis results indicated that the prevalence in the dependence category was higher than in the non-dependence category, with a total of 44 dependent respondents (58.7%) with a description of mild dependence 19 people (25.3%), moderate dependence 12 people (16%), heavy dependence 13 people (17.3%). Respondents often consume energy drinks to get instant energy and can increase endurance while working. The caffeine and taurine in energy drinks provide a stimulant effect that helps patients stay awake and focused, especially when they experience fatigue or lack of energy (Windasari, 2021).

Alcohol Consumption Level

The analysis showed that the prevalence of alcohol consumption category was more than the non-consumption category. A total of 58 respondents (77.3%) consumed alcohol with a low consumption level of 16 people (21.3%), a moderate consumption level of 14 people (18.7%), a high consumption level of 16 people (21.3%), and a very high consumption level of 12 people (16%). Influencing factors are social environmental factors such as trial and error, escaping problems, lack of knowledge, and poor neighbourhood and family. Stress is also an influence as people perceive that consuming alcohol can temporarily relieve stress (Lito, 2021).

Obesity

The analysis results revealed that the prevalence of obesity was more at 46 people (61.3%) compared to non-obese respondents. Risky food consumption behaviour (sugary foods, sweet drinks, soft drinks and instant food) and lack of physical activity cause obesity due to an imbalance between energy input and expenditure, causing the energy that enters the body to be used only a little and most of it is stored in the form of fat (Arifani & Setiyaningrum, 2021).

Relationship Between Energy Drink Dependence on Hypertension Incidence

This study indicates a relationship between the dependence on energy drink consumption and the occurrence of hypertension, with a p-value of 0.026. Many respondents were dependent on energy drink consumption due to work factors, especially in the context of the need to increase stamina and focus.

Energy drink dependence is when a person feels the need to consume more energy drinks to get the desired effect or feels that the amount usually consumed has no effect so they want to increase the amount of energy drink consumption (Windasari, 2021). Energy drink dependence is a risk factor for hypertension as high levels caffeine and taurine can raise the concentrations of renin, catecholamines, and dopamine in the blood plasma. These substances will activate the sympathetic nervous system, resulting in increased contraction of the heart muscle, then increase heart rate and lead to increased blood pressure. Caffeine intake exceeds 400 mg per day for adults, 100 mg per day for adolescents (aged 12-18 years), and 2.5 mg per kg of body weight for children (under 12 years old). Caffeine stimulates the central nervous system and causes vasoconstriction of blood vessels, leading to increased blood pressure. Energy drinks also contain high amounts of sugar, which may lead to insulin resistance and contribute to obesity. Insulin resistance and obesity is also strongly linked to elevated blood pressure and eventually hypertension. (Al-Shaar et al., 2017). The findings of this study are consistent with the research conducted by Dariusz Nowak, Michał Gośliński, and Kamila Nowatkowska (2018), which reported a p-value of 0.003, indicating a relationship between dependence on energy drink consumption and the occurrence of hypertension (Nowak et al., 2018). Saiful & Julahir's research (2023) is also in line with the p-value of 0.000, indicating a significant association between the frequency of energy drink consumption and the occurrence of hypertension (Batubara & Siregar, 2024).

Relationship Between Alcohol Consumption Level on Hypertension Incidence

This study shows there is a relationship between the level of alcohol consumption and the occurrence of hypertension, with a p-value of 0.002. Many respondents consumed alcohol due to social environment such as trial behaviour, escape from problems, lack of knowledge, and unsupportive family conditions. Peers and impressionability, the desire to cover up shortcomings, and unhealthy associations also contribute to alcohol consumption. Stress also influences the level of alcohol consumption as it can feel temporarily stress-relieving. (Lito, 2021). Alcohol contains ethanol, which can raise blood acidity, causing the blood to become thicker. This in turn leads to an increase in cortisol levels in the blood, resulting in heightened activity of the renin-angiotensin-aldosterone system (RAAS). In addition, alcohol consumption leads to an increase in the volume of red blood cells, which raises blood viscosity. As a result, the heart has to work harder, causing an elevation in heart rate and subsequently raising blood pressure (Jayanti et al., 2017). High levels alcohol consumption (31 g/day) can lead to endothelial dysfunction (the lining of blood vessels that controls contraction and relaxation) resulting in increased vascular resistance which in turn leads to increased blood pressure. In addition, alcohol consumption disrupts the electrolyte balance (sodium and potassium) that plays a role in blood pressure regulation, thus risking the incidence of hypertension (Okojie et al., 2020). Alcohol can also interfere with arterial blood vessel function causing arterial plaque build-up (atherosclerosis) so that the blood vessels' lumen becomes constricted. As a result, blood pressure increases, resulting in hypertension (Phillips et al., 2022). The findings of this study align with the research of Onosetale Okojie, Faheem Javeed, Lawman Chiwome, & Pousettef Hamid (2020) with a p value <0,001 which shows the findings regarding the association between alcohol consumption levels and the occurrence of hypertension. Research by Aryn Phillips, et al (2022) is also consistent with this study with a value of (p < 0,05) (Phillips et al., 2022).

