RELATIONSHIP BETWEEN SODIUM INTAKE WITH HYPERTENSION LEVELS IN PATIENTS IN THE REGION DIAMOND PUSKESMAS WORK BOALEMO DISTRICT

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ABSTRACT

Hypertension is a big problem not only in western countries but also in Indonesia, hypertension is suffered by one billion people worldwide and it is estimated that in 2025 it will increase to 1.5 billion people. Intake of nutrients that also affect blood pressure is sodium. This study aims to determine the relationship between sodium intake and the level of hypertension in patients in the working area of Berlian Health Center, Boalemo Regency. The method in this study used a cross sectional research design to see if there is a relationship between sodium intake and the level of hypertension in patients in the working area of the Berlian Health Center, Boalemo Regency. The results showed normal sodium intake with mild hypertension in 12 people (31.5%), moderate in 4 people (10.5%) and 1 person in weight (2.6%), while sodium intake was more with mild hypertension in 4 people (10.5%), moderate as many as 12 people (31.5%) and heavy as many as 5 people (13.1%). It can be concluded that there is a significant relationship between sodium intake and the level of hypertension in patients in the working area of the Berlian Health Center, Boalemo Regency, with a value of p=0.002 (p< 0.05).

Keywords: Intake, Sodium, Hypertension

PRELIMINARY

Hypertension is an increase in systolic and diastolic blood pressure due to heart and blood vessel abnormalities that continue for a long time. Hypertension that often occurs in Indonesia is primary hypertension, which is around 90-95%, occurs due to unclear causal factors, so it is often referred to as " *The Silent Killer* " because sufferers usually do not feel the symptoms for years [14].

Hypertension is a problem big, not only in western countries but also in Indonesia. Hypertension suffered by one billion people worldwide and it is estimated that in 2025 it will increase to 1.5 billion people. hypertension every year or high blood pressure contributed to the deaths of nearly 9.4 million people due to heart disease and stroke and if combined these two diseases are the number one cause in the world [14].

The occurrence of the epidemiological transition along with the demographic transition has resulted in a change in the pattern of infectious diseases to non-communicable diseases (PTM) such as degenerative diseases which are the main factors of morbidity and mortality problems. PTM can kill 41 million people per year or equivalent to 71% of global deaths. Every year, 15

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million people who die from PTM are aged between 30 and 69 years. More than 85% of these deaths occur in countries with lower middle income [15].

It is estimated that the prevalence of hypertension continues to increase significantly, around 29% of adults in the world suffer from hypertension. Cases of death from PTM such as hypertension have increased compared to cases of death from infectious diseases. The mortality rate due to hypertension increased from 7.6% in 2008 to 9.5% in 2014 [10].

The prevalence of hypertension that has been diagnosed by health workers is 24.2%. The proportion of hypertension sufferers in urban areas in 2013 was 26.1% and increased to 34.4% in 2018. Meanwhile, the proportion of hypertension sufferers in rural areas was 25.5% in 2013 and increased to 33.7% in 2018. This pattern is assumed to cause a higher prevalence of hypertension in urban areas than in rural areas due to potentially behavioral risk factors for this problem [10].

Based on the results of the 2018 Riskesdas of Gorontalo Province for Prevalence Rates of Non-Communicable Diseases (PTM) above the average National Prevalence Rate which includes Cancer Prevalence Gorontalo Province ranks 3rd highest with a significant increase from the 2013 Riskesdas results, the prevalence of hypertension occupies ranked 6th highest nationally at 10.11%, an increase compared to 2013 of 9.5%. Meanwhile, the number of sufferers in Boalemo Regency was 2,485 people or reached 7.45 % [6].

Based on Boalemo Regency data in 2021 consisting of 11 Community Health Centers, the highest to lowest achievements were at the Saritani Health Center, the number of Hypertension sufferers was 1,314 (66%), Berlian 891 (53%), Bongo Zero 1,152 (49%), Tilamuta 2,675 (36%), Dulupi 366 (33%), Botumoito 863 (23%), Paguyaman Pantai 368 (18%), Mananggu 521 (17%), Bongo II 648 (14%), Paguyaman 525 (13%) [5].

Nutrient intake also affects blood pressure, one of the micronutrients that affects blood pressure is sodium. Increased sodium intake causes the body to retain fluids which increase blood volume, so the heart has to pump harder to push the increased blood volume through increasingly narrow spaces which results in hypertension [16].

