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The Relationship Between Cholesterol Consumption And Central Obesity Levels And Blood Pressure In Hypertensive Patients At Puskesmas II North Denpasar

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ABSCTRACT

Hypertension is an increase in blood pressure above 140/90 mmHg which is influenced by high cholesterol consumption and central obesity. The purpose of this study was to determine the relationship between cholesterol consumption and central obesity levels and blood pressure in hypertensive patients at the North Denpasar II Health Center. This type of research is observational with a cross sectional design. This research was carried out in February-March 2025. The number of samples in this study is 93 people. The data collected included cholesterol consumption levels using the SQ-FFQ form, central obesity data assessed through waist circumference, and blood pressure measured with RGB BPM PRO (Blood Pressure Monitor). The statistical test used is the spearman rank test. The results showed that as many as 43% had higher cholesterol consumption levels, 78.5% had central obesity, and as many as 61.3% had hypertensive blood pressure. The results of the analysis showed that there was a relationship between the level of cholesterol consumption and blood pressure ($p<0.05$) and there was a relationship between central obesity and blood pressure ($p<0.05$).

Keywords: cholesterol, central obesity, hypertension

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INTRODUCTION

Hypertension is one of the most common non-communicable diseases in developed and developing countries. High blood pressure, which occurs when the arteries relax and deflate or when the heart expands, is called diastolic and the number is lower according to (Gultom et al., 2019).

Adults aged 30-79 years worldwide are estimated to have hypertension as much as 33%. The number of people living with hypertension doubled between 1990 and 2019, from 650 million to 1.3 billion. The Southeast Asian region has increased from 118 million in 1990 to 294 million in 2019 according to the WHO(WHO, 2023). Results of the (Survei Kesehatan Indonesia, 2023) The prevalence of hypertension based on the results of measurements in the population aged ≥ 18 years is 30.8% where this figure has not met the national target so that management and treatment of this condition is needed. Then the results of the (Survei Kesehatan Indonesia, 2023) prevalence hypertension in Bali province based on the results of measurements in the population aged ≥ 18 years received as much as 22.8%.

Hypertension is influenced by various factors including behavioral factors such as smoking and alcohol consumption, hereditary factors and incorrect intake. One example of intake that can cause hypertension is the intake of cholesterol which is risky. Consuming cholesterol that is risky is consuming excessive cholesterol. High cholesterol causes cholesterol deposits and blockages of arteries, which inhibit blood flow to the heart, brain, and other parts of the body according to (Safitri, 2020). In addition, excessive cholesterol consumption can result in an increase in Body Mass Index (BMI) and fall into the category of obesity. Obesity is a condition in which the body has an amount of fat that exceeds its needs. Especially the accumulation of fat in the abdomen, in addition to being the thickest, also occurs the earliest in the obesity process. The purpose of this study was to determine the relationship between cholesterol consumption and central obesity levels and blood pressure in hypertensive patients at the North Denpasar II Health Center.

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METHOD

The type of research conducted was observational with a cross sectional design. The location of the research is at the North Denpasar II Health Center. The research was conducted in February-March 2025. The study population was patients with outpatient hypertension with a consecutive sampling technique conducted by selecting subjects according to inclusion criteria. The sample size of this study is 93 people. The collection of sample identity data was collected by direct interviews with the identity form, then the level of cholesterol consumption was obtained by conducting an interview using the SQ-FFQ form. Central obesity was measured by being assessed through waist circumference, and blood pressure was measured by nurses with RGB BPM PRO (Blood Pressure Monitor). The statistical test used is the spearman rank test with a confidence level of 5% or (α) = 0.05.

RESULTS

Sample Characteristics

In this study, a research sample of 93 respondents who are hypertensive patients at the North Denpasar II Health Center was obtained. The characteristics of the research sample include gender, age, education, and occupation. More details are presented in table 1.

Table 1.Sample Characteristics Distribution

Characteristic	f	%
Gender		
Man	41	44,1
Woman	52	55,9
Sum	93	100
Age		
<30	2	2,2
30-49	29	31,2
≥50	62	66,7
Sum	93	100
Long Diagnosed Hypertension		
≤5 years	66	71,0
>5 years	27	29,0
Sum	93	100

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Education Level		
No School	12	12,9
SD	21	22,6
JUNIOR	10	10,8
SMA	22	23,7
D4/S1	28	30,1
Sum	93	100
Work		
IRT	30	32,3
Laborer	16	17,2
Private Employees	15	16,1
Self employed	18	19,4
PNS	6	6,5
Pension	8	8,6
Sum	93	100

Based on the results of the study from 93 samples, the number of female samples was 52 people (55.9%). The age distribution of the sample was mostly 62 people (66.7%) with an age range of ≥50 years. Some of the sample as many as 66 people (71.0%) were diagnosed with hypertension ≤ 5 years. The level of education of the sample in this study was very diverse, but most of the samples had their last education at the D4/S1 level which amounted to 28 people (30.1%). Judging from the work, most of them are IRTs as many as 30 people (32.3%).