Relationship Between Obesity on Hypertension Incidence

This study indicating a relationship between obesity and the occurrence of hypertension, with a p-value of <0.001. Many respondents were obese due to a lack of physical activity and excessive food intake resulting in an imbalance between calories in and calories burned. Low physical activity can lead to the accumulation of calories in the body, which eventually leads to fat accumulation and obesity. In addition, an irregular diet, such as excessive intake of sweet, fatty, instant foods, sugary and carbonated drinks, can lead to obesity. Obesity directly causes hypertension because the amount of circulating blood increases, resulting in increased cardiac output. If the body mass is greater, heart must exert more effort as the body requires additional oxygen and nutrients. This leads to an increase in blood pressure as the

heart exerts more effort to pump blood. Indirectly, obesity affects the sympathetic nervous system and the Renin Angiotensin Aldosterone System (RAAS). The hormone aldosterone enhances sodium reabsorption (leading to sodium and water retention) in the kidneys, which increases blood volume. Excess fat that accumulates in vital organs such as the kidneys, it raises interstitial hydrostatic pressure, decreases blood flow to the renal tubules, and promotes increased sodium reabsorption. This sodium reabsorption contributes to glomerular vasodilation and hyperfiltration, and stimulates renin secretion. There will then be disturbances in lipid metabolism, such as an increase in triglycerides and cholesterol in the blood leads to the buildup of fat in the blood vessels (atherosclerosis). As a result, smooth muscle contraction and vasoconstriction occur, increasing blood pressure (Arifani & Setiyaningrum, 2021).

Elevated leptin levels lead to an increase in VEGF, which stimulates the hyperactivation of the sympathetic nervous system, either directly or indirectly through chronic remodeling of the gliovascular interface in the hypothalamus. While leptin levels are high in obesity, adiponectin levels are lower. Adiponectin enhances insulin sensitivity, which leads to hyperinsulinemia and insulin resistance. The mechanism through which insulin resistance raises blood pressure involves the phosphorylation of insulin receptor-2, activating the sympathetic nervous system and releasing neuropeptides that further increase leptin production. Additionally, insulin resistance can excessively activate angiotensin II, resulting in smooth muscle contraction, systemic vasoconstriction, increased vascular resistance, and reduced blood flow in the renal medulla, all of which contribute to higher blood pressure (Rumaisyah et al., 2023). The findings of this study are consistent with the research conducted by Jonesius Eden Manoppo, Andi Zulkifli Abdullah, Citra Kesumasari, Ridwan Mochtar Thaha, Sri Achadi Nugrahaeni, Stang Abdul Rahman, and Ridwan Amiruddin (2020), which reported a p-value of 0.001, demonstrating a significant relationship between obesity and the occurrence of hypertension (Manoppo et al., 2020). Similarly, the study by Badriyah & Pratiwi (2024) aligns with these results, with a p-value of 0.001, indicating a significant association between obesity and the incidence of hypertension (Batubara & Siregar, 2024).

CONCLUSION

This study based on respondents data at Asy-Syifa' West Sumbawa Hospital shows that there is a association between energy drink consumption dependence and the incidence of hypertension ($p = 0.026$), the level of alcohol consumption and the incidence of hypertension ($p = 0.002$), and obesity and the incidence of hypertension ($p < 0.001$).at Asy-Syifa' West Sumbawa Hospital. Respondents are advised to be more mindful of their energy drink and alcohol consumption, monitor their BMI by maintaining a balanced diet and engaging in regular physical activity to manage obesity, and ultimately prevent the occurrence of hypertension.

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