Excess sodium intake in the body can increase blood pressure. Sodium will be directly absorbed into the blood vessels, this causes sodium levels in the blood to increase. Sodium has the property of holding water, causing blood volume to rise. Consuming sodium continuously can cause hypertension [8].

According to research conducted by previous studies, it has been shown that the frequency of consumption of high-sodium foods (biscuits, salted fish, milk and its preparations, coffee and seasonings (MSG)) has a relationship with the incidence of systolic hypertension, while tea consumption has a relationship with the incidence of diastolic hypertension [1].

In previous research, it was shown that the consumption behavior variable associated with hypertension was consumption of salty food $\geq$ 1 time per day with hypertension. [7]

To find out sodium intake consumed by a person, you can go through the 24-hour Recal, and use the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) form. Sodium intake is the amount of sodium from food or drink consumed per day as measured using a *semi-quantitative food frequency form* for one month, categorized into two,

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namely more if intake is ≥ 2400 mg/day and sufficient if intake is <2400 mg/day [2]. .

The results of an initial survey conducted in the Diamond Health Center Boalemo Working Area, the number of hypertension patients from January to December 2021 was 891 patients (53%). Researchers conducted interviews with 5 respondents, where the results showed that 4 respondents said they often consumed foods high in sodium, while 1 other person said they rarely consumed foods high in sodium.

Hypertension or high blood pressure is an increase in blood pressure in the arteries. Where is Hiper which means excess, and Tensi which means pressure/voltage, so hypertension is a disorder of the circulatory system which causes an increase in blood pressure above normal values [11].

Hypertension or commonly called high blood pressure is an increase in systolic blood pressure above the normal limit of more than 140 mmHg and diastolic blood pressure of more than 90 mmHg. Hypertension is a condition where there is an increase in blood pressure which gives symptoms that will continue to a target organ such as stroke for the brain, coronary heart disease for the heart arteries, and right ventricular hypertrophy for the heart muscle [4].

Hypertension is a fairly serious medical condition which can significantly increase the risk of liver, brain, kidney, heart and other diseases. Hypertension can occur when blood pressure is greater than the arterial walls and the blood vessels themselves [15].

Sodium Intake Theory

WHO recommends limiting table salt consumption to 6 grams a day (equal to 2400 mg sodium). Salt consumption has a direct effect on blood pressure. It has been shown that the increase in blood pressure with aging, which occurs in all urban dwellers , is a result of the large amount of salt eaten. People who consume high salt in their diet are also people with blood pressure that increases with age . Conversely, people with low salt consumption show only a slight increase in blood pressure, along with increasing age [12].

There is evidence that those with a hereditary tendency to suffer from hypertension have a lower ability to excrete salt from the body. But they consume no more salt than other people , even though their bodies tend to store what they eat. Salt helps retain water in the body, the American Heart Association step II recommends, an average person consumes no more than 2400mg of salt per day, especially people who are sensitive to salt. Excessive salt diet can cause both hypertension. Because salt retains water will increase blood volume which will result in increased pressure in the arteries [12].

Sodium is the only element that is usually consumed in the form of table salt. If sodium intake increases, the kidneys will respond so that the excretion of salt out with urine will also increase. But if the effort to excrete sodium exceeds the threshold of the kidney's ability, the kidneys will retain oxygen so that the intravascular volume increases. Sources of sodium are table salt, monosodium glutamate (MSG), soy sauce, and foods preserved with table salt. Among unprocessed foods, vegetables and fruit contain the least amount of sodium [17].

Relationship between Sodium Intake and Hypertension

The relationship between the level of sodium consumption and the incidence of hypertension is that when there is an excess of salt content in the body, it will be disproportionately reabsorbed by about

20% through a process known as osmosis, so that the salt water remains stable. Excessive salt content continuously causes the volume in the blood circulation to be higher than it should be, as a result, the excess fluid increases the pressure on the walls of the blood vessels. These walls react by thickening and constricting, providing narrower spaces in the blood capillaries, and increasing "resistance" which in turn requires higher pressure to move blood to the organs [16].

Excess sodium intake can increase blood pressure. Sodium that enters the body will be directly absorbed into the blood vessels, this causes sodium levels in the blood to increase. Sodium has the property of holding water, so that blood volume increases and automatically makes blood pressure rise [9].

Salt consumption under normal conditions ranges from 2-3 tsp per day where this amount is still prone to increase hypertension. Therefore reducing salt consumption in hypertensive patients to ¼ - ½ tsp per day is one of the recommended steps. Either table salt or salt Others, contain high levels of sodium. So for people with hypertension, sodium restriction to 2-3 tsp per day managed to lower blood pressure 3.7 mm Hg systolic and 2 mm Hg diastolic blood pressure . Lifestyle modifications can be made by limiting salt consumption to 6 grams per day. [14].