Blood pressure

Blood pressure is classified into two categories: controlled (<140/90 mmHg) and uncontrolled (≥140/90 mmHg). Blood pressure results can be seen in table 2

Table 2. Sample Distribution Based on Blood Pressure

Blood pressure	f	%
Controlled	36	38,7
Uncontrolled	57	61,3
Sum	93	100

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The results in table 2 show that most of the samples, i.e. 57 people (61.3%) had uncontrolled blood pressure, followed by 36 people (38.7%) with controlled blood pressure.

Cholesterol Consumption Rate

The level of cholesterol consumption is categorized into 3 categories, namely less (<80% needs), good (80-110% needs) and more (>110% needs). The results of cholesterol consumption levels can be seen in table 3.

Table 3. Sample Distribution Based on Cholesterol Consumption Level

Cholesterol Consumption Rate	f	%
Less	13	14,0
Good	40	43,0
More	40	43,0
Sum	93	100

Based on table 3, the level of cholesterol consumption in the sample can be categorized into three, namely 13 people (14%) less, 40 people (43%) and more than 40 people (43%). These results show the distribution of cholesterol consumption levels of the study sample

Central Obesity

Central obesity measured by waist circumference measurement is categorized into two based on gender, namely for men it is said that the waist circumference is > 90 cm and not central obesity < 90 cm while for women it is said that the central obesity is >80 cm and not central obesity if the < is 80 cm. Results of the central obesity category with those not visible in table 4

Table 4

Sample distribution based on central obesity status

Central Obesity Status	f	%
Not Obese	20	21,5
Central Obesity	73	78,5
Sum	93	100

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Based on table 4, it can be categorized into 2, namely 20 people (21.5%) who are not obese and 73 people (78.5%) who are centrally obese

The Relationship between Cholesterol Consumption Levels and Blood Pressure

From the results of the study conducted on 93 samples conducted at the North Denpasar II Health Center, it can be seen that out of 57 samples with uncontrolled blood pressure, 30 people (52.6%) had cholesterol consumption levels in the category of more than needed. Then 36 samples with controlled blood pressure were obtained, 10 people (27.8%) had cholesterol consumption levels in the category more than needed

Table 5. Distribution of Blood Pressure Sample Based on Cholesterol Consumption Level

Cholesterol Consumption Rate	Blood pressure				Sum		*p*	*r*
	Controlled		Uncontrolled					
	n	%	n	%	n	%		
Less	7	19,4	6	10,5	13	14,0	0,018	0,244
Good	19	52,8	21	36,8	40	43,0		
More	10	27,8	30	52,6	40	43,0		
Sum	36	100	57	100	93	100		

Based on the scale of the data used, the *Spearman Rank Correlation* test was carried out, and the P-value result *showed a* figure of 0.018 (< 0.05) which means that there is a significant relationship between the level of cholesterol consumption and the blood pressure of hypertensive patients. Then the value r = 0.244 where the relationship between the two variables has a unidirectional nature (positive r value) which means that the higher the cholesterol intake, the higher the degree of hypertension with the interpretation of the correlation coefficient between the variables has a very weak level of relationship.

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The Relationship of Central Obesity to Blood Pressure

From the results of the study conducted on 93 samples, it can be seen that 57 samples with uncontrolled blood pressure were obtained as many as 51 people (89.5%) with central obesity. Then 36 people with controlled blood pressure were obtained as many as 22 people (61.1%) with central obesity.

Table 6. istribution of Sample Blood Pressure Based on Central Obesity Status

Central Obesity Status	Blood pressure				Sum		*p*	*r*
	Controlled		Uncontrolled					
	n	%	n	%	n	%		
Not Obese	14	38,9	6	10,5	20	21,5	0,001	0,336
Central Obesity	22	61,1	51	89,5	73	78,5		
Sum	36	100	57	100	93	100		

Based on the scale of the data used, the *Spearman Rank Correlation* test was carried out, and the P-value result showed a figure of 0.001 (< 0.05) which means that there is a significant relationship between central obesity and the blood pressure of hypertensive patients. Then the value r = 0.336 where the relationship between the two variables has a unidirectional nature (positive r value) which means that the higher the central obesity, the higher the degree of hypertension with the interpretation of the correlation coefficient between the variables has a sufficient level of relationship

This section presents the results that have been processed based on the type of research used. This section presents the data presented in tables and diagrams and their interpretations clearly. The interpretation in the results section is not just reading out the data that has been obtained, but the data obtained is interpreted clearly and precisely accordingly.