SQ-FFQ theory

Semi-quantitative FFQ (SQ-FFQ) is a modified food frequency method by estimating or estimating URT in grams. In the semi-quantitative FFQ, the nutrient score in each subject is calculated by multiplying the frequency of each type of food consumed, which is obtained from the data on the exact composition of the food. Another definition of SQ-FFQ is a method or method of consumption that can provide information about nutritional intake data in general by modifying it based on the FFQ method [3].

The FFQ and SQ-FFQ functions are used to rank individual dietary patterns based on food or nutrient intake based on standard portion sizes that can be used as a reference for each type of food. The data obtained from the SQ-FFQ can be converted into energy and nutrient intake by multiplying the portion size fraction of each type of food per day with the energy or nutrient content derived from the list of appropriate food ingredients [3].

RESEARCH METHODS

This research approach is a quantitative research. Method Quantitative research can be interpreted as the method used to examine certain populations or samples, this type of research is descriptive analytic with a *cross-sectional study design* to see whether there is a relationship between sodium intake and hypertension levels in patients in the working area of the Berlian Health Center, Boalemo Regency.

This research was carried out from September to October 20 22. This research will be carried out in the Working Area of the Berlian Health Center , Boalemo Regency .

The population of this study was 154 hypertensive patients from July-August 2022 in the Working Area of Berlian Health Center, Boalemo Regency with a total sample of 38 respondents. Data analysis was performed univariately and bivariately using SPSS 21.0 for windows.

RESULTS AND DISCUSSION
Univariate analysis

Univariate analysis on each variable is displayed in the form of a frequency distribution of the characteristics of the respondents and the distribution of

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respondents based on sodium intake and the level of hypertension is shown in the table

Characteristics of respondents

Table 1. Distribution of respondent characteristics based on age and gender

Characteristics	F	%
Age		
40 – 55	6	15,8
56–70	32	84,2
Amount	38	100.0
Gender		
Man	7	18,4
Woman	31	81.6
Amount	38	100.0

Source: Primary Data, 2022

Based on table 5 above, it can be seen that most of the respondents are in the age range 56-70 years, namely as many as 32 respondents (84.2 %) and only 6 respondents who are in the age range of 40-55 or only 15.8% . Age prone to hypertension is in the range of 31-55 years and increases when entering middle age, which is around the age of 40 years . The risk of hypertension increases with age, due to the decline in various organ functions and changes in the elasticity of blood vessels [14].

, namely 28 respondents (73.7 %) and only 10 respondents who were male or only 26.3%. Gender of men and women have the same risk of experiencing hypertension. However, men are more at risk of experiencing hypertension at the age of 45, while women are more at risk of experiencing hypertension at the age of 65 and over, namely during menopause [14].

Table 2. Distribution of Respondents' Characteristics Based on Sodium Intake

Sodium Intake	F	%
Normal	17	44,7
More	21	55,3
Amount	38	100.0

Source: Primary Data, 2022

Based on table 6 above, it can be seen that most of the respondents had more sodium intake, namely 21 respondents (55.3%) and those who had normal sodium intake, only 17 respondents (44.7%), so that patients were given education or counseling about choosing good food ingredients and reducing the use of salt in processing the food to be consumed.

Table 3. Distribution of Respondents' Characteristics Based on Hypertension Levels

Hypertension Level	F	%
Light	16	42,1
Currently	16	42,1
Heavy	6	15,8
Amount	38	100.0

Source: Primary Data, 2022

Based on table 7 above, it can be seen that respondents with mild hypertension were 16 respondents (42.1%), moderate were 16 respondents (42.1%) and severe were 6 respondents (15.8%), patients besides receiving treatment also given education related to the provision of food in everyday life.

Brivariate analysis

Based on the data above, it can be seen that 12 respondents with normal sodium intake and mild hypertension, 4 respondents with normal sodium intake and moderate hypertension, 1 respondent with normal sodium intake and severe hypertension. While respondents with excess sodium intake and mild hypertension level were 4 respondents, more sodium intake and moderate hypertension level were 12 respondents, more sodium intake and severe hypertension level were 5 respondents. The results of the statistical analysis of

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the relationship between sodium intake and the incidence of hypertension showed that the p-value was 0.003 (p< 0.05). So it can be concluded that there is a relationship between sodium intake and the incidence of hypertension in the Working Area of Berlian Health Center, Boalemo Regency.