DISCUSSION

Hypertension or high blood pressure is a condition in which there is an increase in blood pressure above the normal threshold of 120/80 mmHg according to (Mambang Sari et al., 2019). Hypertension is characterized by a constantly increased blood pressure in the arteries due to the force of the heart pumping blood excessively. This condition can affect systolic and

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diastolic blood pressure in the arterial system continuously. Factors that can increase blood pressure are divided into two categories: irreversible factors such as age, gender, race, and family history as well as modifiable factors such as lack of an unbalanced diet, high cholesterol levels, obesity, physical activity, excessive alcohol consumption, smoking, and stress.

Blood pressure is the pressure produced by the blood flow on the walls of the arteries due to the contraction of the heart that pumps blood throughout the body. Based on the results of the study conducted on 93 samples of hypertension patients, it was found that 57 people (61.3%) had blood pressure >140/90 mmHg which was included in hypertension. This disease occurs due to the narrowing of blood vessels due to plaque attached to the walls of blood vessels. These plaques are made up of cholesterol, fat, and other substances that can build up on the walls of blood vessels and cause blockages. Blockages can increase resistance to blood flow which can cause damage to blood vessels so that blood vessels become stiffer and cannot widen properly. The state of increased blood pressure will result in the heart having to work harder to distribute blood throughout the body through the blood vessels according to (Dewati et al., 2023).

Based on the results of the research that has been carried out, most of the people (43%) have a higher cholesterol consumption level, which is >110% of the need, where from the results of the research the majority consume processed foodstuffs such as chicken, egg yolks, and also pork. A factor that can contribute to the occurrence of blood vessel blockage is the consumption of foods high in cholesterol which causes the accumulation of plaque on the walls of blood vessels which can block blood flow. Excess cholesterol in the body can accumulate in the walls of blood vessels causing atherosclerosis, which is a condition of narrowing or hardening of blood vessels. If the level of high cholesterol consumption will affect the total cholesterol level in the body, based on research conducted by (Solikin & Muradi, 2020) from statistical analysis using tests Spearman Rank showed that there was a significant relationship between blood cholesterol levels and hypertension degrees in 41 respondents.

From the results of non-parametric analysis with the Spearman Rank Correlation It was found that there was a significant relationship between the level of cholesterol consumption

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and the blood pressure of hypertensive patients at the North Denpasar II Health Center (p = 0.018). High blood cholesterol levels can lead to cholesterol buildup on the walls of blood vessels. If this buildup continues to grow, it can clog blood vessels and disrupt blood flow, increasing the workload of the heart and worsening hypertension. High cholesterol consumption can increase total cholesterol levels in the body, based on research (L et al., 2020) The spearman test showed a value of p=0.04 so that there was a relationship between cholesterol levels and hypertension in employees of the Faculty of Psychology and Health of UIN Sunan Ampel Surabaya. Additionally, consuming high cholesterol can increase triglyceride levels in the blood, which can contribute to fat buildup in the stomach.

There were also results of central obesity measurement in 93 samples and the results of 73 people (78.5%) who were centrally obese were obtained. Being overweight is one of the risk factors that can affect the occurrence of increased blood pressure. Anthropometric examinations can be used to assess nutritional status including overweight and obesity, through measurements of parameters such as body mass index (BMI) and waist circumference. According to research conducted by (Gunaidi et al., 2022) The results of statistical analysis using the Chi-Square test showed that there was a significant relationship between waist circumference and hypertension, with a p-value of 0.047.

Obesity occurs due to high intake of fatty foods which then increase blood fat and cholesterol levels, then this condition can trigger hypertension. Based on the results of the research analysis, the study used a non-parametric test through the Spearman Rank Correlation there is a significant relationship between central obesity and blood pressure of hypertensive patients at Puskesmas II North Denpasar (p = 0.001). This is in line with research conducted by (Nurohmi et al., 2024) Central obesity has a significant relationship with hypertension, both systolic and diastolic blood pressure (P-value < 0.05). The risk of developing high systolic blood pressure was 3.056 times higher in individuals with central obesity, while the risk of developing high diastolic blood pressure was 2.662 times higher.

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CONCLUSION(S)

The results of the study conducted at the North Denpasar Health Center II showed that the blood pressure of hypertensive patients was 61.3% of the samples were included in uncontrolled hypertension and 38.7% of the samples were included in controlled hypertension, the cholesterol consumption level in hypertensive patients as much as 43% of the samples had a higher level of cholesterol consumption, the measurement of central obesity in hypertensive patients as much as 78.5% of the samples was included in central obesity. Based on the Spearman Rank Correlation test , there was a significant relationship between cholesterol consumption and blood pressure ($p = 0.018$) while there was a significant relationship between central obesity and blood pressure ($p = 0.001$). Advice is expected to patients and families to control cholesterol consumption and engage in regular physical activity, health centers provide hypertension prevention education and programs, and researchers develop effective interventions to manage cholesterol and central obesity in people with hypertension.

Conflict of Interest

We all authors declare that there is no conflict of interest from this research activity.

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