DISCUSSION

The Berlian Health Center area consists of 5 Fostered Villages namely Mustika Village, Mutiara Village, Permata Village, Bongo Tua Village and Diloato Village. Each village has a different level of hypertension depending on the number of patients. In 2021 the achievement of hypertension from the highest to the lowest achievement was in Mutiara Village with 250 hypertension sufferers (15.1%), Diloato Village with hypertension with 200 (12.1%), Permata Village with 177 hypertension sufferers (10.7), Bongo Tua Village with hypertension 140 (8.4%), and Mustika Village with 124 hypertension sufferers (7.5%) [5].

Hypertension is a problem big, not only in western countries but also in Indonesia. Hypertension suffered by one billion people worldwide and it is estimated that in 2025 it will increase to 1.5 billion people. hypertension every year or high blood pressure contributed to the deaths of nearly 9.4 million people due to heart disease and stroke and if combined these two diseases are the number one cause in the world [14].

Hypertension is generally defined as an increase in blood pressure which can result in the emergence of other accompanying diseases. Hypertension is characterized by blood pressure that exceeds 140/90 mmHg. Hypertension occurs due to the process of thickening of blood vessel walls and loss of elasticity of the arterial walls. This situation can accelerate the heart in pumping blood to overcome higher and higher peripheral resistance. Of all people with hypertension, 95% of sufferers have the possibility of inheriting or their offspring having the risk of suffering from hypertension in the future, while the other 5% causes diseases such as stroke, cardiovascular or kidney disorders [9].

Excess sodium intake can increase blood pressure. Sodium that enters the body will be directly absorbed into the blood vessels, this causes sodium levels in the blood to increase. Sodium has the property of holding water, so that blood volume increases and automatically makes blood pressure rise [9].

The sampling in this study was carried out using the *Purposive Sampling method,* this research process lasted for 6 days, from 12 September to 17 September 2022 carried out simultaneously with the activities of Prolanis, Germas and PTM. To find out the results of the patient's blood pressure, first blood pressure measurements are carried out by nurses, and anthropometric measurements, then the results are attached to the patient's medical record and further examination will be carried out by doctors and finally for researchers to provide counseling / education to patients.

The researcher explained the aims and objectives and asked the patient's willingness to participate as a respondent in this study. If the patient agrees, *informed consent will be given* which will be signed by the respondent. Furthermore, interviews were conducted by asking the foods consumed based on the *SQFFQ form,* namely foods that contain sodium. Before conducting interviews with respondents, the researcher then checked the completeness of the contents of the questionnaire and informed consent.

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Based on the results of research conducted at Berlian Health Center in Boalemo Regency with a sample of 38 respondents who had blood pressure checked, anthropometric measurements, and interviews, the following results were obtained:

Sodium Intake

Based on the data obtained from the results of sodium intake in patients in the working area of the Berlian Health Center, Boalemo Regency in 2022, 17 respondents (44.7%) had normal sodium intake, because some patients followed the instructions of officers when counseling was carried out in selecting food ingredients, reducing salt use when food processing. More sodium intake by 21 respondents (55.3%) is based on the fact that everyone's diet is different and they often choose food ingredients that are not recommended for consumption and use a lot of salt during food processing so that there are still patients who have being given counseling or given medication for consumption does not affect the patient's blood pressure.

Salt consumption (NaCl) is a very important requirement for humans, including as a spice and food preservative. So far, most people who consume food only think about taste and taste, so they pay less attention to what the body needs. Actually, consumption salt that is sold is not the cause of increased blood pressure. However, it is the sodium content in salt that causes hypertension [9].

An increase in sodium intake causes the concentration of sodium in the extracellular fluid to increase, an increase in extracellular fluid causes an increase in blood volume and blood pressure. An increase in blood pressure that occurs continuously can trigger an increase in the incidence of hypertension [14].

Hypertension Level

Based on table 7, the results of the Hypertension Level in patients in the working area of the Berlian Health Center in Boalemo Regency in 2022 obtained a mild hypertension level of 17 respondents (44.7%) because patients participate in Prolanis activities which are carried out every month at the Health Center to get treatment as well as directions or education either way the use of drugs and food to be consumed. Moderate hypertension level as many as 15 respondents (39.5%) because some patients still often consume unhealthy foods and do not routinely take the drugs that have been given. The level of severe hypertension was 6 respondents (15.8%) because the patients did not take medication regularly and still paid little attention to the selection of food ingredients to be consumed and the use of salt in food processing.

Many factors affect the increase in blood pressure so that it triggers the occurrence of hypertension, namely factors that cannot be changed and factors that can be changed. Factors that cannot be changed include age, gender, heredity, while factors that can be changed are body mass index , fat intake, sodium intake, smoking habits, coffee consumption, stress, and lack of physical activity [14].

Increased sodium intake can affect the secretion of the hormones renin, angiotensin, and aldosterone, and the hormone that plays a key role in increasing the incidence of hypertension is the hormone angiotensin II. The hormone angiotensin II works in two ways , namely through an increase in the ADH hormone, and stimulation of aldosterone secretion [14].

An increase in the ADH hormone results in less urine being excreted out of the body, so that the urine becomes concentrated and has a high osmolality.

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To dilute it, the intracellular fluid will be pulled out so that the extracellular fluid increases. As a result, there is an increase in blood volume and blood pressure in the blood vessels, which in turn causes hypertension. The second way is through stimulation of aldosterone secretion. The presence of aldosterone will reduce the secretion of NaCl by reabsorbing it from the kidney tubules, the increase in NaCl will be diluted by increasing the volume of extracellular fluid which results in an increase in blood volume and blood pressure which can cause hypertension [14].

Relationship between sodium intake and hypertension

Based on table 8, it was found that normal sodium intake and mild hypertension level were 12 respondents, moderate were 4 respondents, and weight were 1 respondent while sodium intake was more with mild hypertension level were 4 respondents, moderate were 12 respondents and weight were 5 respondents. This happens because there are still people who don't pay attention to a good diet, the selection of food ingredients to be consumed and the excessive use of salt.

The results of cross-tabulations that have been carried out show that respondents who have a sodium intake of more than 2400 mg and suffer from moderate and severe hypertension are more compared to those who have a light sodium intake and suffer from mild hypertension. Based on the statistical analysis of the relationship between sodium intake and the incidence of hypertension in Table 8, it shows that the p-value is 0.003 (p < 0.05). So it can be concluded that there is a relationship between sodium intake and the incidence of hypertension in the Working Area of Berlian Health Center, Boalemo Regency.

The results of this study are in line with the research conducted by Rahma and Baskari in 2019, where the results showed that most of the subjects who had sodium intake more than the 2013 RDA suffered from hypertension with a total of 42 people (95.5%), while subjects who had less sodium intake from the 2013 AKG did not suffer from hypertension with a total of 88 people (84.6%) with a p-value of 0.000 (p <0.05). So it can be concluded that there is a relationship between sodium intake and the incidence of hypertension in Japanan Village, Gudo District, Jombang Regency [13].

Another study conducted by previous researchers also showed the same results, namely that there was a relationship between sodium intake and blood pressure with a p-value of 0.003 (p < 0.05). Likewise with research conducted by Cho and Kim (2020) in Seoul, South Korea. The results of this study indicate that the risk factors for hypertension are salt intake, male gender, age , central obesity, and ethnicity. High sodium intake is associated with an increase in blood pressure (OR 1.04, 95% CI 1.01-1.07, p=0.017). A person who consumes a large amount of sodium has a 1.04-fold risk of developing high blood pressure compared to someone who consumes sodium in the sufficient category [4].

Sodium is associated with the incidence of high blood pressure because high salt consumption can shrink the diameter of the arteries, so the heart has to pump harder to push the narrower blood volume and will causes blood pressure to rise. The opposite will also occur when sodium intake is reduced, so will blood volume and blood pressure in some individuals [17].

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CONCLUSION

1. patient's sodium intake in the Working Area of Berlian Health Center most of them have more intake, namely as many as 21 patients (55.3 %) and only 17 normal patients (44.7 %)

2. The patient's hypertension level in the Working Area of Berlian Health Center who were in the mild category, namely 16 patients (42.1%), the moderate category, namely 16 patients (42.1%) and the severe category, namely 6 patients (15.8%).

3. There is a relationship between sodium intake and the incidence of hypertension in the Diamond Community Health Center, Boalemo Regency, with a value of p=0.003 (p< 0.05).

SUGGESTION

1. For health workers, so that they can carry out counseling or outreach activities for the community, especially for the elderly in order to increase knowledge about hypertension and sodium intake .

2. For the community, it is hoped that they can maintain food consumption patterns, especially for hypertensive patients.

3. For researchers, so that it can become material for scientific development studies to add information about sodium intake and hypertension levels.

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